

INDIGENOUS KNOWLEDGE and CLIMATE CHANGE Summaries/Résumés SAVOIRS AUTOCHTONES et CHANGEMENTS CLIMATIQUES



**2-3 November 2016
Marrakesh, Morocco**

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Co-organised by UNESCO and CNRS (France), in partnership with IPAAC and Tebtebba

INDIGENOUS KNOWLEDGE and CLIMATE CHANGE

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With support from the Swedish International Development Cooperation Agency, Japanese funds-in-trust to UNESCO and National Research Agency (France).

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SAVOIRS AUTOCHTONES et CHANGEMENTS CLIMATIQUES

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Cover Photo

© UN Photo/Kibae Park: Hmong indigenous people planting rice, Vietnam

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Summaries/Résumés & Bionotes

Unedited and in original language/Non éditée et dans la langue originale
Summaries and bionotes of all speakers can be found at

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Analyse des conditions du genre et de la vulnérabilité des femmes face au changement climatique dans le bassin versant de l'Ourika, Maroc

Sara BENBRAHIM & Abdellatif KHATTABI

Projet sur l'adaptation au changement climatique dans le bassin de Tensift au Maroc par une gestion améliorée du bassin versant et le paiement pour les services environnementaux (GIREPSE), Maroc

La présente étude a été réalisée dans le cadre du projet GIREPSE relatif à l'adaptation au changement climatique dans le bassin de Tensift au Maroc par une gestion améliorée du bassin versant et le paiement pour les services environnementaux. Son objectif est d'analyser la vulnérabilité des femmes, considérées comme étant un groupe social marginalisé, en rendant visible leurs rôles dans la vie quotidienne des ménages, d'identifier les inégalités liées au genre, de comprendre la vulnérabilité du genre face aux différents aléas climatiques ressentis ainsi que leurs impacts sur les conditions de vie et sur le bien-être de la femme dans le bassin versant de l'Ourika. Le diagnostic réalisé au niveau de cinq douars échantillonnés dans le territoire de la zone d'étude concerne l'analyse des rôles dévolus aux hommes et aux femmes dans différentes activités

et les mécanismes d'accès et de contrôle des ressources et bénéfiques. Il permet aussi la mise en exergue de la vulnérabilité du genre face aux changements climatiques. Pour aboutir à ces objectifs, nous avons eu recours à des outils participatifs de l'analyse socio-économique selon le genre. Les principaux résultats obtenus à l'issue de la réalisation de l'analyse sont que les femmes s'avèrent être plus vulnérables que les hommes face aux aléas climatiques, plus particulièrement les sécheresses et les inondations ; et que ces dernières, de par leur statut, sont doublement affectées : d'une part en tant que partenaire de l'homme dans les activités de production, et d'autre part en tant que femmes au foyer, responsables du bien-être du ménage, de la protection des enfants et de leur nourriture, lors des situations de crises causées par ces aléas climatiques.

Bionote

Sara BENBRAHIM

Après une année préparatoire aux études supérieures en agriculture (APESA) de l'Institut Agronomique et vétérinaire Hassan 2, Sara Benbrahim obtient son diplôme de foresterie générale de l'école nationale forestière d'Ingénieurs à Salé (2014), puis un diplôme d'ingénieur d'état des eaux et forêts de l'école nationale forestière d'Ingénieurs à Salé.

Abdellatif KHATTABI

Abdellatif Khattabi is an agronomic engineer from the Institut Agronomique et Vétérinaire Hassan II, Rabat (1981), and Ecole Supérieure du Bois, Paris France (1980). He holds a Master of Sciences (1988) in economics and PhD in Forestry (1992) from the university of Idaho, USA, a Master of Sciences in ICT, university of Louis Pasteur, Strasbourg,

France (virtual campus). He is now a full Professor at Ecole Nationale Forestière d'Ingénieurs since 1994, and visiting professor University Hassan II, Casablanca, university Mohamed V, Rabat, University Moulay Ismail, Meknes and University Abdelmalek Essadi, Tétouan. He is affiliated to the Royal Institute for Strategic Studies (IRES), Rabat, as a Research Associate. From 1981 to 1994, he was a research scientist at the National Center for Forestry Research, Rabat. His recent research and development interests deal with integrated natural resources management (water, coastal zones, wetlands, fisheries, etc.), environmental assessment,

climate change adaptation, and rural development. Abdellatif Khattabi is the author of many publications (book chapters, scientific papers, expertise reports, documents, etc.), recipient of numerous research grants and consultant for international (UNESCO, ISESCO, UNDP, World Bank, GIZ) and national public and private organizations. Fulbright Alumni, he is the president of the Regional Science Association of Morocco and a member of some professional associations and Lead author for the IPCC fifth report, chapter 5 (coastal zones and low laying areas). IZA Research Fellow since August 2014.

Climate change otherwise: Indigenous knowledge and the coloniality of reality

Anders BURMAN

Department of Human Geography, Human Ecology Division,
Lund University, Sweden

Several studies have shown that indigenous peoples are among the most vulnerable to the effects of climate change and attention has been drawn to indigenous knowledge as a component of climate change adaptation strategies. This paper argues, however, that in order to take indigenous knowledge seriously – i.e. not as “culture” in supposed opposition to “science” – indigenous realities and understandings of climate change need to be taken seriously. This is so because knowledge is not

produced in an ontological void. Rather, knowledge is produced in relation to notions concerning the nature of reality and being. Moreover, in order not to make a mere instrumentalist use of indigenous knowledge, this paper argues that not only the practical outcomes of indigenous knowledge ought to be assessed, but also the ontological lifeworlds within which such knowledge is generated. This paper is based on many years of ethnographic fieldwork in the Bolivian Andes.

Bionote

I received my PhD in Social Anthropology from the University of Gothenburg in 2009. 2009 to 2011 I was a Postdoctoral Scholar at the Department of Ethnic Studies at the University of California at Berkeley. I am currently a Senior lecturer at the Human Ecology Division at Lund University where I teach undergraduate and graduate courses, mainly related to Political Ecology and Environmental Anthropology.

I have published profusely on issues concerning indigenous peoples and movements, activism, cosmology, gender politics, political ontology, the issue of decolonization and knowledge production in relation to central topics of Political Ecology and Environmental Anthropology with a geographical focus on the Andes, Bolivia and Latin America.

I am currently engaged in a comparative research project called “Indigenous peoples and climate change”, focusing on how climate change is perceived and explained differently by different actors and from different ontological life worlds in Latin America. My research focuses primarily on the contradictions arising from the encounter between hegemonic notions of “nature” and “climate” and indigenous knowledge and understandings of the Andean landscape and cosmos. I aim to understand how these contradictions are negotiated and articulated in the indigenized political language of the Bolivian State and emerging oppositional indigenous movements, in a debate on climate justice.

Renforcement de la résilience des communautés pastorales sahéliennes au Burkina Faso : changements climatiques et utilisation des savoirs traditionnels

Hanafi DICKO¹ & Amadou DICKO²

¹ Climate Frontlines Partner, Fédération des Eleveurs du Burkina (FEB) au Sahel, Associations des Eleveurs Traditionnels du Sahel (Dawla Sahel), Burkina Faso

² Institut de l'Environnement et de Recherches Agricoles (INERA), Burkina Faso

Au Burkina Faso, l'élevage occupe une place très importante dans l'économie du Pays. Il participe pour plus 12% au PIB et procure environ 80% des recettes d'exportations. Le Sahel est la zone d'élevage par excellence au Burkina Faso. En effet, cette partie du pays possède les effectifs les plus élevés du pays en ce qui concerne les ruminants. Depuis de milliers d'années les communautés pastorales sahéliennes ont toujours entretenu leur activité d'élevage qui représente leur principal moyen de subsistance. De nos jours cette pratique ancestrale est fortement menacée par les changements climatiques. Autrefois pratiqué sous forme de transhumance ou de nomadisme, l'élevage au Sahel est aujourd'hui confronté à des problèmes multiples parmi lesquels il y a, la restriction des zones de parcours, les changements climatiques soutenus par

la variabilité saisonnière ainsi que les catastrophes naturelles de tout ordre. Aussi, cette disparation des zones de pâturage a occasionné des conflits sanglants entre agriculteurs et éleveurs menaçant ainsi cette cohabitation pacifique qui existe depuis plus de cent ans. En dépit de ces obstacles à l'épanouissement de l'élevage, les pasteurs et les agro-pasteurs des communautés sahéliennes ont toujours entretenu une connaissance traditionnelle utilisée à travers les générations pour réduire la vulnérabilité de leur activité et augmenter leur capacité à s'adapter. De ce fait les pasteurs et les agro-pasteurs des communautés sahéliennes au Burkina Faso ont su adapter leur calendrier saisonnier et développer d'autres techniques culturelles et d'élevages en se basant sur les connaissances traditionnelles transmises de génération en génération.

Bionote

***Amadou DICKO** est ingénieur de recherche en zootechnie-système de productions animales à l'Institut de l'Environnement et de Recherches Agricoles (INERA) du Burkina Faso. Il détient un diplôme d'Etudes Approfondies, en Gestion Intégrée des Ressources Naturelles, option Productions Animales de l'Université Polytechnique de Bobo-Dioulasso (UPB). Son domaine de recherche est l'amélioration de la production des races bovines locales dans le contexte des changements climatiques et de l'insécurité alimentaire.*

***Hanafi Sandou Faroukou DICKO** est agent technique à la retraite du Ministère des Ressources Animales du Burkina Faso. Il est également Représentant de la Fédération des Eleveurs du Burkina (FEB) au Sahel*

et Président de l'Association des Eleveurs Traditionnels du Sahel (Dawla Sahel). Cette Association s'est investie dans la défense des droits des éleveurs traditionnels dans les politiques nationales de développement et dans le renforcement de la résilience des éleveurs du Sahel face aux changements climatiques. Il a collaboré avec des équipes internationales y compris la Direction Générale de la météorologie du Burkina Faso dans le cadre de la recherche pluridisciplinaire sur la communication des prévisions des pluviométries saisonnières auprès des agriculteurs et agro-pasteurs du Burkina Faso. El Hadji DICKO est membre du comité exécutif de l'IPACC (Indigenous Peoples of Africa Co-ordinating committee) qui est un réseau 135 associations des peuples autochtones dans 21 pays d'Afrique.

Coping with a warming winter climate in Arctic Russia: Patterns of extreme weather affecting Nenets reindeer nomadism

Bruce C. FORBES

Arctic Centre, University of Lapland, Rovaniemi, Finland

Sea ice loss is accelerating in the Barents and Kara Seas in the northwest region of Arctic Russia. Assessing potential drivers and linkages between sea ice retreat/thinning and maintenance of the region's ancient and unique social-ecological systems is a pressing task. Tundra nomadism remains a vitally important livelihood for indigenous Nenets and their large reindeer herds. Warming summer air temperatures in recent decades have been linked to more frequent and sustained summer high-pressure systems over West Siberia, but not to sea ice retreat. At the same time, autumn/winter rain-on-snow events across the region have become more frequent and intense. Here we review evidence for autumn atmospheric warming and precipitation increases over Arctic coastal lands in proximity to Barents and Kara sea ice loss. Two major rain-on-snow events during November 2006 and 2013 led to massive winter reindeer mortality episodes on Yamal Peninsula. Fieldwork with migratory Nenets herders has revealed that the ecological and socio-

economic impacts from the catastrophic 2013 event will unfold for years to come. The suggested link between sea ice loss, more frequent and intense rain-on-snow events and high reindeer mortality has serious implications for the future of tundra Nenets nomadism. Nenets oral histories documented that smaller, more nimble privately owned herds fared better than larger collective herds. This strategy has already worked well for dealing with encroaching infrastructure. If Barents and Kara sea ice continues to decline, better forecasts of autumn ice retreat coupled with additional mobile slaughterhouses could help to buffer against reindeer starvation following future rain-on-snow events. Even a few days of early warning could make a critical difference. Realizing mutual coexistence of tundra nomadism within the Arctic's largest natural gas complex under a warming climate will require meaningful consultation, as well as ready access to – and careful interpretation of – real-time meteorological and sea ice data and modelling.

Bionote

Research Professor Bruce C. Forbes (PhD Geography, 1993, McGill University) leads the Global Change Research Group at the Arctic Centre, University of Lapland in Rovaniemi, Finland. He is also a Docent in Plant Ecology/Biogeography at the Faculty of Science, University of Oulu, Finland. Prof. Forbes has a background in applied ecology and geography in northern high latitudes, with special emphasis on permafrost regions. His experience is circumpolar, encompassing studies of rapid land use and climate change in Alaska, the Canadian High Arctic, various regions of northern Russia, and northernmost

Fennoscandia. His approach is strongly interdisciplinary and participatory, aiming for the co-production of knowledge, particularly concerning local and regional indigenous stakeholder-driven research questions. He has conducted fieldwork annually in the Arctic for the past 31 years. For the past 15 years his research has focused on: (1) resilience in social-ecological systems in close cooperation with indigenous Nenets and Sámi reindeer herders; and (2) analyses of proxy data sources for climate change, including extreme weather events, and vegetation productivity in Northwest Eurasian tundra ecosystems.

Traditional weather forecasting among Afar pastoralists in north eastern Ethiopia: Role in climate change adaptation

Mulubrhan Balehegn GEBREMIKAEEL

Climate Frontlines Partner, Mekelle University College of Dryland Agriculture and Afar Indigenous Development Community, Ethiopia

Traditional weather forecasting is applied by many indigenous communities worldwide to forecast weather and guide daily livelihood decisions and climate change adaptation measures. In many indigenous communities worldwide, such traditional weather forecasting still remains to be the only accessible, affordable and actionable source of weather and climate information. Therefore, it is important to document such indigenous knowledge to enhance its use in local climate change adaptation and utilize synergies with the formal weather forecasting system. In this study, I aimed to investigate and document traditional weather forecasting practices among Afar pastoralists of north eastern Ethiopia. Methodologically speaking, I did focused group discussions with clan leaders, community elders and experienced herders; and individual interviews with experienced rangeland scouts, traditional seers and prominent clan leaders.

The Afar traditionally predict weather and climate through the observation of diverse biophysical entities including the stars, winds, livestock, insects, birds, trees and other wildlife. Moreover, traditional seers also do ‘probabilistic prediction’. However, no single prediction is taken at face value; weather forecasting is a dynamic process where information is collected by traditional observations and predictions,

and is triangulated with different sources, including the formal weather forecasting system, to make the safest livelihood decisions. Before any forecasting information is used, it passes through three important traditional institutions that collect, share and analyze the information. These institutions include: 1) the ‘Edo’ or range scouting where traditional rangeland scouts are sent on a mission to assess weather and other spatially and temporally variable attributes on rangelands such as rangeland condition, security etc.; 2) the ‘Dagu’ – a traditional secured and reputable network, where weather information is shared; and, 3) the ‘Adda’ or a group of village elders in the traditional Afar governance system, who evaluate or weigh the pros and cons of forecasting information before making decisions to be followed by communities. These institutions make sure that not only the most probable forecasting is used for decision making, but also that forecasting techniques that lose their reliability are excluded through a circular feedback system.

This study shows that because of its reliability and trust by local community, indigenous weather forecasting can be used for effective adaptation to climate change at local level, while synergies can be created for integration with formal weather forecasting system.

Bionote

I am an Assistant professor of rangeland ecology and pastoralist development at Mekelle University Ethiopia. My responsibilities in this position include teaching courses related to pastoralists climate change adaptation, undertaking research in pastoral areas. I have a long time engagement with Afar pastoralists in north Eastern Ethiopia, so much so, that I now am an honorary member of the Indigenous Afar Pastoral Development Community in Aba’ala Afar.

My recent research work and engagement with the Afar in a project sponsored by the UNESCO Climate Frontlines Project is aimed at understanding the traditional weather forecasting, climate change adaptation and climate change knowledge in order to help them enhance their adaptive capacity. Most of my work with the Afar pastoralists involve, community based engagement involving focused group discussions, participatory observation and practical learning from clan leaders, traditional rangeland scouts, traditional seers of rain makers etc.

Fighting fire with fire

Nolan HUNTER

Kimberly Land Council, Australia

The Kimberley Land Council (KLC) has been delivering innovative Indigenous community development to members for almost 40 years and has developed a strategy for overcoming the key challenges facing Indigenous communities in the north west of Australia, to achieve remote jobs, training, education and health outcomes. This approach nurtures a culture of entrepreneurship in remote Indigenous communities, increases the number of people employed on country and delivers significant environmental outcomes of benefit to the global community.

Managing the regions unique natural resources through Indigenous land management plays a critical role in protecting the Kimberley's rich cultural and environmental heritage. Traditional fire management, or 'right way fire', uses traditional knowledge and modern science practices to reduce the amount of greenhouse gases emitted to the atmosphere from unmanaged, potential dangerous wildfires.

An example is the North Kimberley Fire Abatement Project. The project registered Australia's only savanna burning carbon project on traditional native title lands, which improve fire regimes through best practice management. Australian Research demonstrates that by shifting fire regimes in the tropical north from late dry season to the early dry season – in line with Traditional Indigenous fire practices – it is possible to reduce greenhouse gas emissions from wildfire by as much as half and produce valid carbon credits for carbon markets. There are now 65 projects registered across northern Australia, worth over \$100M, employing over 400 Indigenous rangers. A study by the United Nation University has found this technology could deliver the types of outcomes evidenced in Australia, in global savanna woodland, such as market based mitigation and adaptation, as well as, economic and social benefits to poor and remote communities.

Bionote

Nolan Hunter has been the Chief Executive Officer at the Kimberley Land Council since October 2011. He proudly identifies as a Bardi man from the Dampier Peninsular in northern Western Australia and has a strong connection to his people and a deep appreciation and understanding of his culture.

Nolan's career includes almost 27 years of strategic management background and 14 years in the Commonwealth public service including Indigenous, immigration and humanitarian affairs. He has been a Senior Migration Officer and Vice Consul with the Australian Consulate in Manchester, has served as a director of several Kimberley Indigenous organisations including Broome Aboriginal Media Association and is on the board for Kimberley Foundation Australia; and has been the Chairman of the National Native Title Council since 2011.

He has represented Kimberley Land Council at the UNFCCC Twenty First Conference of the Parties in

Paris (2015), presenting the North Kimberley Fire Abatement Project and the Kimberley Land Councils experience managing fire regimes to help reduce greenhouse gas emissions; the UN Permanent Forum on Indigenous issues (2015), advocating against the closure of remote Indigenous communities; the World Parks Congress on Indigenous Cultural Ecological knowledge (2014), inspiring solutions about protected areas and national parks and the Wild10 Conference in Spain (2013), discussing Indigenous people's role in conservation and land management.

Nolan is an active campaigner for Indigenous native title rights and management of country. He strongly supports the development of sustainable business enterprises based on Aboriginal cultural values as a way to generate wealth in remote communities, ignite social change and create positive futures for Kimberley Aboriginal people.

Pastoral and environmental network in the horn of Africa

Elizabeth KATUSHABE

Climate Frontlines Partner, Pastoral and Environmental Network in the Horn of Africa (PENHA), Uganda

The Bahima pastoralists' own knowledge of forecasting weather and climate, and their observations of, and potential solutions to environmental change, is important for developing strategies that will help this specific community and other pastoralist communities to respond and adapt to climate change and reduce environmental degradation.

The Bahima are an ethnic pastoral group of Ankole tribe of Uganda. They have a lot of indigenous knowledge about weather forecasting which in the past they used to read the weather, forecast rain and drought. This knowledge was used to guide their day to day activities and it was very important for their sustainable livelihood but has been eroded by foreign influence.

Bahima appreciate that there is environmental degradation and climate change and they have indigenous potential solutions to these challenges. If well documented, their knowledge can be used to develop strategies that will help these herders to respond and adapt to climate change and reduce environmental degradation.

Their forecasting knowledge include reading the clouds, the winds and nature (sprouting of vegetation and flowers, movement of insects and birds and personal physical/body experiences) to forecast the coming of the rains or drought seasons. For example the dark clouds, birds flying high in the sky, feeling hot at night, flowering of plants and winds blowing from North West were signs of the coming rains.

When herders saw mist, felt chilly at night, saw clear skies, withering of plants, shedding of tree leaves; these were signs of coming/present dry season.

There also notice a change in; weather patterns (longer dry spells, rains causing floods), in the

vegetation in the area (all indigenous and useful trees and grass) is almost gone and in water availability and amounts.

There is also restricted movement of their livestock because of reforms in land use. They have therefore been forced to change their nomadic lifestyle to sedentary lifestyles. And government regulations stop them from practicing traditional methods like grass burning (okwootsya ensi – oruhiira) and this is very harmful to their livelihoods.

Acaricides used in tick control have destroyed/killed off the bees and therefore there is reduction in wild honey in their areas. There is significant environmental degradation resulting from tree cutting, charcoal burning, poor plastic trash disposal, road gulleys and flooding.

They have adapted to these changes by being more sedentary, fencing off of their land, building semi-permanent houses, building valley tanks/dams for water, clearing of bushes, selling off of indigenous Ankole longhorn breed and replacing them with cross breeds which produce more milk and many other strategies.

Pastoralists do not trust the accuracy of the meteorologists. They perceive that the scientists just guess because at times what the scientists predict does not happen.

The herders appreciate that their indigenous knowledge has limitations but still believe that their indigenous knowledge of forecasting weather would be very useful if scientists would agree to come to them and they share the knowledge. They argue that the indigenous knowledge is very more reliable because they have been living in the area for many years and therefore know more about it.

Bionote

I was born and brought up among the Ankole Long Horn Cattle (ALHC) keeping Bahima community of Uganda. I am a member of the Ankole Cow Conservation Association (ACCA) which is campaigning for ways to ensure that this great indigenous breed does not get extinct. I own 50 pure

Ankole Long Horn Cattle which I graze on family land in Kijumba, Ngoma Sub county in Nakaseke district of the central part of the Cattle corridor of Uganda.

With the use of the LIFE method, I supported some Ankole Long Horn Cattle herders of Nyabushozi

County, Kiruhura District to document the Ankole Long Horn breed.

I graduated from Makerere University with a Bachelor's Degree (Hons) in Social Sciences (Political Science and Public Administration). I also have a Diploma in Secondary School Education and a Certificate in Management. I have been working in development work since 1994 and this has enabled me to participate in several development activities and trainings especially related to gender and pastoralism issues.

I am the Projects Officer (Volunteer) with Pastoral and Environmental Network in the Horn of Africa (PENHA) – Uganda, an NGO mainly concerned about the future of pastoralists and determined to find strategies and advocate for policies for the improvement of their quality of life. In Uganda, PENHA focuses on social –economic empowerment of pastoral and agro-pastoralist women.

I have traveled around, lived and worked in different parts of Uganda, parts of Africa, Asia and Europe. I have interacted with other stakeholders in small scale livestock keeping and pastoralism and agro-pastoralism. I have interacted with individuals e.g Veterinarians, ethno medicine Scientists, politicians, development workers

and organizations e.g. the League for Pastoral Peoples and Endogenous Livestock Keeping (LPP), Endogenous Livestock Development (ELD) and LIFE Network. This has helped me to appreciate the importance of small scale livestock keeping and pastoralism in sustainable livestock development, food security, conserving biodiversity, social-economic development and livelihood improvement.

Currently I represent the Natural Livestock Farming (NLF) Network in Uganda. NLF is an international collaboration aiming to strengthen global expertise on natural ways of livestock keeping. Combined experience on herbal products, animal management, local breeds and biodiversity conservation provides a viable strategy towards good quality animal products while saving antibiotics for our future.

I am a partner with the UNESCO's project "Knowing Our Changing Climate in Africa" whereby I carried out a study and produced a report on; "The Bahima Pastoralists' own knowledge of weather and climate, their forecasting skills, and their observations of and potential solutions to environmental change.; A case study of Bahima pastoralists from Noma, Kinyogoga and Kinoni sub counties of Nakaseke district in the cattle corridor of Uganda.

The integration of indigenous knowledge systems in provincial climate change adaptation and mitigation policy strategies in South Africa. Experiences from Kwazulu-Natal province

Hassan Omari KAYA

University of KwaZulu-Natal DST-NRF Centre in Indigenous Knowledge Systems, South Africa

South Africa is a country characterized by severe and frequent droughts. Past government efforts in dealing with the problem of global warming concentrated on mitigation strategies, with the aim of reducing greenhouse gas (GHG) concentrations in the atmosphere. However, given the slow progress in achieving this, adaptation policy strategies were viewed as a viable option to reducing the vulnerability of local communities to the foreseen negative effects of climate change. There is now a growing realization in the country that climate change adaptation and mitigation policy strategies should be complementary. This paper

argues that the complementary approach to climate change adaptation and mitigation is not a completely new phenomenon in the history of Southern African rural communities. African people in their specific cultural and environmental local communities in the region have for centuries developed and implemented indigenous climate change adaptation and mitigation strategies to reduce climate change vulnerability. These community-based knowledge systems have over the years been marginalized in the search for sustainable solution to climate change concerns. However, recently some provinces in South Africa have started to integrate

indigenous knowledge systems-based climate change adaptation and mitigation strategies in their provincial growth and development policies. The first of these provinces in South Africa is that of KwaZulu-Natal Province. The provincial leadership has recognized the fact that incorporating IKS can add value to the

development of sustainable climate change adaptation and mitigation strategies that are rich in local content, and planned in conjunction with local people. The paper interrogates the prospects and challenges facing the province in this initiative including policy implications for the future.

Bionote

Prof. Hassan O. Kaya is the Director of the DST-NRF Centre in Indigenous Knowledge Systems with its hub at the University of KwaZulu-Natal, South Africa. He initiated and coordinated the IKS Centre and IKS Teaching Programme at the North-West University; the NEPAD Agency IKS Regional Node for Southern Africa which encompasses 12 countries in the region; the Patron of the African Young Scientists Initiative on Climate Change and IKS which organized the first International Student Conference on IKS and Climate Change and the COP17 Round Table Discussions in Durban (2011) on the Role of IKS and African Young Scientists/Youth in Climate

Change and the national team leader of the Department of Science and Technology Initiative on the Development of a Statutory Body and Framework for the Accreditation and Certification of IK Holders and Practitioners.

Prof. Kaya has Ph.D in Sociology of Development from the Free University, Berlin, Germany; Bachelors (Honours) and Master's Degree in Development Studies, from the University of Dar es Salaam, Tanzania; and a Postdoctorate Certificate in International Agricultural Development from the Technical University, Berlin (Germany). He is an experienced researcher, scholar, consultant, and community worker in Indigenous African Knowledge Systems.

Indigenous knowledge, grassroots/marginalized indigenous women and climate change/justice

Toma LAMA

Mugal Indigenous Women Upliftment Institute, Nepal

My presentation is focus on indigenous knowledge, grassroots/marginalized indigenous women and climate change. An overview of present condition and practice of Indigenous knowledge, indigenous women, climate change and justice. Nepal is also on great risk (4 th rank) of environment and climate change, due to this reasons we are raising its impact on crops, trees, herbs, shrubs and livestock as well as livelihood etc. Grassroots and marginalized indigenous women are most affected by the climate change. Their lifestyle is totally depending on the forest and natural resource. Climate change is a issue of social justice. The ones who are already poor and vulnerable living in the rural areas are more prone to the impacts of climate change. Their poor economic condition, lack of education and indigenous way of life (not acknowledged by the government and policy makers) increases their risk of losing lives and

livelihood. Ethnicity, class, caste and geographical region further exacerbate the vulnerability of women to adapt with the changing climate. Indigenous women are also the agents of change to fight climate change. As they do most of the agricultural work, collecting fodder, water, saving seeds, natural resource management skill, women have vast knowledge of the changing environment and can interpret their meaning and take action often relying with their indigenous knowledge. Indigenous women who had never heard of climate change before though were suffering its impacts had been adapting to the changes with their own knowledge and resources however their knowledge and contributions are not acknowledged by the policy makers. I am as a founder president of MIWUI. I would like to share, MIWUI's programme regarding the climate change activities. MIWUI is working with indigenous and grassroots women in

remote areas of Nepal. Since 2013, MIWUI has been working in a Climate Justice Feminist Participatory Action Research (CJ-FPAR) programme. Its main objective is to document the impacts of climate change on the Mugal indigenous women and their adaptation practices. Before During the process of research and advocacy plan has been developed to pressure the policy maker at local national and regional level to put the most marginalized people – indigenous women in any kind of development plans

with a goal of making equality and equity in the access of every community despite their gender, ethnicity and location. The implementation of the project, Mugal women had never heard about climate change although they suffer daily from its impacts: changing temperatures, landslides caused by the melting of glaciers, erratic rains, decrease in food production, etc. The programme also supported Mugal women to organize in the communities and to engage with local decision-making bodies to design climate policies.

Bionote

I am an indigenous woman from the Mugal community. Mugal is a marginalized indigenous community of Nepal. Mugal Indigenous peoples are living in the remotest region of Nepal called Mugu district, Karnali zone, in the Himalayas.

I have been working on gender and climate justice issues for over eight years. As the founding president of the Mugal Indigenous Women Upliftment Institute (MIWUI), established in 2007, I work on “Climate Justice-Feminist Participatory Action Research (CJ-FPAR)” programme including the focal program on climate change and adaptation practice of Mugal indigenous women. I have studied on “Climate Justice-Feminist Participatory Action Research (CJ-FPAR)” with Mugal indigenous women of Mugu district, which is also vulnerable indigenous women group of Nepal. It was the first research on climate change in Mugu district. MIWUI is also affiliated with the National Indigenous Women’s Federation (NIWF) and is a member organization of the Asia Pacific Forum

on Women, Law and Development (APWLD). I am a member of the Organizing Committee of APWLD Climate Justice programme. As a president of MIWUI, I have a leading role and I am managing all the organization’s activities.

Other programs that I have been working on include activities focused on women empowerment, awareness raising, indigenous knowledge and skill, media as well as advocacy for indigenous women’s issues at the national and international levels. I have experience with past United Nations conferences and negotiations including Rio +20, APFSD, UN EMRIP, COP20 and UNFCCC (ADP 2–11).

I have been working as a Project & International Affair-Secretary at the NIWF during four years. I was in charge of the advocacy programme for indigenous women’s rights at the national level. As part of my job, I coordinated with INGOs and NGOs to develop the advocacy positions.

Understanding climate change: Local knowledge/global minds

Annamaria LAMMEL

Université Paris 8 Vincennes-Saint-Denis, France

One of the main questions in the recent climate change problem is how humanity can face the challenge of the reduction of greenhouse gases. How individuals in all around the world can understand the climate change problem and act in an ethical way? This paper proposes to analyse, in a first time, how local knowledge can contribute to understanding the global, systemic character of climate and climate change. Based on the analyses of the literature we will compare how knowledge on climate and how direct climatic experiences versus the lack of knowledge and direct experience can provide local/global views on climatic change. In a second time, the results

of our research will be exposed. In a comparative perspective the correlation between local knowledge on climate and the evaluation of the possibilities and efficiency of individual and collective implication in climate change actions will be compared in four contexts: Paris, French Alps, French Guyana and New Caledonia. The analyses are based on 190 semi-directive interviews realised with adults. Results show a high correlation between the complexity of local knowledge and the evaluation of the possibility and efficiency individual and collective (community) implication. The results will be discussed in the light of relevant literature.

Bionote

Annamaria Lammel is a professor (maître de conférences, HDR) of Psychology at the University of Paris 8, Vincennes-Saint Denis, France. She is a fellow researcher at the Laboratory of Paragraph, University of Paris 8. Since 2014, responsible for e-Lab Interaction between climate system and human system of the Complex Systems' Campus of the UNESCO. Expert IPCC WGII (2010-2014), expert for the United Nation Environment Project GEO-6 (2015–2016).

She received her Ph.D. in anthropology at the University of Debrecen, Hungary (1989), her M.A. (1980) in anthropology at the University of Sciences Eötvös Lorand of Budapest, Hungary, her MA in cognitive psychology at EHESS (Ecole des Hautes Etudes en Sciences Sociales, Paris) (1990), and her professorial thesis (Habilitation à Diriger des Recherches) at the University of Paris 8 (2014).

Primary Area of Expertise: human adaptation to climate and global climate change, anthropology, cognitive and cross-cultural psychology.

Secondary Areas of Expertise: cognitive processes, adaptive behaviour, cognitive vulnerability, cultural mediation related to climate change.

Dr. Lammel has presented her research findings in more than hundred conferences and in several universities: France, Hungary, US, Spain, Poland, Norway, Germany, the Netherlands, Chile, Canada, Mexico, Taiwan, Aruba, Switzerland, England, New-Caledonia, South-Africa, India, Brésil. She has organized and co-chaired several International meetings. She has published eight books; contributed numerous chapters in advanced research volumes and monographs and published numerous articles in academic journals.

Harnessing local indigenous knowledge and practices for climate mitigation and adaptation of agro pastoral communities in Tanzania

Pamela William LEVIRA

Tanzania Meteorological Agency, Tanzania

My presentation will focus on the need to document indigenous knowledge for adapting to climate change.

Introduction will cover the current issue of climate change impacts to indigenous community and why we need to document their skills. This is followed by the methodology section that explains how we managed to capture their skills using various techniques and how

we managed to bring back their skills in other format-a compedium. The section is followed by analysis of indigenous skills on how they helped them to adapt to climate change including challenges of documentations and what could happens to them if these skills are not blended with scientific knowledge. The last chapter will be the conclusion of the presentation.

Bionote

Pamela is a Senior researcher working with Tanzania Meteorological Agency. Pamela holds a Master degree in Climate Change Adaptation from the University of the Sunshine Coast, Queensland Australia and a Post Graduate Diploma in Meteorology from Nairobi University. Pamela core value is to work in globally competitive environment to make positive contribution to the society by sharing knowledge, learning and developing new skills while interacting with other to deliver intended results.

Currently Pamela is part time Lecturer at Ardhi University in Tanzania teaching introduction to

Meteorology to students majoring Environmental Sciences. Her institution has been sponsored by Australia Aid to conduct a one year study (2015–2016) on Quantifying Indigenous Knowledge and Practice to complement meteorological information for enhanced food security.

Her carrier ambitions including improving her understanding about adaptive capacity of indigenous community, to help the indigenous people to understand climate change, environmental conservations, communications for better adapting to climate change in Africa.

From thief to igloo builder: Participatory digital research on climate change with and for indigenous communities in Canada

Ian MAURO

Department of Geography, University of Winnipeg, Canada

For many decades, Inuit of the Canadian Arctic have been observing anthropogenic climate change taking place in their traditional territories, yet it is relatively recent that the insights and voices of Elders were documented in their native tongue using video. In 2010, acclaimed Inuk filmmaker Zacharias Kunuk (*Atanarjuat The Fast Runner*) and Dr. Ian Mauro released *Qapirangajuq: Inuit Knowledge and Climate Change* (www.isuma.tv/ikcc), which is the world's first Inuktitut language film on climate change. From interviews across Nunavut, Elders holistically described their observations of change related to ice, land, ocean and the atmosphere, as well as the associated impacts on wildlife and cultural livelihood as a result of a warming Arctic. While much of this Inuit knowledge was consistent with scientific understanding, some was not, specifically conclusions that Elders made regarding increasing polar bear populations and climate change being linked with the earth further "tilting on its axis". Across the communities studied, Elders believed that polar bear populations were healthy and increasing in number, indeed to such a degree

that the land had become dangerous. Elders in all the communities, without being asked, indicated that the sun, moon and stars were out of position in the sky. Inuit were particularly concerned that the location of the sun's return, after the long polar night, had shifted large distances across the horizon. This multi-media presentation will show how a transdisciplinary approach – linking participatory filmmaking, academic research, and Indigenous knowledge – unlocked the mystery of how climate change has altered the "visual landscape" of the Arctic while also telling the remarkable and ongoing story of Inuit adaptability and resilience. The conversation will reflect on the ongoing impact of *Qapirangajuq* – which continues to be screened globally at leading festivals and academic conferences – and the use of digital media to promote the importance of Indigenous knowledge more generally. Mauro will also elaborate on his role, as a non-Indigenous person working on this project, and how his transformation from Thief to Igloo Builder impacted his life, scholarship and ongoing climate change filmmaking across Canada.

Bionote

Dr. Ian Mauro is an Associate Professor in the Department of Geography at the University of Winnipeg. He is a former Canada Research Chair, renowned filmmaker, and has served on various expert panels related to northern food security and energy. He has completed a trilogy of climate change films across Canada – including Qapirangajuq: Inuit Knowledge and Climate Change; Climate Change in Atlantic Canada; and Beyond Climate

– which all focus on local and traditional knowledge. His most recent project called Climate, Cinema and Cartography will merge film and mapmaking to explore climate change in the Canadian Prairies. Mauro's work has been featured in the Berlin International Film Festival, Smithsonian Institution, National Geographic, Royal Ontario Museum and various film festival and academic conferences worldwide.

Pastoralisme, changement climatique et savoirs traditionnels : Le cas du sud marocain

Anzed MOHAMMED & Boubker LYADIB

Maroc

Cette présentation sera l'occasion de découvrir le mode de vie des éleveurs Amazigh du sud marocain. Le témoignage de l'éleveur Anzed Mohammed présentera les perceptions du milieu naturel qu'ont développées et entretenues les éleveurs-nomades, qui guident leur mode de vie. Son intervention nous permettra de revenir sur les origines du pastoralisme en tant que pratique ancestrale qui a permis à ces populations de développer un rapport harmonieux avec leur milieu naturel offrant des difficultés particulières. L'objectif de l'intervention sera de mettre en perspective ce mode de vie et les savoirs qui ont été produits autour de lui. Ces éléments, profondément enracinés dans les traditions ancestrales de ces populations, se projettent de plus en plus vers un futur où les conditions climatiques sont constamment en évolution.

Anzed Mohammed partagera avec le public quelques-unes des caractéristiques les plus emblématiques de l'élevage transhumant, et parmi

elles, les savoirs permettant à ces éleveurs de prendre les décisions concernant leurs déplacements tels que le moment où ces déplacements sont nécessaires, la direction qu'ils prennent, le moment où ils quittent un endroit pour un autre, ainsi que les moyens d'identifier les années de sécheresse. Parmi ces exemples, il citera l'observation des étoiles, la poussée de certaines herbes, l'arrivée ou l'absence de certains oiseaux, etc.

Des éléments visuels préparés par Boubker Lyadib illustreront tout au long la présentation comment les populations Amazigh se préparent pour faire ces déplacements, le matériel, les traditions et les cérémonies associés aux déplacements, ainsi que la complexité des rôles qui permettent d'articuler les hommes et les femmes à ces activités.

Enfin, nous découvrirons, à travers cette présentation, la façon dont les éleveurs perçoivent le changement climatique et comment cette dernière, à la lumière des savoirs qu'ils possèdent, a donné lieu à des propositions pour résister à ce phénomène environnemental.

Bionotes

Anzed MOHAMMED
Éleveur Amazigh

Boubker LYADIB
Président de l'Association Talaynut-Taghjjit. Responsable du pôle jeunesse au sein de l'organisation Tamaynut. Il a participé à plusieurs formations sur les droits humains et droits des peuples autochtones à Genève.

Traditional warning systems of the Karamojong pastoralist: “Knowledge that builds resilience”

Ismael OCEN

Climate Frontlines Partner, Disaster Risk Reduction Platform for Teso (DDRP4T), Uganda

Karamoja pastoralists occupy the North East Uganda region and are primarily nomadic and agro-pastoralists with population of 2.67 million. Being pastoral and agro-pastoral people, their understanding, forecasting and anticipation of changes in weather and other climatic variables is very important for survivability. Karamojong Pastoralists have a good traditional knowledge related to observing weather and their observation skills which is embedded in bio-physical entities other practices such magic and sorcery.

Their weather stations have unique Traditional Early Warning Systems based on the observation of weather changes and in the traditional knowledge related to weather, as well as interpretation skills

that derive from that observation. They also have their own decision-making procedures based on the traditional knowledge that have guided them from generation to generation. These warning Systems is handy, affordable and can be correctly interpreted for the daily decision making.

This presentation will discuss some of the traditional indicators that are considered as precursors to a hazard in the Karamojong Region. It will show that the warning signs become cues for their daily lives to prepare and plan for a particular incident. The Karamojong communities use these signals to allow them to better interpret the constantly changing phenomena of current time.

Bionote

My name is Ismael Ocen, I work for Disaster Risk Reduction Platform of Teso (DDRP4T) as Programme Manager Climate Change and Disaster Risk Reduction – Research Desk. Born and raised by Parents who are Karamojong pastoralist and successfully being the first in my family to graduate with bachelor degree from Makerere University and eventually with founding support from the government of Uganda under education fund is what I call success in my life.

I am a mid-career researcher who started it career in 2008 with Uganda Red Cross Society by way of documenting vulnerability, capacity, hazards and post conflict in pastoral and agro pastoral communities.

This experience equipped me with skills and experience in adaptation and mitigation. I have also attended trainings organized by International Federation of Red Cross and Red Crescent Societies (IFRC), Food and Agricultural Organization (FAO), International Institute for Rural Reconstruction (IIRR), International Committee of Red Cross (ICRC) and Generations for Peace International.

I am extremely passionate about indigenous people especially the pastoralist of the dry land and it is this zeal that am yearning for and in-depth research on the use indigenous knowledge to predict weather variability to conserve resources in their territory.

Inuit traditional ecological knowledge (TEK), subsistence hunting and adaptation to climate change in the Canadian Arctic

Tristan David PEARCE

University of the Sunshine Coast, Australia

This paper examines the role of Inuit traditional ecological knowledge (TEK) in adaptation to climate change in the Canadian Arctic. It focuses on Inuit relationships with the Arctic environment, including hunting knowledge and land skills, and examines their roles in adaptation to biophysical changes that affect subsistence hunting. In several instances, TEK underpins competency in subsistence and adaptations to changing conditions, which includes flexibility with regard to seasonal cycles of hunting and resource use, hazard avoidance through detailed knowledge of the environment and understanding of ecosystem processes, and emergency preparedness, e.g., knowing what supplies to take when traveling and

how to respond in emergency situations. Despite the documented importance of TEK in adaptation and in maintaining a level of competency in subsistence, the relationships between TEK and adaptation to climate change are not well defined in the scholarly literature. This paper aims to conceptualize the relationships between TEK and adaptation to climate change by drawing on case study research with Inuit in the Canadian Arctic. TEK is considered an element of adaptive capacity (or resilience) that is expressed as adaptation if TEK is drawn upon to adapt to changing conditions. This capacity depends on the development, accumulation, and transmission of TEK within and among generations.

Bionote

Dr. Tristan Pearce is a Senior Research Fellow in Geography in the Sustainability Research Centre at the University of the Sunshine Coast, Australia and Adjunct Faculty in the Department of Geography at the University of Guelph, Canada. He leads an established interdisciplinary research program in cultural geography with an international research profile in Indigenous knowledge and the human dimensions of global environmental change (www.envchange.com). Dr. Pearce has long-term research relationships with Inuit in the Canadian Arctic and newly developed research relationships with Indigenous peoples elsewhere in Canada, Australia and the Pacific Islands (Fiji and

Tuvalu). Much of his work focuses on the generation and transmission of Indigenous knowledge and its role and importance in adaptation to environmental change. He is committed to decolonizing research relationships with Indigenous peoples and continually works to develop research projects with Indigenous partners. This involves engaging Indigenous research partners throughout the entire research process from problem identification to data collection and analysis, and results dissemination. He has consistently published scholarly outputs from his research including 40+ peer-reviewed publications. Tristan is from Prince George, British Columbia, Canada, the traditional territory of the Lheidli T'enneh First Nations.

The confluence of indigenous and scientific knowledge of managing water and mediating conflicts in Burkina Faso

Carla RONCOLI,¹ Ben ORLOVE,² Brian DOWD-URIBE,³ & Moussa SANON⁴

¹ Emory University, USA; ² Columbia University, USA;

³ University of San Francisco, USA; and

⁴ Institut de l'Environnement et de Recherches Agricoles, Burkina Faso

This paper draws upon long-term fieldwork conducted in southwest Burkina Faso, an area characterized by climate uncertainty and competing claims over water resources by a diversity of actors endowed with different levels of power and types of knowledge. Local communities include smallholder farmers, fishers, and pastoralists who have moved into the area from drought-affected northern regions. Water users also include urban residents and a large irrigated sugar plantation. Increasing variability in rainfall and water supplies, linked to climate change, has exacerbated competition over water resources and tensions among this diverse set of users. Through interviews based on photograph elicitation, we studied understandings of water flows and fluctuations from smallholder farmers who cultivate plots along the riverbanks. We contrast local assessments of water sufficiency with the scientific measurements used by

a local water management committee – established by recent water sector reform to mitigate conflicts among users. Knowledge forms and claims are intrinsic to negotiations over water allocation: while the committee's deliberations are driven by scientific data and expertise, traditional knowledge of water and waterways enables smallholder farmers to formulate their own judgments and to demand that their needs be taken into account. Pastoralists, on the other hand, remain marginalized from the local committee, due to its emphasis on agricultural water use. Their main concern is about access to water sources for their herds, which is being hindered by the expansion of riparian farming. Efforts to address climate change impacts on water supplies through participatory institutions must be sensitive to the plurality of understandings and uses of natural resources that exist within local societies.

Bionotes

Carla RONCOLI (PhD, Binghamton University) is Senior Research Scientist in the Department of Anthropology and Associate Director for the Masters' in Development Practice at Emory University. Prior to joining Emory Roncoli worked at the University of Georgia with interdisciplinary research projects aimed to build climate resilience among smallholder farmers and agro-pastoralists, especially in West Africa. Her research focuses on the interaction of indigenous and scientific knowledge in climate risk management in agriculture and has contributed to the development of climate information services across Africa. As a collaborating researcher with the Center for Research on Environmental Decisions (CRED), she has analyzed issues of social inclusion in decentralized environmental governance in southwest Burkina Faso.

Ben ORLOVE (PhD, University of California, Berkeley) is an anthropologist who has conducted field

work in the Peruvian Andes since the 1970s as well as interdisciplinary research in West and East Africa, the Italian Alps, and Aboriginal Australia. While his early work focused on agriculture, fisheries and rangelands, he now primarily focuses on climate change and glacier retreat, with an emphasis on water, natural hazards, and the loss of iconic landscapes. Orlove is a co-director of the Center for Research on Environmental Decisions (CRED). Orlove served on the faculty at the University of California Davis, prior to joining Columbia University, where he now co-directs the Master's Program in Climate and Society. He is also a Senior Research Scientist at the International Research Institute for Climate and Society.

Brian DOWD-URIBE (PhD, University of California, Santa Cruz) and Assistant Professor in the International Studies Department at the University of San Francisco and an Adjunct Research Scientist with the

Center for Research on Environmental Decisions (CRED) at Columbia University. He was previously Chair of the Department of Environment and Development at the UN-mandated University for Peace in Costa Rica. His work focuses on the social, economic, and environmental dimensions of food, agriculture and water policies in Africa and Latin America. Specifically, he explores the impacts of transgenic crops on local farming practices and livelihoods in Burkina Faso.

Moussa SANON (PhD, National School of Agriculture, Rennes, France) is Senior Research Scientist

in the Department of Natural Resources Management and Farming Systems of the National Environmental and Agricultural Research Institute (INERA) of Burkina Faso. As an agronomist he specializes in analyzing and modeling irrigation/water management and climate impacts on agriculture. He has also worked with interdisciplinary research projects centered on applications of seasonal rainfall forecasts to adaptation in agriculture. For several years, Dr. Sanon was seconded to the Millennium Challenge Account Program/Burkina Faso, where he coordinated research and development activities on Integrated Water Resources Management.

How Sami and Evenk reindeer herders conceive of extreme events

Marie ROUÉ,¹ Alexandra LAVRILLIER,² Samuel ROTURIER,³ & Semen GABYSHEV⁴

¹ CNRS/MNHN, France;

² Research center Cultures, Environments, Arctic, Climate (CEARC), Université de Versailles Saint-Quentin-en-Yvelines, France;

³ AgroParisTech/Université Paris-Sud, France; and

⁴ Reindeer herding Evenk community, Russia

From climatologists' perspective, or the IPCC's, the Intergovernmental Panel on Climate Change, extreme events first have to be assessed, recorded, and their intensity measured, to establish a series of data leading to a level of confidence. Then comes the notion of complex system, linked to their unpredictability, which was stressed by both climate scientific experts and local knowledge holders, the difficulty of adaptation facing uncertainty, and the need for an ethical reflection on the responsibilities in the causes. Our communication will analyze the knowledge and conceptions of extreme events held by reindeer herders (Sami from northern Sweden and Evenk from eastern Siberia), to understand the similarities and differences with the ones of climatologists. Indeed, understanding these events is critical for the herders in order to build their resilience. We will also consider the importance of global changes in the development of adaptation strategies.

Understanding the physics of the snow cover has always been determining for Sami and Evenk reindeer herders, today more than ever. But what the herders

observe and analyse, more than an accounting or the causes of the event, are the consequences. And what they observe, more than the acuity of a particular event, is the succession of events which, cumulated or repeated, can put them in a disastrous situation. They observe a process in which, for example, extreme winds, recorded by climatologists as an extreme event, will not be considered as such by the herders because they have no consequence. In contrast a series of variations cold/warm spell, even if each event does not reach a high intensity, can determine the establishing of an ice crust on the snow, preventing the reindeer to access their food. This sequence, or rather this process, will then be described as extreme event, or its equivalent, a catastrophic year for reindeer herding.

For the Evenk today, the ultimate extreme event are wolves, which can eat up to 30 heads of reindeer in two days. As they are depending a lot on climatic conditions affecting the quality and depth the of snow necessary to Evenk herding, results also from the ban of "regulating" predators' populations as it was the case during the Soviet period. For the

Sami, the extreme event is a winter during which the pasture is not accessible anymore and where they have to feed their animals instead of letting them graze freely. In both cases, the herder's adaptive capacity is therefore limited.

For the herders it is only the intensity which defines the extreme event, or the place and time where it

happens, or the accumulation and repetition of more "minor" events. To facilitate the dialogue between different knowledge systems (local and scientific) we will propose a typology of extreme events from the point of view of herders.

Bionotes

Marie ROUÉ, Directrice de recherche émérite au CNRS/MNHN, est anthropologue. Elle a dirigé au Muséum National d'Histoire Naturelle l'UMR APSONAT, Appropriation et Socialisation de la Nature et publié plus de 100 articles et plusieurs livres sur les peuples arctiques et subarctiques, en particulier les Samis éleveurs de rennes du Nord de la Fennoscandie. Spécialiste des savoirs locaux et autochtones, des relations biodiversité/diversité culturelle, elle a travaillé avec les Inuit et les Indiens Cris de la Baie James (Québec arctique) sur les conséquences des grands barrages. Son projet actuel avec les Samis porte sur les changements climatiques, et la coproduction des savoirs, entre savoirs autochtones et sciences (ANR BRISK). Elle est membre du MEP (groupe d'experts interdisciplinaires) et du groupe d'experts sur les Savoirs locaux de l'IPBES (plateforme intergouvernementale sur la Biodiversité et les services écosystémiques).

Alexandra LAVRILLIER is Associated Professor in Social Anthropologist at the CEARC (Cultures, Environments, Arctic, Representations, Climate), University of Versailles – UVSQ, France; 20 years research experience in Siberia; two Siberian native languages' speaker, nomadic school co-founder with

reindeer herders; related current project – BRISK-BRidging Indigenous and Scientific Knowledge about global change in the Arctic (French National Research Agency funded) (UNESCO-MNHN-LMDCEARC) and BRISK' OBS – Observatories of BRISK project (Institut Paul Emile Victor funded). Co-founder and co-manager of a transdisciplinary observatory of climate and global changes among the Evenk reindeer herders with S. Gabyshev.

Samuel ROTURIER is Assistant Professor at AgroParisTech in the lab Ecology, Systematic & Evolution, Paris, France, and has a double doctoral degree in biology and environmental anthropology. His research interests include the restoration of socio-ecological systems and indigenous and local knowledge systems in boreal regions, and more especially reindeer husbandry areas.

Semen GABYSHEV is an Evenk reindeer herder from the Amur region of Russia and Southern Yakoutia (Siberia) (25 years' experience), Siberian Evenk native language speaker, and Associated member of the laboratory CEARC (Cultures, Environments, Arctic, Representations, Climate), University of Versailles UVSQ, France – indigenous co-researcher in the project BRISK.

Climate change and Narragansett cultural revitalization

Jan SALICK,¹ Cassius SPEARS² & Dawn SPEARS²

¹Missouri Botanical Garden, USA

²Narragansett Tribe (American Indian, Algonquian Group)

Climate change on the northeast coast of the US is prominent with rising seas, breaking high temperature records, droughts and floods, all resulting in a rapidly changing environment. Algonquin native peoples of the northeast coast are struggling to revitalize their historically decimated cultures while the environment upon which their cultures are based is changing rapidly. The Indigenous Knowledge (IK) of culture and environment is available through spiritual and traditional practices, but only some IK – notably strategies for adaptation and mitigation – is germane in this changing world. Their struggle for identity and power is much exacerbated by climate change. The components of this process are analyzed and detailed with examples from the Narragansett tribe.

Among the Narragansett, climate change is perceived to include rising and prolonged periods of record breaking temperatures – both summer and winter, year after year. The northeast coast extending out into the Atlantic is one of the areas of greatest sea level rise in the world due to warming waters, changing currents and backup of ocean circulations. Precipitation is variable, some years greater (accompanied by severe flooding) and some years less (this year is a severe drought, exacerbated by little snow causing both ground and fresh water reserves to dwindle before the drought itself). The erratic nature and severity of weather events – including hurricanes, “perfect” storms and even tornadoes, never before seen in the northeast – make adapting to climate change that much more difficult; the tribe tends to react to the immediate crises instead of concentrating on longer term climate change. It is both the rapidity and length of time span over which climate changes are taking hold that determine the intensity of impacts.

The Narragansett recognize that these changes in climate bring about changes in the northeast coastal environment. Vegetation and plants change: the forest floor is drier and more susceptible to hotter fires. Medicinal plants lose their potency (e.g., blueberry as a cleansing agent) while other plant populations increase (e.g., boneset, grasses and lily pads). Black Ash is diminishing, possibly moving northward,

forcing changes in traditional Narragansett culture. Traditional crop varieties (e.g., Narragansett flint corn) are adapted to cooler, wetter conditions. In contrast, invasive species (e.g., Japanese knotweed, honey suckle, purple loosestrife, etc.) are well adapted to the new conditions, to fluctuations and to disturbance. Fish migrate up-river (e.g., trout, herring, shad) but water temperature and flow greatly affect these migrations and resulting reproduction. Other plant and animal populations are alternately spiking and declining (e.g., blueberries, lobster, crabs), an unusual situation with unknown results. Vernal pools are necessary for amphibians and plant populations, but if they do not form or dry too early then dependent populations do not reproduce. Both plants and their pollinators are stressed, each in their own ways, but together threatening their co-adapted reproduction. Sea level rise affects sediment beds and sand bars, home to shell fish, eel grass and scallops that are affected in turn. Oyster spat (larvae) are washed out to sea with rising tides and sea levels. Sea level rise and concomitant storm surges cause coastal fresh water ponds to be breached with ecosystem level results.

The Narragansett adapt to climate change in a myriad of ways. Blooming shad bush no longer predict the shad run, so the Narragansett look to other indicators. Non-traditional crops and crop varieties produce better harvests and grocery stores offer the plenty once provided by nature. Traditional medicines are replaced by pharmaceuticals. American Indian arts and crafts that traditionally depend on ash splints are now made from cedar or bamboo. As a result, the Narragansett become increasingly dependent on the cash culture and global economy. The Narragansett live where they do because of the traditional wealth of sea and land resources providing plenty. When traditional lifeways no longer provide that plenty or allow them to survive, they seek subsistence elsewhere – towns, cities or wherever the job market casts them. Air conditioners supply a tolerable ambiance, while leaving an ever enlarging carbon footprint. While 400 years of oppression has not obliterated the Narragansett or their traditional culture, climate change feels like moving target.

The Narragansett see mitigation of climate change as a basic tenant of traditional natural resource conservation and a minor extension of their traditional land and sea management. The Narragansett have been assisting migrations of animals and plants for millennia by dispersing seeds, larvae and shell fish and by transplanting medicinal plants and saplings of desirable trees. In the face of great economic and social pressures they maintain one of the largest tracts of natural hardwood forest in Rhode Island. They manage seashores, wetlands and inland waters with ample peripheries to prevent damage from hurricanes, tidal surges and droughts. Their Narragansett Food Sovereignty Initiative places tradition, culture, health,

education and the environment beyond economics in their goals to maintain sovereignty, self-determination, self-sufficiency, sustainability, and food security. Though revitalization of indigenous knowledge and culture, this initiative manages not only traditional farmlands, but also the Narragansett environment: forests, grasslands and wetlands; and not only traditional agriculture, but also resources for hunting, fishing, forestry and conservation; as well as the inherent right of plants, animals and nature to survive and thrive. The Narragansett see climate change as intrinsically manageable if people live by the holistic precepts of Mother Earth or Turtle Island, our small and fragile planet, without which we perish.

Bionotes

Jan SALICK

For more than forty years, Dr. Jan Salick, Senior Curator at the Missouri Botanical Garden and “Distinguished Economic Botanist”, has been researching and publishing on Ethnobotany and Ethnoecology, including theoretical, methodological and field aspects. She, her collaborators and her students have been studying the devastating impacts of environmental changes on indigenous peoples throughout that time and around the world. Their work on climate change dates back more than fifteen years and is recognized internationally among scientists and policy makers, especially the Millennium Ecosystem Assessment, IPCC, GPPC, IPBES, which prioritize “Building Synergies between Science and Indigenous and Local Knowledge Systems.” She has received funding from the National Science Foundation (USA), National Institute of Health (NIH and NCI), Ford Foundation, The Nature Conservancy, National Geographic Society and other sources. From the tropical rainforests of Peru and Borneo and the high alpine of the Himalaya, to her most recent work with American Indians, she applies her scientific results to support indigenous peoples and to raise awareness of the impacts of environmental and climate change around the world.

Cassius SPEARS and Dawn SPEARS

Cassius and Dawn Spears are members and representatives of the Narragansett Tribe (American Indian, Rhode Island, USA). In the name of the tribe, Cassius is the founder and director of the Narragansett Food Sovereignty Initiative that strives to maintain and restore indigenous agricultural knowledge and practices. Cassius also works with the United States Department of Agriculture to facilitate supportive Tribal-USDA projects in keeping with tribal values and priorities. Within the Narragansett Tribe, Cassius is known as one of the few remaining tribal members familiar with indigenous knowledge of natural resources (plants, animals, marine life, soils, habitats as well as climate and effects of climate change). Dawn Spears is Director of the Northeastern Indian Arts Alliance (USA). Aside from being an active native artist, Dawn has organized and published numerous art exhibits with American Indian artists from throughout North America. Dawn recognizes the changes in American Indian art brought about by climate change (materials, methods, timing and content). Together, Cassius and Dawn, represent a holistic tribal view of Nature-Culture and the effects that climate change has on its elements and philosophy.

700 year-old indigenous African soil enrichment technique as a climate-smart global sustainable agriculture alternative

Dawit SOLOMON

Cornell University, USA

We will speak about the results of global study conducted by Cornell University, Sussex University, University of Accra, and Aarhus Universities has for the first-time uncovered indigenous African soil enrichment technique practiced for centuries (700 year-old) by villagers in West Africa, which converts highly weathered, infertile, carbon-poor African soil into enduringly fertile farmland with carbon-rich dark earths in climate-smart manner, could be the answer to mitigating climate change and revolutionizing farming across Africa.

We will describe to the global audiences for the first time about the role of indigenous people's knowledge (often regarded as not worthy of scientific discovery) and how indigenous soil management system in West Africa, which targeted waste deposition transforms highly weathered, nutrient- and carbon- poor tropical soils into enduringly fertile, carbon- rich black soils, hereafter "African Dark Earths". We will demonstrate that these soils developed by indigenous people store 200–300% more organic carbon and contain 2–26 times greater pyrogenic carbon or charred carbon, not managed by many conventional best practices. Pyrogenic carbon persists much longer in soil as compared with other types

of organic carbon, making it important for long-term carbon storage and soil fertility. We will also show that in contrast with the nutrient- poor and strongly acidic (pH 4.3–5.3) original soil, African Dark Earths exhibit slightly acidic (pH 5.6–6.4) conditions ideal for crop plant growth, 1.4–3.6 times greater cation exchange capacity, and 1.3–2.2 and 5–270 times more plant- available nitrogen and phosphorus, respectively. We will show the results of anthropological investigations which revealed that African Dark Earths make a disproportionately large contribution to total farm household food consumption (26%) and income (24%) despite its limited spatial extent in some cases only 6% of the total area. We will show radiocarbon (¹⁴C) data showing the recent development of these soils (115–692 years before present). We will also demonstrate how African Dark Earths developed by indigenous people provide a model for improving the fertility of highly degraded soils in an environmentally and socially appropriate way, in resource- poor and food- insecure regions of the world. The method is also "climate- smart", as these soils sequester carbon and enhance the climate- change mitigation potential of carbon- poor tropical soils.

Bionote

Senior Research Associate at the School of Integrated Plant Sciences, College of Agriculture and Life Sciences, Cornell University, Ithaca, NY.

Summary of international and national experience:

◇ *Over 20-year combined research, teaching, and international development experience working with diverse group of partners in Africa (Ethiopia, Kenya, Tanzania, Guinea, Sierra Leone, Ghana, Liberia and South Africa), Europe (The Netherlands, Germany and UK), South America (Brazil) and North America (US and Canada).*

◇ *Extensive international experience in establishing strong collaborative partnerships with private sector, bi- and multi-lateral development partners and international organizations (WB, DFID, USAID, DANIDA etc.), as well as local and international NGOs (CARE, SNV, Farm Africa, REST etc.) in various parts of the world.*

◇ *Strong hands-on expertise in complex, cross-cutting, and across the scale (land-landscape, field to micro- and nano-level) soil fertility and soil health, land degradation, sustainable agriculture and natural resources management, biogeochemistry and biogeochemical cycling of nutrients, soil and water management and other environmental sciences related issues, climate-smart food security interventions, as well as climate change mitigation and adaptation strategies, and land-based food security related climate financing opportunities.*

Education:

◇ *PhD. (Magna Cum Laude): Geocology/Soil Sciences, University of Bayreuth, Germany, 2001.*

◇ *MSc: Soil and Water Management, Wageningen Agricultural University, The Netherlands, 1994.*

◇ *BSc: Plant Sciences, Alemaya Agricultural University, Ethiopia, 1989.*

Biocultural innovations for climate resilience

Krystyna Luna SWIDERSKA

International Institute for Environment and Development (IIED)

Powerpoint presentation rich in photos, to present evidence of the role of traditional knowledge, genetic resources, culture and landscapes (ie. biocultural heritage) and related innovations in climate resilience and adaptation. The presentation will highlight key findings from the SIFOR project on the nature and extent of biocultural innovation, its role in adaptation, the conditions that foster innovation, and ways to strengthen innovation systems. It will highlight key successful innovations – including the crop diversification strategy of the Potato Park

(Peru), and Participatory Plant Breeding in China – based on a quantitative impact study. It will also highlight evidence of the role of biocultural heritage in adaptation arising from the International Network of Mountain Indigenous Peoples which is holding a pre-COP meeting in the Atlas mountains. Finally it will identify key tools being developed for enhancing climate resilience – an adaptive model for Biocultural Heritage Territories for indigenous-led landscape management and a Biocultural Heritage Indication for branding indigenous products.

Bionote

I am a Principal Researcher at IIED where I have conducted research on indigenous peoples' rights for nearly 20 years, with a particular focus on traditional knowledge, genetic resources and biocultural heritage. I coordinate a large EU funded project 'Smallholder Innovation for Resilience: Strengthening innovation systems for food security in the face of climate change' which is entering its 5th and final year. It has explored traditional knowledge-

based or 'biocultural' innovations with 64 indigenous communities in the Potato Park Peru, Southwest China, Himalayas and coastal Kenya. I also provide support for the International Network of Mountain Indigenous Peoples for synthesis and analysis of evidence on the role of biocultural heritage in climate resilience arising through its annual 'walking workshops' involving 21 communities from 10 countries.

Combining traditional knowledge with modern scientific methods to aid adaptation in Vanuatu

Mike WAI-WAI

Department of Meteorology Geo-Hazards, Vanuatu

Communities in Vanuatu have always related to the climate and weather in their own context. Being highly exposed to risks of extreme events such as tropical cyclones, flooding and droughts, communities have naturally adapted in their own ways. They are able to use their surroundings to indicate in advance the different weather extremes they are likely face. These careful observations of their surrounding have allowed them to

come up with their own traditional forecasting methods which have been tested and proven to be very reliable.

In parts of the country where communication is still a challenge, communities continue to rely on their knowledge of the environment to guide their preparedness for extreme events. While there is promise in the use of this traditional based science, there are also challenges.

Mike Waiwai is a Senior Climatologist and Data Analyst and Archiver at the Climate Section of the Vanuatu Meteorological and Geo-hazards Department. He has also been working as assistant Principal Scientist, Research and Development Officer. He is currently completing a Post Graduate Degree in Climate Change and Governance

at the University of the South Pacific (USP). Currently, he is a Human Resource Manager at the Ministry of Climate Change and Adaptation. He coordinates the Traditional Knowledge (TK) Project in Vanuatu, which includes identifying local communities that use traditional knowledge for environmental forecast applications.

Impacts of increased climate variability on Pastoralists livelihood, Tana River Kenya

Abdulahi Halake WATO

NDMA Tana River County, Kenya

The Orma Pastoralist of Tana live in the arid and semi southern part of Kenya with less the 700 mm of annual rainfall. Rainfall distribution in space and time is not uniform and community migrates across the rangeland to tack good pasture and water. Earth pan and natural ponds provide water during rainy season, when moderate dry spell sets-in and pans dry the community depend on shallow wells. The wells are excavated along seasonal river bed manually, initially one or two persons are required to bring water up. The wells are deepened as dry spell progress, more persons required to drawn water, the person at the bottom of the well passing water container to the person above until the ninth person or more in worst case. Migration towards the delta is resorted to when all other alternatives are exhausted.

The community relies on rich indigenous knowledge of seasonal variability or performance by adjusting to changes in their grazing environment from time to time. Traditionally Orma pastoralists manage grazing lands collectively with clear regulation on access to key grazing resources, and enforceable sanctions for people who fail to abide by the rules. Council of elders played critical role in organizing the community. Consensus building and respect of elders consider holy and wise made natural range resource management and conflict resolution a norm. The community depends on elders to provide tentative information of how next season will perform. Observation of animal behavior, stars and reading of slaughtered animals' intestines are some of indigenous knowledge which elders have to predict seasonal performance. Information generated from such observations and historical trends guide grazing/

migration decision making and also ceremonies. Furthermore mastery of appropriate skills and knowledge in grazing management is important to cope with environmental challenges and emerging threats. Grazing and finding water for livestock are main responsibility every Orma engages in from childhood. Pastoralism practiced by Orma entails adjusting to environmental conditions and natural shocks like drought. Families are in constant movement with their herd, from one zone to the other. During rainy season they move away from grazing areas with permanent water and return back to this area as dry spell sets in. Like in all pastoral areas of Kenya and common practice of mobile pastoralism world over, resilience in their ecosystem is determined by flexibility and continuous monitoring of the grazing environment. However, finding of post disaster needs assessment (PDNA) following drought of 2008-2011 puts doubt on the capacity of indigenous knowledge and practices to cope with frequent and more severe drought associated with enhanced climate variability. Recent phenomena associated with climate change including variation of the seasons in terms of onset, temporal distribution and averages and change in the flooding cycle has interfered with the way communities use to monitor and respond to change in their environment. For example onset of rainfall for both long and short rains seasons has shifted from what community was accustomed too. Long rain use to in the months of March, April, May (MAM) has changed, onset are experienced as late as mid-April in the last four years. Timing of the season to guide decision making is one of challenges the community is facing. Dry months of January, February, August, September

and October are now warmer, average temperatures exceeding 37°C during the day. Pasture and browse development after rain is to some extent affected by relative high temperature less soil moisture. Livestock require frequent watering traditionally cattle return for water after every one to two days, this is now not practicable with high temperature and all most always dry pasture. Regeneration of pasture is an expectation which occurs soon after rainfall. Enhanced variability and depressed rainfall resulted environmental conditions which is more challenging to Orma Pastoralists.

As practiced today Orma Pastoralism is facing much bottle necks like, frequent drought, torrential rainfall which occurs in short time causing more run-off and less soil moisture and high temperatures. Pasture regeneration is low between seasons, before community recovers fully from one drought event another sets in. Migrations to dry delta are frequent and out of a costumed seasons. Delta zone are utilized during severe drought, currently livestock migrate to it more often. Livestock disease incidences is now more frequent, pests like tick and biting insects are now more prevalent. Cost of livestock production is increased by frequent need of treatment and

application of pest control chemicals. The community which used to meet basic needs is now shifting towards to food aid dependent over some time. Generally, locations pre-dominantly occupied by Orma pastoralist in Tana River County are ranked high priority for emergency relief food aid since 2004. Droughts are more frequent and last for longer duration, relief food is emerging as an important source of food among the Orma now. Other none climate factors like population increase, more land put under crop production through irrigation, creation of national parks in areas traditional used as grazing areas are yet other factors affecting Orma's livelihood. Crop production is also facing challenges from poor rainfall performance. To facilitate adaptation in Agricultural sector the government established various irrigation projects. This is positive development moves to address food security but has negative effect on Pastoralism. Land tenure practice in key does not recognize grazing area as a form of land ownership i.e. crop farm can claim ownership of a piece of land which he or his father produced crop on. Attempts to develop community land policy are still ongoing but no tangible framework has been developed so far.

Bionote

I am working at Sub-National level for National Drought Management Authority as resilience officer. In addition, I am from pastoralist background and belong to the same group am working for. I am a Borana and there more similarity and less difference between way of live of my community and Orma.

I have facilitated implementation of various micro-projects to build communities resilience. Climate change

has been a major challenge, the pace of our development efforts are over whelmed to overcome enhanced variation of the climate.

Because I closely interact with Orma community on a day to day basis I share with them their frustration as each season comes with more challenges. Weather patterns are less predictive and weather related shocks are more frequent.

Savoirs locaux sur l'eau et changement climatique dans les oasis du Maroc

Abdrahmane ZAABUN & Faouzi EL BACHIR

Maroc

Dans les oasis du Sud du Maroc, les spécialistes de l'eau et de l'irrigation berbérophones ou arabophones sont nombreux à constater l'évolution du débit d'eau de source et d'eau de pluie.

Maitres de l'eau calculant la hauteur de l'eau des bassins et assurant la répartition équitable des tours d'eau pour l'irrigation, maçons traditionnels rénovant

chaque année les canaux d'irrigation, autant d'acteurs locaux dotés de savoirs à même de témoigner de l'irrégularité du débit d'eau ces dernières années. Deux représentants de ces métiers et de ces savoirs locaux originaires de l'oasis de Tighmert dans la région de Guelmim se proposent de présenter leur manière de diagnostiquer le climat et la pluviométrie.

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