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REPORT OF THE
**UNESCO EXPERT MEETING
ON INDIGENOUS KNOWLEDGE AND
CLIMATE CHANGE IN AFRICA**
Nairobi, Kenya. 27-28 June 2018



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Contact details:

UNESCO LINKS programme: links@unesco.org

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SUMMARY

UNESCO's Local and Indigenous Knowledge Systems (LINKS) programme hosted an Expert Meeting on Indigenous Knowledge and Climate Change in Africa on 27 - 28 June 2018 in Nairobi, Kenya. The event was part of the UNESCO five-year project [Knowing our Changing Climate in Africa](#), hosted by UNESCO LINKS and supported by grants from the Swedish International Development Agency (Sida), the Japanese Funds-in-Trust (JFIT), and the regular programme budget.

Knowing our Changing Climate in Africa supported community-based participatory research on indigenous knowledge of weather and climate, and transdisciplinary dialogues with indigenous knowledge holders, meteorologists and other scientists on the synergies and potential complementarity between indigenous knowledge systems and science. This initiative also aimed to stimulate dialogue between indigenous knowledge (IK) holders, scientists and policy makers on how indigenous knowledge contributes to understanding our changing climate and developing a 'best available knowledge' approach to climate adaptation.

The Nairobi expert meeting explored the results of indigenous peoples-led community research on the knowledge of pastoralist communities in five Least Developed Countries, namely Uganda, Ethiopia, Tanzania, Burkina Faso and Chad, and in Kenya.

The results of that research have provided insights into how indigenous peoples understand changes in weather and climate, and the way they observe and forecast those changes at different time and spatial scales. The pastoralists discussed with scientists how their respective knowledge systems contribute to understand climate phenomena, the importance of relevant indicators in climate and weather observation and forecasting, the experience of climate resilience and relevant recommendations for improved policy making.

The meeting represents a substantive contribution to how National Adaptation Plans (NAPs) in Africa can draw on the dialogue and joint action of indigenous and local knowledge (ILK), natural and social sciences, as well as contribute to regional and international policy processes related to climate change.



The expert meeting gathered more than forty participants from several African countries and different backgrounds.
© Gaia Paradiso/UNESCO, 2018

Overview of key observations

1. In the context of African pastoralists, communities apply ILK to observe biodiversity (e.g. animal, insect and plant behaviour and phenology), along with atmospheric observations (e.g. temperature, wind, precipitation patterns and types, and night sky obscurity). These observations allow pastoralists to identify biotic and abiotic indicators on which they rely for weather and climate prediction over different spatial and time scales.
2. ILK provides an integrated model of how different elements, including terrestrial and atmospheric phenomena, interact with one another and indicate ecosystem changes, trends and patterns relevant for coping with climate change, identifying and managing risks, and guiding adaptation on a daily, seasonal, annual and intergenerational scale.
3. Bringing ILK and science into dialogue and mutual understanding can generate 'best available knowledge' that is useful for both knowledge systems, and society, and can provide an important foundation for national adaptation planning and policy development.
4. Engaging transdisciplinary dialogues and supporting projects in which ILK and science engage to tackle common problems opens important opportunities to improve the existing knowledge for a wide range of areas, including weather and climate. However, differences between the knowledge systems pose challenges in terms of developing capacities of the bearers of both knowledge systems to work synergistically. Therefore, facilitating transdisciplinary initiatives requires the engagement of scientific experts from different disciplines, enabling scientists' understanding of the holistic knowledge held by indigenous peoples, usually held by elders.
5. Transdisciplinary cooperation requires attention to existing power inequities between knowledge systems, and adopting a human rights-based approach that takes special consideration to climate and social vulnerabilities specific to indigenous peoples and their knowledge systems. Power imbalance between knowledge systems—with science occupying a dominant role—manifested by the prejudices associated to ILK, and to the non-dominant languages that usually transmit it. This risks undermining transdisciplinary dialogue. Recognizing the respective value of each knowledge systems is a pre-condition to engage in an effective transdisciplinary process.
6. Considering gender dynamics is particularly important in working with and understanding ILK. Presentations showed different gender aspects with regards to knowledge production, transmission, analysis and decision making. Pastoralist participants noted that changes in climate are changing gender patterns, and hence in discussing both knowledge and climate adaptation, the transformative opportunities brought up by recent evolutions in gender dynamics need to be taken into account. Science itself is not gender neutral and the reflections on gender and knowledge are equally pertinent in understanding how and by whom science is produced and applied.



1. CONTEXT OF UNESCO WORK ON INDIGENOUS AND LOCAL KNOWLEDGE AND CLIMATE CHANGE

UNESCO's mandate is building of peace in the minds of men and women. In this regard, science that is directed towards the common good becomes critically important to decisions which help define a path towards a sustainable, peaceful and equitable world in the future, and address the Sustainable Development Goals (SDGs) today. To this purpose UNESCO's Division for Science Policy and Capacity Building (PCB) has as its mandate to mobilize science for public policy and the achievement of the SDGs. The Small Islands and Indigenous Knowledge (SII) Section, under the PCB Division in the Sector for Natural Sciences, has administered its Local and Indigenous Knowledge Systems (LINKS) programme since 2002. [The LINKS programme](#) has been making a unique contribution to understanding the interrelationship between the knowledge systems of indigenous peoples and local communities, and science.

The science of meteorology and climatology are principal sites for generating science evidence in policy making related to climate change and the emerging policy field of climate adaptation. Historically, adaptation to natural variations in the climate has been integral to human survival through ice ages, millennial droughts and in the transition into our present age. All species that we know of today are the products and agents of natural adaptation. Nowadays, we are faced with a rapid and unstable climatic pathway, wherein humans and other species will be obliged to adapt socially, physically, economically at unprecedented speed. The project thus focused on societies that have a long history of successful adaptation, and who are on the frontlines of climate change today. The emphasis was on the dialogue—the knowledge interactions and the mutual

learning opportunities—that occurs when meteorologists and climatologists are brought together with rural traditional pastoralist communities in different parts of Africa.

❖ 1.1 Science and scientists in the age of climate change

Scientists are in a key position to bring scientific evidence and models capable of giving insights and guiding action towards tackling climate change and its effects to the attention of policy makers, decision makers and the general public. Climate change is in part the result of policy making not responding to scientific evidence of the risks and damage of climate change. Climate science has arguably been kept to the margins of policy making for decades, and now as it is rising in importance there is scope to improve the science – policy interface to bring best available knowledge into decision making.¹

Though all sciences have ethical principles and science agencies have constantly evolving ethical protocols, the ethical and social dimensions of science have taken on new complexity, urgency and consequences. The failure to ensure that science is the foundation of national and international decision making on energy and economic development choices places a burden of inestimable weight on future generations. Our challenge is not so much the lack of science, data or modelling and scenario building—the challenge is the effectiveness of science to be integrated into decision making and contribute to the achievement of the SDGs and the common good.

❖ 1.2 Local and indigenous knowledge systems and science

Over the past decade, international mechanisms and instruments dealing with biodiversity, climate and conservation have increasingly recognised the value of diverse knowledge systems, as well as the importance of the participation of indigenous peoples and local communities in those processes. Outstanding elements include, in the field of biodiversity, the UN Convention on Biological Diversity's articles 8(j) and 10(c), as well as the UNESCO and CBD Secretariat Joint Programme of work on the linkages between biological and cultural diversity, and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) assessments.² In accordance with the inclusion of indigenous knowledge on climate adaptation and mitigation, important evolutions have been done by the [Paris Agreement](#) adopted in 2015 by the 21st Conference of the Parties to the UNFCCC. In addition, an increasing inclusion of elements related to indigenous and local knowledge (ILK) has been reported in the [IPCC 5th Assessment Report](#) and subsequent Special Reports.

According to UNESCO, indigenous and local knowledge refers to:

[T]he understandings, skills and philosophies developed by societies with long histories of interaction with their natural surroundings. For rural and indigenous peoples, local knowledge informs decision-making about fundamental aspects of day-to-day life. This knowledge is integral to a cultural complex that also encompasses

language, systems of classification, resource use practices, social interactions, ritual and spirituality. These unique ways of knowing are important facets of the world's cultural diversity, and provide a foundation for locally-appropriate sustainable development.³



Indigenous and local knowledge is embedded in the ways of life of their holders, and informs a wide-range of practices, including their diverse diets, that are anchored in seasonal availability. © AFPAT/ UNESCO, 2017

Indigenous and local knowledge systems are distinct from scientific knowledge systems, with different intellectual heritages, contexts, applications and sustained by substantially different types of institutions. However, far from being opposed to each other, indigenous and local knowledge systems like the African pastoralists' knowledge, and scientific knowledge systems may share important features regarding the centrality of observation in producing knowledge, the compiling of reliable insights on the basis of long-term verified patterns, and according to some theorists, also how hypotheses and models are built and tested, and indeed they may generate complementary results.

Tracker and scientist Louis Liebenberg proposes that science shares its roots with the indigenous art of tracking. In *The Art of*

²As the Technical Support Unit (TSU) for the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) Task Force on Indigenous and Local Knowledge Systems (ILK), LINKS supports the IPBES to recognize and respect the contribution of ILK to the conservation and sustainable use of biodiversity and ecosystems. See Annex 3 for list of Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) assessments.

³UNESCO LINKS programme. <https://en.unesco.org/links>





Tracking: The Origin of Science, he argues that the two systems share a fundamental 'hypothetico-deductive reasoning' that as a system permits moving between inductive reasoning based in observation and evidence, and the capacity to develop hypotheses and apply deductive reasoning, a process that is continually tested and adjusted⁴. Despite their differences of origin, practices and focus, these knowledge systems rely on some shared principles, including: observation, hypothesis building, cross-referencing of various indicators, and then systems of adaptation and modification. As the systems are based on observing different phenomena at different scales, with different approaches, they provide important opportunities for complementarity, particularly with regards to climate adaptation which involves biological and atmospheric factors, impacts and options for behaviour modification.

❖ 1.3 Complementarity of knowledge systems

It is not surprising that different human knowledge systems share certain characteristics and arise from similar observational and intellectual capacities. There are nonetheless also differences between science and indigenous and local knowledge (ILK). Those differences include the structure of science and indigenous knowledge, their institutional supports and ways of transmission. Unlike science, ILK does not divide knowledge into disciplines. As such, climate sciences can consider that some elements of the knowledge indigenous peoples have on weather and climate may be associated with different disciplines, such as botany, zoology or pedology and not being relevant to climate sciences. This means that, for instance, what indigenous peoples know about weather and climate

is intimately linked to the knowledge they have about plants, animals, soils and food. However, ILK production and transmission is applied to problem solving whereby multiple observers combine observations and knowledge to generate shared responses to phenomena.

Indigenous knowledge may be produced through interactions among community members that have a didactic purpose, in which an individual takes the time to teach what they have learned. Knowledge can also be produced by analytic means, whenever prior knowledge is used in encountering new context, or through the transmission of cultural elements in which knowledge is embedded such as dance, song or retelling of myths. That knowledge may also involve elements that natural sciences would not classify as relevant to them, such as dream, or rituals. However, as it has been argued in the disciplines of anthropology and psychology, those elements have a fundamental role in laying the foundations of environmental knowledge.

Given the seriousness of the global climate crisis and vulnerability of rural communities, particularly in the least developed countries (LDCs), the potential complementarity and synergies between the knowledge systems invite us to investigate and recognise the unique characteristics and explanatory potential of ILK to enrich our understanding of weather and climate, and moreover about ecosystems and biodiversity. These descriptions are valuable right now as the phenomena occur. With the benefit of observations by elders over a lifetime and through their unique languages which evolved in situ and contain detailed taxonomies of biodiversity, seasonal cycles, precipitation patterns and atmospheric phenomena, we can also gain

transgenerational information and baselines from earlier times before there was scientific observation present in these territories. Taking time for dialogue, investigation and exploring such synergies and complementarity may reinforce indigenous peoples' resilience, fundamentally change current approaches to climate adaptation and resilience building, and potentially create opportunities for innovations in the co-production of knowledge about weather, climate and nature.

1.4 Community research on pastoralist knowledge

In 2014, LINKS launched its Transdisciplinary Research on Climate Change Adaptation for Vulnerable Indigenous Communities in Sub-Saharan Africa project with the support of the Swedish International Development Agency (Sida) and the Japanese Funds-in-Trust

(JFIT). The project ran from 2014 to 2018 with the focus on knowledge mobilization, transdisciplinary dialogue and policy engagement in five African LDCs, namely Burkina Faso, Chad, Ethiopia, Uganda, Tanzania, and in Kenya.

As accurate, relevant and accessible climate information becomes more urgent for achieving successful adaptation and sustainable development, international attention is focusing on how to embed meteorological and climate services and information in national development strategies, particularly adaptation planning and National Adaptation Plans (NAPs). The community research and policy dialogue facilitated by UNESCO therefore explored how indigenous and scientific systems of climate observation, forecasting and decision making can evolve complementary initiatives with one another and create opportunities to resolve climate challenges through knowledge co-production.



For centuries, African pastoralists have observed environmental dynamics to develop strategies, like the seasonal transhumance, to adapt to the climate of the areas where they live. © AFPAT, 2018





Community research was undertaken by pastoralists in the six countries involved in the project, and included the analysis and documentation of pastoralist seasonal calendars and related observations of predictive indicators in the different local contexts. All seasonal calendars contain elements regarding critical weather conditions for pastoralist livelihood, such as onset and end of rain and dry seasons, and the quality of precipitations and dry conditions. Similarities among seasonal calendars raise questions about the possibility to have insights on about how humans, and those engaged in traditional pastoralism more specifically, construct knowledge systems with predictive capacity. The pastoralist knowledge documented by the pastoralist researchers provide opportunities to establish transdisciplinary activities that can generate innovative data by both upscaling and downscaling information on weather and climate, as well as help inform decision makers on the information that can be generated from them. Possibilities for upscaling are offered when engaging with pastoralist groups from different countries, as some of the observations made by the different communities can be used to develop an approach to understanding weather or climate behaviour at a regional scale based on indigenous knowledge. For instance, group discussions on pastoralist observations of wind movements suggested that the observations made by all groups in the six countries had some degree of correspondence and that a pattern could be explored at a larger scale.

The samples of the UNESCO-supported research suggest that pastoralist knowledge of weather and climate is relevant for policy makers and scientists. Further, there is potential in increasing the interaction between the indigenous knowledge systems

and meteorological and other environmental sciences to generate improved modelling of climate change, predictive capacity in forecasting, and an overall approach to knowledge-based climate adaptation. A dialogue between knowledge systems could help better understand rainfall, rain quality and wind patterns, especially in the arid and semi-arid lands of Africa, to generate more accurate data and understanding of how the atmosphere, terrestrial biodiversity and ecosystems are changing—allowing us a greater time depth of observation and details of current changes from year to year. The interaction of indigenous knowledge and science could increase resilience options, help focus policy interventions, and generally improve the capacity of all actors to make better predictions and respond appropriately⁵.

The research indicates that pastoralists use a number of means to elaborate projections on when it is going to rain, or to know if they are going to face other conditions such as being windy or very dry, how long these trends are likely to last, what their intensity might be. They can also gather information on where good grazing and watering will likely occur within a large territory. A number of signs are used including, for example the flowering of certain trees, behaviour of certain animals and insects, changes in winds and clouds. Even the milk that cows produce can provide information about trends in the natural world. These tools enable herders to live in arid and semi-arid lands, however the forecasting capacity has limitations, especially as the climate becomes increasingly unstable with greater extremes. This challenge is shared by meteorological science, again reinforcing the principle that combining different types of knowledge and analysis may improve our overall capacity and understanding. The gaps that these two knowledge systems have, reminds us of the

importance of working together and finding new synergies in forecasting, observation and climate adaptation responses. Combining certain traditional weather forecasting with meteorology may make forecast stronger and more useful for pastoralists, neighbouring communities and meteorologists.

In this regard, the Nairobi expert meeting highlighted some of these gaps between knowledge systems and how these could be bridged. One critical gap is the need of pastoralists for climate and weather information at a scale that is relevant to them, i.e. at the level of the ecosystem or landscape in which they operate. Dialogue around maps can be used as the basis for generating this type of downscaled information. Participatory mapping was thus identified as a critical tool allowing pastoralists to document and make visible how their nomadic or semi-nomadic land use operates—far from being random, traditional transhumance is designed from a perspective that can be useful for adaptation and sustain the ecosystems which support pastoralism.

In terms of adaptation to climate change, pastoralist practices are based on long experience of interaction with the landscape and numerous environmental variables, and include the deployment of practices to cope with the risks existing in their environments, where both floods and droughts can be regular occurrences. Climate adaptation is one of the greatest policy challenges of our time and the sooner we develop a transdisciplinary approach to adaptation, the sooner people will be able to start working in concert to implement nature-based and ecosystems-based approaches that are supportive to indigenous peoples' livelihoods and rights. Pastoralist knowledge can actually help improve and make robust the scientific

knowledge related to adaptation, and by doing so, enhance communities' resilience.

❖ 1.5 The social dimension of climate change and knowledge systems

Pastoralist communities participating in the project emphasize, on the basis of their research, that policy development, as well as transdisciplinary and interdisciplinary cooperation need to be informed by human rights and equity. This includes transforming gender dynamics and addressing the range of vulnerabilities that challenge an appropriate climate adaptation.



Indigenous peoples' knowledge of the environment is rooted in social interactions that ensure the accumulation, transmission, development and innovation of this knowledge. © Ismael Ocen/ UNESCO, 2017

The pastoralist research has been focused on knowledge primarily. At the same time, pastoralists exist in a challenging situation. They are subject to different forms of vulnerability, some generated by climate instability, some to do with land rights and policy processes, and others to do with competition, conflict and cooperation with neighbouring communities. These and other drivers are changing pastoralist societies and institutions in various ways, some of which increase vulnerability whereas others contribute to resilience.





Pastoralist knowledge and institutional systems are grounded in social structures for which gender has a specific meaning and generates particular dynamics. Women and men possess detailed and sometimes different knowledge about their environment, uses of plants and medicines, and other types of resource use. They have different roles in observing nature and contributing to decision making. With the impacts of climate change and other social drivers, the research and dialogue point out a rapid change in gender roles and norms in relation to climate, environment and natural resources management. The research reports touch on various aspects of the gender-based architecture of knowledge and this became a topic of discussion at the Nairobi expert meeting.

Pastoralist knowledge systems are almost exclusively oral and sustained by social institutions and practices. Within the framework of the project, pastoralists identified various threats posed to the indigenous institutions that sustain knowledge and its intergenerational transmission. Climate and weather-related knowledge is being lost and the transmission to younger generations is not secure due to factors including limited transhumance possibilities from land tenure disruptions, tensions related to religious and modern school bias against traditional practices, and disruptions to the pastoralist economies due to repeated environmental shocks. The research considers some of the challenges with regards to knowledge transmission and the social, economic and other pressures being experienced by pastoralists, many of which are amplified by the unstable climate and competition for scarce water resources.

Numerous externally driven events and issues threaten the reliability of indigenous and local knowledge systems—especially those of pastoralists who live in risk prone environments. Such threats include climate change, including extreme weather variability. Arguably, pastoralism is better suited for such instabilities than rain-fed agriculture. Yet there are limits to adaptation under such circumstances, particularly if there is not an enabling policy and land-use regime in place that creates adaptive opportunities. One example cited was that temporary access to protected areas could be granted during extreme weather events to conserve livestock. There are other threats which challenge the foundations of pastoralist livelihood systems, especially those in the drylands. These include coercive land alienation or ‘land grabbing’ (e.g. for other types of land use including mining, crop farming, biofuels, irrigation, or protected areas that restrict access to pastoralists), and the many ‘modernization policies’ (e.g. sedentary agriculture and irrigation in dry and highly risk prone environments).

In conclusion, measures that aim to enhance the strength of ILK systems in the context of climate change may be an important element of transdisciplinary dialogue, with human rights-based policies and laws promoting indigenous livelihoods being preferred. Among those policies and laws securing land tenure, recognition of their transhumance systems and corridors, including in adaptation policies, have a positive effect on knowledge transmission and generation. Creating constructive interactions of ILK and science requires mediation of the two systems, noting and addressing issues of stigma, power differentials and discrimination.



Through community research supported by the LINKS programme, pastoralist peoples in Africa have analyzed how their indigenous knowledge is relevant to strengthen the implementation of international agreements in their countries. © Nigel Crawhall/UNESCO, 2018



2. MEETING REPORT

This section of the Report summarizes the proceedings of the UNESCO Expert Meeting on Indigenous Knowledge and Climate Change in Africa, held on 27 and 28 June 2018 in Nairobi, Kenya. The event brought together experts including pastoralist knowledge holders, meteorologists, climatologists, adaptation and biodiversity specialists, and national and international decision makers. Community research that had been undertaken by pastoralists in Burkina Faso, Chad, Ethiopia, Uganda, Tanzania, and in Kenya was presented at this expert meeting.

The content of this section is informed by the detailed presentations made by the various experts in panel sessions over the two days, and the discussions and reflections that followed during the group and plenary sessions. The key findings and discussions, summarized as key messages, provide suggestions for good practices and identifies the challenges for the effective uptake of diverse sets of knowledge in adaptation planning.

The expert meeting was preceded by a one-day meeting of the research partners. In this meeting, UNESCO shared feedback on the emergence of pastoralist seasonal calendars and related observations of predictive indicators in the different local contexts. Two thematically related presentations made at this meeting also are included in this meeting report.

2.1 Welcome, opening and introduction



Science experts recognized that indigenous knowledge can be a key factor in efforts to downscale scientific knowledge and can give insights on how climate interacts with local features. © Nigel Crawhall/UNESCO, 2018

The meeting was formally opened with a traditional Maasai greeting and blessing. This was followed by the opening address of Ann Therese Ndong-Jatta, Director of the UNESCO Nairobi Regional Office for Eastern Africa. She provided an overview of UNESCO's role and involvement in climate change adaptation work with pastoralist communities in Africa, which also has a strong focus on gender dynamics. This was later followed by an introductory overview of the expert meeting by Nigel Crawhall, Chief of the Small Islands and Indigenous Knowledge (SII) Section of UNESCO, who spoke on the importance of creating dialogue between indigenous and local knowledge (ILK) and science in order to evolve new knowledge and solutions.



Pastoralism is the backbone of many African economies and societies, and a continually evolving system allowing for a dynamic adaptation between humans, livestock, climate and biodiversity. © Nigel Crawhall/UNESCO, 2018

In her opening address, Ms Ndong-Jatta warmly welcomed attendees before continuing to give an overview of UNESCO’s activities related to climate change adaptation, science and indigenous knowledge in Africa through its LINKS programme. She set the tone by describing UNESCO as an agency that is in a unique position with the “capacity to bring together scientists, policy makers and people of diverse cultural and regional backgrounds to study the challenges faced by humanity, and to apply different knowledge systems to devise sustainable solutions.”

She pointed out that Africa was on the frontline of climate change, yet Africans were not the drivers of this phenomenon even though Africa’s steady developmental agenda had been put at risk. Thus, it was in the interest of Africans to participate in these processes that sought to understand how diverse knowledge systems could cooperate and complement one another to ensure “sustainable futures for all our peoples.” UNESCO was committed to

supporting their member States to mobilize ILK in their respective countries. Also, by gathering scientists, policy makers and indigenous knowledge holders, it was hoped that “the best possible knowledge” could be found to improve policy decisions on climate adaptation and resilience, especially as it impacted vulnerable groups in society such as indigenous peoples.

Describing the work of UNESCO LINKS, and specifically its “Knowing our changing climate in Africa” project, Ms Ndong-Jatta noted that this expert meeting was the “culmination of five years of community-based research, technical dialogues, workshops and policy engagement.” These policy engagements included participation in the processes of the UN Framework Convention on Climate Change (UNFCCC) and the Intergovernmental Panel on Climate Change (IPCC). She acknowledged the participation of members of the World Meteorological Organization (WMO) and the African regional meteorological agencies in project activities.





She continued, pointing out that throughout UNESCO “the importance of science in policy making and in our daily lives” is recognized. At the same time, as an African, she highlighted the relevance to have these discussions as it is well known “that there are many other knowledge systems that long preceded Western science and which evolved in our specific ecosystems and climate contexts.” Describing pastoralism, the focus of the LINKS project, as “the backbone of many African economies and societies,” she paid homage to this “continually evolving system” that has allowed “for a dynamic adaptation between humans, livestock, climate and biodiversity. From the Namib to the Horn of Africa, from the Nile Valley to the depths of the Sahara”.

In addition to contributing to the UN Sustainable Development Goals (SDG)⁶, the LINKS project addressed UNESCO’s two Medium-Term Strategic Priorities: Gender equality and Africa. Addressing the women participants, she said, “I look around the room and I am pleased to see women pastoralists and women scientists. Indeed, any road map for resilience and sustainability must be informed by a gender-sensitive approach and lead us to a gender-transformative result.” She concluded by reminding participants: “Climate change is going to change our societies and our livelihoods; let us be the ones who shape this to the best possible results: equitable, peaceful and inclusive.”

Finally, Ms Ndong-Jatta expressed appreciation towards all those involved in making a success of the programme including the funders, specifically the governments of Sweden and Japan, and UNESCO’s indigenous partner organizations and community researchers. Nigel Crawhall, in his introductory overview, placed the expert meeting within the context of the international discussion on climate change and adaptation efforts. He referred

to the many serious consequences and challenges resulting from the planet’s warming, but also of the opportunities this situation presented. He emphasized that humanity needed to use climate change and climate change tools to help promote peace and peaceful problem solving in the world, and between men and women—the promotion of peace, education, sciences and intercultural cooperation formed the foundation of UNESCO’s work. The Sector for Natural Sciences had received a particular mandate to work with governments and scientists to understand how knowledge and research could shape and inform national and international policy making.

It would be reasonable to say that, in Africa, most knowledge about the environment is held by local and indigenous communities. The task then would be to understand how the best available knowledge about the climate and environment may be mobilized and communicated, in relation to the capacity of meteorological sciences to meet developmental challenges. This combination of efforts by different knowledge holders would help to bring understanding to the evolving context of climate change impacts and how to support and modify human resource use to build resilience and reduce vulnerabilities.

He emphasized the growing importance of climate change adaptation. Human adaptation related to the way people changed their behaviour to cope with changes in the environment, for example, if it was becoming too hot, people may have to grow more heat resistant crops or make different livestock decisions. Many countries are in the process of developing National Adaptation Plans (NAPs), which make a good platform for bringing together science and indigenous knowledge, and enable people to speak to their governments about adaptation policy.



Transdisciplinary dialogues between pastoralists knowledge holders and scientists explored possible synergies between knowledge systems to enhance local resilience. © Nigel Crawhall/UNESCO, 2018

Because of climate change, both scientific and indigenous forecasting systems are facing major challenges in terms of accuracy. Therefore, teamwork between formal science and traditional knowledge is essential to help solve the climate change challenge. This will contribute to the UN SDG, of which Goal 13-Climate Action specifically addresses climate change. Climate change is truly felt at the local level and this reality should be used as a basis to guide sustainability. Likewise, adaptation only happens at the local level. So, it is important that the voice of the local level is heard. He concluded that now, more than ever, global society needs a productive dialogue between indigenous knowledge systems and science, as both systems needed each other. In this way it would be possible to co-produce knowledge to benefit both the indigenous knowledge systems and meteorological and climate sciences.

❖ 2.2 Panel session: Pastoralist knowledge of weather and climate

This panel session of the workshop considered the range and depth of pastoralist knowledge of weather and climate and the challenges brought by climate change on traditional forecasting. In their case studies, presenters reported on community research undertaken with pastoralists from Kenya, Tanzania and Uganda, respectively. The final presentation of the session provided an overview of the research work undertaken by UNESCO with East and West African pastoralist communities.

The research findings of different presenters showed the commonalities of experiences, indicators observed for forecasting, and particularly increased pressure on land use and availability and the negative effects this pressure has on the adaptive strategies of pastoralist communities. Also, the impact of climate change on traditional women's roles and livelihoods in pastoralist communities in East Africa has proven to be far-reaching. Mannava Sivakumar was the session moderator.





2.2.1 Samburu and Laikipia Maasai knowledge for seasonal weather prediction in Kenya

Presented by Malih Ole Kaunga, Indigenous Movement, Peace Advancement and Conflict Transformation (IMPACT)

The research conducted with the pastoralist communities included focus group discussions, attending ceremonies, field observations and interviews with key indigenous knowledge holders. It was found that natural resource governance and rights of passage were key areas for adaptation and weather prediction amongst the Maasai pastoralists, which helped them to plan for variability and adaptation.

Regarding weather knowledge, there are a number of weather indicators that announce when the rain will come. Among them, the presence of dust devils, the flowering of certain trees, or the behaviour of different wildlife and livestock. In addition to reading physical signs during the day, every community has “their own astronomers” who can read the moon and the stars. This reading depends on what is present in the atmosphere, i.e. dust or moisture, and whether the stars are visible. However, the effects of climate change on the environment are noted with concern. As one elder, Ole Nkoile, said, “My son, nature has changed. Seasons have changed—trees are no longer talking to us; we do not know what is happening.”

The role of women is changing due to climate change and a slowing population growth at 4.5% per annum, as men now have to move over larger landscapes than before. As a result, there is an increasing number of women-headed households.

Challenges include an increasing demand for expansion of community conservation areas that are externally funded by donors through entities such as the North Rangelands Trust (NRT), coupled with large-scale infrastructure, exploration and renewable energy initiatives. This has the effect of curtailing pastoral movements which, in turn, is reducing the value of their coping strategies. Therefore, land use needs to be better negotiated to ensure all benefit—different land users and nature.

2.2.2 Pastoralists’ weather knowledge and forecasting skills in Tanzania

Presented by Elifuraha Laltaika, Association for Law and Advocacy for Pastoralists (ALAPA)

The research focus was on the importance of historical coping and adaptive strategies of Maasai pastoralists in Tanzania. Research techniques such as focus group discussions, interviews and storytelling were key to engaging the indigenous knowledge holders, who usually are specific elders or women.

Pastoralism is dependent on the knowledge of weather forecasting and prediction. The methods range from examining plants, studying the characteristics and behaviours of animals, observation of patterns of clouds, and knowledge of ecosystems including the pastoralist rangelands. Usually the observation of clouds is done in the morning to predict how the weather will turn out to be that particular day. Studying the stars and astronomical signs is important during dry seasons to forecast the beginning of the next rains. Slaughtering goats to examine the intestines can help interpret whether the subsequent season will be characterized by insufficient rains, indicated when the

intestines are found to contain bubbles. These methods are important sources of information and alert pastoralists to inter-annual seasonal variability, as well as knowing how close, in terms of days or months, the rainy season is, a situation that differs from year to year.

Weather prediction and knowledge management are complex and involve dealing with contradictory signs, as well as involving multiple signs or indicators. It is clear that the oral tradition on which indigenous knowledge systems rely are important to Maasai pastoralists. Sometimes predictions are not accurate. Special prayers may be said by women who dress in black. Women have an important role to play in terms of prayers to God and being able to predict weather, and this is acknowledged in traditional weather prediction. These predictions help to make decisions, for example about conserving water points and not cutting down trees. Livestock and homestead movements is a complex issue and not done lightly and these are based on weather predictions. As one elder noted, “This serves to reinforce that weather prediction among Maasai pastoralists is not linear, but rather complex or multi-layered, meaning some manifestations call for different actions.”

Indigenous knowledge can be used for decision making. For example, the use of indicators to predict whether it is going to rain or be dry, helps communities be prepared. This provides a means of how to use such information for implementation, for example to sell livestock if there is going to be a drought. Weather prediction amongst pastoralists is primarily for mobility. It can also be used to encourage pastoralists to store food, sell livestock, purchase cereals and conserve water points. All of these strategies help reduce stress on the system and people.

Unfortunately, science and outsiders often tend to downplay the role and importance of indigenous institutions and knowledge, particularly those related to women. It was noted that “God hears women’s prayers,” and here Maasai women wear traditional clothes and they pray for various reasons including for rain, having good families, etc.

The discussions following this presentation noted that there are similarities between the Maasai and Karimojong. When traditional forecasting fails the Karimojong, women mobilize and sing to provoke the rain to come. Men are not supposed to interfere with women’s prayers. It is often elder women and young girls who make special prayers for improved rainfall, among other things.

As is the case with many pastoralist societies, there are increasing challenges, including: climate change and the accuracy of predictions compared to the past; more invasive species, for example, the plant species *Prosopis*; and the disappearance of indigenous language terms or key words used by elders. It is clear that pastoralist mobility is the lifeline to help these communities sustain their livelihoods. However, this has now been constrained by the impacts of land grabbing for conservation, irrigation and agriculture as well as for settlement, which is having severe impacts on the sustainability of pastoralism.



Younger generations have an important role in knowledge transmission. Keeping pastoralist livelihoods alive is crucial for boys and girls to participate in knowledge sharing. © Veronica Gonzalez-Gonzalez/UNESCO, 2018





2.2.3 Indigenous techniques of observation and interpretation of weather among the Karimojong of north-eastern Uganda⁷

Presented by Ismael Ocen, UNESCO LINKS Partner, Ocean One Social Research Centre

Seasonal calendars were used as a key tool during the community research on weather observation and interpretation with Karimojong pastoralist knowledge holders. These calendars are a fundamental tool for Karimojong in terms of early warning signs, as specific indicators of weather events are identified for every season.

The Karimojong seasonal calendar identifies four main seasons. Akichereet is considered as being the first season in their calendar, as it brings the first rains. The first rains are considered very important, as these determine the rest of the year's weather and thus the quality of the rangelands. Akiporo is the season when good range and vegetation for the livestock is available, and thus critical to livelihoods. It is also the longest season and lasts for seven months. Erupe is an important season for decision making, as people prepare for livestock movement and decide which grazing areas to conserve and reserve, a strategy practiced by other pastoralist communities like the Turkana. During this season there are changes in the movement of the clouds, and some bird species sing, for example the rain bird. Finally, Akamu is the dry season and it is key to have the reserved grazing areas available before this season starts.

Based on lunar cycles, seasonal calendars are used to help predict when it might rain. Different types of moons, as well as the flowering of certain tree species, are

used as indicators that the rain is close. Frogs, and lightnings and thunders are also indicators that the rains are about to start.

Karimojong also identify different types of rains, and associate to them indicators that announce them, and events that may follow those rains. For example, dust devils often come before the dust rains, while they know that if it rains during the "dark days of the moon," it can be a good sign to their livelihood, but not at the time of the full moon.

It was also discussed that the way the wind blows is also an important source of information, and that this knowledge can be used to make links to meteorological information, as both pastoralists and scientists have accumulated knowledge on it.

Indigenous knowledge faces a number of challenges, including loss of livestock and land. Poverty has destroyed much knowledge, for example, as happens when governments confiscate livestock thereby reducing people's livelihoods and their knowledge. In addition, there are challenges of land grabbing and subsequent loss of grazing areas. Together, these factors undermine key pastoralist strategies to address climate change in such dry and risk prone areas. It is important to restore these indigenous knowledge systems in the context of co-producing knowledge, as this may help to strengthen the case for their restoration. Therefore, it is essential to identify the functions of the various key knowledge holders in the areas of weather prediction and land management.

2.2.4 “Knowing our changing climate in Africa”: some key findings

Presented by Veronica Gonzalez Gonzalez, LINKS programme, UNESCO

This presentation provided a summary of the LINKS programme and the Knowing our changing climate in Africa project, together with the key findings from community research conducted by pastoralist communities in East and West Africa. The specific focus of this research was on pastoralist knowledge of weather and climate and to make the links to adaptation strategies, including mobility strategies. The research paid special attention to gender, and worked to raise awareness of the value of women’s knowledge.

It was noted that the LINKS programme emphasized the importance of interdisciplinary cooperation, drawing on disciplines across the natural and social sciences, and transdisciplinary cooperation which is built across knowledge systems, notably between indigenous peoples’ knowledge systems and those of science. This dynamic is summarized in Figure 1 below.

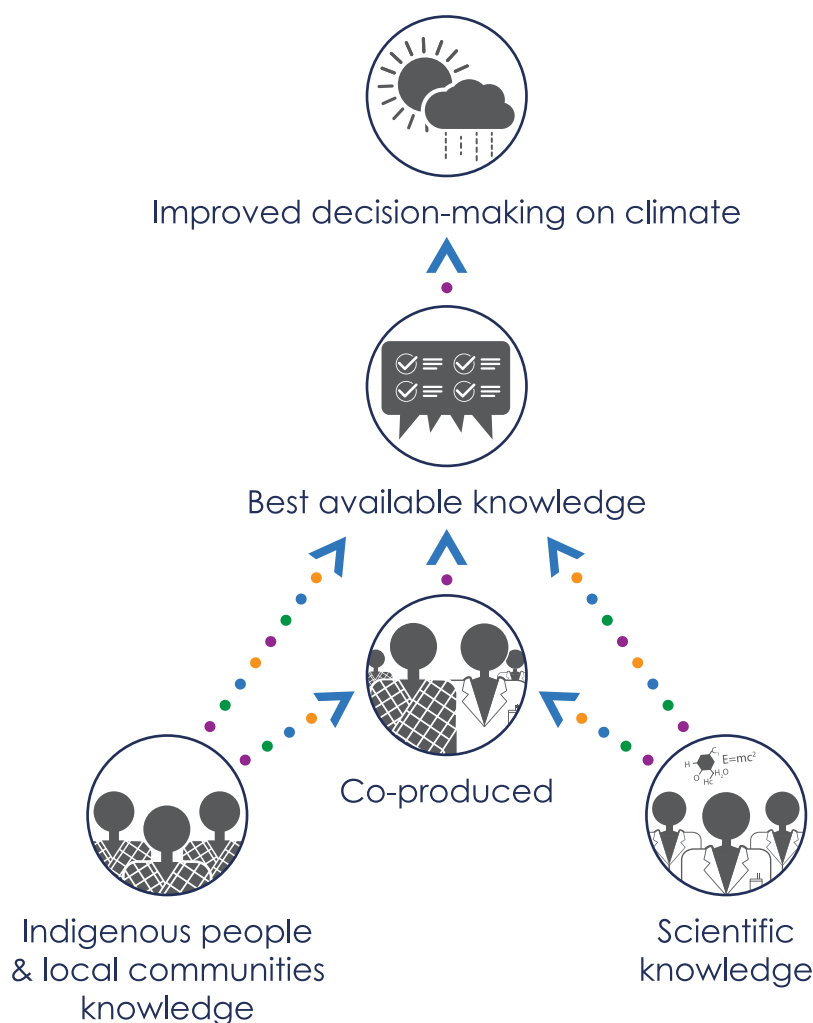


Figure 1: Inclusion of knowledge systems and co-production of knowledge. This figure shows the possible knowledge systems interactions that can help generate improved decision making on climate.



Pastoralists from six African countries shared the findings of their research and analyzed main differences and similarities between their knowledge systems and science. © Nigel Crawhall/UNESCO, 2018

The community research work took place in the arid and semi-arid tropics of Africa (Burkina Faso, Chad, Ethiopia, Uganda, Tanzania and Kenya). Pastoralists live in environments with high climate variability and exposure to stress. As a result, they have observed and responded to local weather and climate for millennia. Based on their knowledge, they take critical decisions with respect to their well-being and that of their herds. They adapt and maintain resilience in the face of global change, including climate change.

Seasonal calendars were a key research tool for the analysis and framing of pastoralist weather analysis. The research included identifying weather and climate patterns, including intra-annual variability (seasonal calendars) and inter-annual variability (multi-year cycles), as well as the analysis of weather and climate indicators. This was done by describing indigenous observation systems,

pastoralist interpretation and forecasting skills. Their knowledge was analyzed to see how useful this would be for adaptation and decision making, coping with drought and extreme risk events.

Participants in the research identified a variety of indicators for weather and climate forecasting which included: abiotic indicators—wind direction and strength, cloud formations, humidity, lunar cycles and constellations, appearance and position of moon and stars; and, biotic indicators which included plant phenology—flowering and fruiting, growth, withering or loss of foliage; and, animal behaviour of wild or domestic animals—termite flights, bird migration, bird song or nesting sites. These indicators are observed all through the year and reveal that the constant presence of pastoralists within their landscape is a powerful element in their observational capacity.

Reflecting on the documentation of these indicators, it showed how important it was to contextualize indicators in time and place in terms of forecasting and making ordered and systematized classifications of the objects observed. Some indicators provided information on quality of the events to come, others on their timing, while some were considered by pastoralists to be more reliable, and others more common. Having dialogues between indigenous knowledge holders, meteorologists and scientists from other disciplines is important in order to see the similarities in the observational tools they use. It is also important to establish the need to upscale or downscale available information, and to explore strategies to achieve this⁸.

After the presentation there was a discussion about women's voice on climate change and weather knowledge, especially the indicators that they use and how these are implemented. The project raised awareness of women's knowledge which had been very important in the research. Women are able to tell the quality of the pasture by the quality of the milk: if the milk is very thick, then there is not adequate pasture and water. As this is related to the quality of the current season, it is also a critical element for analysis that seek to predict what the following seasons would look like. Discussions among participants considered that women were also important in the process of knowledge transmission to children, as they spent more time with them. Behind pastoralist decision-making processes there are institutional practices that need to be understood by external agencies. Decision making can be fairly general or specific and formal, and usually is differentiated by gender.

Furthermore, climate change has resulted in social pressures and changes as well as ecological impacts that have had an impact on the roles and functions in indigenous societies that are divided according to gender and age group. With rapidly changing gender roles, the relationship between gender and knowledge has to be understood as dynamic, and attention must be given to not creating greater vulnerabilities or inequalities.

Participants also briefly discussed the difference between the terms 'indigenous peoples' and 'local communities'. The term 'indigenous peoples' is a legal concept that was outlined in the 2007 [UN Declaration on the Rights of Indigenous Peoples](#) and by the [Resolution on the Rights of Indigenous populations/communities in Africa](#) of the African Commission on Human and Peoples' Rights. The African Commission gave particular attention to the situation of pastoralists and hunter-gatherers as indigenous peoples in Africa. Among other criteria, indigenous peoples are self-identified and have associations with particular territories, culture and identity. Other communities may be referred to as local communities.

⁸The terms 'upscaling' and 'downscaling' are used to describe the adaptation and flow of information from the local level to national or global levels (upscaling), and vice versa (downscaling). Upscaling refers to how localized observations and tools may be pertinent to larger territorial and time application, including national forecasting, and climate analysis and models. Downscaling refers to achieving precise weather and climate information that is meaningful for pastoralists and farmers in their local context and according to the specificities of local weather patterns.



2.2.5 Key messages

Indigenous and local knowledge (ILK)

1. Pastoralists are facing increasing challenges which include climate change and accuracy of predictions compared to the past. In addition, they face such challenges such as alien invasive species, and the loss of indigenous language elements or words used by elders.

Dialogue and co-production of knowledge

2. It is vital to implement methodologies that can foster a dialogue between knowledge systems. Such methodologies should enable certain aspects of indigenous knowledge systems to be upscaled and be included in broader reflections on weather and climate.
3. Indigenous knowledge can also be a key factor in efforts to downscale scientific knowledge on weather and climate—it can contribute to understanding how the scientific principles on climate, and climate information concretely apply to specific local realities at the landscape or ecosystem level. This will help provide stronger traditional and scientific indicators for interpretation.
4. Having dialogue between indigenous knowledge holders, meteorologists and other disciplines is important to see the similarities among them and how their knowledge can be upscaled or downscaled.

Land use and livelihoods

5. In some cases, too much land is in conservation, which has reduced pastoralists' risk management options and adaptation strategies, while land alienation has restricted transhumance. Therefore, land use needs to be more equitably negotiated so that all users and the environment can benefit.

Gender

6. Women's knowledge and capacity to cope with climate change and weather, especially the indicators that they use and how these are implemented, need to be disaggregated in the process of knowledge documentation.
7. The way women generate and express their knowledge, and how it is different from men, needs to be highlighted.



Pastoralist women are crucial for the generation and transmission of indigenous knowledge.

© Jennifer Rubis/UNESCO, 2017

❖ 2.3 Panel session: Perspectives from different knowledge systems on weather and climate

The main themes that emerged from the panel session were the transdisciplinary dialogue between indigenous and scientific knowledge systems, the co-production of knowledge, and the appropriate inclusion of indigenous knowledge in formal educational institutions. The first two presenters spoke about their research methodologies based on participatory action research (PAR), and their findings on pastoralist indigenous knowledge, particularly knowledge of the seasons. The final presenter, describing the role of the African Centre for Meteorological Applications for Development (ACMAD), spoke on the weather and climate services they offered communities, as well as opportunities for sharing knowledge with indigenous knowledge holders. Paul Lokol of the Karimojong community was the session moderator.

2.3.1. Weather forecasting skills of Bahima herders in Nakaseke district, Uganda

Presented by Elizabeth Katushabe, UNESCO LINKS Partner, Pastoralism for Protection of Biodiversity Africa (PAFOPROBA)

During the research study, in-depth interviews were conducted with twelve knowledgeable women and men in the Bahima pastoral community to document their detailed indigenous knowledge and seasonal calendar. Six men and six women were interviewed from different parishes of


the two sub-counties. Interview guides and consent forms were designed and translated into the local language. The purpose of the study was discussed and agreed to, as well as the importance of having their consent to participate. Sub-county leaders were involved, and they supported the mobilization of the community.

The Bahima are a pastoral group of the Ankole originally found in southwest Uganda. Since they migrated there in the early 1950s, they are still found along the famous “cattle corridor” of Uganda— an area stretching from southwest to north-eastern Uganda. The cattle corridor is approximately 84,000 square kilometres, an area covering about 40 per cent of the country’s territory.

Weather-related elements for the Bahima include wind (direction and strength), clouds, mist, fog, dew and temperature. The sun, moon and stars are also analyzed in terms of their appearance and colour; the moon whether it was clear (dry season) or shrouded (rainy season); and also the visibility of the stars, e.g. Rwabahembezi is the early morning star. A variety of animals and birds are observed for changes in behaviour and the vegetation assessed, as some species flower before the rains start.

The Bahima have five seasons in their traditional seasonal calendar. It is around these seasons and the calendar that the Bahima manage their livestock. The five seasons are: two wet seasons—a short one called Katumba and a long one called Itumba; two dry seasons—a short one known as Akanda and a long one called Ekyanda. Then there are intermediary periods between the wet and dry seasons, known as Emirari. The Bahima describe in detail the characteristics of each season, and what they do in terms of livestock management.





Participants in the study stressed the importance of the complementarity between scientific knowledge and indigenous knowledge systems. The national education system did not promote an understanding of indigenous knowledge of weather, climate and environment, including such practical examples of traditional seasonal calendars and other forms of indigenous knowledge. It is important to engage with local government about indigenous knowledge, not just as an element of culture but as a component of national knowledge development and science capacity building. There is more analysis needed in terms of what Member States do about indigenous and local knowledge for education and to encourage the co-implementation and co-production of knowledge.

To conclude, in a context of changing and unpredictable climate, it is important to work with communities to document their indigenous knowledge of weather, their long-term observations of climate and environmental change, as well as their community-based strategies for resilience. This knowledge can be mobilized for discussions with climate and environmental scientists as this local knowledge can contribute to a broader understanding of the changes occurring, as well as the responses required for effective adaptation. The inclusion of diverse knowledge systems within climate change policy processes will provide decision makers with a better understanding of how indigenous knowledge contributes to assessing climate change, its impacts and the range of options it offers in terms of community adaptation. Therefore, the engagement and use of Bahima indigenous knowledge is key to addressing the impacts of climate change in Uganda's cattle corridor.

2.3.2. Weather and climate forecasting in the Nganyi community, western Kenya

Presented by Maria Onyango, Department of Management and Economics, Jaramogi Oginga Odinga University of Science and Technology

Weather, climate forecasting and early warning are critical for building community resilience, management of local disasters and supporting sustainable development. The Nganyi farming community from Western Kenya uses indigenous knowledge as a critical knowledge base for coping with local hazards. It provides them with a survival tool for adapting to extreme weather events through understanding past cyclic climate changes. Indigenous knowledge is defined as communal, holistic and spiritual knowledge that encompasses every aspect of human existence. The Nganyi community has accumulated their indigenous knowledge through generations of experience. They are able to predict recurrent local weather patterns, how and when local natural hazards occur, and how to plan to cope with the negative impacts. Indigenous knowledge has been integrated in the planning and management of the local natural environment, livelihoods, and lives.

For indigenous knowledge to exist, there are laboratories everywhere in the landscapes. Indigenous knowledge systems such as these can be an important basis for science. In the Nganyi community many examples can be found of community resilience, and research work is being done by local communities.

An important aspect of knowledge is the social structure in which it is embedded. Within it, both men and women have their

own and different roles, which corresponds to different knowledge sets. Understanding this configuration is crucial for enhancing adaptation to climate change, since it has empowered communities by enabling the transmission of knowledge, and it has also shaped different types of vulnerability within the community, making women often more vulnerable than men. It is therefore important to focus on gender aspects and women in particular to ensure the safeguarding of indigenous knowledge so that it continues to be transmitted intergenerationally.

While climate events affect men and women across the globe, research demonstrates

that the gender and age groups are impacted differently. Women and youth are more vulnerable because they face social, economic and political barriers that limit their coping capacity. However, women are also holders of a unique knowledge within the community. The women of the Nganyi community actually demonstrated that women have a vast knowledge and expertise that can be used in climate change mitigation and adaptation, and disaster reduction. Their responsibilities in households, as stewards of natural and household resources, position them well to contribute to livelihood strategies adapted to changing environmental realities.



Local communities in Africa can hold valuable insights related to weather and climate. These insights can be relevant in to manage local disasters and support sustainable development. © Nigel Crawhall/UNESCO, 2018





There are some gaps that need to be filled to ensure that indigenous knowledge is useful to climate change adaptation. These are: indigenous knowledge methods are not properly documented which creates a knowledge vacuum; the accumulated indigenous knowledge and practices are passed on from one generation to another through traditional socialization processes led by community elders— most of this knowledge is disappearing very fast due to changing value systems; and, there is a need to develop an indigenous knowledge training model that can be used to strengthen modern science predictions.

2.3.3 Role of the African Centre of Meteorological Applications for Development (ACMAD)

Presented by Hubert Kabengela, ACMAD

The African Centre of Meteorological Applications for Development (ACMAD) provides climate services on disaster risk reduction at continental, regional, and national levels. ACMAD described its role as regional climate centre, which allowed it to further strengthen its mission as climate information producer at the continental level, in addition to the capacity of regional weather centres and the National Meteorological and Hydrological Service (NMHS) in their respective missions to provide climate information on a sub-regional and national scale.

The type of climate services that ACMAD provides is climate monitoring and prediction, drought monitoring, climate status and assessment reports, as well as climate services for politicians and decision makers. ACMAD was able to develop these services thanks to donor funding. The challenge remains how to service user

needs, which needs to be very decentralized and varied. There has been a tendency to provide climate information based on science and for the global knowledge base. The challenge now is how to improve dialogue between pastoralists and the climate services, so that these services actually help pastoralists and other land users. Therefore, the challenge is how to get information to pastoralists, for example by use of cell phones.

Furthermore, in its role as producer of climate information, ACMAD organizes meetings with the platforms of the various users of climate information. These platforms include pastoralists who constitute an important community to contribute climate information as part of their pastoral activities, but climatic conditions are causing difficulties. These meetings with users are a dialogue to find satisfactory means of communications between them and weather services.

ACMAD has shown how it supports the NMHS and its users by organizing the Regional Climate Outlook Forum for the development of specific climate products for sub-regional and national users.

In conclusion, ACMAD proposes that the capacities of African climatic institutions are reinforced so that they have permanent capacity to provide climatic services to satisfy the needs of users. Thus, communication between these climatic institutions and communities should be developed for collaboration into the process of sectoral development.

2.3.4 Key messages

Indigenous and local knowledge (ILK)

1. It is important to work with communities to document their indigenous knowledge of weather, their long-term observations of climate and environmental change, as well as their community-based strategies for resilience. This local knowledge would contribute to a broader understanding of the changes of climate that are occurring, as well as the responses required for effective adaptation to it.
2. Some gaps for including indigenous knowledge into climate change adaptation policies include that: indigenous knowledge methods are not properly documented; understanding how indigenous knowledge is passed on from generation to generation through the community elders; most of this knowledge is disappearing due to changing value systems.
3. Participatory Action Research (PAR) is essential for strengthening adaptation policies to climate change and variability, and to enhance communities' adaptive capacity and resilience.
4. Education currently does not promote understanding of indigenous knowledge. The key challenge is how to include indigenous knowledge into the formal education systems.

Dialogue and co-production of knowledge

5. Finding knowledge co-production methods that include indigenous and scientific knowledge and methods is necessary for strengthening communities' climate change adaptation.
6. The importance of building on the complementarity of indigenous knowledge and scientific systems was stressed.
7. The development of an indigenous knowledge training model that strengthens scientific weather forecasting should be considered.
8. There is a need for indigenous knowledge and science forecasts to work closely together for community-based adaptation.

9. Pastoralists and scientists should engage in a discussion about their knowledge on predicting weather that can lead to knowledge co-production. This will make both pastoralist and scientific predictions stronger and more useful for adaptation.

Climate information for pastoralists

10. Scientists and meteorologists can work with pastoralists to produce climate and weather information at a scale that is relevant for use by pastoralists. This should be ecosystem or landscape based. Most countries already have ecosystem maps, and these should be used as the basis for providing such information.
11. The role of smart phones and electronic media is an important aspect to be considered to best disseminate climate information.

Institutional relationships

12. Encouraging transdisciplinary inter-institutional relationships (between ILK and science institutions) may increase the adaptive capacity of communities and their respective ecosystems to climate change and variability, while knowledge co-production inclusive of indigenous knowledge and science may improve national capacity to mobilise the best available knowledge for climate adaptation.
13. Indigenous knowledge should be treated as a component of national knowledge development and science capacity building.
14. The inclusion of diverse knowledge systems within climate change policy processes will provide decision makers with an understanding of how indigenous knowledge contributes to assessing climate change, its impacts, and the range of options for community adaptation.

Land use and livelihoods

15. Interdependencies of rural – urban livelihoods should be acknowledged in addressing vulnerabilities and strengthening climate change adaptation.



Participants stressed the importance of strengthening indigenous knowledge as a way to strengthen their local resilience. © Nigel Crawhall/UNESCO, 2018

❖ 2.4 Breakout session

The group discussions held during the first breakout session of the workshop addressed two of the workshop themes. One of the themes, the upscaling indigenous knowledge was strongly linked to the inclusion of indigenous knowledge in the institutions of dominant society, such as schools and research institutes. The session on gender focused on the impacts of climate change on women, and the transformation of gender roles in indigenous societies. The challenges of security of land and livelihoods were raised as important factors that affected both the integrity of indigenous knowledge, as well as the livelihoods of women.

2.4.1. Upscaling indigenous knowledge

Facilitated by Ismael Ocen

Reporting by Mulubrhan Balehegn Gebremikael

In order to upscale indigenous knowledge, new relationships must be grown between the respective knowledge institutions, i.e. between holders of ILK and partnering science agencies. In this regard, it is important to set up means for participatory prediction and co-learning between indigenous knowledge holders and meteorologists. This, in turn, would help to

have indigenous knowledge included in the national adaptation processes, including in national adaptation plans (NAPs).

Documenting indigenous knowledge and fostering knowledge co-production would facilitate its inclusion in processes such as the IPCC and, therefore, in the national climate change adaptation decision-making processes. The NAPs offered an important policy window that participants need to engage with as soon as possible with the focal points, as some countries were in the process of developing their NAPs. Thus, indigenous knowledge learning and sharing hubs should be established, and integrated into school's curricula. This would help safeguard and upscale indigenous knowledge and protect its resource base in terms of land and identity.

This requires sensitization and awareness creation on the importance and relevance of indigenous knowledge, so that indigenous knowledge products can be better known and disseminated. For this to happen, better formats and approaches need to be developed and used that work best for mainstreaming indigenous knowledge through showcasing, the landscape approach, and in-depth analyses and documentations of indigenous knowledge. This would help advocate for more progressive and dynamic policies that accommodate for emerging issues, especially those related to indigenous knowledge.

Indigenous knowledge is primarily situated at the local and village level, yet it is relevant at the national level, regional level, and even at the global level, especially for the IPCC. It is equally important to ensure that indigenous knowledge systems are incorporated into schools and formal education curricula. Looking at ecosystems provided a focus for both upscaling and downscaling.

It was also discussed that agencies like the African Development Bank and other multilateral organizations should be consulting indigenous knowledge holders when dealing with investments that affected indigenous peoples.

2.4.2 Is climate change changing the roles of women and men?

Facilitated by Nailejileji Asia Tipap, Pastoralists Indigenous Non-Governmental Organizations Forum (PINGOs Forum)


Reporting by Nasinyari Marko Sitayo, Maasai Elder

Participants discussed that women and men experienced different impacts from climate change, particularly regarding their roles as food producers. Much has changed in recent times as both women and men are doing the same sort of work and working together.

Strategies for climate change adaptation need to take into account the different roles and knowledge that women and men have in food and crop production, and dairy and livestock production. Climate change strategies should be focused on developing alternative livelihood options to take into account the impacts of climate change on agriculture. In this regard climate adaptation is important, referring to the ability of a system to adjust to climate change to moderate potential damage and to take advantage of opportunities.

Women and men had different roles regarding their livelihood production in their communities. Women are key players in ensuring adequate long-term food security. Traditionally men and women did not often





really work together. This has changed as it seems there are opportunities for joint work. Such diversification was a form of adaptation. Climate change adaptation needed to be gender-sensitive and empowering to women and girls, and take into account indigenous knowledge.

There had been an increase in temperature which contributed to the drying up of rivers and natural springs. As a result, climate change has had significant impacts on fresh water sources, affecting the availability of water used for domestic and productive tasks. This has had an added impact on women who are responsible for water management at the household level.

Climate change is expected to affect livestock population growth and economic and land-use change. Due to low rainfall and drought conditions, pastures have decreased significantly leading to lower production. Disease due to climate change is expected to affect production because of the sensitivity of livestock to excessive temperature and humidity.



The importance of generating gender-sensitive climate change adaptation that empowers women and girls, while taking into account indigenous knowledge, was highlighted in several presentations. © Nigel Crawhall/ UNESCO, 2018

2.4.3 Key messages

Indigenous and Local Knowledge

1. Documenting indigenous knowledge will help create pathways by which indigenous knowledge can be discussed at the IPCC, so that NAP writers can access it.
2. It is important that indigenous knowledge systems are included into schools and education curricula.

Dialogue and co-production of knowledge

3. It will be important to set up for participatory prediction and co-production (indigenous knowledge holders and meteorologists), which will help indigenous knowledge to be included in the NAP processes.
4. Ecosystem approaches can be a focus for both upscaling and downscaling information.

Institutional relationships

5. International and national institutions working on adaptation to climate change and issues relevant to indigenous peoples need to put in place measures to interact with indigenous knowledge holders and their respective institutions.
6. Global and regional multilateral organizations should consult indigenous knowledge holders when dealing with investments that affect indigenous peoples.

Gender

7. Climate change adaptation must be gender sensitive and empowering and also needs to take into account indigenous knowledge.
8. There are challenges which need to be addressed in terms of gender, including inadequate access to climate services.
9. It is important to empower women economically in terms of decision making, for example, encouraging the joint implementation of grazing systems.
10. Women need to be empowered to have the choice to diversify their income sources for example with respect to small scale business, value adding on milk products, so as to be more resilient.

Land use and livelihoods

11. It is important to focus on the adaptation value of reserved grazing areas.



Pastoralist women were recognized as key players in ensuring adequate long-term food security.
© Jennifer Rubis / UNESCO, 2017



2.5 Summary of Day One

Nigel Crawhall provided a brief summary of the discussions and insights of the first day of the expert meeting. It was noted that indigenous knowledge and science both have detailed knowledge about their environment, weather and climate. People needed to see how these domains can have a healthy relationship with each other and contribute to sustainable development and peace. Indigenous knowledge tends to be locally specific but often uses similar methodologies as science, namely, from observation pastoralists elaborate deductions that can be compared to hypotheses, they monitor signs that can be similar to scientific indicators. They elaborate complex systems that interrelate diverse elements and phenomena and can fulfil the heuristic functions of a theory. Indigenous knowledge also has a practical aspect in daily life, as such it is an applied knowledge that is constantly being assessed for its functional application.

Just as science is shaped by social and economic structures of the societies in which it develops, indigenous knowledge is distributed through gender and age sets, and can be shared amongst different groups. There are various institutions that are interrelated with indigenous knowledge, for example relating to livestock and ecosystems management. It is important that these institutions are not threatened, because if it might be difficult for knowledge to be revised to adjust to new environmental requirements. Indigenous knowledge as much as science, is reliant on its institutional framework to function, evolve and be transmitted.

In the same way science does, indigenous knowledge has its own logic, framework and context. The indicators to observe different seasons can be, for example, the presence or absence of a star, where

changes in the night sky might indicate the possibility of the presence or absence of rain coming. Behavioural changes in herds and people often happen before the onset of rains which may be due to atmospheric pressure or humidity, for example. Identifying this sort of detail can create the space for dialogue between indigenous knowledge and science.

Seasonal calendars are important sources of indigenous knowledge and for dialogue, as they support the capacity of pastoralists to know weather and climate and to identify weather and climate patterns. This knowledge constitutes a tool for specific scientific activities, such as forecasting, an area in which meteorological data and indigenous knowledge observation can be used together for mutual benefit. However, the time and geographical scales used by meteorology tend to be larger than those needed by pastoralists and local communities. For example, pastoralists need knowledge and information at the local level, in a user-friendly format and specific rainfall data, etc. The challenge is how can meteorology deliver appropriate data at that local level. As indigenous knowledge is locally and context specific, such knowledge might be useful at both national and local levels, hence the need for upscaling and downscaling of knowledge.

In terms of gender, there are different roles with relation to weather and climate. These roles may be changing, especially as climate change comes more intense and as awareness about climate change and the links between climate stress and pastoralists change. For example, climate stress might cause increased family violence which have links with peace both in the household and more generally. A gender lens is vital in terms of promoting more inclusive, constructive and equitable dialogue.



International instruments relative to climate change support indigenous knowledge and their holders as important elements on climate action. © Nigel Crawhall/UNESCO, 2018





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2.6 Panel session: Environmental observation skills

In this panel session, presenters described their research work on pastoral observational skills, including weather-related observation strategies. Presenters describe detailed knowledge of weather-related indicators, and also raise the ethical issues that arise from this type of research. For example, how indigenous and local communities can safeguard their knowledge and knowledge base in order to share more freely. Hubert Kabengala from ACMAD was the session moderator.

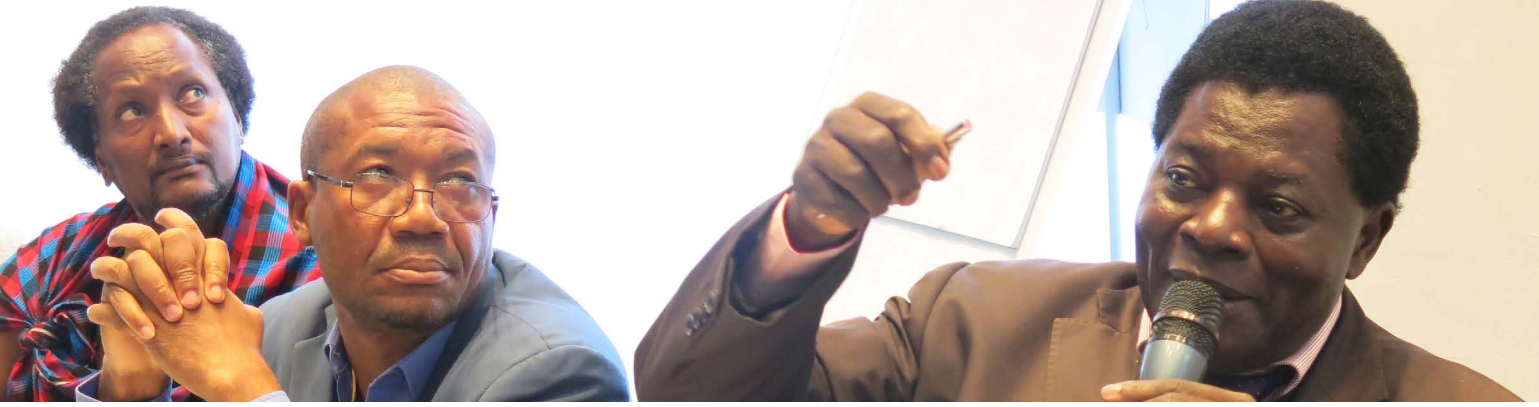
2.6.1 Rain cloud knowledge of the Parakuiyo Maasai in Morogoro, Tanzania

Presented by Adam Kuleit Ole Mwarabu, Parakuiyo Pastoralists Indigenous Community Development Organizations (PAICODEO)

The community research methodology undertaken with the Parakuiyo Maasai community was participatory in nature. This included having people seated in circle for group meetings and conversations about community knowledge of rains. Conversations were held with elders, women, men and youth in groups and individually. They were held without paper or written records because these can create nervousness. Rather it was all verbal, and notes were made afterwards. For some conversations, community findings were documented on flip charts, in audio or video.

In Maasai culture, rain clouds have certain defined characteristics. There are traditional names for the clouds which include: Makarot, and Loltawa (that bring long, heavy rains covering large areas); Kipusi, Olpalakanga, Lolaikamban, Olongw'i, and Olong'u (that bring different types of rain, from soft to heavy, but covering a relatively small area); Lolkaria; and Nepumba or Maruguru. The Maasai analyze other weather attributes such as wind direction and strength, presence of dust and fog. Indicators of a coming rainy season can include:

- a) Different vegetation flowering, new growth and leaves on certain trees such as Olng'araji, Oloisa, Oiti, Olkambala, Olaiseleiyai and Olmisira;
- b) Increased Olwao or rolling dust;
- c) Rain clouds with thunder and lightning seen from afar;
- d) Presence of rain stars such as Olokira le Nkakenya (Kilekeny), Olokiro lo litorobo (Olokiro le Nteipa), Ilanyamuk (male stars) and Inkokwa (female stars);
- e) The moon bending to the right side (heavy or ordinary rainfall indicator) and the moon cycle;
- f) Singing of birds such as Otilo, Olube, Inekipiriak flying over the sky;
- g) Bulls and cows crying, smelling Inkuta (rain drops) and moving towards the rain when grazing;



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- h) Presence of Embaso-Inkatambo nataana (smoky cloud covering the land and mountains) and the presence of Enkoitiko (extension of zebra like spotted cloud in the sky);
- i) The moon or sun making ring kraals like a manyatta (a traditional temporary settlement, usually an encampment) through Enkoitiko cloud.

Maasai attribute the reduction and disappearance of rain to a number of causes, for example reduction and degradation of trees and forest habitats, and certain habitats associated with rain clouds. The loss of many important cultural aspects e.g. rains songs and prayers and ritual practices, combined with the curse of the god, Enkai Nanyokie. Urbanization and land grabbing of important areas of rich vegetation and also sacred sites are creating threats.

It is clear that the young people are not so interested in learning from the elders, for example about different types of rain clouds and what it means. There are a range of types of rain cloud and types of wind which predict the coming of rain. This is the “language of the rain clouds”. In terms of talking with the elders, it is important how you talk with them, e.g. talking to really listen. So, to what extent do these rain cloud types resonate with meteorological definitions of rain clouds and scientific approaches that try to explain their evolution and origins? Do other indigenous groups have similar framing of cloud and wind types? Are there common attributes that could be used more in future? These are questions that need to be explored and answered.

Clouds analysis based on indigenous knowledge resonate quite well with meteorological science, where they are critical signs and can form one set of indicators for working with meteorological data collection. Across different groups in Maasailand there are some differences in naming and in how clouds position in their territories, otherwise the rest is broadly similar. The Maasai say that lightning, not just the clouds, has a home.

The moon, morning and evening stars help identify when it is going to rain. Both men and women know about the stars, yet there is a particular spiritual link that women have with God in terms of prayers for rain, where the morning star is very important. If it disappears or does not follow the right path the community has to perform a mock marriage. This happened in 2017.

The Maasai calendar has changed over time, as this is linked to their grazing calendar and that has been broken down due to climate change. The Maasai calendars start when the rains start. The knowledge of the elders needs to be passed on, and it is important to have databases of the different indigenous knowledge systems. We need to document and use such knowledge to help adapt to climate change. It is also important to hand this on to the younger generation. It is clear there are both physical and spiritual sides of indigenous knowledge.

Maasai peoples also have been monitoring the snows of Kilimanjaro that are disappearing, and they say this is “Kilimanjaro dying”.





2.6.2 Traditional weather forecasting among Afar pastoralists in north-eastern Ethiopia⁹

Presented by Mulubrhan Balehegn Gebremikael, UNESCO LINKS partner, Mekelle University

In Afar in Ethiopia, climate change is a major concern. This has resulted in decreased milk production, increased use of goats rather than cattle, as goats are better able to make use of bush vegetation—not just grass. The people have traditional scouts and individuals who collect information about the landscapes and the condition of the rangelands. They then report back to the elders.

People identify six different types of wind. In addition, the role of non-weather variables is important to understand for decisions regarding mobility. Such non-weather variables relate to, for example, the proximity of cultivated land, the presence of ticks, and broader security issues. This all contributes to decisions that the Afar make in terms of migration routes they will use, based on weather predictions and other variables.

Traditional weather predictions are not perfectly correct and cannot be taken totally at face value. However, neither are meteorological weather predictions perfectly reliable. This means that the two systems of knowledge can work together so that we co-produce improved weather prediction knowledge based on indigenous knowledge and science. There is a tremendous opportunity to use apps and social media to learn about weather predictions and to share information more widely about weather predictions with the pastoralists, many of whom now have mobile phones.

2.6.3 Harmonizing the Nganyi community's indigenous knowledge of rainfall prediction with modern science's early warning systems in western Kenya

Presented by Laban Ogallo, IGAD Climate Prediction and Application Centre (ICPAC)

The research sought to demystify Nganyi rainfall prediction through indigenous knowledge (IK) to see whether IK is a usable science at the community level in support of local disaster risk reduction and climate change adaptation. The research brought together indigenous rainfall forecasters from Nganyi community in western Kenya and climate scientists from the Kenya National Meteorological Department and several universities through community participatory action research (PAR) to produce integrated local seasonal climate forecasts for the local community climate risks reduction applications. The research was supported partly by the Climate Change Adaptation in Africa (CCAA) project that was supported by the UK's Department for International Development (DFID). The overall objective of the research aimed at combining indigenous knowledge with modern science to build up resilience for local climate risks and climate change adaptation.

The indigenous knowledge system of the Nganyi community is based on observing seasonal changes in the local natural systems within the local environment and landscape. They base their forecasts on the local knowledge from their ancestors on the impacts of weather and climate on the local environment systems. This includes animals, plants, insects, reptiles, atmospheric

conditions, astronomic features, etc. The community has about eleven observatories (sacred shrines) each addressing specific local IK indicators. Forecasts from the various IK indicators are harmonized by the community experts to generate consensus rainfall forecasts for the coming rainfall season. The results from the research showed the great advantage of integrating IK and modern science forecasts in community-based climate monitoring services and early warning system in support of local disaster risk reduction and climate change adaptation in the project location in western Kenya.

One of the key challenges in the management of climate-related risks like droughts and floods at local community levels in Africa is timely availability of local accurate weather and climate early warning services. At present it seems as though scientific knowledge is not really available at the local level, due to a lack of adequate funding and the required technical capacity. The main challenges of modern science, weather and climate information systems are to downscale this to the local community level. IK, on the other hand, is often based on local community oral knowledge that are not well documented to allow the verifications of such forecasts.

While it is important to get climate early warning data at regional and national levels, we need to make sure it is also locally available, where the vulnerable communities are living, and for the implementation of disaster risk reduction and climate change adaptation policies. In general, local communities in the area are not able to use such scientific information, and continue to depend on the locally available IK. The local indigenous rainfall prediction experts use family guarded oral knowledge inherited from their ancestors. Such inherited

technical indigenous knowledge is never shared with any outsiders even from the local community.

It is important that local education curricula can integrate indigenous knowledge, but this has to resonate with the curriculum at the national level. Here the younger generation can learn from both the elders and from the meteorological data. However, many indigenous peoples do not want to share some of their knowledge, and they keep it secret as it is one component of their intellectual property rights. The Nganyi community have patented their knowledge, so it is now more sharable. It was clear that we have to have ways to use this knowledge to help us adapt, especially at the local level. In Kenya, for example, the National Meteorological Department is now county based and have county meteorological forums. In these types of forums we have the opportunity to integrate IK with local meteorological forecasts.

Regarding IK climate change indicators, the key question needing research is, how does climate change affect such indigenous knowledge systems and the response systems for climate risk management, including climate change adaptation?



2.6.4 Key messages

Indigenous and local knowledge (ILK)

1. Indigenous peoples' knowledge, science and technologies need to be included in national and global climate change strategies, plans and implementation actions.
2. Comparative studies of the ILK of different indigenous communities will help to find common attributes and complementarity of various ILK systems, thereby broadening the available indigenous knowledge base for adaptation planning.
3. Conserving indigenous weather knowledge will help ensure food security for indigenous communities living in areas with insecure rainfall.
4. It is important to include indigenous knowledge in local education curricula.
5. Including indigenous and local knowledge in schools may motivate indigenous youth to practice this knowledge.

Research and documentation

6. Weather knowledge needs to be well researched and archived among the various indigenous communities in East Africa.
7. It is important to establish databases that document indigenous knowledge systems for future generations and for wider applications such as adaptation and resilience planning.

8. Research needs to be conducted into the challenges posed by climate change to indigenous knowledge systems.

Dialogue and knowledge co-production

9. Capacity building is important for: a) knowing local climate risks including for adaptation; b) understanding the advantages and limitations of indigenous knowledge and science; c) building bridges between indigenous knowledge holders and scientists on modern meteorology.
10. Local forums are valuable sites of information exchange and knowledge co-production, including for upscaling and downscaling weather information.

Climate information for pastoralists

11. There should be sufficient funding and capacity to improve the dissemination of local weather information and to provide climate early warning services. The establishment of local data centres to collect and disseminate weather and climate information is an option to consider.
12. The important role of community knowledge in local climate risk management should be highlighted.
13. Mobile phones and social media may offer opportunities for pastoralists and scientists to share ideas and information.

❖ 2.7 Panel session: Policies towards enhancing pastoralists' adaptation

In this panel session, presenters shared information and suggestions for cooperation with national and international institutions to strengthen adaptation initiatives. The example of the Mbororo pastoralists' involvement with the Chadian climate change platform was given as an example of good practice. Presenters also spoke about the opportunities offered by the UNFCCC process and its Local communities and indigenous peoples knowledge platform, LCIPP. Elifuraha Laltaika was the session moderator.

2.7.1. UNFCCC and indigenous peoples: A case study from Chad


Presented by Hindou Oumarou Ibrahim, UNESCO LINKS Partner, Fulani Indigenous Women and Peoples Association of Chad (AFPAT)

The research focused on the participatory 3D modelling project undertaken by Mbororo pastoralists, and their engagement with national and international climate change adaptation processes. The Mbororo people are nomadic and semi-nomadic herders who live in Chad, Cameroon, the Central African Republic, Niger and Nigeria. They have developed a variety of indigenous practices based on their interactions with their environment. They build on these knowledge systems to cope with seasonal weather patterns and sustainably manage meagre resources. Mobility is a key challenge for the Mbororo people, as their migrations can take them from 100 kilometres to over



The ongoing elaboration of climate change adaptation policies was identified as an opportunity to support collaboration between indigenous knowledge systems and science towards tackling common problems.
© Nigel Crawhall/UNESCO, 2018





1,000 kilometres away, as well as having to cross national borders. To better manage their natural resources, they are making the links between science and indigenous knowledge using participatory 3D modelling (P3DM) to bring diverse peoples together.

Chad has signed and ratified the Paris Agreement of 2015. Some of the impacts of climate change experienced in this country include changes related to seasonal unfoldings, desertification, loss of biodiversity, drought, reduced numbers of livestock and availability of water, land grabbing and increased mobility. All elements leading to conflict. In Chad, there has been a platform between indigenous peoples, meteorology experts and national government in existence for over five years. This dialogue has started to influence the way Chad reports on its Nationally Determined Contributions (NDC), National Adaptation Programme of Action (NAPAs), National Adaptation Plan (NAPs) and national communication on indigenous peoples' knowledge.

Like other pastoralist groups, the Mbororo have seasonal calendars with between five to seven seasons, depending on the landscapes involved in the practice of their livelihood (nomadic or semi-nomadic). Also, planning is based on lunar and not solar months. In southern Chad there are seven seasons, though there are fewer in the drier north and this also provides a basis for adaptation mapping.

The Mbororo have a detailed knowledge which they draw on to predict weather. This includes: a) the size and the shape of fruits produced by a certain palm tree, which may indicate whether or not the coming year will be good; b) abundance in spring of a certain lizard is a predictor of a good season; c) changes in the direction of the wind from east to west is



Climate policies should promote the inclusion of pastoralists knowledge, perspectives, and aspirations for the future. © Veronica Gonzalez-Gonzalez/UNESCO, 2019

an indicator of rain that will last for days; d) although the sky may be clear, the occurrence of a particular insect species indicates that it is about to rain. These kinds of observations enable pastoralists to assess weather aspects that are relevant to their livelihood, as quality of the rain is more important than the quantity for the Mbororo pastoralists, being more useful for the land and grazing.

The presentation also touched upon the [Chad participatory 3D modelling project](#), undertaken by AFPAT, which has documented this indigenous knowledge in terms of weather predictions, pastoralist grazing patterns, and decision making regarding their transhumance movements. The 3D maps have been digitized, and provide an analysis of seasonal migrations based on ecosystems. One key outcome is better land use planning for all land users, including farmers and pastoralists. The 3D maps can also be used to inform. They can be used to establish transboundary laws in order to have these pastoralist migratory routes respected, as it may happen that Chad pastoralists may have to pay up to two US dollars per head of livestock to cross national boundaries.

The Mbororo have engaged in a dialogue with the Chad meteorological agency about their indigenous knowledge. The results of that collaboration led to interesting and useful methodologies that are now being used by the Chad National Agency for Meteorology. Unfortunately, the input of indigenous knowledge to these methodologies has not always been recognized. Also, the funds to support methodological development have not reached the communities involved in their elaboration.

In the international arena, there are a number of initiatives that support indigenous

peoples' promotion of their knowledge on climate. An important structure to take note of is the International Indigenous Peoples' Forum on Climate Change (IIPFCC), being the autonomous indigenous peoples' co-ordination structure at the UNFCCC negotiations. There are also a number of references to indigenous peoples and their knowledge in the UNFCCC including:

1. **Climate change policies and actions** need to ensure effective participation in climate policies; human rights obligations related to indigenous peoples; and the inclusion of indigenous peoples' knowledge into work related to technology transfers.
2. **Adaptation**—Indigenous peoples' knowledge can guide and inform adaptation policies; enhanced use of indigenous knowledge and practices in adaptation; and compiling good practices and tools for use of indigenous peoples' knowledge.
3. **Afforestation and reforestation**—Assessing impacts of afforestation and reforestation projects for indigenous peoples, together with the role of indigenous peoples in monitoring and reporting those dynamics. It is stated that there has to be full and effective respect of the rights of indigenous peoples, according to the United Nations Declaration on the Rights of Indigenous Peoples.

Further, there are five references to indigenous peoples and indigenous peoples' knowledge under the Paris Agreement of 2015, including:

1. "Acknowledging that climate change is a common concern of humankind, Parties should, when taking action to address climate change, respect, promote and consider their respective obligations on





(...) the rights of indigenous peoples...”,
in the Preamble

2. “Agreeing to uphold and promote regional and international cooperation in order to mobilize stronger and more ambitious climate action by all Parties and non-Party stakeholders, including (...) local communities and indigenous peoples”, in the Preamble
3. Article 5.2: REDD+ (importance of incentivizing, as appropriate, non-carbon benefits associated with reducing emissions from deforestation and forest degradation)
4. Article 7.5: Adaptation Parties acknowledge that adaptation action (...) should be based on and guided by the best available science and, as appropriate, traditional knowledge, knowledge of indigenous peoples and local knowledge systems...
5. Decision 135: Recognizes the need to strengthen knowledge, technologies, practices and efforts of local communities and indigenous peoples related to addressing and responding to climate change and establishes a platform for the exchange of experiences and sharing of best practices on mitigation and adaptation in a holistic and integrated manner.

Within the United Nations, indigenous peoples have established seven socio-cultural regions for representation: Africa; Asia; Central and South America and the Caribbean; the Arctic; Eastern Europe (including the Russian Federation, Transcaucasia and Central Asia); North America; and, the Pacific. In addition, Member States have established various regional groups of countries which include

the European Union, the G77, China, the Africa Group, the SIDS (Small Islands and Development States), etc. The Africa Group is led presently by Senegal that supports issues of indigenous peoples. It is also important to work with the country UNFCCC focal points to get support. In addition, the Nairobi Work Programme (NWP) on impacts, vulnerability and adaptation to climate change includes a focus on indigenous peoples’ knowledge. The NWP has developed studies on gender, indigenous peoples and local knowledge, and ecosystem-based adaptation. It has been noted that changes can be made at the right time and place. For example, indigenous knowledge has been included into the Chad NDC. One way to do this at the national level is to make reference to decisions that have already been made at the international level. Policy changes at national level could include contributions to the national constitution, laws, procedures or other decision-making instruments that can be informed by global decisions.

2.7.2. Vulnerability, impacts and adaptation assessment in the Northern Rangelands of Kenya

***Presented by Joyce Kimutai,
Meteorological Department of the
Ministry of Environment, Kenya***

The joint research project with the Northern Rangelands Trust (NRT), CARE, and the Kenya Meteorological Department assessed past climatic trends, shocks, and resilience capacities (anticipatory, absorptive, adaptive and transformative) of the communities within each conservancy and county with respect to livelihoods, food and nutrition security, social and cultural norms, and governance structures.

Quantitative and qualitative data collection were used through household interviews and focused community discussions. This data was collated with information from key informants from conservancies and county sector-level experts. This involved historical trends analysis, downscaling of climate change data and climate scenario development, together with gender responsive community adaptation action planning. A variety of tools and approaches were used, for example institutional mapping, trend analysis, community visioning, feasibility analysis, community vulnerability and capacity assessment (CVCA), and participatory scenario planning (PSP).

The research results will be synthesized along three thematic areas for each county's specific conservancy adaptation action plan: a) ecosystem services; b) water resources (both within and external to conservancies); and c) livelihood activities (agriculture, industry, trade and their associated services).

The expected results include: i) a resilience strategy for the NRT conservancies demonstrating community-based approaches; ii) county-specific conservancy adaptation action plans for seventeen NRT conservancies; iii) at least 3,000 people in over ten communities sensitized on climate resilient livelihoods through field activities, of which two thirds are vulnerable (women, youth, people living with disabilities and other marginalized groups); iv) at least two people in each conservancy with capacity built on community-based tools and the practical application in community assessments; and v) learning generated from activities contributing to national policy and practice dialogues.

There is an exchange of climate and weather information between the scientific and indigenous knowledge systems. This helps to improve forecasting and enhance the understanding and use of seasonal forecasts and climate outlooks, for example. The work is part of County Integrated Development Plan; thus, sustainability is better assured.

2.7.3. Indigenous knowledge under the UNFCCC process

Presented by Tiffany Hodgson, UNFCCC Adaptation Programme

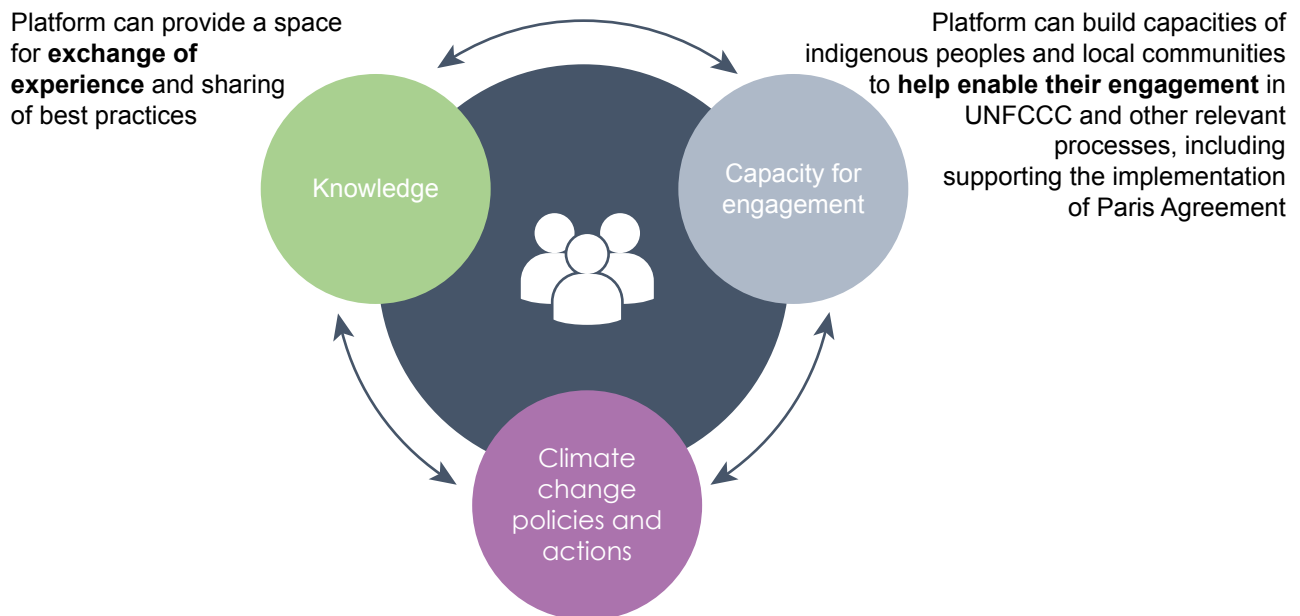
The Executive Secretary of the UNFCCC, Patricia Espinosa made the following statement:

Indigenous people must be part of the solution to climate change. This is because you have the traditional knowledge of your ancestors. The important value of that knowledge simply cannot—and must not—be understated. You are also essential in finding solutions today and in the future. The Paris Climate Change Agreement recognizes this. It recognizes your role in building a world that is resilient in the face of climate impacts.

For rural and indigenous peoples, indigenous and local knowledge informs decision making about fundamental aspects of day-to-day life. This knowledge is integral to culture and also encompasses language, systems of classification, resource use practices, social interactions, ritual and spirituality. To help bring this indigenous knowledge into the international arena, the Local Communities and Indigenous Peoples Platform (LCIPP) was established in December 2017 with the following



structure (See Figure 2 below). There are three elements to the functioning of the platform: knowledge; capacity for engagement; and climate change policies and actions.



Platform can facilitate integration of diverse knowledge systems, practices and innovations, and the engagement of indigenous peoples and local communities in **relevant climate change related actions, programs, and policies**

Figure 2: Functions of the Local Communities and Indigenous Peoples Platform

A multi-stakeholder workshop on implementing the LCIPP was held in May 2018 and was co-moderated by indigenous peoples and Party representatives. A number of opportunities were identified for indigenous peoples to get engaged in the LCIPP and the UNFCCC process towards COP24. At the time, negotiations were focusing on establishing a facilitative working group, and how to develop a work plan for the platform. This remains an important opportunity for indigenous peoples and indigenous knowledge to feed into the ongoing NAP processes. (See www4.unfccc.int/nap).

As an example, Kenya's NAP made the following provisions: a) strengthen early warning and climate information services through improving the climate information service providers network and enhancing integration of local/indigenous knowledge into early warning systems; b) promote indigenous knowledge on crops; and c) conduct capacity building in indigenous knowledge, livestock insurance schemes, early warning systems, early action, livestock management and breeding.

Indigenous peoples can offer solutions from which all people would benefit. As indigenous peoples have known about adaptation for a long time, there is much to learn from them. These are important steps forward in indigenous peoples' recognition in the UNFCCC. The key matter is how to implement a new constituted body under the LCIPP.

2.7.4 Key messages

Mapping tools for pastoralist knowledge

1. The Chad participatory 3D modelling is based on indigenous knowledge related to weather predictions, pastoralist grazing patterns, and the reasons that pastoralists move from place to place. It provides important lessons for other pastoralists. This provides for better land use planning for all.

Institutional relationships

2. The Africa Group is in a strong position in terms of indigenous peoples within the UNFCCC, and pastoralists should talk with their country delegates or speak at the IIPFCC.
3. Negotiations are focusing on establishing a working group for the IIPFCC. This is an important opportunity for indigenous peoples and indigenous knowledge to influence the NAP process.
4. Chad has had a platform between indigenous peoples, meteorology experts and national government for over five years. Lessons can be learned from Chad as to how to influence other countries in the areas of NDCs, gender and biodiversity, NAPAs and NAPs and national communication on IPs knowledge.

5. There are a number of references to indigenous peoples and indigenous knowledge in the UNFCCC and pastoralists should make use of these opportunities to inform and influence.
6. One way to do this at the national level is to make good reference to decisions that have already been made, for example national policy, the constitution, or in terms of global decisions.
7. The Local Communities and Indigenous Peoples Platform (LCIPP) is an opportunity for pastoralists to engage and work together in preparation of COP meetings, by influencing the country delegates and focal points.



Dialogues between pastoralists from different peoples allow for cross-fertilization processes between their knowledge systems. © Jennifer Rubis/ UNESCO, 2018



❖ 2.8. Breakout session

The group discussions held during the second breakout session of the workshop addressed two further workshop themes. The first theme on the use of mapping tools indicated that P3DM is a key tool for documenting and sharing knowledge, which also raised the critical question of custodianship and ownership of knowledge. The second theme discussed community needs for climate information, and the downscaling of climate information to the local level was highlighted. Also, a number of practical examples and suggestions were made to improve communication technology. Water harvesting and migration routes were used as examples of areas where climate information may be useful for planning.

2.8.1. Making climate information relevant for pastoralists by using mapping tools

Facilitated by Nigel Crawhall

Reporting by Mannava Sivakumar

Participatory 3D modelling (P3DM) was discussed as an example of how people use their own language to express how they view their landscapes differently as elders, youth or women. Participants cited examples of P3DM in Ethiopia, Kenya, and Chad, while simpler participatory mapping techniques have been widely used across the region. The exercise of P3DM is a methodology that can show the traditional knowledge of the environment. Such mapping is also gaining interest in nearby schools, making it a potential means for enhanced experiential education.

For meteorology, part of the challenge is how to bring the meteorologists' data to a scale that was usable by villages, not just at the national level, since with climate change pastoralists needed focused information. Maps can help in such cases, especially if the maps are of sufficient quality, and possibly overlaid on google maps.

Participants discussed the challenges when using such a powerful tool as P3DM. Key was ownership of the maps and where they were stored. What happened as a result of the empowering processes for which mapping had been, and still is responsible? This mapping process might be used as a vehicle for peace, or it might result in boundary conflicts especially with increased climate change. How did such maps impact on the wider population and be made useful to them? These participatory maps belonged to the community and should be accessible and owned by them. Therefore, a safe place needed to be found to store them both electronically offsite on a server and onsite, for example, at a nearby school.

2.8.2. Community needs in relation to climate information for adaptation

Facilitated by Adam Kuleit Ole Mwarabu

Reporting by Malih Ole Kaunga

A variety of interlinked needs at the community level was identified that needed to be taken into account when elaborating methodologies on how indigenous knowledge relates to scientific meteorological knowledge. Enhanced capacity on pastoralist insurance for their livestock and their lands, as well as how to improve use of cell phone applications for their own information, were key needs

mentioned by participants to ensure that people have adequate access to information. Information could be made available through telecom providers in the different countries. Related to this was the use of solar power so that phones can be easily charged in isolated areas. This would all help enable greater cooperation between pastoralists and scientists of the meteorological departments.

Other needs expressed related to water harvesting, which is an important vehicle for restoration, soil conservation and thus for adaptation. The control of invasive species for example *Prosopis* was also mentioned as this is becoming an increasingly important challenge as the effects of climate change increased. The need for policies that protect livestock migration routes was expressed as much land has been grabbed, for example the grabbing of livestock holding grounds in Kenya.

Communication was identified as an important element in dealing with these challenges. Communication could be further developed in terms of meteorological data which could be sent by mobile phone and alert people to, for example, forthcoming dry periods or floods.

The need for information on climate change was expressed. It was considered important to understand climate change impacts on diseases, livelihood strategies, and existing adaptation strategies of pastoralists. Information should be passed on in the vernacular languages rather than just English or French. With climate change there may well be the emergence of new diseases or changed patterns of diseases. Lastly, participants felt that there is too much policy emphasis on protecting wildlife, and less emphasis on the importance of protecting important livestock areas and movement routes. There needs to be a balance.



Pastoralists' perspectives on weather and climate contribute to the richness of the available knowledge on weather and climate. © Nigel Crawhall/UNESCO, 2018



2.8.3 Key messages

Mapping tools for pastoralist knowledge

1. Participatory 3D Modelling (P3DM) helps people work in their own language on how they view their landscapes as elders, youth, or women. P3DM is a good methodology to show the traditional knowledge on the environment.
2. Challenges include who owns the maps and where they are stored. What happens as a result of the empowering processes for which mapping has been responsible?
3. P3DM mapping is also gaining interest in schools. This could be used as a means for enhanced experiential education.

Climate information for pastoralists

4. A lot of education and information on climate change is needed, including how it impacts on diseases on livelihood strategies, and what this means for existing adaptation strategies of pastoralists.
5. For meteorology, part of the challenge is how to bring their data to a scale that is usable by villages, not just at the national level.
6. Enhanced capacity on pastoralist insurance for their livestock and their lands as well as how to use cell phones applications better for their own information are key needs to ensure that people are connected.

Land use and livelihoods

7. Water harvesting is important for restoration and soil conservation and thus for adaptation.
8. The control of invasive species will become an increasingly important challenge as the effects of climate change become greater.
9. Policies are needed to protect the livestock migration routes.
10. A balance is needed between protecting wildlife, and the importance of protecting important livestock areas and movement routes.



Community research is an important element in the process of empowering pastoralists through their own indigenous knowledge. © Adam Ole Mwarabu/ UNESCO, 2020

2.9. Closing Session

The organizers gave a special vote of thanks to the UNESCO Regional Office for Eastern Africa in Nairobi and the donors, the Swedish International Development Cooperation Agency (Sida) and the Japanese Funds-in-Trust (JFIT), as well as all the experts who attended. The hope was expressed that the pastoralist seasonal calendars that had been developed would be made more available when published. UNESCO undertook to offer support with the UNFCCC in terms of the indigenous knowledge platform, LCIPP, and the NAP process.

The meeting was considered to be an enriching event—there had been open discussions about the importance of indigenous knowledge and the interface with meteorological and scientific knowledge. It was considered important to raise awareness of the value of indigenous knowledge, in order to promote this knowledge in the African Union and other multilateral organizations. Indigenous knowledge offered many opportunities that could be used for the betterment of all, highlighting the importance and value of sharing information and experience, enabling pastoralists to advocate more strongly.

Land grabbing was raised as a serious issue, requiring joint and strong action. This includes grabbing of pastoralist migratory routes, lands for irrigation, for forest reserves or for formal protected areas, though clearly land grabbing is a much greater issue than what was addressed in the meeting.

Participants were encouraged to use diverse mechanisms to broadcast the findings of the meeting. It was thought to be equally

important that participants return to their communities and explain what had taken place at the meeting, to ensure that interest in the meeting and its findings continue into the future.

Experts on indigenous knowledge, science, and meteorology were better able to understand each other's language. This would be the basis from where to find ways to foster co-production of knowledge and implement the findings to improve weather forecasting and predicting, as well as reduce the risks to pastoralists in fragile and risk prone landscapes. However, more countries and communities needed to become involved in the process of knowledge co-production. UNESCO would like to see a continuation of this programme to achieve this end. In addition, the UNESCO Office in Nairobi undertook to support community radio initiatives upon request.

Participants of the workshop thanked UNESCO and the LINKS programme for organising the project, research and the meeting which had enabled them to come together and share as a group. However, it was important to focus the findings of the meeting at the local level. This would enable the full and effective participation of all people and stakeholders. It would also be important to involve national governments and regional institutions, thereby ensuring that the voice of indigenous peoples finds its way into regional forums as well as national and global levels. It would be important to incorporate all indigenous peoples in these processes so as to have a voice and a better life on Earth for all. The workshop was formally closed with a Maasai prayer and blessing.





3. ANNEXES

Annex 1: Programme

Wednesday 27 June, 2018

08:30 – 09:00	1. Welcoming of participants
09:00 – 09:30	2. Opening by Ms Ann Therèse Ndong-Jatta, Director of the UNESCO Multi-Sectoral Office in Nairobi for East Africa
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09:30 – 10:00	Coffee/tea break
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10:00 – 10:30	Introduction to the expert meeting Mr Nigel Crawhall , Chief of the Small Islands and Indigenous Knowledge Section, UNESCO
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10:30 – 12:00	Pastoralists Knowledge on Weather and Climate Moderator: Mr Mannava Sivakumar, Senior Consultant <ul style="list-style-type: none">• Mr Malih Johnson Ole Kaunga, Founder and Director of the Indigenous Movement for Peace Advancement and Conflict Transformation (IMPACT)• Mr Elifuraha Laltaika, Executive Director, Association for Law and Advocacy for Pastoralists (ALAPA)• Mrs Veronica Gonzalez-Gonzalez, Project Coordinator, Climate Frontlines Africa, UNESCO
<hr/>	
12:00 – 13:30	Lunch Break
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13:30 – 15:00	Perspectives on Weather and Climate from different Knowledge Systems Moderator: Mr Paul Lokol, Karimojong pastoralist <ul style="list-style-type: none">• Mrs Elizabeth Katushabe, Pastoralism for Protection of Biodiversity Africa (PAFOPROBA)• Mrs Maria Onyango, Professor at the Bondo Technology University• Mr Hubert Kabengela, African Center of Meteorological Applications for Development (ACMAD)
<hr/>	
15:00 – 16:30	Breakout Sessions <ul style="list-style-type: none">1. Upscaling indigenous knowledge Facilitator: Mr Ismael Ocen, One Social Research Centre Rapporteur: Mr Mulubrhan Balehegn Gebremikael, Associate Professor Mekelle University, Ethiopia2. Is climate change changing roles of women and men? Facilitator: Mrs Nailejileji Tipap, Maasai Pastoralist woman Rapporteur: Mrs Nasinjari Marko, Maasai Pastoralist woman
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16:30 – 17:00	Coffee/tea break
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17:00 – 18:00	Wrap-up session Facilitator: Mr Nigel Crawhall, UNESCO Rapporteur: Mrs Veronica Gonzalez-Gonzalez, UNESCO
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18:00 – 19:30	Cocktail

Thursday 28 June, 2018

- 08:30 – 10:30** **Environmental observation skills**
Moderator: Mr Hubert Kabengela, ACMAD
- **Mr Adam Kuleit Ole Mwarabu**, Parakuiyo Pastoralists Indigenous Community Development Organizations (PAICODEO)
 - **Mr Laban Ogallo**, Project Coordinator at IGAD Climate Prediction and Application Centre (ICPAC)
-
- 10:30 – 11:00** **Coffee/tea break**
-
- 11:00 – 12:30** **Policies towards enhancing pastoralist adaptation**
Moderator: Mr Elifuraha Laltaika, ALAPA
- **Mrs Hindou Oumarou Ibrahim**, Association de femmes peules et peuples autochtones du Tchad (AFPAT)
 - **Mrs Joyce Kimutai**, Meteorological Department of Kenya
 - **Mrs Tiffany Hodgson**, Programme Officer, Local Communities and Indigenous Peoples Platform, UNFCCC secretariat
-
- 12:30 – 14:00** **Lunch Break**
-
- 14:00 – 15:30** **Breakout Sessions**
- 1. Making climate information relevant for pastoralists by using cartography tools**
Facilitator: Mr Nigel Crawhall, UNESCO; Rapporteur: Mr Mannava Sivakumar, Senior Consultant
 - 2. Community needs in relation to climate information for adaptation**
Facilitator: Mr Adam Kuleit Ole Mwarabu Rapporteur: Mr Malih Ole Kaunga
-
- 15:30 – 17:30** **Conclusion session**
Facilitator: Mr Mannava Sivakumar Rapporteur: Mrs Veronica Gonzalez Gonzalez
-
- 17:30 – 18:30** **Closing session**





Annex 2: List of Participants

PASTORALISTS

Mr Adam Kuleit Ole Mwarabu
UNESCO LINKS Partner, Parakuiyo
Pastoralists Indigenous Community
Development Organizations (PAICODEO)
paicodeo@gmail.com
TANZANIA

Mr Asaine Lerapachao
Samburu elder
KENYA

Mrs Benedetta Rifika Kurinta
Laikipia Maasai Elder
KENYA

Mr Elifuraha Laltaika
UNESCO LINKS Partner, Association for
Law and Advocacy for Pastoralists (ALAPA)
elifuraha.laltaika1@gmail.com
TANZANIA

Ms Elizabeth Katushabe
UNESCO LINKS Partner, Pastoralism
for Protection of Biodiversity Africa
(PAFOPROBA)
elizabethkatushabe@yahoo.com
UGANDA

Mr Godson Nduya
Maasai Elder
TANZANIA

Ms Hindou Oumarou Ibrahim
UNESCO LINKS Partner, Association de
femmes peules et peuples autochtones du
Tchad (AFPAT)
hindououmar@gmail.com, www.afpat.net
CHAD

Mr Ismael Ocen
UNESCO LINKS Partner, Ocean One
Social Research Centre
ismaelocen@yahoo.co.uk
ocean1socialresearch@gmail.com
UGANDA

Mrs Jennifer Koinante
Executive Director Yaku Laikipia Trust &
Council of Elders Indigenous Peoples of
Africa Coordinating Committee (IPACC)
koinante6@yahoo.com
KENYA

Mr Kelvin Lpesina Lemantaan
Samburu Elder
KENYA

Mr Lesira Sambuli Siria
Maasai Elder
TANZANIA

Mr Lkitasian Leringato
Samburu Elder
KENYA

Mr Lkomingon Lelengeju
Samburu Elder
KENYA

Mr Malih Ole Kaunga
UNESCO LINKS Partner, Founder and
Director of the Indigenous Movement
for Peace Advancement and Conflict
Transformation (IMPACT)
olekaunga@impacttrustkenya.org
KENYA

Mr Mokorino Ole Mepukori Laikipia
Maasai Elder
KENYA

Ms Nailejileji Asia Tipap
Pastoralists Indigenous Non-Governmental
Organizations Forum (PINGO's FORUM)
ntipap@pingosforum.or.tz
TANZANIA

Mrs Nasinyari Marko Sitayo
Maasai Elder
TANZANIA

Mr Nkapilil Losupuko Njokilai
Laikipia Maasai Elder
KENYA

Mr Paul Lokol
UNESCO LINKS Partner, Karimojong
Pastoralist
nicekarimojong@gmail.com
UGANDA

Mrs Rosemary Nenini Putunoi
Laikipia Maasai Elder
KENYA

Mrs Samaiyon Mparasori
Samburu Elder
KENYA

CLIMATE AND ENVIRONMENTAL SCIENTIFIC EXPERTS

Mrs Alice A. Oluoko-Odingo
Lecturer at the University of Nairobi
aaodingo@yahoo.com
KENYA

Mr Edmund Barrow
Consultant - Community Conservation &
Governance
Overall conference rapporteur
Edmund@Barrow.co.ke
KENYA

Mr Hassan Roba
Intergovernmental Science Policy Platform
on Biodiversity and Ecosystem Services
(IPBES)
hgroba@gmail.com
KENYA / SOUTH AFRICA

Mr Hubert Kabengela
African Center of Meteorological
Applications for Development (ACMAD)
hubertkabengela@gmail.com
NIGER

Mr Ismael Luta
Climate Prediction and Application Centre
(ICPAC)
KENYA

Ms Joyce Kimutai
Kenya Meteorological Department - Ministry
of Environment
kimutaijoy@gmail.com
KENYA

Mr Laban A. Ogallo
Project Coordinator at IGAD Climate
Prediction and Application Centre (ICPAC)
logallo50@gmail.com
KENYA

Mr Mannava Sivakumar
Founding Editor-in-Chief, Weather and
Climate Extremes (Elsevier), Senior
Consultant, World Bank and UNESCO
mannavas@gmail.com
SWITZERLAND

Ms Maria Onyango
Professor at the Bondo Technology
University,
clajos2000@gmail.com
KENYA





Mr Mulubrhan Balehegn Gebremikael
Climate Frontlines Partner, Associate
Professor Mekelle University, Ethiopia
mulubrhan.balehegn@mu.edu.et
ETHIOPIA

Mr Paulino Omay
Climate Prediction and Application Centre
(ICPAC)
gsabiiti@icpac.net
KENYA

Ms Peris Kariuki
Intergovernmental Science Policy Platform
on Biodiversity and Ecosystem Services
(IPBES)
pmweru@yahoo.com Fwork

INTERNATIONAL ORGANIZATIONS

Mrs Annah Rutebuka Muja
African Development Bank
a.rutebuka@afdb.org

Mrs Tiffany Hodgson
Programme Officer, Local Communities and
Indigenous Peoples Platform, UNFCCC
secretariat
THodgson@unfccc.int

UNESCO

Ms Ann Therese Ndong-Jatta
Director of the UNESCO Regional Office for
Eastern Africa based in Nairobi
ndong-jatta@unesco.org

Mrs Alice Ochanda
National Programme Officer, Gender &
Science – Natural Sciences
UNESCO Regional Office for Eastern Africa
based in Nairobi
a.ochanda@unesco.org

Mr Jayakumar Ramasamy
Programme Specialist – Natural Sciences
UNESCO Regional Office for Eastern Africa
based in Nairobi
r.jayakumar@unesco.org

Mr Nigel Crawhall
Chief of the Small Islands and Indigenous
Knowledge Section, UNESCO
n.crawhall@unesco.org

Mrs Veronica Gonzalez Gonzalez
LINKS programme (Small Islands and
Indigenous Knowledge Section)
v.gonzalez-gonzalez@unesco.org

❖ Annex 3: List of IPBES Assessment Reports

From its inception, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) recognised the importance of indigenous and local knowledge (ILK) to the conservation and sustainable use of ecosystems. IPBES enshrined work with ILK in its deliverables and objectives. The IPBES [conceptual framework](#) explicitly considers multiple knowledge systems and types of values.

The LINKS programme hosts the IPBES Technical Support Unit on ILK (TSU-ILK), which supports the IPBES Task Force on ILK to develop and implement methodologies for working with ILK in IPBES assessments and other workstreams. The TSU-ILK has developed and implemented the “[Approach to recognizing and working with ILK in IPBES](#)”, as well as methodological guidance for recognizing and working with ILK in IPBES, and a “[participatory mechanism](#)” to facilitate the participation of IPLC in IPBES assessments and other activities.

IPBES Assessments

IPBES has produced the first global-scale environmental assessments that seek to explicitly and systematically work with ILK.

Completed assessments:

- [Assessment Report on Pollinators, Pollination and Food Production](#) (delivered 2016)
- [Regional Assessment Report on Biodiversity and Ecosystem Services for Africa](#) (delivered 2018)
- [Regional Assessment Report on Biodiversity and Ecosystem Services](#)

[for the Americas](#) (delivered 2018)

- [Regional Assessment Report on Biodiversity and Ecosystem Services for Asia and the Pacific](#) (delivered 2018)
- [Regional Assessment Report on Biodiversity and Ecosystem Services for Europe and Central Asia](#) (delivered 2018)
- [Assessment Report on Land Degradation and Restoration](#) (delivered 2018)
- [Global Assessment Report on Biodiversity and Ecosystem Services](#) (delivered 2019)

Ongoing assessments:

- [Methodological assessment regarding the diverse conceptualization of multiple values of nature and its benefits, including biodiversity and ecosystem functions and services](#) (2018-2022)
- [Thematic assessment of the sustainable use of wild species](#) (2018-2022)
- [Thematic assessment of invasive alien species and their control](#) (2019-2023).

Three more assessments are in the pipeline:

- [Thematic assessment of the interlinkages among biodiversity, water, food and health in the context of climate change](#) (starts 2021)
- [Thematic assessment of the underlying causes of biodiversity loss, determinants of transformative change and options for achieving the 2050 vision for biodiversity](#) (starts 2021)
- [Methodological Assessment of the Impact and Dependence of Business on Biodiversity and Nature’s Contributions to People](#) (starts 2022).





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