



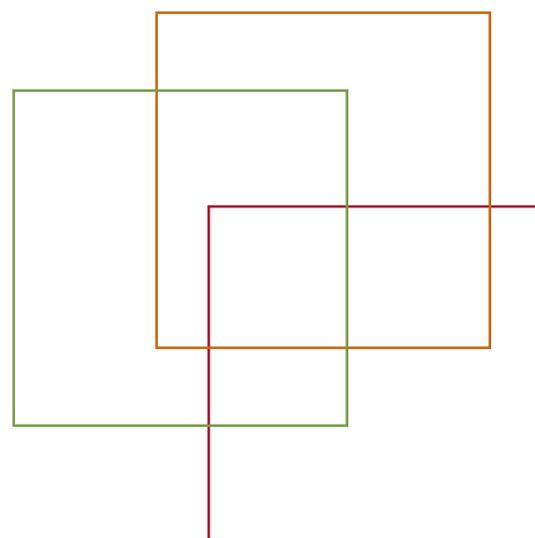
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# Indigenous peoples and climate change

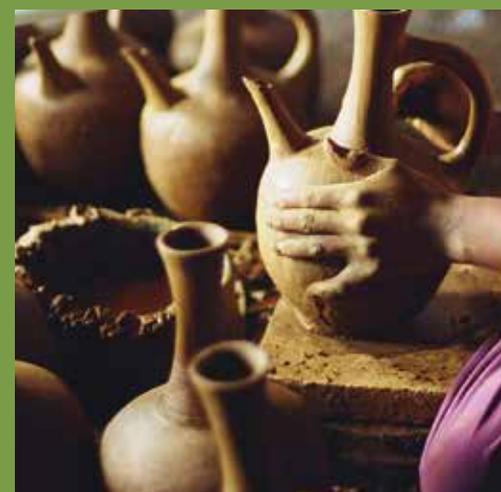
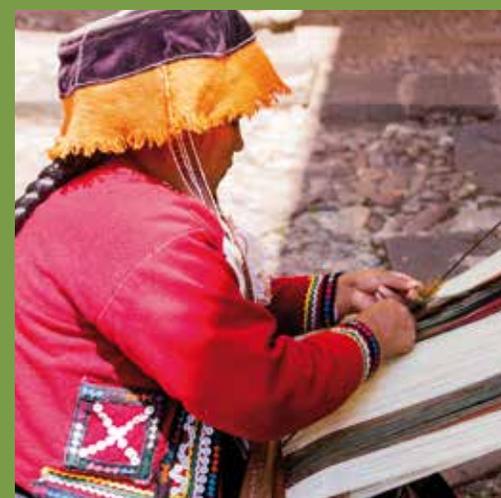
Emerging Research on Traditional  
Knowledge and Livelihoods



In collaboration with:



SCHOOL OF GEOGRAPHY  
AND THE ENVIRONMENT



# Indigenous Peoples and Climate Change:

Emerging Research on Traditional Knowledge and Livelihoods



Gender, Equality and Diversity & ILOAIDS Branch



SCHOOL OF GEOGRAPHY  
AND THE ENVIRONMENT



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## Preface

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The 2030 Agenda for Sustainable Development and the Paris Agreement on Climate Change have reinvigorated the international community's commitments towards an inclusive and environmentally sustainable form of development. Indigenous and tribal peoples have an important role to play in realizing the ambitious goals of these global frameworks and meaningfully combatting climate change. Their traditional knowledge, which cuts across numerous aspects of sustainability and resilience – from forecasting weather patterns, improving agricultural practices, to customary institutions for improved management of natural resources – has increasingly gained recognition at the international level as a vital way forward. The practice of traditional knowledge in the everyday lives of indigenous women and men is yet to be adequately understood, however, with many research gaps confronting policy-makers. Prominent among these is an understanding of the interplay of traditional knowledge systems, rooted in indigenous ways of life, cultural approaches and traditional occupations, with the transformations being experienced in societies, economies, institutions, technologies and the climate.

As the ILO celebrates its Centenary, as well as the 30<sup>th</sup> anniversary of the Indigenous and Tribal Peoples Convention, 1989 (No. 169), this publication shares some glimpses into traditional knowledge at work, against a backdrop of the multiple transformations underway. It highlights the unique role played by indigenous women and men in shaping a low-carbon economy and a sustainable future of work. It builds on the ILO's previous work on traditional occupations as well as indigenous peoples and climate change, and takes forward the ILO's strategy on indigenous peoples' rights for inclusive and sustainable development. The ILO has been supporting traditional livelihood activities among indigenous peoples, which are largely based on a unique relationship with their lands and natural resources. The ILO also promotes new forms of income generation, if so chosen by the communities, including through supporting community contracting mechanisms, entrepreneurship, small businesses and cooperatives.

A collaboration between the ILO and the School of Geography and the Environment, University of Oxford, this publication draws on recent and emerging research conducted directly with communities across Asia and the Pacific, Africa, and the Americas. In so doing, it aims to bridge the academic and policy worlds, sharing the experiences gained by researchers and the communities themselves with policy-makers and key stakeholders, including trade unions, employers' organizations and governments. This publication seeks to inspire greater discussion and research in the field of traditional knowledge, seen through the dual lens of the world of work and social justice.

### **Shauna Olney**

Chief

Gender, Equality and Diversity & ILOAIDS Branch  
International Labour Organization

### **Professor Heather Viles**

Head of School

School of Geography and the Environment  
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This publication has been prepared through a collaboration between the International Labour Organization (Gender, Equality and Diversity & ILO AIDS Branch of the Conditions of Work and Equality Department) and the School of Geography and the Environment, University of Oxford. The edited volume (or compendium of case studies) was envisioned and prepared by Ariell Ahearn (University of Oxford), Martin Oelz (ILO) and Rishabh Kumar Dhir (ILO). It benefited from studies by Vanessa Burns (University of Oxford); Mulubrhan Balehegn (Mekelle University); Selam Balehey (Mekelle University); Seble Samuel (CGIAR Research Program on Climate Change, Agriculture and Food Security); Greta Semplici (University of Oxford); Allison Hahn (City University of New York); Daniel Cooper (University of Oxford); Nina Kruglikova (University of Oxford); and Ariell Ahearn (University of Oxford). Special thanks to Uma Rani (ILO) for reflecting on the studies and contributing towards the concluding remarks, and also to Professor Dawn Chatty for facilitating the engagement between the ILO and the University of Oxford. The publication further benefited from the English language editing by Richard Cook and his team. Special thanks also to Professor Heather Viles for her support for the publication. Finally, the publication would not have been possible without the encouragement of Shauna Olney, Chief, GED&ILOAIDS Branch, and Manuela Tomei, Director of the Conditions of Work and Equality Department.

## Abstracts

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### Surviving Extreme Weather: Mongolian indigenous knowledge, local institutions and governance innovations for adaptation

*By Ariell Ahearn (University of Oxford)*

This case study discusses the role of traditional environmental knowledge and forms of local governance in grassland stewardship in Mongolia. Herders in this region face increasing temperatures and unseasonable weather in a region already characterized by an extreme environment. The case examines the intersections between traditional environmental knowledge, local institutions and practices, and government policies and programmes to encourage adaptation. In particular, the Mongolian Index Based Livestock Insurance programme and the role of local governing bodies are discussed.

### Traditional water management as an adaptive subsistence practice: A case study from coastal Timor-Leste

*By Vanessa Burns (University of Oxford)*

This case study presents research on traditional water management and adaptive subsistence practices in two coastal communities in Timor-Leste. Situated in the Indonesian archipelago in the midwestern Pacific, Timor-Leste is highly vulnerable to environmental change. Extreme weather, such as flood and drought, puts additional pressure on subsistence resources and worsens the poverty and malnutrition prevalent in rural Timor-Leste. Using ethnographic and participatory methods, this study investigates how communities are adapting to the increasing severity of droughts and poor access to water. The aim of the research is to investigate the impacts of environmental change on custodial water practices and traditional environmental knowledge. In addition, it asks how women's custodial practices are contributing to successful adaptive strategies. Research evidence shows that custodial water practices have two main adaptive responses to environmental change. First, the increased vulnerability of the coastal environment to changes in the environment places a greater emphasis on the success or failure of women's highland water practices. Secondly, women's environmental knowledge of the highland is at the forefront of a slow retreat by agriculture, grazing and new housing away from the coast and towards highland sites.

### The role of customary institutions in climate change adaptation among Afar pastoralists in north-eastern Ethiopia

*By Mulubrhan Balehgn (Mekelle University) and Selam Balehey (Mekelle University)*

Traditional weather forecasting is a method applied by many indigenous communities worldwide to forecast the weather and guide daily livelihood decisions and climate change adaptation measures. The aim of this study was to investigate and document traditional weather forecasting practices among the Afar pastoralists of north-eastern Ethiopia, using focused group discussions and individual interviews. The Afar traditionally predict weather and climate by observing diverse biophysical entities including livestock, insects, birds, trees and other wildlife. In addition, traditional seers, when consulted by local communities or individuals, also make "probabilistic predictions". The biophysical indicators used in weather prediction are of different types. No single prediction

is taken at face value; weather forecasting is a dynamic process whereby information is collected by traditional observation and prediction and triangulated with alternative sources of knowledge, including the formal meteorological weather forecasting system,<sup>1</sup> so as to make the safest and best informed livelihood decisions. Before any forecasting information is applied, it first passes through three important traditional institutions that collect, share and analyze the information presented. These institutions are: (1) the “*Edo*”, or range scouting, where traditional rangeland scouts are sent out on a mission to assess the weather and other spatially and temporally variable factors, such as rangeland condition, security and others; (2) the “*Dagu*”, a traditional secure and reputable network where weather information is shared; and (3) the “*Adda*”, a group of village elders within the traditional Afar governance system who evaluate and weigh the pros and cons of the forecasting information before making livelihood decisions on behalf of the community.

### *Witsaja iki, or the good life in Ecuadorian Amazonia: Knowledge co-production for climate resilience*

*By Seble Samuel (CGIAR Research Program on Climate Change, Agriculture and Food Security)*

Contemporary narratives of climate change have been recounted predominately through the lens of western sciences. However, indigenous and traditional knowledge systems are increasingly finding their voices echoed within the field of climate change, as the limitations of a purely scientific discourse are revealed. Through the stories and perspectives of the Sapara Nation, located in the Ecuadorian Amazon, this research illustrates local insights and perceptions of environmental change, as well as the onset of the external drivers – natural resources extraction and ecological conservation programmes – influencing the livelihoods and territories of this region. Through participatory resilience workshops, grounded in the framework of the Indigenous Peoples Biocultural Climate Change Assessment Initiative (IPCCA), this research explores themes of territory, hunting and fishing, medicinal plants and agriculture, spiritual worlds and climate prediction. This journeying into traditional ecological knowledge systems illustrates perceptions of time that are cyclical, relational and rooted in the environment; predictions of climate grounded in the insights of dreams, surrounding temperatures and the presence of flora and fauna; and autonomous, resilient Indigenous knowledge systems. These approaches reveal a radically altered environment, one of unpredictable winds and rains, altered wildlife patterns, disappearing species, destroyed habitats and the onset of new illnesses, complicating food sources, traditional livelihoods and mobility. In response, the Sapara Nation is crafting its own vision for its livelihoods and territories, in the midst of a changing climate.

### *Seeing like the herder: Climate change and pastoralists’ knowledge – insights from Turkana herders in northern Kenya*

*By Greta Semplici (University of Oxford)*

As debates about climate change intensify and call for the attention of an international community rushing to find solutions and remedies to protect our common future, it is of vital importance to pause, take a step back from global meetings, round tables and forecasting metrics, and to ask: what climate features are embedded into local knowledge, in what practices is this knowledge performed, and how does local knowledge account for changes in the climate? This case

<sup>1</sup> Afar pastoralists follow local news and politics through local radio, therefore almost every family has a radio which is also a source of meteorological weather information.

study explores indigenous knowledge of climate change in drylands, drawing upon ethnographic research among Turkana herders in northern Kenya. It warns against the danger of a univocal and acritical focus on climate change, de-contextualized from local knowledge, practices and performances. It argues that a good starting point for understanding changes in the climate is to incorporate local perceptions into analysis by exploring local meanings of space and time, how people and places relate to each other, and how local knowledge is built, transmitted and, most importantly, changed over time. By taking these elements into account, not only may views of climate change differ to include longer-term and multifactorial explanations, but the views and understandings of local strategies may also acquire a renewed value.

### The revitalization of shamanic health care in Suriname

*By Daniel Cooper (University of Oxford)*

Climate change poses significant health risks for indigenous peoples. Traditional medicine can play an important role in mitigating these risks, especially in remote areas detached from national health-care systems. Recognizing the challenges and opportunities for intervention, the Amazon Conservation Team (ACT) is working to revitalize shamanic healing in the rainforests of Suriname, a small country on the north-east coast of South America. After a review of the literature on climate change, the physical and human geography of Suriname, traditional and intercultural medicine, and shamanism, this paper draws from fieldwork, interviews, and other sources to analyse the ACT's Shamans and Apprentices Program. Not only does this partnership combine traditional and modern medicine, but it also works to empower indigenous communities through mapping, training, and the documentation, transfer, and preservation of indigenous knowledge integral to the maintenance of this fragile and abundant Amazonian biome. Ultimately, the case study serves as a model for other indigenous and local communities and policy-makers who aim to improve health care by blending traditional and modern knowledge and technology.

### Pastoralist journalists: Producing reports, knowledge, and policy from the pastures

*By Allison Hahn (City University of New York)*

How do pastoralists participate in the production, analysis and discussion of their own communities via new and social media? This paper examines the concept of citizen journalism as applied to pastoralists and argues that the media productions made by pastoralists must be recognized as meaningful work on par with other citizen journalist work. From this argument, the paper examines the ways that national and international development organizations have incorporated the work of pastoralists in their reports, media productions and future development projects.

### Augmented realities: The digital economy of indigenous knowledge

*By Daniel Cooper (University of Oxford) and Nina Kruglikova (University of Oxford)*

The integration of indigenous knowledge with modern science, technology, and innovation is increasingly seen as a means to address emerging climate realities. After a review of the literature on indigenous knowledge and the digital economy, this paper draws from diverse sources and personal communications to evaluate an indigenous tech start-up called Indigital. This Aboriginal-owned and operated social enterprise uses cutting-edge digital technology to translate and augment cultural landscapes within the Kakadu World Heritage Area in the Northern Territory of

Australia. It aims to create a platform to showcase local sacred sites, knowledge, and technology in compelling ways that contribute to the preservation of heritage and the creation of jobs in the digital economy. Participatory approaches and profit-sharing mechanisms improve the ethical dimension of augmenting cultural assets, but significant risks remain. This case study demonstrates the potential and challenges of creating partnerships intended to empower indigenous individuals and communities through the introduction of digital devices and software applications that store, transmit, and augment reality.

# 1. Introduction

*By Rishabh Kumar Dhir (International Labour Organization) and Ariell Ahearn (University of Oxford)*

---

Climate change has emerged as one of the defining challenges confronting the world today. Its impacts, together with the measures required to address climate change (climate action) – through mitigation and adaptation – have many implications for the economy and for society (IPCC, 2018). Floods, droughts and extreme weather events, for instance, are already putting social and economic relations under stress in many areas, while changes in such sectors as energy and forestry are transforming the world of work for countless women and men throughout the world (ILO, 2018). However, climate impacts and climate actions both have particular implications for those groups already confronted by social and economic vulnerabilities. The Intergovernmental Panel on Climate Change (IPCC, 2014, p. 54) has stated explicitly that:

[p]eople who are socially, economically, culturally, politically, institutionally or otherwise marginalized are especially vulnerable to climate change and also to some adaptation and mitigation responses [...] This heightened vulnerability is rarely due to a single cause. Rather, it is the product of intersecting social processes that result in inequalities in socio-economic status and income, as well as in exposure. Such social processes include, for example, discrimination on the basis of gender, class, ethnicity, age, and (dis)ability.

In this regard, indigenous and tribal peoples are uniquely at risk of being placed at the forefront of the direct impacts from both climate change and climate-related mitigation and adaptation actions, despite being among those who have contributed the least to climate change (ILO, 2017a; IPCC, 2018; IPCC, 2014).

Research by the International Labour Organization identifies six characteristics that are shared by indigenous peoples<sup>1</sup> in the context of climate policies and impacts, which, in combination, are not present in any other group, thereby posing unique risks:

First, indigenous peoples are among the poorest of the poor, the stratum most vulnerable to climate change. Second, they depend on renewable natural resources most at risk to climate variability and extremes for their economic activities and livelihoods. Third, they live in geographical regions and ecosystems that are most exposed to the impacts of climate change, while also sharing a complex cultural relationship with such ecosystems. Fourth, high levels of exposure and vulnerability to climate change force indigenous peoples to migrate, which in most cases is not a solution and can instead exacerbate social and economic vulnerabilities. Fifth, gender inequality, a key factor in the deprivation suffered by indigenous women, is magnified by climate change. Sixth, and lastly, many indigenous communities continue to face exclusion from decision-making processes, often lacking recognition and institutional support. This limits their access to remedies, increases their vulnerability to climate change, undermines their ability to mitigate and adapt to climate change, and consequently poses a threat to the advances made in securing their rights (ILO, 2017a, p. 7).

While the risks faced are manifold, indigenous peoples are increasingly coming to be recognized as “agents of change” in achieving strong and meaningful climate action. The economies

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<sup>1</sup> For practical reasons, the term “indigenous peoples” is preferred in this chapter. It includes tribal peoples and is also now the most commonly used term. For more information, see, “Who are “indigenous peoples”?” (ILO, 2017a, p.5).

of indigenous peoples are dependent on natural resources and ecosystems, with which they share a complex cultural relationship. Often, their economic activities, ranging from agriculture to hunting-gathering, are rooted in a principle of the sustainable use of their natural capital as a core productive asset, with incomes being dependent upon the value to be derived from nature. It has therefore been argued that indigenous peoples are in “the vanguard of running a modern economic model based on the principles of a sustainable green economy” (ILO, 2017a, p. xi). Moreover, in addition to cultural approaches, the exceptional nature of indigenous peoples’ traditional knowledge and occupations plays a fundamental role in the functioning of their sustainable economic model. Greater research on these aspects, alongside recent public policy developments, is increasingly serving to highlight the potential of traditional knowledge in strengthening climate mitigation and adaptation, as well as having an important part to play in achieving the Sustainable Development Goals (ILO, 2016a). Most recently, the IPCC (2018, p. 25) has recognized indigenous peoples as a key partner, noting that: “Strengthening the capacities for climate action of national and sub-national authorities, civil society, the private sector, indigenous peoples and local communities can support the implementation of ambitious actions implied by limiting global warming to 1.5°C (*high confidence*).”

That said, while there is a heightened focus on indigenous peoples’ traditional knowledge, occupations, livelihoods, worldviews and ways of life at an international level, considerable research gaps remain in the understanding of the everyday practice of traditional knowledge. Salient among these are its gender dimensions and its interactions with transformations introduced by factors such as economic and institutional changes, technological changes, as well as the impacts of climate change and climate actions. Such gaps pose a challenge to a full appreciation of the good practices of traditional knowledge and the inroads made into inclusive natural resources management, as well as the economic, environmental and social innovations underway that operationalize traditional knowledge in a rapidly transforming world of work.<sup>2</sup>

This publication (*Indigenous Peoples and Climate Change: Emerging Research on Traditional Knowledge and Livelihoods*) presents a compendium of case studies to address these gaps in understanding by providing policy-makers with concrete examples of traditional knowledge at work at a grassroots level – and, in some cases, its interplay with national and international developments. It takes recourse to emerging research conducted directly with communities in different countries across Asia and the Pacific, Africa, and the Americas to showcase the experiences of traditional knowledge systems and occupations as they engage with the natural world, economic and governance systems, as well as “modern” science and technology. Furthermore, rooted in preliminary on the ground evidence, it sheds light on the challenges and ways forward to furthering inclusive climate action and sustainable development shaped by indigenous peoples’ knowledge and aspirations. This publication does not, however, aim to provide exhaustive accounts of either the threats to indigenous peoples from climate change or an assessment of national policies in this regard; rather, it focuses on sharing glimpses into existing practices as well as the innovations made by communities to meet their livelihoods needs and cope with climate change. It seeks to inspire interest and further research among diverse stakeholders, including governments, employers’ organizations and trade unions, by strengthening an understanding about what traditional knowledge entails in everyday practice, and its potential in shaping a future of work that is sustainable and inclusive.

Drawing upon the emerging research in this field, this publication also brings to the fore the importance of the ILO's Decent Work Agenda, including the Indigenous and Tribal Peoples Convention, 1989 (No. 169) as well as the ILO's *Guidelines for a just transition towards environmentally sustainable economies and societies for all* (ILO, 2015a). This year, 2019, marks the 30<sup>th</sup> anniversary of ILO Convention No. 169 (alongside the ILO's 100<sup>th</sup> anniversary) as a key international standard promoting the rights of indigenous peoples. From empowering indigenous women, who are often the custodians of traditional knowledge (ILO, 2017b), to promoting cooperatives and other forms of enterprises that build on traditional knowledge systems to create sustainable economic and environmental outcomes (ILO, 2016b), indigenous peoples' access to decent work opportunities has the potential to both preserve and take forward traditional knowledge through opportunities across traditional occupations as well as new forms of economic activities. In doing so within the framework of the Decent Work Agenda, this publication also provides a way forward to better engaging with traditional knowledge and occupations to achieve the intertwined goals of climate action, sustainable development and social justice.

## Furthering an understanding of traditional knowledge

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While there is no universally accepted definition of “traditional knowledge” at the international level, the World Intellectual Property Organization (WIPO, 2012, p. 42) notes the following:

“Traditional knowledge,” as a broad description of subject matter, generally includes the intellectual and intangible cultural heritage, practices and knowledge systems of traditional communities, including indigenous and local communities (traditional knowledge in a general sense or *lato sensu*). In other words, traditional knowledge in a general sense embraces the content of knowledge itself as well as traditional cultural expressions, including distinctive signs and symbols associated with traditional knowledge.

In international debate, “traditional knowledge” in the narrow sense refers to knowledge as such, in particular the knowledge resulting from intellectual activity in a traditional context, and includes know-how, practices, skills, and innovations. Traditional knowledge can be found in a wide variety of contexts, including: agricultural knowledge; scientific knowledge; technical knowledge; ecological knowledge; medicinal knowledge, including related medicines and remedies; and biodiversity-related knowledge, etc.

Furthermore, regarding “indigenous knowledge”, it notes (WIPO, 2012, p. 20):

Indigenous knowledge is knowledge held and used by communities, peoples and nations that are ‘indigenous’. In this sense, “indigenous knowledge” would be the traditional knowledge of indigenous peoples. Indigenous knowledge is, therefore, a part of the traditional knowledge category, but traditional knowledge is not necessarily indigenous. Yet the term is also used to refer to knowledge that is itself “indigenous”. In this sense, the terms “traditional knowledge” and “indigenous knowledge” may be interchangeable.

Often, terms such as “Traditional Ecological Knowledge” or “Traditional Environmental Knowledge” are used with regards to indigenous peoples' knowledge. In this context, WIPO (2012, p. 42) makes the following clarification:

The Dene Cultural Institute defines “traditional environmental knowledge” (TEK) as “a body of knowledge and beliefs transmitted through oral tradition and first-hand observation. It includes a system of classification, a set of empirical observations about the local environment, and a system of self-management that governs resource use. Ecological aspects are closely tied to social and spiritual aspects of the knowledge system. The quantity and quality of TEK varies among community members, depending on gender, age, social status, intellectual capability, and profession (hunter, spiritual leader, healer, etc.). With its roots firmly in the past, TEK is both cumulative and dynamic, building upon the experience of earlier generations and adapting to the new technological and socioeconomic changes of the present.”

Traditional ecological knowledge is also defined as “a cumulative body of knowledge and beliefs, handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment. Further, TEK is an attribute of societies with historical continuity in resource use practices; by and large, these are non-industrial or less technologically advanced societies, many of them indigenous or tribal.”

The Convention on Biological Diversity (CBD) is another important source for engaging with the concept of traditional knowledge. In this regard, The Secretariat of the Convention on Biological Diversity (SCBD, n.d., p. 1) also provides a definition:

Traditional knowledge refers to the knowledge, innovations and practices of indigenous and local communities around the world. Developed from experience gained over the centuries and adapted to the local culture and environment, traditional knowledge is transmitted orally from generation to generation. It tends to be collectively owned and takes the form of stories, songs, folklore, proverbs, cultural values, beliefs, rituals, community laws, local language, and agricultural practices, including the development of plant species and animal breeds. Traditional knowledge is mainly of a practical nature, particularly in such fields as agriculture, fisheries, health, horticulture, and forestry.

These definitions help in better understanding the respective social, economic, cultural, institutional and environmental aspects of traditional knowledge. Furthermore, an important area where this knowledge is manifested in the everyday lives of indigenous women and men is through the practice of traditional occupations. In this context, when seen through the lens of the world of work, traditional knowledge is closely intertwined with the skills that indigenous peoples use in their traditional occupations, and with the organization of economic activity (for example, natural resources management) based on traditional institutions. Such skills may also have a contribution to make in “non-traditional” occupations and employment, particularly with regards to environmental conservation. Often, however, the traditional knowledge and skills of indigenous women and men go unrecognized and are undervalued (UN, 2017; ILO, 2017c). At the same time, indigenous peoples can often be faced with restrictions on their engagement in traditional occupations due to factors such as discrimination or a lack of recognition of their rights, lands and resources (ILO, 2007). This can have markedly detrimental implications for the preservation and promotion of traditional knowledge, as well as the socio-economic development of indigenous peoples. Against this backdrop, it becomes all the more important to engage with the concept of traditional knowledge which brings together elements related to the world of work, such as skills, occupations and the organization of economic activity (for instance, the management of natural resources, cooperatives or enterprises through traditional institutions) – all of which are not only fundamental to traditional forms of economic activity, but also to developing new opportunities in a low-carbon economy.

## International developments regarding traditional knowledge

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Over the last few decades, indigenous peoples' issues have gathered momentum at the international level. The ILO's Indigenous and Tribal Peoples Convention, 1989 (No. 169) and the United Nations Declaration on the Rights of Indigenous Peoples (UN, 2007) have played a key role in taking forward indigenous peoples' socio-economic development based on their own aspirations and world views. The ILO Convention No. 169 (ILO, 1989), for instance, was among the first international instruments to draw attention to indigenous peoples' "knowledge and technologies" (Article 27.1) and "traditional activities" (Article 23.1), such as fishing or hunting-gathering, to promote indigenous communities' economic self-reliance and development. In recent years, along with an enhanced focus on indigenous peoples more broadly, international instruments have more specifically come to recognize the importance of traditional knowledge in enhancing resilience and achieving meaningful climate action.

The Convention on Biological Diversity (CBD), which came into force in 1993, placed an important focus on traditional knowledge for its potential contribution to both conservation and the sustainable use of biological diversity. In its preamble, the close and traditional dependence of many indigenous and local communities on biological resources was recognized, while Article 8 (j) of the Convention provided the following (SCBD, n.d., p. 2):

Each contracting Party shall, as far as possible and as appropriate:

Subject to national legislation, respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity and promote their wider application with the approval and involvement of the holders of such knowledge, innovations and practices and encourage the equitable sharing of the benefits arising from the utilization of such knowledge, innovations and practices.

More recently, traditional knowledge has also gained considerable relevance in the context of disaster risk reduction. The Sendai Framework for Disaster Risk Reduction 2015–2030 (UN, 2015a), which was adopted by UN Member States, explicitly highlighted the fact that "Indigenous peoples, through their experience and traditional knowledge, provide an important contribution to the development and implementation of plans and mechanisms" (Section V. 36. (a)(v)). It also identified among the priorities for action (Section IV. 24. (i)) a need to:

[E]nsure the use of traditional, indigenous and local knowledge and practices, as appropriate, to complement scientific knowledge in disaster risk assessment and the development and implementation of policies, strategies, plans and programmes of specific sectors, with a cross-sectoral approach, which should be tailored to localities and to the context.

The international process around climate change is another platform where traditional knowledge has gained considerable attention: in this case, for enhancing climate action. The Paris Agreement (UN, 2015b), for instance, explicitly notes the importance to climate adaptation action of "traditional knowledge, knowledge of indigenous peoples and local knowledge systems", along with the "best available science" (Article 7.5). Most recently, under the United Nations Framework Convention on Climate Change (UNFCCC) process, a Local Communities and Indigenous Peoples Platform, and a related Facilitative Working Group was established with the aim, as noted by the UNFCCC, "to preserve and strengthen indigenous and local knowledge systems, enhance the engagement of local communities and indigenous peoples

in the UNFCCC process and integrate their considerations into climate change policy and action” (UNFCCC, 2018). In this regard, the Facilitative Working Group is particularly unique, as one half of its members are to be government representatives, while the other half are to be indigenous peoples’ representatives.

Such developments at the international level have initiated an important process that not only recognizes the value of traditional knowledge in addressing the key challenges facing the world today, but also the role indigenous peoples can play as key partners. Moreover, for achieving the 2030 Agenda for Sustainable Development, with its pledge that “no one will be left behind” (UN, 2015c, p. 1), indigenous peoples’ proactive participation as agents of change will also be essential. From enhancing sustainable agricultural practices and food security; ensuring the sustainable management and use of natural resources; promoting sustainable forms of livelihood, creating green jobs and encouraging climate sensitive innovation, entrepreneurship and businesses; to securing the peaceful and stable societies necessary for inclusive social and economic development – indigenous women and men, with their wealth of traditional knowledge and practices, will have a critical role to play in the story of realizing the Sustainable Development Goals and building a low-carbon economy (ILO, 2016a).

## Ground realities of traditional knowledge

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Several positive developments at the international level, broadly focusing on indigenous peoples’ issues and on traditional knowledge more specifically, have opened up many avenues for taking forward multiple approaches to sustainable development and climate action. The several gaps that exist between the international level and the realities on the ground continue, however, to pose many challenges to the well-being of indigenous peoples and the realization of their aspirations (UN, 2017). At the same time, a limited understanding of the everyday practices of traditional knowledge, occupations and livelihoods, particularly in the context of policy-making, has constrained the translation of international developments into national and local implementation. Against such a backdrop, indigenous peoples continue to face social, economic and environmental vulnerabilities, and yet, as this publication shows, are devising ways to cope with and confront the changes occurring all around them.

Indigenous peoples’ lives, knowledge systems, occupations and livelihoods are increasingly engaging with many threats, as well as some opportunities, with changes related to the economy, society, technology and the climate. Traditional occupations, for instance, which often share a strong relationship to land, are being impacted by exclusionary economic policies that limit indigenous peoples’ control over their traditional resource base (Thomas, 2000; ILO, 2015b). As an example, in many countries in Asia and the Pacific, there is an absence of explicit recognition of indigenous peoples through dedicated legal, policy and institutional frameworks, which poses challenges for ensuring respect for universally accepted human rights and for tackling structural issues that perpetuate socio-economic exclusion and marginalization (ILO, 2015b). There are, however, more and more cases of indigenous peoples’ well-being having improved, for instance through cooperatives that empower communities economically and politically (ILO, 2016b). At the same time, indigenous peoples are also increasingly blending traditional knowledge with modern scientific knowledge and approaches to further climate action and enhance their well-being (ILO, 2017a).

Building on such developments and addressing research gaps through case studies, this publication highlights instances of indigenous peoples' ground realities in the practice of traditional knowledge, often set against a backdrop of an interplay between, on the one hand, rights and the use of resources and lands, and on the other, changes in climate, institutions, society, economy and technology. *Ahearn's* study set in Mongolia discusses traditional knowledge-based innovations for adaptation, and examines the local institutions that draw upon government policies and new technologies. *Burn's* work in Timor-Leste explores how traditional water management and subsistence practices are adapting to severe drought and poor access to water, and foregrounds the gender dimension of women's custodial practices. *Balehegn and Balehey's* research from Ethiopia showcases how customary institutions play a vital role in traditional weather forecasting and improved adaptation to climate change. *Samuel's* paper is set in the Ecuadorian Amazon and engages critically with purely modern scientific discourses of climate change to highlight the indigenous ways of life grounded in traditional knowledge and what are the local perceptions of the environmental change being brought about by many transformative external drivers. *Sempli-ici's* study of pastoralists in Kenya explains what it means to think about climate change from below, when describing how traditional knowledge is a key part of the pastoralists' everyday life. *Cooper's* study in Suriname brings to light the advantages of combining traditional and modern knowledge, particularly through partnerships that can work towards empowering communities and mitigate risks. *Hahn's* work connects the local and the international, as well as the traditional and the modern, by focusing on the "pastoral journalists" in East Africa who are building new communicative norms and networks. In the final case study, *Cooper and Kruglikova* showcase how indigenous knowledge is being called upon in the digital economy, and shaping an indigenous tech start-up as an enterprise with a unique model for profit sharing. Learning from these studies, the Conclusion to this compendium discusses pathways to ensuring that traditional knowledge is promoted and valued as a fundamental aspect of indigenous peoples in the world of work, as well as in climate action and sustainable development.

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## 2. Surviving Extreme Weather: Mongolian indigenous knowledge, local institutions and governance innovations for adaptation

*By Ariell Ahearn (University of Oxford)<sup>1</sup>*

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### Introduction

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In June 2016, the rural county of Khan Bogd in the South Gobi Desert, Mongolia, was covered in puddles, the sandy soil split with rivulets running across the flat landscape. The dusty roads became saturated and turned into a rusty red mud, making driving almost impossible. Camels stood with their calves, wool soaked in a way that made them oddly resemble wet poodles. Rain in this area of the country was an unusual event. In this particular region of the South Gobi, precipitation averages 95.3 millimeters per year (MDT-IEP Report, 2017, p. 3). Only weeks earlier, the community had gathered at a sacred mountain to attend a mountain worshipping ceremony and ask for rain to come to the area. They were blessed with rainfall the day of the ceremony, reinforcing the belief that respect for mountain and land spirits would keep nature in balance.

Mongolia, which is characterized by approximately 80 per cent grasslands (Barcus, 2018), has been home to mobile pastoralists for centuries. It is “the largest remaining contiguous area of common grazing in the world” (Reading et al., 2006). Pastoralists in this region herd yaks, camel, horses, goats and sheep, also known as the “five snouts” in the Mongolian language. They rely on adequate rainfall to promote the growth of pasture. Precipitation and fresh ground water are therefore essential for both traditional livelihoods and current forms of economic production. While Mongolian herders are already exposed to an extreme environment, changes in climate have created new risks to their livelihoods. As Mongolian President Elbegdorj stated at the 2014 UN Secretary-General’s Climate Summit, “If you have doubts about whether climate change is happening or not, come to Mongolia. Ask a herdsman, ‘Is climate change happening?’ Our herdsman will give you a true answer. They’ve already told me that it is happening, and happening for real” (Khaliun, 2014). This case study examines Mongolian traditional custodial land use systems and semi-formal governance institutions as examples of resilient systems by which Mongolian herders are able to cope with climate variation and new forms of environmental extremes.

### Climate change in Mongolia

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Mongolia is a dryland region with wide variation in annual and daily temperature, with extreme minimum temperature recorded as  $-31.1\text{ }^{\circ}\text{C}$  to  $-55.3\text{ }^{\circ}\text{C}$  in January. In July, the extreme maximum temperature has been recorded as  $+28.5\text{ }^{\circ}\text{C}$  to  $+44\text{ }^{\circ}\text{C}$  (Dagvadorj et al., 2014). Mongolia’s high altitude makes it colder than regions at the same latitude, with Ulaanbaatar infamously

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1 *Acknowledgements:* With special thanks to Professor Dawn Chatty for her distinguished service to mobile pastoralists worldwide.

named the coldest capital city in the world. Average temperatures in Mongolia have increased by 2.1 °C over the course of the twentieth century (Dagvadorj et al., 2014) and temperatures are projected to continue to rise (Ojima et al., 2017). Mongolian climate change studies have shown that there are regional differences in climate variability based on the ecosystem type. Some regions, for example, show higher rates of average temperature increase, although across the region minimum summer temperatures have risen and unseasonable weather has been observed (Venable et al., 2015). The pressure on water resources is predicted to be exacerbated due to the phenomenon of Central Asian glacial melt, and several researchers have concluded that the region will see an increase in the prevalence of “arid and desert areas” (Dagvadorj et al., 2014, p. 33). Additionally, warming temperatures are associated with melting permafrost (Fassnacht et al., 2011); the loss of permafrost can contribute to increases in arid conditions in some regions (Sharkhuu and Sharkhuu, 2012).

Future scenarios remain unclear as long-term climate trends become more unpredictable. As Fassnacht et al. (2011) write, the most significant change in climate is the increase in temperature, while changes in precipitation are less definitive. Nonetheless, Mongolia’s grasslands remain an important element in the earth’s climate system. Some 40–50 per cent of all land on earth is made up of grasslands (Suttie et al., 2005; Wang et al., 2013), and grassland soils are able to store large amounts of carbon (O’Mara, 2012). Neely et al. (2010, p. 244) write, “While C storage in grasslands is less per unit than forests, the total amount of C that grasslands store is significant because the area of these ecosystems is so extensive”. Degraded grasslands, where vegetation is sparse, can exacerbate droughts and erosion due to higher rates of evaporation and more intense run-off from rains (Neely et al., 2010). According to the Food and Agriculture Organization (FAO, 2010), encouraging sustainable land use practices by pastoralists is one way to develop robust grasslands. Traditional Mongolian land use practices, which encourage frequent mobile herding practices and different grazing techniques for each animal breed, can be seen as one form of climate change adaptation which relies on traditional knowledge and skills. The changes in weather patterns induced by climate change, however, also require new types of information, technology and institutional support to be provided to ensure that herders can continue to make sustainable land use decisions.

The Mongolian Government has been proactive in developing policies to protect grasslands and address the livelihood challenges faced by pastoralists. Mongolia’s Parliament passed the National Action Programme on Climate Change in 2011, which aims to focus national adaptation strategies on areas such as “conserving natural resources, especially natural pasturelands” and “enhancing the capacities and livelihood opportunities of rural communities” (ADB, 2014, p. 8). Pasture degradation, soil erosion, deforestation, loss of water sources and frequency of droughts, *dzud* (winter disaster) and dust storms have been identified as climate change impacts in Mongolia, although there is local variation between ecosystems. A recent study of tree rings representing 2060 years of growth found that an unusual extended period of drought occurred from 1996 to 2011 (Hessl et al., 2018), which contributed to a series of *dzud* in 1999–2001 and 2010–2011. Thousands of livestock died of starvation and extreme cold during these periods. This level of covariate risk, affecting many households in a wide geographic area, compromised individual households’ coping methods (see Ahearn, 2017).

The actions taken by the national government are focused on reducing Mongolia’s emissions, especially in the rural pastoralist economy, and developing ways to maintain sustainable grass-

lands and reduce the potential for degradation. In 2012, the Mongolian Government established a strategy focused on “green development” with initiatives related to promoting “green society” and “green economy” (Ojima et al., 2017). According to Ojima et al., the Green Development policies involve “enhancing the modern cultural landscapes, strengthening pastoral livelihoods while incorporating modern technologies, developing renewable energy resources, improving access to appropriate livestock breeds and use of veterinary practices and access to markets for more finished products” (p. 186). Maintaining sustainable grassland ecosystems is central to rural livelihoods in Mongolia and to global climate change adaptation efforts. Rural herders, as well as government agencies, are aware of the importance of the grasslands for climate change mitigation and the rural economy and are taking positive steps to address the multiple dimensions of conservation and economics in this context.

## Components of traditional environmental knowledge of herders in Mongolia

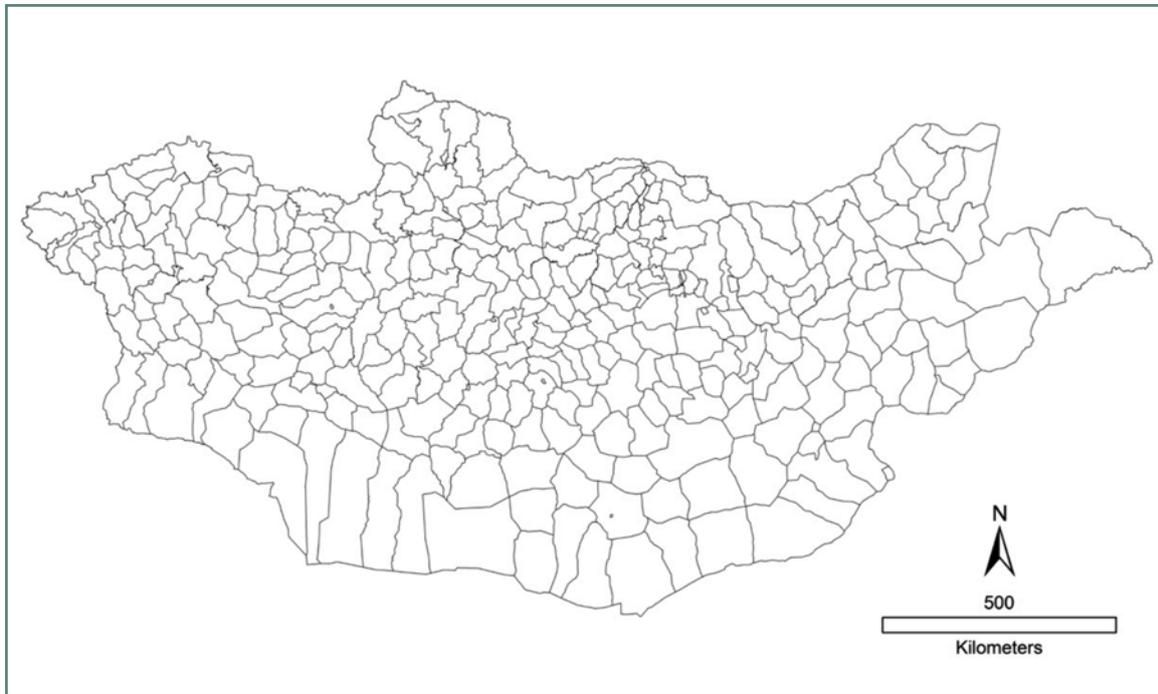
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As Fassnacht et al. (2011) state, “Local, traditional and/or indigenous knowledge has proved very useful for identifying the degree and effects of climate change” (Fassnacht et al., 2011). Mongolian herders’ close observation of livestock and wildlife behaviour, knowledge of their “homeland” *nutag* landscapes and interaction with pastures, wildlife and water sources on a daily basis form an evidence base for understanding and making sense of climate variability.

This knowledge interacts with other political and economic systems – such as accessing health care or schooling children (Ahearn and Bumochir, 2016) – as households make livelihood decisions. Two core elements of mobile pastoralism are (1) practices of mobility and (2) wider governance and land tenure systems, which allow mobility to be practised. Practices of mobility are enabled by traditional knowledge, certain forms of technology, such as mobile housing (the traditional felt *ger*) and transport (trucks, cars and pack animals). Mobility also requires supporting infrastructure, such as the availability of public wells for drinking water and livestock use. The protection of land, as state-owned with exclusive ownership prohibited, is key to the continued viability of mobile livelihoods. Custodial land tenure is the accepted form of land tenure, as discussed below.

Traditional environmental knowledge of herders in Mongolia is not necessarily limited to those individuals and households practising mobile pastoralism today. As herding is an important dimension of Mongolian history, culture and national identity, there is a celebration of traditional practices and attitudes towards nature across society, including within urban households. Despite this celebration of the cultural heritage of pastoralism, the focus of this case study will be the knowledge and practices of rural Mongolian herders as they relate to land use practices, governance and decision-making processes. Approximately 30 per cent of working Mongolians are pastoralists and the majority of rural land is used for livestock husbandry. Agriculture is a significant industry, with cashmere, wool, leather and other textiles forming a basis for national industry and export. Rural land outside of urban areas is predominantly state-owned and organized into *soum* (county) and *bag* (sub-district) administrative units (see figure 1 below).

**Figure 1. *Soum* (county) administration boundaries in Mongolia.**  
Each province is divided into *soum*



Source: Leah Holgiun prepared the map for the author.

Herders are registered in a *soum* and typically move to seasonal camps and herd livestock within the boundaries of this area, although they may cross into neighbouring *soum* during times when pasture and water resources are limited. Local administration of herding occurs at the *soum* level, including registration of individual herder winter camps and regulation of pasture use through district councils. Pastoralists' close interactions with livestock, wildlife and local environments therefore constitute a significant resource for grassland stewardship, but these practices operate within governing institutions and wider state policies.

Fijn (2011), in her ethnography of Mongolian pastoralism, describes the in-depth knowledge that each herder has of their livestock and genealogy of herds. The Mongolian language has unique words for animals of each breed of livestock from the first to the fifth year of life. For example, there are separate words for a one-year-old goat and a three-year-old goat, also distinguished by gender and other identifying characteristics. Mongolian herders have also developed complex vocalizations and songs to teach animals how to suckle their young, and to train them in their favoured methods of milking, grazing and watering. Fijn writes, "Mongolian herders use a wide range of verbal signals and commands to communicate with herd animals, both on an individual level and on the level of the herd as a whole. I noted five general sounds commonly used for all herd animals; thirty used for sheep and goats; and sixteen for cattle and seventeen for horses" (p. 112). Observations of livestock and wildlife behaviour also provide herders with information regarding forthcoming winter weather (Soma and Schlecht, 2018).

Herder belief systems also prohibit certain types of land uses. Humphrey et al. (1993) have posited the idea that herders see the environment ("nature") as an interactive system of which

they are an integrative part, where the actions and behaviours of humans have impacts on wider environmental processes. An illustrative example is the shame associated with small-scale mining practices. High (2013, p. 3) writes, “The land is seen as demanding respect (*hundetgeh*) and many taboos inform people’s engagement with the land. Digging into the ground is one such prohibition. Although Mongolia is a country with abundant mineral wealth, historical sources evidence a long standing aversion towards digging into the ground and pursuing its mineral riches”. Other such beliefs regulate the way Mongolians interact with the landscape on a daily basis, such as rules regarding water use and conservation, and are intertwined with household economies. For example, the practice of collecting dried dung for fuel, the practice of utilizing every part of their livestock for food (meat and dairy products) and wool fibres for sale and personal use demonstrates the strict forms of conservation and recycling used by Mongolian pastoralists. As described in the opening vignette, local mountain-worshipping ceremonies are conducted on an annual basis to maintain positive relations between humans and land spirits or guardians (*gazariin ezen*). Such ceremonies often coincide with horse racing and wrestling events, which serve to bring the community together in one location. These ceremonies also occur at a national level, with the President of Mongolia and members of state travelling to sacred mountains to pay their respects and maintain good relations with the land (Sneath, 2014).

Mongolian herders’ ability not only to survive but to flourish in extreme environmental conditions provides examples of core adaptation skills which can be applied to new climatic conditions. These livelihoods are wholly sustainable, do not rely on carbon-producing industries and have avoided the trap of consumer culture. In this context, national policies are essential for facilitating the continuation of practices of mobility and conservation.

## Custodial land use and environmental governance systems

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Mongolia’s ecosystems support a variety of mobile pastoralism practices. In the forested northern (*khangai*) regions, yaks are a primary source of milk and fermented horse milk (*airag*) is plentifully produced (Bat-Oyun et al., 2015). In the drier Gobi regions, camels and goats are the most frequently milked livestock, with a special fermented camel milk beverage enjoyed in the summer. The production and consumption of traditional foods play a central role in Mongolian social norms, forms of hospitality and ritual offerings, and within family relations (Ruhlmann, 2016). For nearly all pastoralist households, income from raw cashmere sales in the spring provides the largest source of income, followed by sales of other products, such as sheep wool, camel wool, dairy products and meat (which households sell in differing amounts depending on the types of livestock they own). Household economies are based on sales of livestock produce; some households supplement this income with seasonal work or small business income.

In contemporary Mongolia, livestock mobility depends largely on the size of herd, condition of pasture and availability of water. Accessing schooling for children also requires new forms of mobility and finance for households during the school year; debt finance has become common among herders with school-aged children (Ahearn and Bumochir, 2016). Thus, household economics and access to services are important factors in herder land use and mobility decisions. Custodial land use is a complex tenure system, supported by local and national government regulations as well as herder customs and perceptions of the environment and their relationship with it. Currently, all rural land is protected in the Mongolian constitution as public “common” land,

but use is restricted according to local government regulations. Sneath (2001, p. 43) defines custodial tenure as a system in which “agencies had conditional rights to use territory and always within a wider socio-political framework. Indeed, in the past, land, livestock and people were constituent elements of socio-political domains ruled by distinct authorities”. This land use system, which allows mobility to be practised, has been protected by the Government of Mongolia despite pressure from agencies, such as the Asian Development Bank, to shift to exclusive or private tenure rights (Sneath, 2001). This tenure system is essential to maintaining traditional herder knowledge and mobility practices, and to the continued support of grassland ecosystems. This system should be seen as a positive institution which can support climate change adaptation and mitigation if combined with other forms of investment in the rural areas, such as maintenance of common wells and other infrastructure. Indeed, Wang et al. (2013, p. 1678) have demonstrated that “mobility was the dominant category of livelihood adaptation strategies used by herders in Mongolia. Herders changed the beginning, end and duration of their migrations to adapt to climate variability and change”. According to Agrawal’s research, synthesizing a broad range of case studies, local institutions are essential to livelihood adaptation to climate change. Wang et al. (2013, p. 1674) define local institutions as “both formal laws and policies and informal norms that structure human interactions and govern interactions between human and environment”. These institutions can have a range of influence and effect on human–environment interactions. As the authors indicate, the adoption of formal laws which conflict with the conventional activities of local institutions can have negative and counterproductive effects (i.e. maladaptation).

Local government councils at the *bag* (sub-district) and *soum* (county) level are decision-making bodies where a range of discussion and consultation takes place. During a *soum* meeting in central west Mongolia, a herder explained to me,

This meeting is consultation among herdsman. It is about the local development fund. Before this election, the system was vertical and decision making on finance was always from top to down. From the Ministry on top ... but now it has all changed ... all decision making is made locally, we receive budgeted funding and we make decisions how to spend it. Under this ethos, herdsman and workers’ community consult among ourselves how to spend this fund, how to develop, and what we should spend for ... etc.

These local government forums have grown out of socialist era administrative structures, but currently are a place where herders can give feedback to local administrative leaders and environmental governance decisions can be developed. For example, decisions concerning the establishment of a new winter camp for a household would be made at a *bag* meeting, as well as detailed discussions related to local government projects and policies. These forums provide a space to discuss and resolve conflicts over land use or the establishment of new families in the area. The activities and functioning of *bag* and *soum* councils vary depending on the region to reflect the specific circumstances faced by that area.

Thrift and Byambabaatar (2015) have found that herders mitigate environmental risks through mutual aid relationships and networks. This finding is reiterated by Janes and Chuluundorj (2015, p. 101), “Successful herding depends to a considerable extent on maintaining a pool of social support through relatives, neighbors and friends. It is through these networks, based principally on relations of generalized reciprocity, that households gain access to needed labor; obtain key resources such as winter shelters and water”. Labour pooling is common when households move to new locations, during the shearing season for goats, sheep and camels, when training horses,

and during the slaughtering season in the late fall. Thrift and Byambabaatar (2015) argue that the focus of international development programmes on individual households does not adequately address the multi-sited nature of households and the importance of networks in weathering economic and environmental shocks. These networks are not only important for rural herders, but for relatives living in urban centres who receive annual *idesh*, or meat and dairy product supplies from the countryside, for the winter months (Ichinkhorloo and Thrift, 2015). Informal networks are often structured on gender- and age-based hierarchies and expectations about mutual aid and assistance. These hierarchies are also seen in custodial tenure practices.

Local governance systems are complex in rural Mongolia and combine a range of local knowledge, networks, and public forums within a wider system of laws and practices, including government protection of common grazing land and custodial land use practices. In this case, grazing is not a “free for all”, but is closely regulated by both local governance institutions and informal institutions. Social norms and beliefs play an important role in the types of land use activities which are seen as acceptable. Unfortunately, in many areas mining is a growing industry, which both takes land away from pastoralism and leads to extensive loss of topsoil and general soil degradation. In this context, a more concentrated investment in the sustainable conservation practices of local herders should be prioritized, especially with the advent of open pit mining.

## Index-based livestock insurance and sustainable supply chains

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In the past decade, there has been more of an effort to address the risks that herders face from uncertain markets and climate change-related risks. The climatic hazards of *dzud* (winter disaster) and drought, in combination with anxiety over pastureland degradation, has resulted in significant efforts by international aid and development agencies to develop and apply rangeland management frameworks, such as pasture user groups or community-based rangeland management organizations. Over 2000 of these groups were established during the course of the 1990s (Reid et al., 2015). For example, herder groups, such as the Hustai Centre, have received external funding from European development organizations to encourage alternative income-generating activities and cooperation between households (Sanjmyatav, 2012). Indeed, many pasture user groups were built on already existing networks of herders to provide a forum for training, information exchange and monetary support.

One of these efforts is the Index Based Livestock Insurance (IBLI) scheme, which was piloted by the World Bank in 2006. During the socialist period, livestock were grouped into collectives and were insured by the Government, which provided monetary compensation or in-kind compensation for loss of livestock (Luxbacher and Goodland, 2011). This system broke down after the end of socialism during the ensuing period of economic crisis. In any case, the 2006 pilot of IBLI was successful and was expanded into a national programme from 2011. Index-based insurance in Mongolia is measured on the basis of livestock mortality. When the district-level mortality rate of a species of livestock rises above a set percentage, then the insurance takes effect and herders are entitled to receive payments (Bertram-Huemmer and Kraehnert, 2017). Participation in IBLI scheme is voluntary for herders and a study of the programme demonstrated that the insurance payments significantly improved household recovery from the 2009–2010 winter disaster (Bertram-Huemmer and Kraehnert, 2017). The index-based insurance scheme is purchased by individual households and may be unaffordable for poor households. Therefore,

additional policies have been introduced to supplement the IBLI scheme and support the rural economy's poor households.

Understanding and addressing the economics of mobile pastoralism in Mongolia is an essential component of enhancing the traditional environmental knowledge of herders and enabling them to continue living sustainable livelihoods. The economic constraints to herding are many, including fluctuating market prices for meat and wool as well as difficulties in accessing markets for the sale of produce. Macroeconomic factors also play a role, which is a common issue for pastoralists worldwide. Writing about climate change adaptation for pastoralists, Herrero et al. (2016) state, “structural inefficiencies in livestock markets include long distances to market, inconvenient timing and location of sales, high transport costs, high taxation and insecurity” (p. 426). This is also an issue in rural Mongolia. The lack of infrastructure and landlocked geography of the country pose additional barriers for efficient export of livestock products. The Mongolian Government has started to address the difficulties faced by the agricultural sector, which is a positive start although more work is needed. From 2010 to 2015, the Government established two subsidy funds for herders. The Small and Medium-sized Enterprises (SME) Development Fund, the Pasture Management Programme and the Veterinary Programme were established to offer credit and loans to herders and to provide services for rodent control in pastures and veterinary support for livestock (Gunjal and Annor-Frempong, 2014).

Additionally, since 2011, the Government of Mongolia has initiated wool subsidies for sheep and camel wool (Rasmussen and Annor-Frempong, 2015). In previous years, low prices meant that many producers threw away their wool or failed to access markets. Since the introduction of the subsidy, more wool has been sent to domestic wool-processing facilities. In 2013, I travelled with a *bag* governor who went to each herder household to purchase and collect wool. The raw wool was then transported to a carpet and felt-making factory in the provincial centre. This *soum* bordered the provincial centre territory and the *bag* governor lived in the provincial centre, which made this process more efficient. Nonetheless, the collection process involved weeks of work and travelling hundreds of kilometres to each herder household. For *soum* located at a much greater distance from the provincial centres, this process could be extremely time consuming and create additional burdens for local government staff. Given this context, the geography of Mongolia and the physical infrastructure available pose specific challenges for climate change adaptation. The widespread adoption of smart technology, such as satellite TVs and mobile phones, by herders offers the potential for the development of more innovative systems to communicate and coordinate through the informal networks and local institutions that already exist in rural areas.

## Conclusion

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This case study has reviewed some of the basic elements of Mongolian traditional environmental knowledge related to grassland management and the local and national initiatives that have been developed to address issues on climate change and the rural economy. Mobile pastoralism in Mongolia is an indigenous livelihood, practised across the Inner Asian steppe for centuries. As former President Elbegdorj stated, climate change has come to Mongolia and is a new reality faced by pastoralists and the population as a whole. While these groups contribute little to climate change, the temperature in this region of the world has already increased by over 2 °C and is likely to continue to rise. Unseasonable weather and climate hazards pose additional challenges.

Moreover, the fossil fuel industry's mining sector is actively digging up the Mongolian grasslands to reach large deposits of coal, further contributing to grassland degradation and an increase in emissions. The homelands of Mongolian pastoralists are therefore affected by the fossil fuel consumption of economies in multiple ways, in terms of both climate change and industrial land use.

The Mongolian Government has committed to develop “green” policies and programmes aimed at making the agricultural sector more sustainable, while also promoting the welfare of rural populations. It is encouraging that the Mongolian Government continues to support pastoralist mobility by protecting the custodial land use practices of herders. This is a key aspect of pastoralist traditional environmental knowledge and practices, and also an important adaptation strategy. Index-based livelihood insurance and the implementation of policies related to sustainable rural supply chains for agricultural products are promising developments. More research should be conducted in this area to find ways to further utilize the wireless technologies being adopted by herders. In many ways, the herders should lead the way with climate change adaptation programming, and the Government and international agencies should lend support to the local communities, who are experts in living in uncertain and variable climatic conditions.

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### 3. Traditional water management as an adaptive subsistence practice: A case study from coastal Timor-Leste

*By Vanessa Burns (University of Oxford)<sup>1</sup>*

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#### Introduction

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This case study is based on research carried out in collaboration with the communities of Fatumeta and Behali, on the north coast of Timor-Leste, in the district of Manatuto. The island of Timor is the easternmost of the Lesser Sunda Islands, in the Indonesian Archipelago. The Democratic Republic of Timor-Leste comprises the eastern half of the island. The state was established in 2002, after the occupation of the Timorese peoples and their lands by Indonesia between 1975 and 1999, and following two years of transitional governance by the United Nations. This research forms part of a broader project investigating adaptation governance in the Coral Triangle Region. Within this broader body of research, this case study focuses on traditional water management. In particular, it explores the role of women's custodianship of water management in the adaptive coastal landscapes of the field sites. Research design was carried out in consultation with community leaders. Methods included a combination of individual (22) and group (3) interviews, participatory mapping workshops and participatory observation of women's water collection (for distribution, see table 1).

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<sup>1</sup> *Acknowledgements:* This case study is based on participatory research carried out in conjunction with community members of Fatumeta and Behali, Manatuto District, Timor-Leste (2013). The research was supported through a Norman Ellis award and a Charles Green Award (Jesus College, University of Oxford).

**Table 1. Distribution of research participants**

Variable		Fatumeta	Behali	Total
Number of participants	Female	10	12	22
Age of participant (years)	Under 18	3	2	5
	18–30	2	2	4
	31–40	2	1	3
	41–55	1	1	2
	56–70	1	2	3
	Over 70	1	4	5
Birthplace	Behali		4	4
	Fatumeta	5		5
	Mountain village	5	8	13
Livelihood	Weaving	5	8	13
	Home duties	5	8	13
	Student	5	4	9
Education	Literate	5	4	9
	Illiterate	5	8	13
	Primary education	5	4	9
	Secondary education	5	4	9
	Tertiary education	2	0	2

In the context of environmental change, water management is a critical issue for equatorial island nations such as Timor-Leste. The west equatorial Pacific climate is affected by The Western Pacific Monsoon, with year-to-year variations driven by El Niño Southern Oscillation (ENSO) and the Indian Ocean Dipole. Future climate projections for Timor-Leste show a between *high* and *very high* confidence that surface air and sea-surface temperatures will continue to rise; that the intensity and frequency of days of extreme heat and heavy rainfall will increase; and that ocean acidification and mean sea-level rise will both continue to increase also (Australian Bureau of Meteorology and CSIRO, 2011, 2014). These projections are in line with regional studies of the Coral Triangle, South East Asian and Pacific regions, which show wetter conditions linked to La Niña events (the positive phase of ENSO); dryer conditions linked to El Niño events; and the challenges that ENSO-related extreme weather and sea level rise bring to the Pacific Islands (Australian Bureau of Meteorology and CSIRO, 2014; Quinn et al., 1978).

The water sector in Timor-Leste has been severely weakened by the destruction of 90 per cent of the country's infrastructure during the periods of conflict, a slowing economy and the increased frequency and intensity of drought events linked to the El Niño Southern Oscillation climate system in the Pacific region (World Bank, 2018; Australian Bureau of Meteorology and CSIRO, 2014). Of Timor's population of 1.26 million (2016), 70 per cent live in rural areas where water access is poor. The WHO and UNICEF Joint Monitoring Programme have shown that access to

piped water has decreased, dropping from 38 per cent to 28 per cent of the rural population over the period 2010 to 2015 (JMP, 2015). The research conducted for this case study also evidences that sources of piped water are becoming increasingly unreliable during the dry season. While Timor-Leste has improved water access for 60 per cent of the rural population through alternative water supplies (e.g. desalination and rain catchment), this is below the Millennium Development Goal of 75 per cent of the rural population. This means that 40 per cent of rural and 28 per cent of the total population are living with “unimproved” access to water. In the coastal field sites of this case study, this means no local access to water for most people during the dry season.

The Timorese have a strong tradition of custodial water management. What this case study explores is how custodial practices around water are informed by, and inform, environmental change at the two field sites of Fatumeta and Behali. Results show that this adaptive environment is a complex interweaving of the custodial practices that have been re-appropriated and re-established as an act of self-determination in the context of Timorese independence. At the same time, custodial practices have become increasingly gendered, and this has developed in response to changing environmental conditions. Yet, women’s custodial practices are also the main factor in influencing the boundaries of adaptive subsistence practices, which are increasingly moving away from the coast and towards highland areas. There follows below a discussion of the socio-political and environmental histories that contextualize the adaptive practices of the research participants. There is also an overview of the extreme weather events impacting communities. Following on from this, custodial water practices are discussed, in relation to environmental change, the separation of duties between men and women, the geographic positioning of these duties, and the gendering of environmental relations more generally. Lastly, this paper investigates the burden placed on women, whose custodial practices are believed by many community members to be a causal factor in environmental change, but who as a group are the most influential in determining the adaptation of agricultural and grazing practices.

## Key findings

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### *Socio-political and environmental histories*

The residents of both the communities of Fatumeta and Behali are originally oral-based highland peoples, displaced to the coast during the Indonesian era. Their adaptation to environmental change in the coastal environment is profoundly challenged by the impacts of this displacement. For oral-based peoples, the retention of traditional environmental knowledge (TEK) is heavily reliant on there being a continuity of relations between peoples and their traditional lands (McWilliam, 2007, 2011; Darian-Smith and Hamilton, 1994). Intergenerational knowledge sharing is also critical to retaining traditional knowledge, and this was severely disrupted through the loss of family members. The resettlement projects in the sub-district of Bauhau (within which both field sites lie) initially imprisoned displaced mountain populations in the township of Manatuto (to the east of Fatumeta and Behali). As one interviewee recalls, “many people died from [hunger] – [as] there was no food” (Interview 19). Many people also disappeared after resettlement in 1980. One interviewee recalls that shortly after her family’s arrival in Fatumeta, “our father went hunting for fish at Pasaputi [a beach to the west of the village] and was captured by the Indonesians. Since then we never met our father” (Interview 10). Over three-quarters of interviewees referred to a

loss of TEK in connection with the loss of a family member during the period of resettlement. Interviewee 5 states that her “[g]randmothers didn’t pass on histories. If we could see our grandparents when we were growing up we would know those histories”.<sup>2</sup> Similarly, interviewee 16 states that she “doesn’t know any stories or history because when I was born my grandmother had already passed away”. And interviewee 4 stated that her “grandfathers knew histories but ... [we] didn’t have contact with grandparents when [we were] growing up. [Our] parents didn’t know histories ... therefore [we] couldn’t pass [histories] on to our children”.

The history of the villages as internment camps shaped, and continues to shape environmental relations. One person remembers

a border [high concrete wall] constructed around the village, at the base of the mountains [to the south], along the beach [to the north], between Fatumeta [east of Behali] and Behali, and Behali and next village west. There were Indonesian military buildings in the village and [Indonesian soldiers] would patrol from the morning to the evening (Interview 17).

These structures actively controlled people’s relationship with the land and the sea through various modes of access. For the majority of the villages’ history, people were not able to move freely. While permission to leave the camp was given for the purposes of wood collection and fishing for periods of up to one hour, this restricted the distance one could travel away from the village. Residents who exceeded this time limit were punished (Interviews 1, 2, 19, 20). Many of the geographies of land use established around military structures during the period of internment have, until recently, continued to be observed including areas used for wood collection and fishing. When both villages were destroyed by fire during the Indonesian forces retreat in 1999 – in a campaign that saw the systematic burning of every village in Timor – the concrete walls and buildings built by the Indonesian military were the only ones to survive. One participant recalls that among the community’s own houses ‘there were only traditional houses [made of wood and thatching]. Everything was destroyed’ (Interview 2). The remnants of military architecture remain a visible and active part of both villages; one remaining section of the coastal border wall in Fatumeta now acts as a *de facto* sea wall, and offers some protection from tidal inundation. Yet, these ruins also stand as monuments to the former imprisonment of many of the participants: and reminders that the re-appropriation of both sites, from places of internment to places of independence, is a significant act of self-determination and place building.

To add to the difficulties of adapting to the coastal environment, the coastal areas of the sub-district in which both villages are situated were not included within the compass of traditional custodial practices. This means there is no history of including them within the customary legal frameworks which are used in part for the management of subsistence resources. This raises the possibility that, even though TEK has been interrupted by conflict, the kind of detailed knowledge of the coastal climate necessary to usefully inform new agricultural practices may never have existed. One possible reason for the omission of coastal areas from custodial practice is their unsuitability as agricultural land; there is strong evidence from the participatory research that coastal areas are considered more vulnerable to extreme weather events, such as drought, flood, windstorms, and tidal inundation.

<sup>2</sup> Research participants commonly referred to elderly relatives, or indeed ancestors, collectively, as “grandmothers” or “grandfathers”.

**Figure 1. Behali (left panel) and Fatumeta (right panel) with hand-drawn data from participant workshops**



There is, however, some evidence that broad principles of customary law (*tara bandu*) are drawn upon to develop resource management practices in Fatumeta. For example, the principles of human–environment relations that are part of national mythologies of the sea have informed the development of marine practices at the two field sites. Knowledge of seasonal ocean dynamics embedded in stories of *tasi feto* (the North sea) has informed the development of subsistence fishing practices. Customary laws that protected specific areas and species on traditional lands have been re-appropriated to the coastal environment. For example, one participant spoke of a customary law in place on traditional lands that gave protection to a sacred stone, within the vicinity of which no hunting was allowed (Interview 18). In principle, this same law protected a number of local habitats and ensured the inter-generational sustainability of certain resources (a no-take zone of sorts). This customary legal principle has been re-appropriated to the coastal environment to manage fish stocks through the creation of “old” fishing areas (i.e. where the “grandfathers” fished), which are managed as seasonal no-take zones, and “new” fishing areas. Certain marine species, such as the black dolphin, are also protected. Community leaders in Behali have developed customary law prohibiting the collection of wood from those mountain slopes closest to the village; a response to deforestation linked to landslides and reef damage during the wet season.

### *Extreme weather events*

The coastal and highland climates in the region of Manatuto differ significantly. This has made the adaptation of subsistence practices to the coastal environment a very challenging one. Added to this, contemporary environmental change now seriously undermines what environmental

knowledge of the coastal environment has so far been developed. The impacts of most concern to participants relate to anomalous rainfall patterns. Each village has a different set of adaptive concerns based on their differing geographies and access to water. Fatumeta is heavily impacted by an increase in the intensity and longevity of drought events due to its poor access to water. Fatumeta is also the most exposed to storms, both windstorms during the dry season and rainstorms during the wet season. In contrast, Behali is impacted by an increase in the intensity of heavy rainfall during the height of the wet season, which leads to flash flooding and has a devastating effect on the community's infrastructure and resources.<sup>3</sup> These extreme weather events focus adaptive concerns around water management. For the purposes of this case study, whose aim is to highlight women's roles in water management, special attention is paid to the practices of Fatumeta, the gender roles of which were the more defined in the research data.

### *Traditional water practices*

The Timorese have traditionally held an animistic worldview, which understands the physical boundaries of human–environment relations as fluid. Custodianship of the land and sea, therefore, is a complex, embodied experience. The main custodial practice evidenced by the research relates to water management. Custodianship of water has traditionally been centred around the management of highland groundwater systems, and has been shared between male and female elders (Palmer, 2011). In Fatumeta, however, men's sites and practices have developed in the coastal area, while the highlands have, post-independence, been reclaimed as women's sites. Evidence suggests this division is connected with the development of fishing practices after the communities' displacement (exclusively a male livelihood in both Behali and Fatumeta), raising questions about how understandings of the water cycle have changed as part of adapting to the coastal environment (Interviews 19 and 20).

### *Coastal practices*

Whereas traditional highland water practices are generally understood to produce rain, the men's practices observed in Fatumeta instead "call" rain from the sea. Anthropologist Astrid Stensrud's ethnographic study of water relations in the Peruvian town of Chivay documents a men's highland practice of similar principle. Stensrud recalls the custodian:

carrying a bottle of seawater brought all the way from the Pacific Ocean ... [he put this] together with a starfish from the ocean into the mountain spring "so that it will call for more water" ... the small amount of seawater, though separate, is still connected to – and part of – the Pacific Ocean ... the ocean is enacted as the origin of all water (2015, pp. 37–38).

While men's practices in Fatumeta show a similar understanding that rainfall is produced by the ocean, there are two distinct differences: water practices are confined to the coastal area; and there is no clear articulation of how new coastal practices might be connected – via the water cycle – to women's highland custodial practices. I suggest this is likely to be related to what

<sup>3</sup> Research at both sites showed an increase in the intensity of storm surges and windstorms during January–March, and a longer dry season, with less overall rainfall. Tidal inundation is increasing in area and frequency at both sites. Evidence shows that patterns of rainfall and temperature are changing; there is more flooding over the wet season, *during* El Niño phases (1982, 1986, 1992, 2006) and very severe flood events at the height of the wet season during a *weak* La Niña phase (Burns, 2019).

anthropologist Andrew McWilliam notes is the Timorese cultural focus on the interior. McWilliam's extensive work in Timor has evidenced that, unlike many Pacific islanders, the Timorese are not a coastal peoples (McWilliam, 2002). This suggests that men's coastal water practices may have developed in parallel with the development of fishing practices, and further, that these practices may be conceptually disconnected with custodial practices of the interior.

Over the past five years, the coastal sites maintained by men for custodial practice have been subject to storm surges and tidal inundation (mapping workshop 1). These events have interrupted water practices and threaten to make the sites inaccessible in the near future. Historically, it is common for interruptions to traditional practices such as these to be blamed for environmental changes. Anthropologist Lisa Palmer notes a case where Portuguese interference in traditional water practices was believed to have resulted in springs drying up in Baucau, a city east of Manatuto district (2011 p. 149). Moreover, over three-quarters of the participants linked drought events with custodial practices (Interviews 5, 6, 17, 22; mapping workshop). Yet, as environmental change also prevents men's custodial practice taking place, blame for such events has been overwhelmingly attributed to a perceived failure in women's custodial practice.

The complexity of gender dynamics and their connection to environmental relations in the participant communities is deeply layered, and trying to make sense of events, particularly through the identification of causal factors, may run counter to the logics that make up animistic cosmologies. What is clear is that environmental relations are traditionally highly gendered, and there is some evidence to suggest that these are informing interpretations of environmental change. There are a number of examples from the coastal environment. While the East Timorese are not traditionally coastal peoples, the ocean does have an important role in ancestral relations in Timor-Leste. McWilliam refers to the East Timorese as having a "long term engagement with their coastal waters" and to the "the symbolic spaces and mythical properties that seascapes are accorded" (2002, p. 7). This is reflected in Timorese beliefs with regards to the North and South seas, known respectively as *tasi fetu* and *tasi mane*, that is, the *female* and *male* seas. These broadly held cultural beliefs about the sea have informed the development of new coastal practices relating to both fishing and men's water management. One participant explains the characteristics attributed to the two seas:

[T]asi fetu [the North Sea on which the villages lie] is the feminine sea as it is calmer, and the [swells] are relatively low. *Tasi mane* is never low, and were we talking on the south coast, we wouldn't be able to hear over the noise of the waves (Interview 20).

It is the feminized 'calmness' of the north-sea that has supported the establishment of fishing practices and men's custodial sites. Yet, while *tasi fetu* and the inter-tidal areas are feminized spaces, research participants state that they are almost exclusively used as men's spaces for socializing, fishing and men's rites (Interviews 8, 19, 22).

Environmental changes such as increased storm activity, tidal inundation, and shifting fish stocks challenge the gendered concept of *tasi fetu* as a calm and hospitable environment. Most significantly, these changes complicate understandings of the tidal inundation of men's sites and the disruption to men's custodial practice. This change in the characterization of *tasi fetu* may also contribute to widespread feelings of blame towards women for the success or failure of water practices. While the Timorese are not traditionally coastal peoples, they are islanders, and

emerging understandings of a more hostile *tasi fetu* may be informed by regional histories in which the sea, and seafaring, are both highly gendered. An early account in anthropologist Bronisław Malinowski's 1922 study of coastal Papua New Guineans, for example, notes that many ritual preparations were made to protect boats from the "flying witches" believed to prey on sailors (p. 158). Yet, the success of men's ocean voyages was ultimately a responsibility invested in women, with unsuccessful voyages attributed to the failure of women to uphold certain duties (whether custodial or more mundane). While there was no evidence to suggest women in Fatumeta were held responsible for the success of fishing trips, there may be some appropriated sense of duty over the success of men's coastal practices that has emerged under conditions of environmental change.

Local concepts of *tasi fetu* also conceive of the sea as sacred; and it is these beliefs that have been the central guiding factor in the establishment of contemporary marine practices in the two field sites. One participant, for example, states that "any animal that is found [on the beach is] sacred and can't be touched". This includes many sand-nesting birds and sea turtles (Interview 22), but also applies to a number of marine species, such as the (so-called) black dolphin (*ibid.*). The coast is also a habitat for saltwater crocodiles, believed to be a sacred embodiment of ancestors. A fisherman explains the central role crocodiles play in the local context:

The beach is considered a sacred place and if you do something bad [i.e. a taboo, also described as a "mistake"] on the beach there is a belief that a crocodile may come and eat you. [For example] Atauro people [from the Timorese island of Atauro] went to Manleo [a nearby town] and made a mistake and a crocodile came out onto the beach. They killed the crocodile and brought it to Atauro. This is an example of a mistake. Another example is if you steal another person's property ... If you don't make mistakes, you are safe in the ocean ... we have to keep our belief in the beach, and in the sea, and that keeps us safe and we can go fishing (Interview 20).

These questions of physical and moral access to the sea position the inter-tidal zone as a threshold between the land and a marine environment conceived as morally pure, or purifying. It is a complex land and seascape made up of seen and unseen, human and nonhuman, animal and spirit relations in an interplay of activity lived out through everyday subsistence practices. Historian Charles Zerner's study of nearby East Indonesian fishing communities describes a similar seascape, where "many imagine the marine world to be populated by a highly responsive community of invisible spirits [where] ... a fisherman's fate ... depends upon his relationship to these fractious spirits of the place" (1998, p. 557). Based on the relatively recent adaptation to coastal living, these examples suggest a logic is at play that appropriates broad principles of environmental relations taken from national mythologies of the sea and traditional highland practices (e.g. land management of sacred areas) in the development of custodial practices at the two field sites.

What is not evident, when compared with other coastal communities in the Coral Triangle region, is the same complexity of knowledge and practice around fishing and the local governance of marine areas. While certain marine practices are not without potential consequences, these practices are generally self-governed, because strictly speaking there is no *tara bandu* (customary law) governing the use of marine environments. By comparison, nearby East Indonesian islands, such as the Maluku Islands, have "historically possessed well defined marine territories under the control of particular villages ... [with offshore constructions] that function as a ritual sign ... and a boundary marker' (Zerner, C. 1998, pp. 543–44). Climate adaptation studies of

communities living on the neighbouring Torres Strait Islands have found them to rely on the traditional environmental knowledge of a “seafaring people, who pride themselves on their intimate understanding of the seasonal shifts in the ocean and weather [and where] events such as the timing of king tides are predictable” (Green, 2009, pp. 220–21). As such, adaptation to living in coastal landscapes is ongoing; it is complicated by a lack of governance frameworks, and the lived experience of environmental change that continues to shift the foundations on which new subsistence practices, such as coastal water management, have been built.

### *Highland practices*

At the time of the research, many residents in Fatumeta were without a source of water close to the village. Fatumeta had six water tanks fed by spring water, two of which were private, and four empty when research began at the start of the dry season. Drought events have dramatically decreased access to water during the dry season. Mapping workshops evidenced that prior to 2008 there were on average two weeks during the dry season when springs closer to the village were not reliable sources of water. In 2013, water collection from mountain springs was necessary for 18 of the 22 participants interviewed for the period June–September – a daily practice over a period of approximately 4 months. For residents without access to private water tanks (which feed off better access to groundwater), the only option is to travel up into the mountains to collect water. This task is undertaken exclusively by women and involves a return trip on foot of approximately 6–20 kms taking 4–8 hours. It is complicated by childcare responsibilities which, as far as could be determined, fall entirely to women. Because the journey is physically demanding, it cannot be made by small children, who are instead left in the care of older children in the village. Breastfeeding infants must, however, be taken on the journey given its duration, adding a further burden to the return journey on which women carry approximately 50 kg of water per person. This amount will last an average family one day. This means that such a journey must be made each day by a female member of every family during periods of drought.

For the first few months of the dry season, participants collect water from sources A and B (see figure 2). Come the end of July, however, participants are travelling to, what is for the time being, the closest perennial source of water and this represents an extremely significant increase in the time spent and distance travelled to collect water. Developing subsistence practices are delineating extended areas of land use, not only for water collection, but for agricultural practices and the new residential areas relocating closer to more reliable water sources. Figure 2 shows a trend in new housing being built in the highlands, where it is closer to water sources B and C. Figure 3 shows new agricultural areas established closer to water sources A and C, and a new grazing area near water source A.

Women’s water practices are carried out as part of a daily journey to collect water from mountain springs. Within the animistic framework of the communities, even the process of walking – the way one moves one’s body – manifests in the movements of ground or rain water. According to the custodian’s worldview, there is no physical separation between the physical body, the physical landscape and the ancestral landscape. There is also no physical separation from the success or failure of water practices, seen as an embodied expression of ancestral relations. This means that anomalous weather events, such as those linked to anthropogenic climate change, upset the perceived balance of ancestral relations; or, as the participants understand it, represent a failure

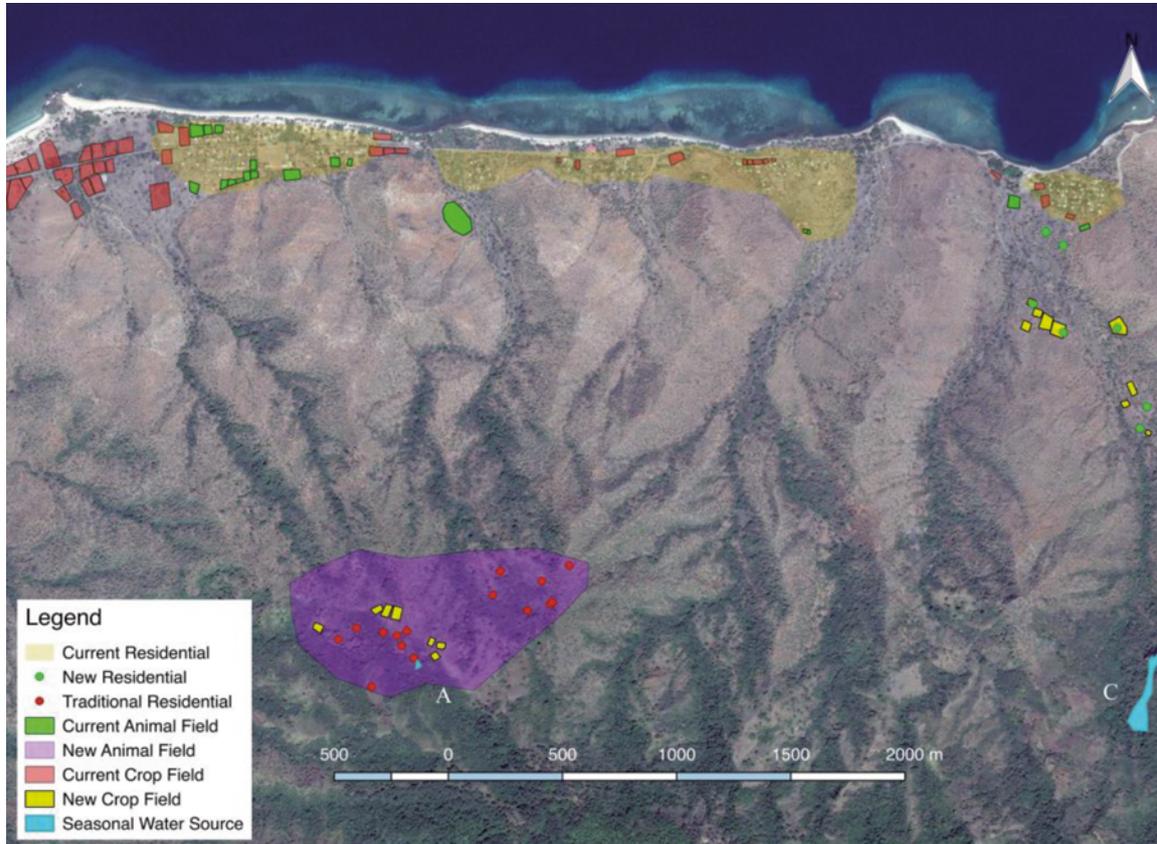
**Figure 2. Location of water sources: A, seasonal water source; B, seasonal water source; C, seasonal water source; D, perennial water source (based on the research participants hand drawn data from mapping workshops. See table 1 for distribution) (Burns, 2019)**



of custodial responsibility. This puts enormous pressure on this group of female water bearers for the success or failure of custodial practice, as well as the attribution of blame for water shortages within the village. This may constitute the basis for new forms of discrimination against women and exacerbate existing bases for discrimination. Family interviews and livelihood focus groups, conducted as part of the broader research project on the Coral Triangle Region, showed that a large proportion of male participants blamed female elders in particular for the decrease in access to water. This was irrespective of the fact that the men's water practices have been interrupted by tidal inundation and therefore (according to the logic of the participants' environmental relations) could likewise be rationalised as a contributing factor.

Yet, women's water practices also constitute a position of power that is well recognized by the residents of the two communities. One positive acknowledgement of this is that women's practices have facilitated the re-emergence of subsistence practices in the mountainous interior. The daily practice of water collection acts as a boundary marker that, over the course of time, continually maps the discontinuities of groundwater. It is through these practices that areas of more reliable water access have been identified, and this environmental knowledge has formed the basis of the extended land use shown in figures 2 and 3.

**Figure 3. Fatumeta: Changed agricultural practices (based on the research participants hand drawn data from mapping workshops. See table 1 for distribution) (Burns, 2019)**



## Conclusion

Under the conditions of increased drought and flood that are predicted for the Pacific region, water management will most likely continue to be the central theme of local adaptation strategies in Timor-Leste. Subsistence communities are particularly vulnerable to these anomalous events, because of the reliance of their livelihoods on foreseeable seasonal patterns. There are a number of serious socio-historical contexts already impacting the communities of Fatumeta and Behali, the result of hundreds of years of colonization and oppression that have eroded traditional environmental knowledge and resource management. Environmental change exacerbates these conditions, undermining what progress has been made in adapting to the coastal environment, and aggravating power imbalances, such as those between men and women.

There are two main features that characterize the adaptation of custodial water practices to environmental change. First, the vulnerability of the coastal environment to extreme weather has placed a greater emphasis on the success or failure of women's custodial water practices (when compared to men's). Secondly, the more reliable sources of water identified through women's

practices are driving a shift in land use for subsistence agriculture, grazing and new residential housing. What this adaptive response represents, perhaps most significantly, is a return to lands within the geographical boundaries of (some residents') traditional lands where TEK is perceived to be more reliable.

What is significant about adaptive responses in the two field sites discussed, Fatumeta and Behali, is that the participants' animistic worldview allows for the development of an adaptive geography defined around an environmental system (e.g. the water system). It has been noted of other indigenous societies more broadly that there is an innate sustainability to traditional environmental management practices, and that this is in part due to there being a moral basis to understandings of good environmental relations (ILO, 2017). What this study contributes to this position is evidence that traditional environmental practices in Timor-Leste are not only driven by a moral basis (expressed through 'good' ancestral relations), but that as a result, practices may also be more flexible in their ability to respond to both prolonged and sudden environmental change. I suggest that of particular significance is their ability to conceive of, and respond to, dynamic systems that move through space and time. Further, the adaptive practices shown in this study position women as the primary agents of change even as the custodial responsibilities that facilitate this agency may simultaneously marginalize women for (as is understood) *enacting* changed environmental conditions.

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## 4. The role of customary institutions in climate change adaptation among Afar pastoralists in north-eastern Ethiopia

By Mulubrhan Balehegn (Mekelle University) and Selam Balehey (Mekelle University)<sup>1</sup>

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### Introduction

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Understanding, predicting and anticipating changes in the weather and other climatic variables is very important for rural communities which depend on natural resources for their livelihood. Indigenous communities all over the world rely on direct observation of changes in the environment for forecasting climatic and environmental changes likely to affect their livelihoods decisions (Nyong et al., 2007; Mercer et al., 2007).

Biophysical animate and inanimate entities observable to the human senses, as well as “spirits” and non-physical elements, are used to predict future and current weather variables that cannot be directly observed (Acharya, 2011). Those biophysical entities observed include plants, animals including livestock, birds, insects and different types of wildlife (Onyango et al., 2010; Orlove et al., 2010; Chang’a et al., 2010). Magic, voodoo and sorcery, which are all difficult to explain in terms of physical variables, are also practiced by many indigenous communities across the world, especially in Africa (Grivetti, 1981; Kwanya, 2014). The Afar pastoralists, through centuries-old experiential knowledge passed down the generations by the word of mouth, have developed elaborated strategies for predicting or forecasting the weather and climate variables (Balehegn and Tafere, 2013). Such traditional weather forecasting strategies are common among many indigenous communities across the world (Acharya, 2011; Garay-Barayazarra and Puri, 2011). They are an essential resource, as they often appear to be the only accessible and understandable weather information available to local people, and thus the only source of information to guide climate-dependent livelihood decisions (Masinde and Bagula, 2011).

The Afar predict drought or any variation in the weather, such as flooding, lightning, destructive and windy rain, based on the observation of biophysical entities such as trees, animals (birds, insects), stars, wind direction, and others. Moreover, prediction is also done by experienced traditional weather forecasting seers. However, many indigenous communities across the world have seen a generational degradation and decline in the use of indigenous weather forecasting and other traditional knowledge systems. This is the result of land and natural resource dispossession (Balehegn, 2015a), including State policies in favour of centralization at the expense of

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bio-regionalism, where policies and administrations attuned to natural social-ecological differences (Fratkin and Roth, 2006; McGinnis, 1999), and globalization (Gilberthorpe and Hilson, 2014). Similarly, climate change and the associated increase in variability, especially in arid and semi-arid systems, have resulted in a decrease in the reliability of many of the traditional weather forecasting knowledge systems. As a result, many indigenous people are abandoning the use and generational transmission of indigenous knowledge systems (Roncoli et al., 2002; Kalanda-Joshua et al., 2011; Slegers, 2008; Kagunyu et al., 2016).

Despite an observed generational degradation of indigenous weather forecasting knowledge, transition towards the use of modern weather forecasting and climate change information systems is very limited among indigenous communities. This is because of their many limitations when applied to indigenous or local communities. These include:

- 1) Conventional weather forecasting information is often not accessible to indigenous rural communities, who usually lack access to communication media (Shoko and Shoko, 2013).
- 2) Even when accessible, it is difficult for members of indigenous communities to interpret and use this information, as many of the world's indigenous communities are not equipped with the necessary science and language skills (Shoko and Shoko, 2013).
- 3) The facilities and installations used by conventional weather forecasting science and practice are very expensive. It is usually beyond the financial capabilities of communities and governments to install, run and maintain them in the remote and inaccessible locations where many indigenous communities reside (Masinde and Bagula, 2011).
- 4) Most importantly, indigenous communities require forecasting information at a smaller, local scale affecting villages, districts, and rangeland sites and so on, to make daily livelihood decisions, such as where to take livestock. Conventional weather forecasting science is, however, only usually practiced at larger scale and at coarser resolutions (Roncoli et al., 2002), producing information which is most often irrelevant to the decision requirements of local communities. Therefore, even when it is accessible, affordable and correctly interpretable, conventional weather forecasting information is not directly relevant to the daily decision-making of indigenous communities, such as pastoralists (Chisadza et al., 2015).

Because of the challenges in applying modern climate knowledge systems, indigenous knowledge about climate and weather forecasting not only remains relevant, but continues to be the only accessible and affordable alternative to modern weather forecasting science (Chisadza et al., 2015; Green et al., 2010).

Local climate and weather forecasting knowledge can provide information and insights that can be used for successful climate change and variability adaptation at the local level (Chisadza et al., 2015). The strength of indigenous knowledge makes it a critical element that needs to be taken into account by the national weather forecasting systems. Many studies comparing indigenous with modern weather forecasting knowledge have confirmed a positive correlation between the climate and weather indicators used by indigenous and by modern science (Chisadza et al., 2015; Ziervogel et al., 2010). These studies inevitably recommend the co-production of weather and climate knowledge by these two knowledge systems to create a system which benefits from

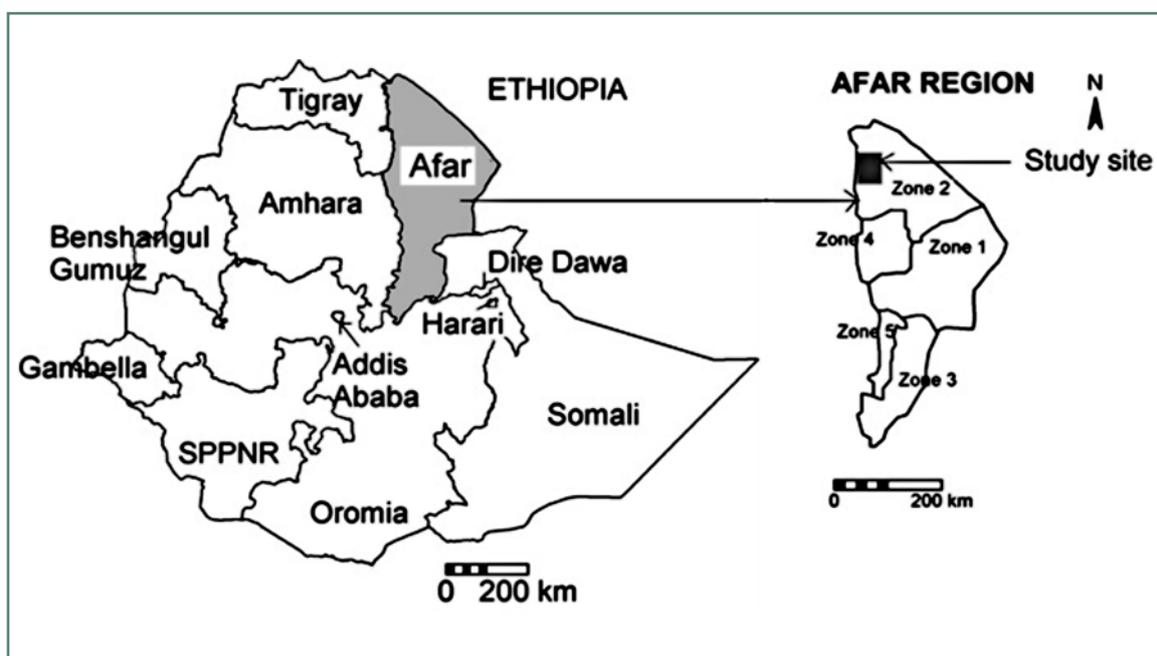
the accuracy of the modern systems as well as from the local relevance of traditional systems (Weatherhead et al., 2010; Mugabe et al., 2010; Kalanda-Joshua et al., 2011).

## Description of the study area

The study was carried out in *Ab'alá* district of the Afar regional state of Ethiopia (figure 1). According to the Bureau of Pastoral and Rural Development (BoPRD), in 2008, the total population in the district was 35,443 inhabitants with 2,683 pastoral households, and 3,226 agro-pastoral and mixed farming households (BoPRD, 2008). The Afar and Tigrians are the two dominant ethnic groups in the study area. The Afar, who are pastoralists and agro-pastoralists, speak the Afar Language, a Cushitic family language. The Tigrians practice mixed farming of crop and livestock and speak the Tigrigna language, an Afro-Asiatic Semitic language. While the Afar are predominantly pastoral and agro-pastoral communities, with increased involvement in farming, petty trading and labor migration, the Tigrians are mainly crop-livestock mixed farmers with crop production a primary source of livelihood (Balehegn and Tafere, 2013).

The *Ab'alá* district is characterized by an arid and semi-arid climate with vegetation groups identified as desert and semi-desert scrub land (Friis et al., 2010). The total area of land in the district is 172.18 ha, containing 24.18 ha of rangelands, 9.34 ha of forest and 128.71 ha of desert. There are 9.64 ha of cultivated land under rain-fed cultivation and 15 .000 ha under irrigation, with maize, sorghum, teff and barley being the most common crops. The livestock population comprised 44,605 cattle, 38,306 sheep, 87,352 goats, 28,834 camel, 4,841 equines and 2,564 poultry (BoPRD, 2008).

**Figure 1. The location of the study area, the *Ab'alá* district, relative to the Afar Regional State, zones within the Regional State and Ethiopia (Balehegn et al., 2015)**



## Methods and activities

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A triangulation of different techniques including focus group discussions, individual interviews and a review of relevant bibliography were used for this study. Six focus group discussions were organized, each of which included six ethnic Afar members, one from each of the following categories: community leaders, elderly men, elderly women, clan leaders, herders and local pastoral and agricultural office personnel. Participants in the focus group discussions were selected according to their experience in traditional weather forecasting and the use of such information in their daily activities. The six members of each group were made up of people with extensive experience in herding and *Edo*, or traditional rangeland scouting.

Furthermore, individual discussions and interviews were held with three traditional rain-makers, or traditional seers. Such people usually work independently of the *Adda* or *Edo* systems, and are consulted mostly by individuals or groups. A detailed investigation was made of cases or examples of indigenous weather forecasting and the use of forecasting information by indigenous people.

Information collected from the different groups was categorized according to its similarity and presented in a narrative form.<sup>2</sup> The narration about different aspects of traditional weather forecasting knowledge was collected, organized and interpreted in the focus group discussion. It was then presented back to a special group of people that included two traditional weather forecasting seers, two clan leaders, two elderly women and two young herders. These people were selected based on their experience and knowledge in traditional weather forecasting. This special group gave feedback about the collected information and its interpretation, which was used to decide the final information and interpretation to be included in this report.

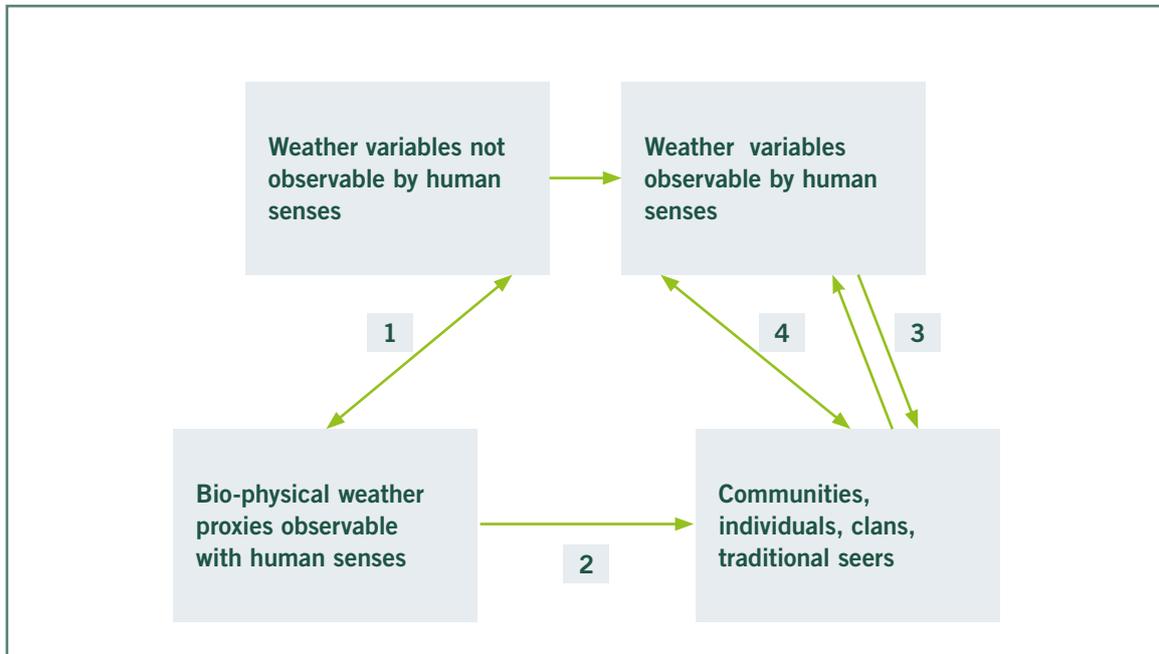
## Framework for understanding Indigenous weather forecasting

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Local people living in rural areas routinely interact with the natural environment which provides opportunities for observing subtle changes in the environment. Indigenous weather forecasting is therefore similar to “citizen science” or “crowd sourcing”, where weather data is collected by individuals close by and familiar with the source of data or the environmental variable being observed (Wiggins and Crowston, 2011). Biophysical entities in the environment, such as the migration patterns of birds (Richardson, 1990), a change in the reproduction behavior of insects or the wind direction, all provide practical proxies for weather and climate change (Acharya, 2011). Though local people cannot directly measure weather variables, they can directly observe the biophysical manifestations with their senses (Chisadza et al., 2015). The interpretation of these biophysical variables is therefore used as a proxy indicator of a change in the weather (figure 2).

<sup>2</sup> Such narrations included for example, instances when traditional weather forecasting was used for decision-making. For instance, Ali Hamfere (67, male), a clan leader in Aba'alá town, recalled that when a young man herding camels and camped far away from his village, he and his friends sought advice from a traditional seer, because the fodder where they were camped was depleted and they were not sure where to go. A local herder recommended they talk to a traditional seer. The seer, an old man, is said to have used pebbles, and waited for the night to come so he could observe the patterns of stars. The seer predicted there would be rain in Aba'alá within a week's time. Ali Hamfere and his friends started on their way back to Aba'alá and to their delight, when they arrived at Aba'alá after three days of walking, the “Duras”, a natural depression, were already full of rain water and their camels could drink, and they stayed there for about four months.

**Figure 2. Schematic representation of the development of indigenous weather forecasting knowledge among Afar pastoralists (the numbers indicate the order in which this dynamic process takes place)**



In figure 2, it is important to note that arrow 1 is bi-directional, which means that sometimes observable biophysical entities could be the result as well as the cause of an impending, or already happening, change in weather variables. Therefore, what local people observe could both be a result of a change in the weather that has either already occurred or is taking place and a cause of what is going to happen in the near future. For instance, the flowering of a tree could be due to an increase in humidity detectable only by the tree (Orlandi et al., 2005; Speranza et al., 2010). In other cases, observable entities, such as the direction of the wind, could be the cause of an impending change in weather or a climatic variable (Gearheard et al., 2010). In arrow 2, people observe these biophysical proxies of the weather and of the climate and collect data.

The proposition, accumulation and transmission of indigenous weather forecasting knowledge is a dynamic process. Local people not only record observable changes and try to associate them with the results or happenings (arrows 2 and 3, respectively), but they also use the feedback they receive from a continuously changing relationship between observable biophysical variables and unobservable change in the weather to continuously update and improve their fund of knowledge (Orlove et al., 2010; Sillitoe, 2007). After repeated observation of biophysical proxies and the events that seem to follow or be associated with these observations, local communities construct or propose a relationship of the type “A causes B”. Through repeated observation and association, local people obtain feedback from the result. For example, if sometimes A does not cause B or instead causes C, then people readjust their deduction accordingly. After repeated cycles of observation, prediction, feedback and readjustment, people can then safely go on to predict even the least detectable future outcomes with a higher level of confidence (albeit not a quantified one). All forms of outcome, including a good rainy season, a drought, or a windy season, are considered good lessons that teach the Afars to better tune into their environment and make them more and

more capable of understanding and predicting future weather and climate events. Every event is therefore a learning event. The Afar have a proverb for this: the Afars say '*Dabalkadahamoka*', which roughly translated means "the tribulations that you had to endure during drought, are less than the lessons you learn".

This all goes to imply that local communities are not rigid followers of only one system; rather, they select those systems that are accessible and effective for a given condition, including information from formal meteorological weather forecasting. This is why, because the repeated failing of many traditional prediction systems, many indigenous communities are modifying their strategies and actively seeking out information from modern weather forecasting (Roncoli et al., 2002). In the Afar pastoral areas, for example, modern weather forecasting information is actively sought through the local radio and government news media. People do not, however, accept this information directly without testing it by making comparisons with local conditions and local biophysical observations. In this way, indigenous weather forecasting is in principle similar to formal meteorological weather forecasting where current observable variables are used to predict future events (Gearheard et al., 2010; Hobart, 2002).

### *Traditional weather forecasting and the role of customary institutions*

Weather forecasting is an important activity in the lives of pastoral communities whose economic survival depends on the movement of livestock and household members at the right time of the year and to the right place. As a result, among Afar communities, different, long-established customary institutions and traditions are involved in weather forecasting and the use of such information. These institutions and traditions include: (1) the *Adda*, a traditional Afar administration system, where knowledgeable elders, known as "*Asayamaras*", are respected members of the community and trusted by the community members to direct almost all aspects of the life of the Afar pastoral communities (Hailu et al., 2008); (2) the *Edo*, traditional rangeland scouts dispatched whenever Afar pastoralists are faced with the prospect of unpredictable future weather. They are sent to different places to collect information about the weather, rangeland condition, local politics and other information relevant to the livelihoods of their pastoral communities (Tesfay and Tafere, 2004); and (3) the *Dagu*, an effective and reputable traditional human-based information and knowledge-sharing network, through which anything anywhere that is relevant to the pastoral life of the Afar is made to reach all relevant individuals and households (Moges, 2010).

When any village or community in the Afar land is faced with the prospect of uncertain weather in the future, information about future weather is collected through the observation of biophysical entities by any member of the Afar pastoral community. Elders consult traditional seers and specialists for further prediction to be made by traditional seers. The *Adda* elders gather to discuss what is to be done on the basis of this information. They most commonly decide to send strong, experienced herders versed in the traditional techniques of weather forecasting to collect information about the weather in those rangelands located furthest away (Tesfay and Tafere, 2004). The individuals sent for rangeland scouting (*Edo*) make detailed observations about the plants, soil, atmosphere and the condition of the animals in the areas they visit. Such observations made are with regards to the local plant species, the constellations of stars, winds and the characteristics of birds, wild animals, serve as indicators of weather and climate change in the Afar pastoral land.

Besides those biophysical weather indicators that are observed in a planned fashion, the *Edo* rangeland scouts also undertake a detailed observation and analysis of the rangeland condition. The rangeland condition in distantly located areas, is not weather prediction information *per se*, but is an important consideration when deciding whether to move livestock and households once a weather prediction has been made. Sometimes, the decision made by the community is dependent on other conditions found in the rangelands, irrespective of whether the weather is good or bad. Table 1 summarizes the most common observations made by the *Edo*, in addition to biophysical indicators of weather. All observations made from special indicators, such as special plants, insects, birds and environmental variables, are used to come to a conclusion about the possible near future weather conditions in the rangeland they are visiting.

As part of collecting information, the scouts in *Edo* actively seek out information from other people from other locations. Whenever, the people in *Edo* meet anyone coming from any direction, they always make the customary *Dagu*. During *Dagu*, people who have just met exchange the customary greetings of “*A SelamWealikum*” and “*WealikuAselam*”. Those in *Edo* then usually ask the stranger a detailed list of questions. Who are you? Where are you from? Where are you going? What is happening there? How is the weather (now and in the future)? What is the reason for that kind of weather prediction? Whose animals are where? What is the security situation? Who said so? How? Why?, are just some of the many questions the people in *Edo* ask so as to extract information about the weather, pastures and politics of distantly located rangelands (Moges,

#### Box 1. Description of the Afar traditional information network (the *Dagu*)

The “*Dagu*”, dubbed the “Internet of the Afar” by some people, is a traditional, highly effective human-based information communication network of the Afar pastoralists. During *Dagu*, people who have just met exchange the customary greetings of “*A SelamWealikum*” and “*WealikuAselam*” and kiss each other’s hands. Those in *Edo* then usually start asking a detailed list of questions of each other. Conversation usually starts with the phrases “*lytiimahatobie?*” and “*Intiimahatubilie?*”, meaning what have your ears heard or your eyes seen? Then conversation might then be about a variety of issues in the daily life of the Afar, including the weather, livestock, marriages, funerals, conflicts and so on (Moges, 2010).

The purpose of the *Dagu* is to obtain as much current and relevant information as possible. The Afar have a saying that the perfect *Dagu* is done with the perfect stranger. One of the interviewees, Ilalta Mohammed (82, male from Aba’alá), recalled one of his most consequential *Dagu*, which he claimed probably saved the lives of many villagers. It was when he was a young man of 26 and arrived late at his village after a long day at the markets. He met a man he had never seen before. The man was in a hurry and he had very little patience for a *Dagu*, but, being an Afar himself, he felt obliged to tell everything that he had heard. He told Ilalta Mohammed that the last rains in most of the highlands had failed and that the cattle were suffering and dying of hunger, and that it was only a matter of time until the highlanders started a “*Gaz*”, or cattle raiding of the Afar villages. He also mentioned that there was very good fodder and water near Bahre in Afar and that it was well-protected by armed Afar warriors. Ilalta Mohammed went straight to the elders of the village, before even visiting his own house, to tell them what he had heard. The elders discussed the issue overnight and made another *Dagu* about it, asking whether anyone had any relevant information about the issue. One of the villagers said that he had met a highlander “*Fikur*” in the market that day and learned that the weather in their area was not good and that this *Fikur* might send some of his animals to him. The elders immediately ordered a removal to around Bahre the next morning. About a week after that decision, Ilalta Mohammed and his villagers learned that the Christian highlanders had tried to raid their former village, but returned back to their highlands empty handed.

2010). During *Dagu*, every Afar has a tribal responsibility and obligation to transmit any credible information they may have without reservation or limitation (Moges, 2010). In cases where someone is not the original source of the information, they are obliged to name the person from whom the information was obtained (Moges, 2010). Afar pastoralists trust completely and depend upon information obtained from *Edo* and *Dagu* because, as a people who are strong adherents to rulings given by the *Adda*, misinformation can have serious consequences, not only for an individual, but also for an entire clan, who will be forced to pay compensation by way of camels to victims of misinformation (box 1). In this way, the *Dagu* is made proof against misinformation and falsehood through an effective and strong circular feedback system in the *Adda* (Moges, 2010).

The role of the *Adda* elders is usually important in the interpretation of different information. The *Adda* elders do not depend only on the weather related information they receive from individuals, however. They also themselves collect local information, including through direct observation of the local biophysical observations of weather, and through weather indicator-related information obtained from individuals, or advice from traditional seers, or even information from the State weather forecasting service broadcasting through state radio and television. Information such as rainfall during the coming rainy season, and sometimes daily weather forecasting, especially that related to rain is highly sought after and used by the *Adda* elders as data for their decision-making. The *Adda* elders then triangulate information from different sources and formulate the most probable weather scenarios which are then applied to the planning for livestock grazing and the migration of the tribes. Migration and migratory routes vary from place to place and from district to district. Community actions are based on the probability of each weather forecast, with the most probable always considered first when making decisions.

If the weather is said to improve in the near future, and abundance is predicted, the *Adda* elders advise their community members to stay put, and may start planning celebrations, festivities and marriages. However, households are advised to undertake a different course of actions to help them survive an existing drought. These include collecting famine foods (i.e. seeds and fruits of the *Gasrayto*, *Medera*, *Kusrailto*, *lui-mederto*, *adayto* and *ado-hadita*), selling some animals, purchasing grains (such as sorghum, wheat, barley and millet), temporary migration to a nearby village, taking loans (of money, grains or animals) from relatives or friends in other places or even those in other production systems.<sup>3</sup> Households with a suckling camel-calf are usually advised to sacrifice the calf, so that the milk produced by the camel will be exclusively for human consumption and enough for children and other members of the family. Such calves are slaughtered, their meat eaten, and their skin made into either a stuffed calf or dried. A stuffed animal is called locally a “*Kibu*” and is presented to the mother came to stimulate milk secretion (Balehegn, 2015b; Balehegn, 2016).

In cases when there seems to be no hope of the rains arriving in the near future (a period that can last up to between two and five years), the *Adda* elders gather the household heads to advise on and discuss the best course of action to be taken. The course of action advised in such scenarios usually includes selling animals (destocking), slaughtering and storing meat, purchasing grain and migration to the nearest, safest rangelands likely to provide the community and its herds

<sup>3</sup> Many Afar pastoralist households have “Fikurs”, literally meaning lovers or other households whom they love or, more appositely, trust and rely on or call upon during difficult times. Fikurs are usually farming households from the highlands of the neighbouring Tigray or Amhara regional states. During droughts, Afar households get grain, animals or other forms of support from their Fikurs. Moreover, Afar households may send some of their animals, and in the worst case, their children, to stay with the Fikur until the rains return. The Afars would do the same, were drought or any other natural disaster to affect the highlanders.

Table 1. Non-weather variables observed by *Edo* scouts that help in the decision-making which follows after weather prediction

Observation at <i>Edo</i>	Information collected or reported	Use in community decision-making
Biophysical weather indicators	Flowering or blooming trees, constellation of celestial bodies, wind direction, strength and wind condition (coldness or hotness)	Helps to understand future weather conditions, determine migrations, marketing and sell of animals etc.
Availability and distribution of water on rangelands	What type of water is there? How many animals and people can be supported? Is the water safe or clean? Are there “ <i>Durras</i> ”, a natural depression, which can collect rain water if it rains?	Depending on the weather prediction information, information on water availability in different sites can be used to decide where to go at a certain point. Some sites may be used as temporary staying places until the rain starts
Proximity to cultivated land	Is there cultivable land around; at what stage are the crops? Is there a risk of encroachment by livestock? Would that cause conflict?	Knowing what land is cultivated and at what time helps communities avoid such land, which can at certain times serve as a source of stubble grazing? Pastoralists therefore need to understand the cultivation calendars of their agrarian and agro-pastoral neighbours
Disease and practices	Are there ticks <sup>4</sup> or other diseases present? Will there be an outbreak of animal or human disease, e.g. malaria, “ <i>Gendi</i> ”, if the area receives rain?	Based on predicted weather, the disease conditions and parasites vary
Security	Are there hostile families or clans present? What is the local political situation? Whose families or clans are nearby the land being assessed? What is the predator population <sup>5</sup> (mainly hyena and foxes)? Will it be a problem for the goats?	In instances of high risk, pastoralists may completely avoid going to certain places, or may send selected strong individuals to do so. To combat the problem of predators, herds might be split herds into camels and goats or sheep and the small ruminants moved to less risky areas
Soil type	What type of soil is there? Will it be able to grow grass after rain?	Dark clay soils tend to promote good grass growth after little rainfall, but tend to be muddy and disease ridden after the Segum rains. They also absorb a lot of heat during the hot season. These factors affect mobility decisions
“ <i>Alla</i> ” or “rumen fill”	This is the level of satiation, or the level of fill, of the rumen of animals grazing or browsing in an area that is being assessed. Scouts in <i>Edo</i> check whether animals are satisfied or not	A good “ <i>Alla</i> ”, or rumen fill, for animals already browsing or grazing in an area being assessed indicates the amount of browsable fodder available. This allows pastoralists to gauge the duration, direction and timing of mobility
Slope and topography	Is the land steep slopped? Is there a risk of flooding? Will it be suitable for large animals, such as camel and cattle?	Typically, slopping and steep rangelands are not suitable for camel browsing. Most of the time, goats and sheep are more sure-footed and steep areas will be allotted for goat and sheep rather than camel and cattle
Species composition of toxic plants and weeds	Are there toxic plants? What is their composition? What is the risk of animals dying there?	The decision on where to move is affected by the level, composition and stage of growth of toxic plants, irrespective of the predicted weather. For instance, pastoralists avoid a flowering “ <i>andelfo</i> ” or ( <i>Caparis tomentosa</i> ) <sup>6</sup> at all stages, as this plant is highly toxic to camel, causing instant collapse and death

4 The sudden onset of Segum rains is said to encourage the infestation of certain rangelands with a dangerous level of ticks. Despite a positive prediction of Segum rain, pastoralists tend to avoid such places for some time.

5 *Edo* scouts look for indicators, such as predator foot tracks, predator faeces, animal nests, to calculate the risk posed by predators

**Figure 3. Afar pastoralists construct their houses from the simplest of materials in readiness to be suddenly ordered by the *Adda* elders to relocate themselves and their livestock**



with enough fodder and water. Historically, migration involved crossing international and regional borders, when mobility was mostly governed by ecology and amount of forage available. However, currently, mobility is limited by new border controls and the Afars usually only move within their own regional state. If migration is decided upon, a smooth schedule to enable the best possible help to be provided for the most vulnerable individuals (children, the elderly and pregnant and breastfeeding women) will be prepared. Individuals and households might also decide to migrate to find labouring work; this usually entails travelling to Middle Eastern countries, such as Saudi Arabia.

### Drought and the role of indigenous weather forecasting in coping with adaptation

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The Afar landscape has been exposed to various drought occurrences. That is why the Afars have developed a nomenclature and categories for the different types of drought that occur at different times and with different variations. These names are “*Abara*” and “*Adalsa*”, and “*Hagaya*” and “*Gilalta*”. The “*Abara*” type is not necessarily a meteorological condition, but rather mainly

indicates a lack or shortage of livestock fodder, usually resulting in emaciated animals. *Abara* is considered site-specific because, while some places could be in an “*Abara*” condition, others could still have abundance with “fat” animals and people. The “*Adalsa*” is, on the other hand, a condition of dryness, which results in multiple problems, including emaciated livestock, famine, conflict and a water shortage. *Adalsa* is considered a widespread drought condition affecting people all over Afar. “*Hagaya*” is only a seasonal shortage of rain or moisture and is not considered as drought, but rather only as a dry condition. It is only when the *Hagaya*, or dry season, extends beyond the normal average length that it is referred as either *Abara* or *Adalsa*. “*Gilalta*” is a dry season characterized by extremely cold conditions. It is considered a drought because due to the cold condition, many fodder species shed their leaves and this results in a seasonal shortage of fodder.

The Afar also hold a fund of knowledge about the rains. They claim that they used to be very precise with respect to the timing and location of the rains. However, today, not only has the amount of rainfall decreased, but its timing and spatial distribution has also been greatly disrupted (Balehegn and Tafere, 2013). A traditional Afar proverb says “*Rain discriminates between two horns of an ox*”, where as one elder likened the current rainfall situation in his area to “*rain which does not fall on either of the two horns of an ox*”.

Many Afar herdsmen believe that the increase in the frequency of drought and the disturbance of the traditional rainfall calendar are a result of the “*Curse from Allah*”; in other words, a price people pay for their transgressive behaviour and disobedience to heavenly commandments. Most of the elders who participated in the group discussions explained that in the past people were united to such an extent that almost all Afar individuals were able to survive the hardest of times because food and other resources were shared among clan and family members. However, today, individualism is leading to the abandonment of important traditions, such as the “*Du’a*”, begging elders for a blessing, and the religious tradition of “*Zaka*” where a rich herder shares milk, meat and sometimes even live animals, with poorer families. These changes are causing divine retribution, and thus causing more droughts, famine and starvation (Balehegn and Tafere, 2013). Many Afar elders believe that such “unfavorable” social changes are what is making Allah withhold the rains. Such an explaining away of biophysical challenges, such as climate change and its associated drought and food scarcity, as the acts of a supernatural being has been noted by other studies in pastoralist (Balehegn and Tafere, 2013; Apata et al., 2009) and agrarian communities (Balehegn et al., 2014). Such types of extra-biophysical or supernatural explanations are not only the result of a lack of scientific understanding of the environmental causes, but also indicate the frustration and helplessness felt by local communities (Balehegn et al., 2014). This means that, since pastoralists do not have a direct solution to the problems that confront them repeatedly, they try to feel less guilty by explaining it away as something beyond their power to solve. Moreover, sometimes indigenous knowledge has no equivalent in the language of science. Therefore indigenous peoples find explanations that do not fit with scientific understanding or discourse. The knowledge held by indigenous people is different to that of the scientific paradigm; the fact that it is expressed as an extra-biophysical or supernatural explanation does not necessarily mean that it is not valid.

That said, there were some informants who by exception associated drought with over population (both of people and livestock), over grazing and the deforestation of rangelands which causes scarce and erratic rainfall patterns. Yet, even when an explanation other than one of supernatural

retribution is given, Afar pastoralists do not directly talk about drought in its meteorological sense; rather, they use a lot of biophysical and social indicators to describe the reoccurrence of drought. These phenomena are related usually to *livestock productivity*, *biophysical changes*, and *socio-economic* and cultural changes. Similar observations are made by Belehegn and Tafere (2013), who claim that biophysical entities are widely perceived and understood by Afar pastoralists because they are more concrete and observable to the senses than measurements of rainfall, temperature and other variables.

## Conclusion and recommendations

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This study has identified some of the traditional weather and climate indicators used by the Afar pastoralists of north-eastern Ethiopia. Traditional indicators include changes in biophysical entities, including livestock, birds, insects and other wildlife, and changes in the constellation or patterns of celestial bodies. Besides direct observation of biophysical or environmental entities, the Afar pastoralists also consult traditional seers or rain-makers that make what we like to call a “*pure probabilistic prediction*” of future weather. The Afar pastoralists recognize the potential and limitations of their traditional weather forecasting techniques. Therefore, no prediction information is taken at face value. Rather, the Afars, through their traditional administration system, the *Adda*, make a triangulation of information from different sources, such as weather and climate assessment scouting missions, the *Edo*'s, and the traditional weather and other information communication network, the *Dagu*. Information collected from different sources, including formal weather information, is used to determine the most probable weather scenario for the near future. Based on the most probable weather scenario, the traditional administration, the *Adda*, then makes the livelihood decisions that are to be followed by households and entire communities. Such decisions usually involve timing, duration and the routes and destinations of migration, the planning of festivities and marriages, the purchase and selling of livestock or grain, the storing of dried meat and the rationing of milk.

This shows that the production and use of traditional weather forecasting knowledge directly influences the daily lives and livelihoods of Afar pastoralists. In recognition of the importance of traditional weather and climate knowledge to the livelihoods of local communities, we recommend that the use of such knowledge be enhanced by the documentation of these knowledge systems and their integration or hybridization with formal meteorological weather forecasting.

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## 5. *Witsaja iki*, or the good life in Ecuadorian Amazonia: Knowledge co-production for climate resilience

*By Seble Samuel (CGIAR Research Program on Climate Change, Agriculture and Food Security)*

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### Introduction

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The Earth's climate now follows a treacherous and historically unprecedented course, heralding an unparalleled anthropogenic climate crisis of rising seas, emissions and temperatures; retreating snow, ice cover and permafrost; and an influx of extreme events, such as droughts and floods (IPCC, 2014). This threatens the demise of physical and biological systems, terrestrial and marine ecosystems and human well-being (IPCC, 2014). Networks of climate scientists, research institutions and international forums, whose narratives originate, in large part, from the field of western science, have issued urgent warnings of an impending precipice.

Such a framing, however, has many flaws: it excludes alternative perspectives and knowledge systems; distorts realities at the local level (Lahsen, 2007; Smith, 2007; Bäckstrand and Lövbrand, 2007); and struggles to either compel mainstream society to take action or forge binding climate policies to keep temperatures within safe limits. It is born out of a fundamentally contradictory system in which climate knowledge is predominantly created by, and composed of, the voices of scientists from within those industrialized or western countries whose model of human interaction with ecological systems has so far proven to be unpromising and destructive.

This research is inspired to challenge such a paradigm by creating space for other forms of knowledge systems, in particular traditional ecological knowledge, or TEK, grounded in holistic, multi-general, experiential and place-based understandings of environmental change (Robson et al., 2009). Focusing on the Sapara Nation of the Ecuadorian Amazon, this research strives to highlight the power of indigenous and local ecological knowledge in strengthening climate resilience. This case study is the outcome of extensive fieldwork conducted in the region between 2011 and 2012. It was conducted through a collaboration between several global programmes and organizations. These were:

- Indigenous Peoples Biocultural Climate Change Assessment Initiative (IPCCA): This is a global programme that seeks to incorporate indigenous voices into climate change discourse; preserve traditional and local climate knowledge; generate indigenous climate adaptation and resilience strategies towards climate threats; and build bridges between indigenous traditional knowledge and western science using participatory methods (IPCCA, 2011).
- Land is Life: This an international network of indigenous-led organizations and communities that strives to promote the rights of indigenous peoples to self-determination and the collective ownership of lands, resources and ancestral knowledge (Land is Life, 2017).
- Ashiñwaka, the Sapara Women's Association of Ecuador: This association protects the rights of Sapara women by defending them against violence and mistreatment, and focuses predominantly on health, education and territory.

- United Nations University: The key funder of this research project.

More specifically, this research explores, through the lens of TEK, the foremost vulnerabilities to environmental change that the Sapara Nation, its territory and livelihoods, currently faces, as well as the key drivers prompting these changes.

Such research is vital in reshaping how climate knowledge and resilience is conceptualized, uprooting it from the monolith of western science and instead giving voice to the localities in which climate impacts are borne, by embedding it within the holistic field of traditional ecological knowledge systems. At present, despite a strong consensus with respect to the severity and immediacy of climate change, climate policy and national emission reduction targets and pledges have not proven sufficient to prevent global temperature exceeding the two degrees Celsius limit enshrined in the Paris Agreement (UNEP, 2017). There exists, therefore, a need to incorporate diverse knowledge systems into global scientific climate discourse so as to create a complementary narrative of climate change; one that facilitates a sustainable relationship with the natural environment, and includes contributions from marginalized communities and knowledge systems. For this research, participatory methodologies were applied collaboratively over a six-month period of fieldwork in the Ecuadorian Amazon between 2011 and 2012. Techniques were grounded in the approaches of the IPCC, including the facilitation of participatory resilience workshops, semi-structured interviews and participant observation during demonstrations, meetings, assemblies, panel discussions, as well as in traditional territories.

## Scientific climate knowledge and its limitations

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Our current understanding of the climate crisis has largely been informed through the lens of scientific knowledge, relying on western approaches and schools of thought grounded in empirical studies, interdisciplinary research, data and recorded observations (Alexander et al., 2011; Riewe and Oakes, 2006). This field has developed global assessment reports and research publications informing international climate conventions and consortiums. The findings narrate the unequivocal warming of the Earth system, with elevated greenhouse gas emissions triggering sea-level rise, flooded coastal regions, food insecurity, desertification, drought, ocean acidification and biodiversity loss (IPCC, 2014).

Despite the pervasiveness of the climate crisis, and the scientific consensus on its anthropogenic roots, scientific warnings and international mobilizations have failed to incite adequate climate policy to curb emissions and repel climate threats. Scholars have identified key factors limiting the effectiveness of this largely scientific body of climate change knowledge: namely, the manipulation of scientific uncertainties; the universalization of environmental threats; the distortion of the local; the externalization of the environment; and the exclusion of alternative perspectives and knowledge systems (Alexander et al., 2011; Lahsen, 2007; Smith, 2007; Bäckstrand and Lövbrand, 2007).

The limitations of climate science, at present, include an inability to predict local manifestations of climate change with complete accuracy within a specific context (Nerlich et al., 2010). While important proximate models are generated through scientific approaches, the existence of scientific “uncertainties” is often used by climate change sceptics and vested interests to impede ambitious mitigation measures (Lomborg, 2010).

While it serves as a central rallying cry, the depiction of climate change as a fundamentally international issue gives rise to multiple, unintended implications for the interdisciplinary field. Smith (2007) argues that the notion of climate change as “global” can serve to universalize environmental threats, and, in so doing, distort climate responsibilities and vulnerabilities which are distributed disproportionately between industrialized and developing countries respectively as a result (Roberts and Parks, 2006). The labelling of climate change as a global experience is further complicated by the distortion of local phenomena and the externalization of the environment (Smith, 2007). When framed in this way, climate change can be visualized as something beyond our experience and disconnected from our everyday lives, thereby engendering desensitization and a sense of detachment (Smith, 2007).

This detachment is heightened by the removal of meaning and experience associated with the figures, charts, numbers, tables, percentages and measurements by which climate science is currently substantiated. In part because of this, climate change can appear as largely invisible (Nerlich et al., 2010). Such numerical representations of the world around us, found in figures and charts, create a dynamic in which we may more readily become desensitized to the profoundly real implications embedded within such quantifications of the earth’s climate.

These multiple limitations to the scientific framing of climate change have produced a standstill exemplified by the profound gap that exists between climate science and binding climate policy. While the scientific world has provided influential and groundbreaking findings regarding climate change, the current deadlock between climate crisis and climate action has highlighted some of its shortcomings. There is therefore an important need to incorporate alternative knowledge systems into the science-dominated climate change discourse (Alexander et al., 2011); to include marginalized perspectives and diversify towards a resilient climate knowledge base that can command effective climate action.

## The resurgence of traditional ecological knowledge

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The concept of TEK is grounded in multi-generational, experiential, place-based and holistic ways of knowing the natural environment. These teachings and understandings are transmitted through oral histories, spirituality, values, worldviews, songs, among other creative means, as approaches for dynamically interpreting and conceiving of the natural world (Pierotti and Wildcat, 2000). The concept has been used interchangeably - but not limited to - the terms Indigenous Knowledge, Traditional Knowledge, and Indigenous Ecological Knowledge.

Over the last several decades, the notion of TEK has seen a change in its overall acceptance and recognition. In the 1950s and 1960s, the concept of TEK was largely viewed by many theorists and scientists as an inefficient and subordinate knowledge system; one that impeded effective pathways to development (Agrawal, 1995). Science and technology were seen then as the crucial factors when shaping environmental planning and in decision-making processes (Riewe and Oakes, 2006).

Yet, despite this, the perception of TEK is being transformed. The last two decades have seen a resurgence in the popularity of TEK across distinct scientific, academic and community fields (Riewe and Oakes, 2006). Many contributing factors have been associated with this transition in thinking which has impacted a range of diverse arenas and disciplines: namely, an increase in

research funding into indigenous knowledges and the greater understanding of the importance of indigenous knowledge systems that has been promoted through multimedia productions (Agrawal, 1995). While this rebirth of discourses involving TEK first took place within the disciplines of anthropology, sociology and geography, TEK has continued to grow in influence and to permeate into other fields, such as ecology, soil science, forestry, aquatic science, fisheries, wildlife management, information science and water resource management, among others (Warren et al., 1993).

As the relevance and complementary nature of TEK for multiple disciplines comes to the fore, Nakashima et al. (2012, p. 7) argue that it holds “elements of significance for local livelihoods, security and well-being, [rendering it] essential for climate change”. Given the current challenges associated with the global scientific framing of climate change, local, place-based insights have been described as necessary inputs for effective climate understanding and planning to ensue (Alexander et al., 2011). This view is shared by international environmental institutions who recognize that the imposition of rigid policy measures often fails over the medium and long term through a lack of local support (Moller et al., 2004). Similarly, a need to integrate the local has been emphasized by many scholars who contend that sustainable development can only be achieved through the inclusion of both indigenous and scientific knowledge systems – and then only with a clear emphasis on the priorities and objectives of local peoples (Rahman, 2000; Riewe and Oakes, 2006).

## On integrating knowledge systems

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Given the obstacles to action associated with a purely scientific approach to climate discourse, namely the disconnect between climate science, climate policy and widespread societal action on environmental issues (Helm, 2005; Riewe and Oakes, 2006; Sarewitz, 2004), there is a critical value to be had from the incorporation of alternative climate discourses into the predominantly scientific framework of climatic change. In fact, Finucane (2009) goes so far as to argue that climate science alone will be insufficient in effectively solving the climate crisis.

Indigenous insights into, and conceptions of, climate change have the potential to provide much needed perspectives and vantage points within climate change discourse and policy, given the knowledge gaps and systemic challenges within climate science. Such an integration is vital, not only for purposes of utility, but for equity. Within the current climate framework, dominated as it is by western science, local knowledge of the natural environment held by indigenous nationalities is largely omitted; insights and observations of indigenous knowledge systems have traditionally been excluded from scientific sources due to peer-review requirements (Alexander et al., 2011; Nakashima et al., 2012).

Despite these trends of marginalization, both historical and contemporary, of distinctly indigenous knowledge systems, (Riewe and Oakes, 2006) neither scientific knowledge nor TEK should be ranked as superior or inferior to one another. Both knowledge systems possess the capacity to complement one another and increase overall effectiveness so as to enhance the breadth and depth of current climate knowledge. As Pierotti and Wildcat (2000, p. 1333) have highlighted:

[C]onvergence of TEK and western science suggests that there may be areas in which TEK can contribute insights, or possibly even new concepts, to western science. TEK is inherently multidisciplinary in that it links the human and the nonhuman, and is the basis not only for indigenous concepts of nature, but also for concepts of indigenous politics and ethics. This

multidisciplinary aspect suggests that TEK may be useful in resolving conflicts involving a variety of stakeholders and interest groups in controversies over natural resource use, animal rights, and conservation.

TEK represents an important component in facilitating a move towards progressive climate knowledge that equitably and effectively promotes a holistic approach to the framing of climate understanding and action that complements the current scientific framing of our changing climate.

## Sapara Nation

The Ecuadorian Amazon, an incredibly diverse region both biologically and culturally, spans nearly half of the country's mainland territory with the vast majority covered by native tropical forest (figure 1) (López et al., 2013). Ten indigenous nationalities – Achuar, Andoa, Cofán, Kichwa, Sapara, Secoya, Shiwiar, Shuar Arutam, Siona, Waorani – populate this region, with territories covering roughly 60 percent of Ecuadorian Amazonia (López et al., 2013). It is currently a site of confluence between: a diversity of peoples, including both indigenous nationalities and settlers; a national system of protected areas to manage critical terrestrial and marine ecosystems; and the external pressures from oil exploration and extraction, roadway construction, mining, hydroelectric dam infrastructure, land use change, agricultural and livestock development, and deforestation associated with the aforementioned drivers (López et al., 2013).

**Figure 1. Political administrative boundaries of the Ecuadorian Amazon**



Source: López et al. (2013)

As the Ecuadorian Amazon has undergone a significant transformation due to this convergence of internal and external drivers, so too has the Sapara Nation. Once a nomadic people of approximately 98,500 inhabitants, composed of diverse ethno-linguistic groups and spanning a vast territory from Archidona to Pastaza River (figure 2), the Sapara Nation has been greatly altered by the presence of external pressures (Castillo et al., 2016). Commencing in the seventeenth century, a violent history of colonization and evangelist missions, as well as encroachment by the rubber industry in the mid-nineteenth century with its associated indentured labour and disease, followed by gold mining in the twentieth century, pierced and disrupted traditional Sapara livelihoods (Donoso, 2004; Trujillo, 2001). Following this series of ruptures, the Sapara Nation has become sedentary, with a much reduced population of 550 inhabitants. In 2001, the oral and cultural traditions of the Sapara Nation were declared an Intangible Cultural Heritage of Humanity by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) (Bilhaut, 2011). Today, only a handful of elders are Sapara speakers, a figure that was recorded at 20,000 in the nineteenth century (Castillo et al., 2016), while Kichwa has become the dominant language. The endangered status of the Sapara language has complicated this indigenous nationality's struggle for cultural survival and made it a key focus within its education systems. The Sapara Nation is now organized into 23 communities in Pastaza Province, situated between the rivers Conambo and Pindoyacu.

**Figure 2. Ancestral versus present-day Sapara territory**



Source: Castillo et al. (2016); CODENPE (2012)  
 Note: area in dark, ancestral territory; area in light, present-day territory

## Methods: Participatory resilience workshops

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During the course of the research, our collaborative team of Ashiñwaka and Land is Life travelled on three separate journeys to Sapara territory, facilitating participatory workshops with five communities: Llanhamacocha, Masaramu, Jandiayacu, Ripano and Nima Muricha. These resilience workshops focused on a diversity of themes, including territory, medicinal plants, agriculture, hunting, fishing, the spiritual world and climate prediction. The goals of these workshops, in the construction of baseline development and a conceptual framework, were grounded in the Indigenous Peoples Biocultural Climate Change Assessment Initiative. They included gathering stories on historical and present-day climate trends, local interpretations of resilience and adaptation and perceptions of drivers influencing socio-ecological vulnerability to climate change (IPCCA, 2011). Distinct approaches were used, depending on the resilience theme chosen, and are detailed below.

**Territory** – Participatory community mapping and storytelling were the key approaches applied during the territory workshops. Participatory mapping provides “a valuable visual representation of what a community perceives as its place and the significant features within it. These include depictions of natural physical features and resources and socio-cultural features known by the community” (Corbett, 2009, p. 4). Particular issues explored were creation stories regarding the Sapara territory, traditional territorial uses, changes from traditional to contemporary land use, factors influencing these changes, presence of new actors within the Sapara territory and local conceptions of “*witsaja iki*”, that is, living well.

**Hunting and fishing** – Communities collectively created participatory charts to illustrate the hunting and fishing elements of their livelihoods. Within each chart, community members included the predominant kinds of fish and animals they hunted and fished, the seasons in which these species were most prominent, and the traps most commonly used to hunt and fish these species. These specific insights were shared within the contexts of ancestral and contemporary hunting and fishing patterns, highlighting changes in practice, the reasons for such shifts, as well as the impacts on wildlife presence and movement, and forms of sustenance.

**Medicinal plants and agriculture** – During hikes through the territorial forests of the Sapara Nation, community members identified those plants which form part of their traditional medicinal systems, and their uses and preparation methods, as an integral element of community health and resilience. The agricultural component took place during visits to *chakras*, the space where Sapara communities plant, cultivate and harvest their crops. Communities shared knowledge regarding traditional *chakras* and perceived changes within the agricultural sphere, crop production and growth patterns, and the aspects of their livelihoods affected by this variability.

**Spiritual world** – Conceptual mapping was applied as a way to visually imagine and illustrate the spiritual world within Sapara cosmology. Within these representations were the myths, dreams and spirits that form part of Sapara territory, their roles and powers, the implications they have for Sapara livelihoods, and the interactions and relationships these mythologies have with the environment.

**Climate prediction** – Climate calendars were created by the participating communities. These depicted traditional practices and livelihoods, wildlife presence and patterns, and their associated seasons and climates. This was complemented by an evaluation of any changes noted in these traditional climate calendars, and their livelihood impacts. Communities also shared distinct approaches to climate prediction, grounded in local ecological knowledge.

Further, I conducted semi-structured interviews on the topics of territoriality, Sapara livelihoods, oil exploitation and resistance, environmental change and TEK, with a diversity of sectors and communities. These included indigenous nationalities, environmental organizations, social justice activists and indigenous rights organizations, such as the Confederation of Indigenous Nationalities of the Ecuadorian Amazon (CONFENIAE) and the Confederation of Indigenous Nationalities of Ecuador (CONAIE). This was so as to develop a multi-faceted understanding of these key issues in relation to Sapara livelihoods and climate resilience. During this research project, a substantial portion of the knowledge I gathered from my experience with Sapara communities stemmed from participant observation (Schensul et al., 1999). This included living with members of Ashiñwaka; attending demonstrations (e.g. Women in Resistance to the Destruction of Nature; Plurinational March for Water, Life, and Dignity of the People); observing and participating in coalition meetings on topics that included forest management and oil exploitation; attending the annual Sapara Assembly; and attending training workshops on oil resistance and technical sessions on national forest schemes. Such experiences created space for the acquisition of new and diverse perspectives and thinking regarding Sapara livelihoods, environmental change and resilience.

## Creating culturally appropriate frameworks

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In the process of assessing the climate vulnerabilities confronted by Sapara populations across their territory, it became necessary to re-evaluate my own worldviews and biases; to realise that concepts which I had, naively, perceived as almost universal were conceptualized and internalized in entirely distinct ways. This realization became necessary as a prerequisite for attempting to visualize certain aspects of Sapara cosmology. This reimagining and rearranging of fundamental perceptions became manifest through the interpretations of time and knowledge, facilitating the understanding of noted climatic changes and affected livelihoods among Sapara communities.

## Concepts of time

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When facilitating the climate prediction workshops, Sapara communities shared their understanding of their traditional climate calendar, including seasons of heavy rains, dry periods, sunshine and animal presence, among other factors. During these sessions, the notion of the Julian calendar (January–December) was perceived as a completely foreign concept. Instead, time and the seasons were conceived based on aspects of the world around them, present wildlife and the natural environment.

As recounted by Alejo Najar of Masaramu, “the seasons start with the *mono gordo* (large monkey), then the season of *ave gordo* (large bird) begins, and last comes the season of *pez gordo* (large fish)”. The season of *el mono gordo* is roughly equivalent to the months of January to May. This period, with its heavy rains, is referred to as winter. The season of *el ave gordo* corresponds to

the months of May to July, when there are light rains and periods of sunshine. This is followed by the season of *el pez gordo*, which is the shortest period, roughly corresponding to the month of August, and throughout this season there are high temperatures and long periods of sunshine. During the remaining time of September to December, there are no large animals; however, the *chakra* crops and flowers are in full bloom, and there is therefore an increasingly reliance on the harvesting of this produce. As the terrestrial animals begin to fatten, the cycle begins again, with the return to the season of *el mono gordo*.

This perception of time and the seasons is not only cyclical and rooted in the environment, it is also relational. For example, the Sapara communities explained that the presence of the *guachico* fish is highest when the guava or papaya plants are blossoming; that toucans flock when the *morete* fruit is ripening; that the shio fish is present only when the rivers are clear. These insights into environmentally based conceptualizations of time strongly correlate with the premises of TEK that “all things are connected ... [and] all things are related” (Pierotti and Wildcat, 2000, p. 1333). This background of learning about a unique cosmology of interpretations of time and the seasons forms the foundation from which to understand how Sapara communities interpret and comprehend their climate.

## Ways of knowing

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Across Sapara territory, communities shared a diversity of ways of knowing regarding perceptions of environmental change. From Ripano, Jandiyacu and Masaramu, community members were able to predict rainfall by the prevalence of the *aya ulyu* mushroom, *tamia añangu* ants, rainbows, hot night-time temperatures and dreams of *chicha*; sunshine by the prevalence of *india añangu* ants, cold night-time temperatures and dreams of setting light to something; high winds through dreams of flooding; successful hunting through dreams of insects sucking blood; successful fishing through dreams of yucca; and danger in the *chakra* through dreams of snakes.

These insights provided space in which to reflect on different ways of knowing, and the autonomy associated with these distinct ways of imagining, understanding and relating to natural environments. Marco Montaguano of Llachamacocha shed light on this self-sufficiency: “the jungle is our very own SuperMaxi within our territory, because we can find medicine, we can find our food, we can sustain ourselves in the forest”. Such astute and resourceful ways of knowing validated Robson et al.’s (2009, p. 173) conception of knowledge as an “adaptive cultural element”, both dynamic and complementary to scientific understandings of environmental change and natural resource management.

## Noted climatic changes

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Perceptions of climatic changes among Sapara peoples from Llachamacocha, Jandiyacu, Ripano, Masaramu and Nima Muricha, were far-reaching and numerous. These communities stressed that their calendar of seasons (*mono gordo*, *ave gordo*, *pez gordo*, *chakra*) is no longer a predictable one. Instead, they cited instances of increasingly strong winds with completely altered patterns; unexpected heavy rains that were seemingly never-ending; unusually strong sunlight; and extreme climatic events, with two to three hurricanes experienced in the past five to ten years

uprooting trees, *chakras* and homes. As Najjar remarked, “we know what will happen the next day, but we can no longer predict the seasons”. Communities had observed additional changes related to altered animal patterns. These included the disappearance of certain species; destroyed wild-life habitats, leading to dispersal; as well as the presence of new illnesses previously absent from their territories.

These observed changes in the natural environment have had profound impacts across Sapara livelihoods. Within the agricultural realm of *chakras*, the five communities remarked that weeds have been growing rapidly due to the heavy rains, and it has become nearly impossible to uproot them. This has caused food shortages as staple crops, such as plantains, become smaller, damaged or rotten as a consequence. Strong sunlight reduced the working hours available for labouring in the *chakra* fields, and has also slowed crop growth and parched the soil during the summer season.

Hunting has been limited, because it is not possible to hunt during the heavy rains. Hunting patterns and the weapons used are changing due to the dispersal of animals causing increasingly difficult hunting conditions. Fishing has also been affected; however, this is due to rising water levels and flooded rivers making fishing increasingly challenging. Heavy winds have adversely affected both housing and mobility across several regions of Sapara territory. Homes have been destroyed by increased wind velocity, rendering current infrastructure insufficient. Fallen trees block common travel routes along the river and on land, thereby reducing mobility and creating ever more dangerous livelihood conditions.

## Triggers, territoriality and climate change

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External drivers are in the process of transforming territoriality across the Sapara Nation, creating pressures that could further aggravate traditional livelihoods and climate conditions. These include natural resources extraction and conservation that exclude the priorities of indigenous peoples. These shifts are exemplified by the recent entry of extraction and commodification into Sapara territory, as well as the emergence of new actors in the region’s ecological governance, with profound implications for the territorial sovereignty of the Sapara Nation.

Natural resource extraction concessions have many implications for the territories and livelihoods of the Sapara Nation. In this regard, effective participation and consultation mechanisms will be critical for ensuring traditional livelihoods and knowledge are protected and encouraged. Ecuador is a signatory to the ILO Indigenous and Tribal Peoples Convention, 1989 (No. 169) (Carrión, 2012), which provides important guidance regarding indigenous peoples’ consultation and participation, with the objective of achieving agreement or consent. A lack of meaningful consultation about resource extraction, however, threatens to erode the collective rights of the Sapara Nation. Such transformations could aggravate processes of organizational fracture across the livelihoods and territories of the Sapara Nation, in turn, threatening both its cultural survival and climate resilience.

Ecuador’s forest conservation programmes represent another substantial driver transforming the territories of the Sapara Nation. More than 120,000 hectares have been assigned to such conservation schemes across Sapara territory (Departamento SIG, Fundación Altropico, 2011). However, a lack of transparency in transmitted information has facilitated the appropriation of lands and complicated the territorial sovereignty and rights of the Sapara Nation. These multi-fac-

eted issues, compounded by the lack of a formal consultation process, have far-reaching implications for Sapara territoriality, and jeopardize the ability of communities to make fully informed decisions about the governance of their lands. Most significantly, if meaningful consultation and participation are not defended, these dynamics have the capacity to erode self-determination and territorial rights through the legal repercussions of resource extraction and conservation.

## Conclusions

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The insights from the Sapara Nation's TEK reveal territories and livelihoods that are being radically transformed by a myriad of external pressures, including a changing climate of unpredictable and heavy rains, strong winds and sunlight, and extreme events that compromise food security, hunting and fishing practices, mobility and housing. This encroaching dynamic is aggravated by the entry of new actors and the distinct visions for the future of these Amazonian territories set out in programmes for environmental conservation and natural resources extraction.

However, rather than allow drivers, such as exploration concessions, forest conservation programmes and a changing local climate, to entirely reshape the territories upon which the Sapara Nation depends and thrives, communities are instead crafting their own visions for their lands and livelihoods. *Naku* (jungle in Sapara) is one such indigenous-led model that combines ecological stewardship and community entrepreneurship, promoting alternative economic models such as ecotourism and food sovereignty, and converging around integral values, such as healing and spirituality (Castillo et al., 2016). Grounded in their unique knowledge systems for a markedly different trajectory, proposals such as *Naku*, rooted in *witsaja iki*, Sapara cosmology of the good life, illustrate visionary imaginings of a distinct livelihood and territorial path for the Sapara Nation.

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## 6. Seeing like the herder: Climate change and pastoralists' knowledge – insights from Turkana herders in northern Kenya

*By Greta Semplici (University of Oxford)*

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**Figure 1. Seeing like the herder, Lorengelup, December 2015**



Photo credit: Greta Semplici

It has now become almost a routine. Every morning I sit at my desk in the shared open space of my department where I am writing my PhD thesis.<sup>1</sup> Mechanically, I take my computer out of the bag, switch it on and before diving into the depths of resilience discussions in dryland areas I first go over emails and the main news. Here, more and more often, I am pointed towards the countless problems climate change has brought to the region where my doctoral research is based: Turkana County, in the Northern Kenyan arid lands. . It is inevitable; it seems everybody talks about it: the county where “almost everything is an emergency”, in the words of Peter

<sup>1</sup> This case study is drawn from my doctoral fieldwork in Turkana county, northern Kenya. It is adapted from my DPhil thesis, titled “Moving deserts: The resilience challenge. Stories of mobilities from a Kenyan desertscape”, at the University of Oxford, Department of International Development. I wish to thank all Turkana people who have hosted me, shared their journeys and taught me their living ways. I also wish to thank my research assistants who have been patient and helpful throughout.

Lokoel, the deputy governor (Hatcher, 2014); the county now forced to confront the biggest and most harmful of all its problems, that which contains all others: climate change.

Turkana County, known as the cradle of humankind, is one of 47 Kenyan counties, located in the country's former Rift Valley province. It is the largest and most north-western county in Kenya, bordered by Uganda to the west, South Sudan and Ethiopia to the north and north-east and Lake Turkana, formerly Lake Rudolf, to the east. It falls within Kenya's arid and semi-arid lands (ASALs) and is characterized by recurrent droughts which have led many scholars to define it as a "drought-driven" system (Ellis and Swift 1988). In addition, conflicts caused by unclear authorities, raids, competition for pasture and water, land fragmentation, climate change, and also recently by extractive industries (oil and hydroelectric power), pose a further challenge to the predominantly pastoral population that inhabits Turkana.

In East Africa, debates about climate change focus on the increasing temperatures and higher rainfall variability, with a growing likelihood of more frequent and extended droughts (Schilling et al., 2014). Reports about climate change in Turkana frequently find that the average temperature in the county is increasing. A common piece of data shared is the 2°C rise in minimum and maximum temperatures between 1967 and 2012 recorded by the meteorological station based in Turkana's capital, Lodwar (Avery, 2012). Furthermore, the aftermath of new and more unpredictable climate patterns is increasingly reported (Human Rights Watch, 2015). Commonly, it is stated that the *long* rainy season has shortened and become drier, and that the *short* rainy season has become hotter and wetter, with annual rainfall remaining at low levels. Frequently reports state that, whereas a severe multi-year drought used to occur once every ten years (Ellis et al., 1987), the time-span between droughts has now shortened, with, for example, four droughts occurring just in the last decade (Mude et al., 2009). This is said to threaten people's ability to access food, water, health and security; other common concerns one reads about are women and girls having to now walk longer distances to dig for water in dry riverbeds; increased competition over diminishing grazing lands for herds; and animals being less healthy and dying. Nonetheless, the extent, impacts and causes of climate change are still open to debate, with no overarching agreement among the international community (Vrålstad, 2010).

I lived in Turkana for 14 months between 2015 and 2017, 6 months of which were later officially declared as drought – described (once again) as "one of the severest droughts in living memory" (Morland, 2017). I was conducting ethnographic multi-sited research which pushed me from the highlands along the Ugandan escarpment to the lowlands around Lake Turkana, passing by the vast open plains of the Turkana semi-desert central areas. I was exploring the meanings of resilience as lived and experienced by herders compared with institutional definitions, as the term is becoming prominent in the development sector. In this paper, I use this experience to reflect on how local knowledge, practices and performances can contribute to climate change debates. The aim is to provide readers with some clarity about climate change in Turkana in relation to local knowledge and people's long exposure to climatic variations.

As I was in the midst of climate change, manifesting in the latest drought to hit the Horn of Africa, I could not but ask myself: what do Turkana herders have to say about climate change? Or, put more broadly, what climate features are embedded into local knowledge; in what practices is this knowledge performed; and, how do Turkana herders account for changes in the climate?

This short case study will show (a) the importance of integrating pastoralists' knowledge and expertise into environmental and climatic assessments. Not only are they valuable informants on the processes of change in their landscape, but also the changes in their knowledge and practices reflect the changes in their surroundings, as part of broader adaptation responses. Hence, a second argument is that (b) herders' knowledge is not static, and that understanding changes in knowledge and practices reveals a lot about broader changes – including climate changes. This case study concludes by (c) warning against a univocal focus on climate change as the driver of all problems. Without disregarding the relevance of climate change, it should be understood within a broader context of high ecological variability, as well as considered in relation to political and economic factors that are co-responsible for the current risks faced by dryland inhabitants.

### Thinking climate change from local knowledge

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I sit together with Apa Lokiria in the shade of a big acacia tree. Beyond the round confine of the branches crowning the tree, the air trembles. We look at the white sky, the *colour of milk*. He is one of the oldest member of the small community where I am hosted for my fieldwork; local people told

**Figure 2. Turkana elder in his homestead, Lorengelup, November 2015**



Photo credit: Greta Semplici

me, “you should *walk* with Apa Lokiria if you want to learn about us”. Walking in Turkana, if together with herders, is not only a physical movement; walking encompasses observing, tracking and remembering. Walking implies building, sharing and transmitting knowledge. With Apa Lokiria, we walked in the area surrounding Lorengelup village, through the sinuous dry riverbeds, through bushes of wild fruit, encountering footprints made by camels and goats, deep, hand-dug wells, as well as through the dirt road that cuts through the village, the piles of charcoal sacks waiting to be sold, the primary school and through the wind-pump built by Unicef. While walking, we also visited places of his memory; we walked through his life, his recollections, and recorded the changes that have occurred. He was teaching me, and I was learning. Now, resting under the acacia tree, Apa Lokiria points at the sky: “I remember, when I was a kid playing with my friends running into the moving shades of clouds, the fastest won [...] nowadays, there are no more clouds and the sky has the colour of milk.”

Discussions of indigenous knowledge and climate change are primarily enquiries about people and places, locales and the environments where they live. These are experienced, perceived and finally co-produced in the reciprocal relationship between human and nonhuman beings and organisms. Hence, it encompasses (1) a certain understanding of space and time, not as separate dimensions, but rather as, inevitably, co-implicated, coordinated and co-specified (Casey, 1996; Massey, 2005); (2) a study of the relationship between people and places; and (3) insights about forms of knowledge building, transmission and mutation. To re-situate climate change within local knowledge and practices, this case study is built around three highlighted elements:

- 1) meanings of space and time;
- 2) climate change seen through a relational lens;
- 3) forms of knowledge formation, transmission and mutation.

## Meanings of space and time

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Dealing with space, beyond its abstract or flat, two-dimensional connotations, implies dealing with its multiplicities, and its constitutive complexity (Massey, 2005). Indeed, such complexity emerges when wayfaring through Turkana with herders and their livestock. Seen from an aerial photograph, Turkana County looks like a dull area of desert, an arid savanna that welcomes nothing more than thorns and dust (see figure 3). Yet, by looking at the region from within, moving through it, Turkana does not appear ecologically uniform. Turkana is a place where many ecosystems intersect, including, as it does, plains and mountains, hills, piedmonts, sandy-dunes, flood-plains, lake shores, bushland, grasslands, wooden forests, and other features (Herlocker et al., 1994; Johnson and Anderson, 1988). Such heterogeneity often disappears when a zonal model, which organizes space into homogenous cells, is adopted. Each spatial differentiation becomes a spatial segmentation and the land’s surface is divided into a mosaic of externally bounded segments.

If scale of observation has long been a problem in ecology (Krätli, 2016), such a bounded view is contested by the practice of making large-scale ecological connections performed by herders. Moving with herders implies moving beyond maps and taking advantage of multiple habitats across and within various ecological niches. By walking, one starts seeing signs that reveal the existence of these connections: tracks of birds, animals, people; the footprints of donkeys loaded to excess; the printed tire-tracks of motorbikes; foils of hunted animals. The landscape is webbed with paths and footways. By means of mobility, Turkana herders respond to a learnt feature of their space:

Figure 3. Turkana County



Source: Adapted from Google map-satellite [accessed: 19 Oct. 2017].

variability (Krätli, 2015). The signs of large-scale connections also provide a renewed understanding of temporality; large-scale connections not only link various ecologies but also simultaneous *times*.

Like space, time tends to be analysed in a punctiform manner (Casey, 1996). As a result, next to maps lie clocks and calendars. Adam (1998) introduces a *time-scape* perspective into the concept of environment which renders the “invisible” tangible, through attention to processes that appear on the surface of the environment, defined as *symptoms*. For Adam, time-scapes are socially and historically constructed descriptions of the environment. There is no overarching universal time that governs every society. This understanding became apparent from my numerous attempts at developing seasonal calendars with Turkana herders. I tried to understand human activities

across the year by fitting a sequential organization of time into western months. Such a goal was continuously hampered by an incredible variation in the sequence of months. I then started focusing on the actual descriptions provided by my interlocutors for each month and observing how they related to people and livestock tasks (figure 4). Time appeared to be spatially defined with a focus on its spatial qualities more than its sequential order. Units of observation were colours, texture of soil, leaves, wind, clouds, taste of water; and these give a clear indication as to past/present/and future events in the space. There is no fixed November that is identical to every other November in every other year across multiple ecological niches. Rather, there is a moment in time when somewhere *dry pods fall from trees, when there is no rain, but a strong wind blows and most of trees remain without leaves*. Time and space have merged: what happens in space (lands, grass, plants, trees, clouds, roads, and so on) is translated into people's understanding of time and prescribes actions to be taken.

In this understanding of time, sun and rain are the main markers of time. The Turkana calendar divides every solar year into two years, *sun and rain*, and gather all rains fallen in one year into one single collective memory; the same applies for the months of *sun and wind*. Rain patterns are irregular and can make one Turkana sun-year cover several western years until the rain comes. The marker of seasons is the moon. I quickly started loving the nights of a full moon in the desert. Not just for the white flood of light which transforms darkness into a game of shades and makes sand grains shine, but for the significance, for the excitement and the expectations that a full moon brings. They are night of dances, migrations, raids, rituals and ceremonies. A full moon night is the night that signals a new month, when brothers exchange their stocks of animals to look after to obtain a full understanding of the *four legs*.<sup>2</sup>

In this way, Turkana herders have moved beyond a dichotomy of landscape as neutral and external to human activities. They do not simply observe space and time as would a lay audience; rather they participate with it, modify it and incorporate changes into their living. When I was attempting to compile seasonal calendars, it was apparent that the Turkana people were aware of what they are supposed to do when clouds move and reunite in the sky in preparation for rain; when pasture greens up or land turns into mud; when trees shed their leaves; when there is sun and wind; when water withdraws, and land is dry. The order of the months did not really matter, because an order had rarely been seen; in the words of one focus group participant: "The characteristics of these months change all the time; we look at what happens around us and decide accordingly. We need to be prepared and have learnt to observe."

For the Turkana, seasonal calendars are not chronological progressions of time, but an interpretation of time as participated in and experienced by people through hints and clues gradually revealed in space. These hints and clues will tell the herder what task to perform. As a result, decision-making appears not as an arbitrary choice, but rather an account of changes – including changes in climate.

The variability of drylands manifested through space and time increases opportunities for herders, if one knows how to see. This requires the abandonment of narrow scales of observation in favour of large-scale ecological connections. Through such a lens, drylands are no longer a realm of fragility and scarce resources, but one of affordances, and acquire a relational perspective defined in terms of accessibility.

<sup>2</sup> A complete herd, including cows, goats, sheep and camels.

Figure 4. Seasonal calendar extract

Month	Meaning	Description
Lokwang	Derived from word ekwang, bright. It indicates the month of sun and wind	Everything is dry. It is the worst time of the year. It is the month of suffering.
Lodunge	Derived from verb <i>Adudung'iar</i> , to close/fall. It is the month that marks the end/fall of the dry season and the beginning of the rain season.	End of the dry season, there are some scattered short rains in the surrounding areas.
Lomaruk	Derived from Akimaruk, formation of clouds. Early sign of rain. Clouds move in preparation of the rains.	Beginning of the rain season, clouds come together (the clouds are moving fast).
Titima	Derived from <i>akititimare</i> , process of pasture germination/flowering. There is good grass for livestock.	Plants start flowering.
Ei-Ei	Derived from <i>akielarr</i> , to scatter/to blossom and mature.	Plants have matured. There are rains; flowers bloom and petals become big and can be seen even from far away, some plants also have matured.
Lochoto	Derived from <i>echoto</i> , mud. It is the month of heavy rains, the whole place become muddy.	Livestock are giving birth, they are healthy and fat. It rains a lot, vegetation is green and all over. This is the best month of the year. Most motor cars have problems crossing because there is too much mud.
Losuban	Derived from verb <i>akisub</i> , to make. This is the time for doing and for rituals.	Livestock has a lot to feed. There are many ceremonies. People have plenty of food, grass turns yellow, there is no rain.
Lotiak	Derived from verb <i>akitiak</i> , to separate/divide. This is the month that divide the rainy season from the dry season.	The grass is yellow, animals are still doing well. This is a transition month, end of the rain season.
Lomuk	Derived from the verb <i>akimuk</i> , to cover. There are short rains and the sky is covered by scattered clouds.	Most trees turn green, there are flowers and fruit. Trees are forming heavy shadows with their crowns. No rains.
Lopoo	Derived from <i>akipore</i> , to cook. This is the month of hardship.	Many trees start to flower, feeding animals with fruit and leaves. People gather wild fruit and cook berries for many hours, and drink blood from livestock.
Lorara	Derived from <i>araraun</i> , make things fall off. This is the month when trees shed their leaves.	Fruit are ripe and start to fall from trees, no rain, strong wind blows, dry pods fall from trees, most of trees remain without leaves.
Lolongu	Derived from <i>along'u</i> , arid/dry. This is the month of livestock movement in search of pasture and water.	Very dry period. Trees start drying, there is scarcity of water, prices of food rise, animals are weak or die, even wild birds can be seen dying in the bushes. Water pans get dry, food is scarce, and price is high. All trees become like skeletons, animals grow thin.

Source: Author's elaboration.

## Climate change through a relational lens

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**Figure 5. Walking through Turkana, Lorengelup, January 2016**

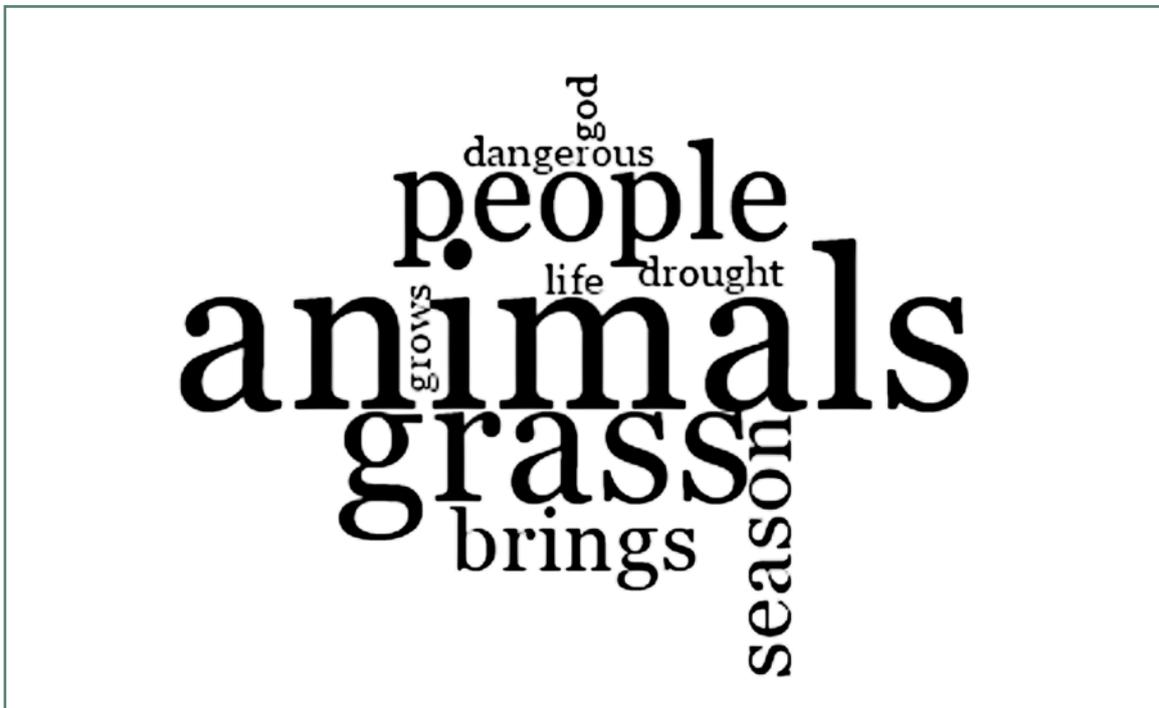


Photo credit: Greta Semplici

Despite issues of accessibility having been first discussed following the ground-breaking contribution made by Sen in the early 1970s with his interpretation of the Sahel famine (Sen, 1981), dominant approaches continue to represent drylands as fragile and with few resources (Neely et al., 2010; Oliveira et al., 2003). This is evident in the choice of indicators used to classify drylands which focus on “discrete states”, such as average rainfall, length of growing season, and moisture levels (Krätli, 2016). Reports produced using these indicators give an overriding image of drylands as homogenous with, on average, little resources. Yet, resources are available, though not uniformly distributed, and therefore lost in standard averages. By *seeing like the herder*, mountains and their slopes, soil and salt licks, water and grass, fruit, plants and roots, enemies and friends become mobile borders, the complexity of arid ecosystems and their boundaries primarily defined in terms of accessibility.

Accessibility becomes a relational concept that entails continual assessment: for instance, what resources are available and for what purpose; when, where, how to access them; when to leave

Figure 6. Meanings of rain



Source: Author elaboration.

them to reproduce; and how to preserve them for future use. Accessibility is experienced at multiple levels: the possibility of reaching pasture and forage for the herd (existence/location of pasture, mobility, security, low/no parasite infestation, terrain, presence of water, social ties in the area, low competition from other herders, etc.); the herd's capacity to feed on it (feeding selectivity); as well as time (accessibility of good quality pasture might be seasonal, but also refer to the ability of the herder to reach it at the time when nutrients peak in the life cycle of the dominant plants, or at night). Hence, relational accessibility does not solely imply physical accessibility to places, but also has climatic, ecological, territorial and social dimensions. For the purpose of this case study, I focus on climatic accessibility and related local knowledge.

Drylands are classified according to aridity scales or length of rain seasons or both. Rainy seasons are defined by using rain as the principal indicator. Thus, it is relevant to understand what rain is for herders. I took note of most of the discussions about rain and realised that rain itself was rarely the object of discussion (figure 6). To talking about rain is to talk about its relations with people, animals, grass and the future.

We spoke about rain in every setting. Looking at shoats (sheep and goats) from the shade of an acacia tree. Inspecting goat entrails found along our paths. Rain was danced on nights when there was a full moon. Rain was whispered along human-chains emerging from deep wells. Rain was dreamt, remembered from the past, prayed for in the future. Rain was in morning tea, in community meetings and in children's games. Rain was in the green sprouts, in the dry pods and in the skeleton of trees. Rain is in every word, and beyond words. Rain is the plants, the rivers, the animals. Rain is God, life and death.

Rain is associated with a lack of rain (seasons and drought, see figure 6). Rain comes seasonally, but not marked as clearly as indicated in climate change reports. Dry seasons contain *ng'irupei* (short showers); wet seasons are interrupted by the sun and *ekuwam* (wind). The dry season and the rainy season co-evolve, temporally and spatially (Galvin et al., 2001; Oba, 1992; Soper, 1985). Rain in Turkana is so erratic that no one can predict when, where or how much it will rain with any degree of accuracy. This is described in historical ethnographies, for example “In the *Ateker* region a normal rain pattern is said to start at the beginning of April [...] this is more exceptional than normal as the amount and incidence of rain varies considerably” (Dyson-Hudson, 1958, p. 6). Indeed, droughts represent one of the most widespread hazards in the region (NDMA, 2015); as Glantz (1987) puts it, droughts are “a part of climate and not apart from it”. This led to rain-making becoming a specialized activity more than for other *Ateker* groups.<sup>3</sup> In response to a high variability in rainfall, Turkana herders have developed different practices of divination. This includes forecasting and rainmaking, both practiced with the help of diviners (*emuron*). The former practice of forecasting I witnessed myself and can happen through the inspection of a goat's entrails or through messages sent to the *emuron* in his dreams by God (*Akuj*).

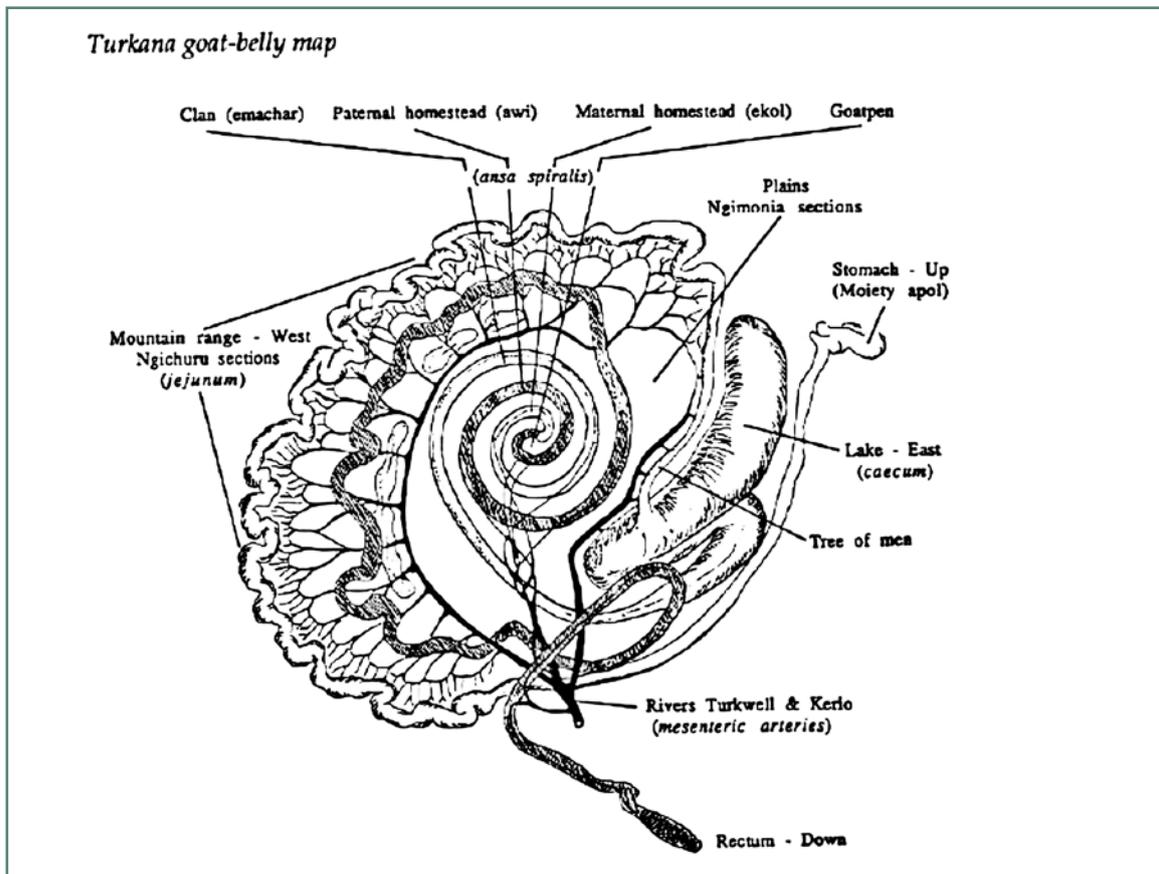
The herders' maps are represented by a goat's intestines curled in upon themselves (figure 7). The conventional form of mapping places the reader outside, from above, and represents the space horizontally as a surface (Massey, 2005). Turkana herders' maps are different to this and change in accordance with the position of the subject. Intestines are spread on the ground by diviners and adjusted to take the shape of the surrounding landscape. Elements of the intestines represent rivers, mountains, hills, plains and Lake Turkana. From irregularities in the intestines, local diviners find a visual representation of future events and transformations in the landscape on which to base forecasting and decisions. This shows not only the great investment made by Turkana culture in the production of their space, but also a fluid perception and representation of this space. By using soft animal matter, the Turkana map is necessarily flexible, allowing for different routes to be taken every migration (Broch-Due and Schroeder, 2000). Topographic features, such as hills, ridges and rivers, become signposts and not fixed elements in the representation of space.

The other way to forecast events is through dreams. These dreams are visions; visions of the future. They can be joyful dreams with rain, milk and fat, or they can predict bad events: diseases, droughts, raids. If the scale of the bad event is large and involves entire communities, several *emuron* may receive the same visions and collective action is required. “We do see it in visions. We predict bad disasters. God tells several *emuron*, from different corners. Especially human and animal diseases, droughts; we can also see the good seasons to come, when people have plenty to eat.” (interview to local *emuron*, December 2015, Lorengeup)

The intervention performed in the event of a bad drought approaching requires the reunion of powerful elders and *emuron* together with MPs and other government representatives, who collectively pray to God for rain. “We heard all traditional leaders were gathering next to Kalobeyei, next to Moruanayece, where Turkana believe to be originated. We went there. MPs and government people were also there. And then it rained, I still cannot believe it.” The quote above was spoken by a non-Turkana United Nations official, who had recently moved to Lodwar. I could not tell how

<sup>3</sup> Composed of the following groups: Karamojong, Jie and Dodos of Uganda; Taposa and Jiye of southern Sudan; Nyangatom of Ethiopia; Turkana of Kenya

Figure 7. Turkana goat-belly map



Source: Broch-Due and Schroeder (2000, p. 63).

much of his excitement was due to a sense of “traditionality” he had just witnessed, or to a mixture of fear and delight at the *real* drops of rain that fell after the ritual was performed. Whether the ritual made it rain or not, for non-Turkana this was an impressive spectacle. For Turkana herders, this is a way of perceiving unpredictable changes in their environment and making sense of them, and to feel safe and in control of their everyday living. In addition, this also testament to a long exposure to climatic variations and subsequent adaptation to such phenomena in the form of local understanding and the practices performed in response.

As this shows, in drylands, average rainfall predictions are rarely reliable and often meaningless. Information shared about rainfall do not include averages or amounts of rain; it does not even include rain itself. Rather, it is about how rain relates with human and non-human organisms. What herders are concerned about is how rain will be distributed and where it will fall, bearing in mind that “a good rain season is when there is enough water and it is well spread” (Krätli, 2015). Turkana herders have built their knowledge and forms of protection around a salient feature of their space: variability – including climate variability. The best way of understanding climate change in drylands is to start by understanding local processes of knowledge formation, transmission and mutation – this being highly informative about local cultures, the inherent features of lived places and that changes that are occurring.

## Knowledge formation, transmission and mutation

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**Figure 8. Knowledge transmission to younger generations, Lorengelup, January 2017**



Photo credit: Greta Semplici

There is a general conception that nomads do not get lost (McDonell, 2016). What is this conception based on? There is a growing consensus that movement is in itself a way of knowing (Habeck, 2006; Humphrey, 1995; Ingold, 2011). According to Ingold (2007, p. 102), it is not possible to detach the dynamics of movement from the formation of knowledge, because it is not possible for the mind to ascend from the surface of the world and leave the body wandering around: knowledge is embodied in place-to-place movement. The best way to know the everyday landscape is trekking, during when the environment is perceived along a path of observations. Similarly, Salza (2014) says: “mobile people do not enact *in situ* but on the way”; it is through trekking with Turkana herders that I have learnt that cognition is both motion-sensitive and site-specific (Macfarlane, 2012).

I, as a novice herder, am walking with Apa Lokiria through his landscape and specific features in the environment are pointed to me. By exploring their space, novice herders gain experience and undergo a process of enskillment made by a mixture of watching, listening, smelling and directly experiencing. By walking, herders learn – which is not a codified action, but is demonstrated by

example (Anderson, 2000, p. 117). Turkana herders have a very practical and generation-related view of the environment. They know most of the benefits and dangers that come from it; distinguish fruits and herbs; know the nutritional values, patterns and distribution of plants; how to read traces to find vital resources. Turkana herders encode their knowledge in the environment, in the form of beliefs and warnings. These serve to train new generations of herders, protect them and instil strength. This is how I was taught what to fear and what to enjoy. I could only possibly learn about the danger of thorns which “steal skirts (and huts)”, by walking through them and getting an infection through a cut; about the hidden demons among mountain rocks tripping up travellers, by strenuously climbing among them and feeling my legs hurt; about the evils in the wind, by being lost and feeling anxious in the middle of a sandstorm. Often, when there is a strong, dusty wind, some Turkana people would stretch out their right arm and shake their hand against the wind, saying “*taman kayaye*” (“go through the other side”, or “go away, evil!”) to the devil or spirit carrying the wind. In this case, Turkana herders have encoded in the wind its potential dangers through a shared performance – teaching the novel herder what to be careful about, offering protection and the strength to cross over unpredictable spaces.

Protection is also offered by amulets and talismans. It is not rare to see herders, including very young children, wearing a small piece of wood (*ekamuka* or *ebata*) around the neck, wrist or even around the waist (women), as a protection against bad things (snakes, scorpions, spiders or the “evil eye”). In this, the environment is a crucial school of life. Elders (like older animals in a herd), who are proven masters of it, are the main transmitters of such knowledge. This explains why elders are respected, and why power is in the form of a gerontocracy. In the hierarchy of herders, enskillment and knowledge translate into authority, as well as into a higher degree of freedom to choose where to go and what to do on the basis of accumulated experience. A knowledgeable herder has learnt to use their environment and recognise changes by means of experience. In other words, a knowledgeable herder is an experienced herder. This experience is used to manage risks, a preferred choice among herders over maximizing profit (Salza, 2014).

Elders' knowledge of their space is not static. Rather, it is subject to change through their movement and shared experiences across drylands; as such, it is better understood as a process rather than an archive. During my walk with Apa Lokiria, I was brought to see what changes have occurred in his landscape: the road, charcoal sacks, the school, the wind pump. He also took me to places of his memory when in times of severe drought “goats were eating nylon paper”, but also times when “God unlocked the padlock” and it rained for days and days. Through gradual learning, older herders widen their knowledge “off-track” (Habeck, 2006, p. 134). Their viewpoints are neither timeless nor changeless; on the contrary, older herders are continually changing and reviewing the images by which the world is seen (Humphrey, 1995, p. 140). Reviewed images of lived places have informative elements for climate change discussions. For example, they offer detailed information about frequency and length of droughts, number of days separating seasons, reduction of clouds and whitening of the sky; about reduced grass quality, and bush encroachment in crop fields or along rivers preventing access to water sources; about a lower water table and increasingly dangerous deep wells; and about disappearance of wild animals *except the hostile ones*.

New knowledge is organised around these observations. Changes are imputed to various causes. For example, many told me “prolonged droughts happen because of urbanization. In the past there were no vehicles and modern things, the rain was plentiful and there was grass”. Others

believe that “God has gone missing”; “God is angry because we started adopting a modern lifestyle and does not want to let water rain down and therefore the water table has reduced”. Others blame local diviners: “[T]he *emuron* pretends to know more than God and demands from people a lot of sugar and *ataba* (tobacco) to do God’s job. The *emuron* of the past were good; they were not greedy. Nowadays they only worry about wealth and alcohol.” Others instead said that “noise and modern things are responsible for the lack of grass nowadays – now, no grass is growing even if it rains”, or “when it rains, parts of it collect into pools; all the animals together in the same place ... the grass that could be available ... too many animals treading on the ground and there is no more grass”. Others complained, “this deep hole here [referring to a drilled borehole]! This is stealing our water!”.

Changes in the environment as well as in the climate are not only noted and observed by herders (making them highly valuable informants about the ongoing processes in their landscape), but also accounted for and incorporated into their understanding and perception of space. Thanks to long experience in their lived places they recognize the complexity of variations which cannot be solely imputed to climate change. Through their observations and narratives, we can learn to see the many factors at interplay in drylands that are co-implicated in their modification. These include sedentarization, roads cut through bushland, expansion of settlements, deep drilling of boreholes, the politics of restriction and enclosure, among others.

## Concluding remarks

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The increased frequency of droughts is supported by the literature, even though recent studies question this common assertion (Adger et al., 2001; Devereux, 2006; Robbins, 2004). Although evidence of climate change and its causes is still under discussion, academic and policy circles have predominantly resorted to a climate-change narrative to explain climate patterns in drylands and human mobility, almost uncritically (Jónsson, 2010). Debates ignore historical cycles of fluctuating rain patterns in drylands where extreme weather variability and an unstable environment should be understood as the norm. Using climate change as single push-factor obscures the interplay of several other factors (political, economic and cultural) that can explain human mobility and mirrors those ideologies which privilege fixity above mobility. Indeed, such narratives focus on negative environmental changes (land degradation, decreasing precipitation and droughts) as *pushing* mobility. As a result, mobility is seen a forced *coping* strategy against something bad.

This logic is, arguably, reversed in drylands where positive environmental change (land flourishing, increased precipitation, peaking nutritive values) generates mobility. In these terms, mobility cannot be framed as coping but as an adaptive strategy developed to benefit from traits in the lived space. When seen in this way, mobility is an advantage. Additionally, negative environmental changes cannot themselves be solely blamed on climate change, but are closely linked to economic, social and political causes (Castles, 2002), including misguided development strategies, an unequal distribution of power and conflicts over resources (Blaikie and Brookfield, 1987; Sen, 1981). The danger of dominant climate change narratives is that they remove the political responsibility for environmental changes and instead introduce new fears into people’s understandings of their environment: “Now that there is climate change what will we do? If there is no rain here, and there is not rain there – where we used to migrate – what will we do? Death only will be the future.” (old male herder, Lorengelup, November 2016)

Yet, by unpacking local accounts of climate change, factors other than the climate itself merge into the same narrative (sedentarization, changes in land use, resource accessibility, and so on). Hence, local narratives of climate change should be interpreted with equal care, being themselves socially constructed, and, rather, used to discover different perspectives into the stresses that affect local livelihoods.

This case study suggests that using local knowledge to make sense of climate change is a good starting point for contextualizing it. Local knowledge of climate change builds from a certain understanding of space and time, one which explains variations in terms of variability and is prepared to take advantage of this variability, rather than fearing it. Local knowledge retains biological and cultural information and is built relationally between lived space and resources exploited. It follows rainfall, as rains relate to people, grass and the future, and it also builds forms of protection in the shape of rituals, prayers and amulets, when confronted by rains' unpredictability. Finally, such knowledge is not static as it is built through movement and experience. Hence, it provides valuable insights into changes, including climate changes. It is transmitted through the generations and modified as changes are observed. It is linked and encoded in the environment and recognizes the co-implication of several factors in the modification of lived spaces.

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## 7. The revitalization of shamanic health care in Suriname

By Daniel Cooper (University of Oxford)

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### Introduction

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The overriding lesson of scientific reports on climate change such as the 2014 World Bank report, *Turn down the heat: Confronting the new climate normal*, is that nobody will be immune to its impacts. However, the costs are going to fall inequitably on poor, remote, and marginalized groups, including indigenous peoples, whose livelihoods depend on surrounding landscapes. Due to this intimate connection, indigenous peoples and local communities are not only vulnerable, but they also have highly specialized knowledge rooted in place. This connection and knowledge represents a unique asset with considerable potential to contribute to local, regional, and global climate solutions. Research shows that incorporating traditional knowledge into climate-change policies can lead to the development of mitigation and adaptation strategies that are cost-effective, participatory, and sustainable (Hunn, 1993; Robinson and Herbert, 2001).

Beyond the direct impacts of extreme weather, climate change can affect human health and well-being in less direct ways such as exposure to air pollution, water-borne diseases, famine, malnutrition, and forced migration. Climate refugees – people forced to move into crowded conditions by extreme weather or rising seas – typically face an increase in health risks, including undernutrition, food- and water-borne illnesses, measles, and respiratory infections (Biermann and Boas, 2010). Soil degradation, freshwater scarcity, population pressures, and other forces related to climate change are potential causes of conflict. Trauma from conflicts, floods, droughts, and heat waves can lead to mental health issues like anxiety, depression, and suicide. More heat can mean longer allergy seasons and more respiratory diseases. More rain increases mould, fungi, indoor air pollutants, and mosquitos. According to a recent report, mosquito-borne dengue fever has increased 30-fold in the past 50 years (Benelli and Mehlhorn, 2016). Senior citizens and poor children – especially those already afflicted with malaria, malnutrition, and diarrhoea – tend to be most vulnerable to heat-related illnesses. Many indigenous peoples and local communities exist beyond the reach of most national health-care systems. In such remote geographies, traditional knowledge and medicine can play a significant role in mitigating the health risks associated with climate change.

Rainforest biomes and their constituent reservoirs of knowledge and resources in Central and South America, Central Africa, and South-East Asia face significant climate-change risk. Warmer temperatures and decreased precipitation during dry periods are manifesting longer and more severe droughts and substantial changes in seasonality (World Bank, 2014). These fluctuations, coupled with land-use changes, could lead to devastating impacts, including increased erosion, degradation of freshwater systems, loss of ecologically and agriculturally valuable soils, loss of biodiversity, decreased agricultural yields, increased insect infestation, and the spread of infectious diseases (ibid.). The climate and deforestation-driven substitution of forests to savanna-like and semiarid vegetation has been dubbed the Amazon forests' "die back" (Cox et al., 2004). According to one estimate, current trends in livestock, agriculture, logging expansion, mining,

fire, and drought could destroy or severely damage 55 per cent of the Amazon rainforest by 2030 (Nepstad et al., 2008).

## A physical and human geography of Suriname

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The Republic of Suriname is the smallest country in South America (under 165,000 square kilometres; 64,000 square miles). It has a population of approximately 558,368 (ABS, 2016) that live mostly on its north-eastern Atlantic coast in and around the capital and largest city, Paramaribo. It is bordered by French Guiana to the east, Guyana to the west, and Brazil to the south. Dutch is the official language. The country gained independence from the Kingdom of the Netherlands in 1975; however, it still maintains close economic, diplomatic, and cultural ties to its former colonizer.

The country can be divided into two main geographic regions: the northern lowland coastal area where there has been extensive colonial cultivation, and most of the population lives; and the southern part that consists of tropical rainforest (covering approximately 80 per cent of the country's land surface) and sparsely inhabited savannas along the border with Brazil.

There are many national parks in the country, including Galibi National Reserve along the coast; Brownsberg Nature Park and Eilerts de Haan Nature Park in central Suriname; and the Sipaliwani Nature Reserve on the Brazilian border. Located in the upper Coppename River watershed, the Central Suriname Nature Reserve has been designated a UNESCO World Heritage Site for its forests and rivers of biodiversity. According to the UNEP World Conservation Monitoring Centre, approximately 16 per cent of the country's land area is national parks and lakes (UNEP, 2009).

Lying two to five degrees north of the equator, Suriname has a very hot and wet tropical climate where temperatures do not vary much throughout the year. Average temperatures range from 29°C to 34°C (84–93°F). Due to the high humidity, actual temperatures are distorted and may therefore feel up to 6°C (11°F) hotter than the recorded temperature. The year has two wet seasons: from April to August and from November to February.

Suriname's largest ethnic group is East Indian (27 per cent of the population; ABS, 2016). Maroons, whose ancestors are mostly runaway slaves that fled to the interior, constitute the next largest ethnicity at approximately 22 per cent divided into five main groups: Ndyuka (Aucans), Kwinti, Matawai, Saramaccans, and Paramaccans. Surinamese Creoles, mixed people descending from African slaves and mostly Dutch Europeans, form 15.7 per cent of the population. Javanese make up 14 per cent of the population, while 13.4 per cent identify as being of mixed ethnic heritage. Other groups include the Chinese, Brazilians, Lebanese, Jews, and a few influential Europeans. Indigenous peoples are 3.7 per cent of the population, with the main groups being the Akurio, Arawak, Kalina (Caribs), Trio, and Wayana.

## Traditional medicine and intercultural health

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According to the World Health Organization (WHO, 2013), traditional medicine (TM) – as opposed to modern, western, or allopathic medicine – refers to the sum total of the knowledge, skill,

and practices based on the theories, beliefs, and experiences indigenous to different cultures, whether explicable or not, used in the maintenance of health as well as in the prevention, diagnosis, improvement or treatment of physical and mental illness. All kinds of people use TM to help meet some of their primary health-care needs in every country around the world. The use of TM, and what others call complementary and alternative medicine (CAM), has become increasingly popular in the last few decades. A 1990 survey in the United States revealed that one-third of American adults used “unconventional therapies” (van Andel and Carvalheiro, 2013). Almost half of Southern Australians used non-medically prescribed alternative medicine in 2000. Reports from Western Europe suggest that 20 per cent (Netherlands) to 49 per cent (France) of the population have used CAM at least once (ibid.). The use of herbal medicinal products has increased over the past three decades with approximately 80 per cent of people worldwide relying on them for health care (Ekor, 2014).

Several researchers have looked into the utilization patterns and interactions between traditional and modern health-care practices among indigenous populations in Ecuador (Kroeger, 1982; Finerman, 1983; Pedersen and Coloma, 1983) and in Latin America and the Caribbean more broadly (Nigenda et al., 2001). Additional research stresses the need for community participation in health initiatives that are linked with indigenous rights and empowerment (Morgan, 2001; Jagtenberg and Evans, 2003).

During a market survey in 2006, researchers collected data on the diversity, source, and volume of plants being sold and exported, and the preferences of urban consumers in Suriname (van Andel et al., 2007). They discovered that more than 245 species of medicinal plants were sold at the markets of Paramaribo with an annual value of the domestic and export market estimated to be worth over US\$1.5 million. Prices were determined by resource scarcity, processing costs, distance to harvesting sites, and local demand. The paper concludes that the growing number of urban Maroons with their cultural beliefs regarding health and illness, and their strong family ties to the interior, are the primary moving force behind the commercialization of herbal medicine in Suriname.

Another study of the “Sustainability aspects of commercial medicinal plant harvesting in Suriname” concludes that the increased commercialization of medicinal plants due to urbanization does not invariably lead to declining resources and species loss (van Andel and Havinga, 2008). With its low population density and market dominated by disturbance species, Suriname offers good possibilities for sustainable medicinal plant extraction.

A further study that is particularly relevant to this paper was undertaken by a team of researchers who looked at the best practices in intercultural health in Latin America by focusing on five short case studies, including one on the Shamans and Apprentices Program in Suriname (Mignone et al., 2007). The study concludes that there is much to be gained from indigenous autonomy and the blending of traditional and western health-care systems.

This paper builds on the literature above by providing updated information on the Shamans and Apprentices Program and a discussion of the ACT’s work in the wider region. It also adds an analysis of the programme within the context of increased health risks associated with climate change, and the revitalization of the shamanic arts.

## Shamanism: From Siberia to the Americas

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Shamanism is thought to be the oldest form of healing, dating back to at least the Upper Palaeolithic in Siberia (Sidky, 2017). However, historical marginalization, ethnocide, and genocide from religious and political pressures have plagued shamanic cultures for centuries. Despite these challenges, the shamanic arts have endured and in some cases been revitalized (for more information on revitalization movements, see Wallace, 1956; Cooper, 2015). For example, research suggests an increase in the adoption of shamanic healing techniques into western medicine in the United States (Thayer, 2009).

According to animist ontology, humans and other-than-human persons (Hallowell, 2002 [1960]) are made up of very different material, yet all have similar interiorities composed of an animating force that links all “things” and “beings” in an interconnected web of life. The principle human interlocutor of this multidimensional web is the shaman, the paragon of animism. The word “shaman” comes from ancient reindeer-hunting cultures in the Tunguska and Manchuria regions of Eastern Siberia, including the Manchu, Evenki (meaning “he who runs swifter than the reindeer”), Baikal (a Paleo-Siberian Mongolian group) and other Tungusic and Samoyedic-speaking peoples (Balzer, 1990). In Tungusic, the word *sama* means “to know in an ecstatic manner” (Barfield, 1997). This conceptual system and associated practices are of great historical import because they retain ancient forms of belief and ritual that spread all over the world, including across the Beringia land bridge through waves of migration to the Americas approximately 10,000–30,000 years ago (Hoffecker et al., 1993; Tamm et al., 2007; Perego et al., 2009).

The ancient Siberian shamanic worldview is composed of upper, middle, and lower worlds. This ontology also includes a belief in the soul or spirit that can separate from its material body and inhabit other corporeal forms. Shamanism was of central importance in the Americas prior to the arrival of the Europeans and still plays an important role among contemporary indigenous groups, as well as other segments of the population. Extensive research has documented this tradition among indigenous communities in Amazonia (Eliade, 1964; Reichel-Dolmatoff, 1971, 1975; Harner, 1980, 1984; Schultes and Hoffman, 1980; Schultes, 1988; Schultes and Raffauf, 1990, 1992; McKenna, 1992; Plotkin, 1993; Schultes et al., 1998; Cooper, 2015) and elsewhere (Czaplicka, 1914; Black Elk, 1953; Hoppal and Sadowszky, 1989; Balzer, 1990; Winkelman, 1992, 1995, 2010). Contemporarily, shamanic practitioners, including pan-shamanic and neo-shamanic specialists, can be found all over the world, including in London, New York, and other major cities.

A shaman is considered a medium to communicate with the spirits to heal, harm, prophesize, and mediate in situations of social or environmental conflict, and much more (Winkelman, 1992, 2010). Shamanism is an ecstatic tradition that often involves disembodiment and soul-flight to complex and interconnected worlds inhabited by spirits of animals, plants, trees, stones, other shamans, the deceased, therianthropes (human–animal hybrids), and countless other-than-human beings. In order to enter into an altered state of consciousness, or what Winkelman (1995) calls an “integrative mode of consciousness”, a shaman may resort to sensory overload or deprivation through drumming, dancing, chanting, fasting, bingeing, smoking, vomiting, isolation, meditation, hyperventilation, and more. Some shamans use psychotropic and entheogenic (generating the divine within) plants (such as tobacco, ayahuasca, peyote, or psychedelic mushrooms), often used in combination with one or more of the other techniques mentioned above. While in a trance, a shaman can journey into the “unseen” world to acquire knowledge or persuade the masters of game to release their animals for the hunters, or lock them up.

Shamanism also commonly includes transformation or shapeshifting into an animal such as a deer, bird, spider, or jaguar in order to visit or traverse a specific realm “unseen”, to perform a certain task, acquire knowledge, or commune with game. The rituals involved with such metamorphoses often include a symbolic death and/or sacrifice to maintain a reciprocal relationship with the spiritual domain (Reichel-Dolmatoff, 1971). Just as feeding on game nourishes humans, the spirits of wild species consume the life force of humans. In most cases, a male shaman will “marry” a female spirit of a game species. As explained by Harvey (2013, pp. 286-287): “Thanks to his ‘spouse’ it is as a husband and not as an abductor that he will be able to hunt in the realm of wild spirits for promises of game . . . Where fishing is important, his marrying a ‘spouse’ in the aquatic world will give him access to the resources of this world”. These beliefs and rituals help indigenous peoples preserve their identity, health, and a socio-ecological balance. With considerable spatial and temporal range, animist and shamanic traditions around the world have much in common, though each is unique and intimately connected to the diverse living landscapes and communities that they co-evolve within.

Indigenous shamans act as healer-priests, responsible for the health and balance of individuals, their communities, and the diverse plant, animal, and spirit beings that inhabit the surrounding landscape. Over thousands of years, Amazonian communities have accumulated vast storehouses of knowledge of plants, animals, and other resources. Although a large number of important pharmaceuticals have been discovered from studying the TM of indigenous peoples, medicinal flora and fauna (especially insects and frogs) are just two components of traditional health systems. Ceremonies and rituals, songs and dances, incense, charms, and invocations often accompany the use of medicinal products in healing in order to address psychological, spiritual, and communal aspects of health (see Cooper, 2015).

## The Shamans and Apprentices Program

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Traditional healing practices are being revived in the far south of Suriname among indigenous and Maroon communities. The revitalization began following recommendations from the Harvard-, Yale-, and Tufts-educated ethnobotanist Mark Plotkin. Together with his wife, Liliana Madrigal, Plotkin created and serves as the president of a grassroots conservation organization known as the Amazon Conservation Team (ACT, founded in 1996). He is the author of several papers (Plotkin, 1988a, 1988b; Plotkin and Balick, 1984; Plotkin et al., 1983) and books including *Tales of a shaman's apprentice* (1993), *Medicine quest: In search of nature's healing secrets* (2000), and *The killers within: The deadly rise of drug-resistant bacteria* (Shnayerson and Plotkin, 2002). He was awarded the Gold Medal for Conservation by the San Diego Zoological Society in 1994 and named “Environmental Hero for the Planet” by *Time* magazine in 1999. He featured in the IMAX documentary short film *Amazon*, which was nominated for an Academy Award in 1997. The principal conservation strategy of Plotkin and the ACT is to create partnerships with indigenous groups to blend traditional knowledge with western science in order to understand, document, and preserve natural and cultural heritage.

After conducting extended fieldwork in the interior forests of Suriname, Dr Plotkin lamented the fact that old shamans were dying and taking their knowledge with them, so he established an intergenerational TM knowledge transmission programme known as the Shamans and Apprentices Program. This initiative included the creation of several TM clinics, and the first large-scale

participatory cultural mapping project in the Amazon, which was subsequently replicated in Brazil and Colombia.

In contrast to the coastal indigenous groups largely displaced by European colonization, those in the interior tended to remain in specific geographical zones living rotational subsistence lifestyles until the mid-1800s. Settlements of extended family units, particularly those in forested areas, were not permanent, since soil fertility was poor and there was a constant need to move; therefore shifting cultivation was associated with shifting settlements. These patterns were significantly altered when Christian missionaries began to arrive in the interior of Suriname in the 1800s (Raphael-Hernandez, 2017). The colonial government primarily viewed the interior as a source of natural resources; therefore, the only modern medicine or education that reached indigenous communities in the interior was left to Christian mission stations.

More recently, the Medical Mission (*Medische Zending*) has delivered primary care in the interior of Suriname; however, their efforts have been severely compromised because of the government's inability to provide regular and timely funding. In 1999, delays in funding almost forced the Medical Mission to close its operations and clinics indefinitely. In the course of working with indigenous peoples, Medical Mission physicians and community health workers have observed that patients often respond well to TM and that certain indigenous and Maroon remedies, such as treatments for leishmaniasis and setting bone fractures, are perhaps more efficacious than the pharmaceutical interventions and therapies they can provide. Local shamans also have several effective medicinal plant treatments for gastrointestinal disorders, an important disease burden in the area. Many are convinced that the integration of TM with western health care, as provided by the local Medical Mission, will result in the improved health of indigenous communities.

In July 2000, with the help of the ACT, a clinic for shamans and apprentices was opened in the Trio village of Kwamalasamutu with a training facility where young individuals (about 12 years old) began to receive introductory training in TM. The clinic includes a medicinal plant garden and a handbook in the Trio language of medicinal plants and their uses. The Trio are fully in charge of both the transfer of knowledge and the treatment of patients in the clinic. The practice is efficient, cost-effective, and manageable. After teaching young individuals, the shamans test the students in each of the villages where the programme is run. Following the success of the clinic in Kwamalasamutu, there are now additional clinics in other villages including Peleletepu (Tepu), Apetina (Puleowime), Maroon villages Gonini Kiki Mofo and Kajana, and Uranai, a Brazilian indigenous community. The ACT is also engaged in similar efforts with shamans and apprentice programmes in Colombia, Brazil, and Costa Rica.

The TM clinic in Kwamalasamutu began with financial support from the ACT that continues to make modest payments to the shamans and apprentices as reimbursement for their services. The ACT also provides support in the form of supplies for the clinic. Efforts are being made to develop income-generating activities to enable community members to pay for the medical services they receive. The ACT aims to achieve sustainable development through the mapping of local landscapes, enhancing land and intellectual property rights, protecting forests, and helping locals to generate income through the exploitation of non-timber forest products such as Brazil nuts and stingless bee honey (see Plotkin, 1988b). The ACT has also facilitated an international exchange with Colombian shamans who are members of UMIYAC (the Union of Yage Healers of

the Colombian Amazon). This organization has made great progress with its own shaman and apprentice programmes, which include a code of ethics and certification for traditional healers.

There are many positive externalities related to cultural recovery, conservation, and the overall sustainable development of traditional knowledge and medicine. The clinic described above and its practitioners, exchanges, and research programmes represent one of the most comprehensive documentations ever undertaken of a traditional health system in an Amazon indigenous community, which offers invaluable opportunities for scientific analysis and improved health care. Judging from improved health indicators and the enthusiasm of the apprentices and the community, a continued supply of apprentices and patients will not be a problem.

Traditional healing practices can be highly effective, particularly for ailments where western medicine is deficient. A weakness lies in attempts to cure ailments for which no effective TM is available. Inability to provide a cure, or even a fatal outcome could undermine credibility, especially since what is taking place is a revitalization of TM practices following the discouragement of their use under the influence of missionaries. Despite their progress, the shamans are aware of their limitations, particularly where introduced diseases and conditions that require surgical management are concerned.

In 2007, the ACT created the Indigenous Park Guard Program. This initiative provides selected members of Suriname's indigenous communities with the opportunity to earn a living while also protecting their natural and cultural heritage. About 30 trained guards are now active in four villages of the Trio and Wayana peoples. The guards are regularly engaged in creating maps, monitoring water quality, conducting inventories of plant and wildlife species, and collecting data on the wildlife trade. The guards' research establishes the baseline data needed by community leaders to inform their land-use decisions and the ongoing monitoring system necessary for adaptive management.

In addition to the efforts described above, the ACT has partnered with local governments and indigenous communities to protect 14 uncontacted groups in north-western Amazonia. They have also successfully mapped 70 million acres of forest in indigenous territories throughout Central and South America.

In January 2015, shamans from various villages across Suriname's interior participated in a two-day evaluation of the Shamans and Apprentices Program. They were all in agreement that the programme has successfully encouraged the transfer of knowledge to the younger generation, and it must be prioritized and further developed. They also agreed to continue to share knowledge between villages, since each community and shaman holds specific knowledge that may be helpful to others.

In May 2015, Plotkin asked his supporters to donate to a unique project to create the Trio Indian Shaman's Encyclopedia. The project serves as a guide for indigenous peoples throughout the Amazon seeking to protect oral shamanic knowledge. The encyclopedia is in the Trio language and is only available to the Trio people who can then share the document and their methodologies with others. This information will not be made public or translated into any other language, thereby keeping all information safe and private.

In November 2015, several Trio shamans were honoured by the President of Suriname with the Honorary Order of the Palm. Two of the shamans who were awarded, Riri Pinoma and Wuta

Wajimnoe, are active in the ACT's Shamans and Apprentices Program. They received this recognition for their long-standing commitment to their communities in southern Suriname. Riri Pinoma, more commonly known as Korotai, leads the programme in Kwamalasamutu. After trying his hand at mining, he came to the conclusion that destroying the forest for only a small amount of gold was not a good idea, so he returned to his village, where he continues his fathers' shamanic tradition by teaching younger individuals how to identify and use traditional plant medicine.

There is considerable scope for the improvement of health care through blending traditional and modern science and technology, for example, providing adequate follow-up treatment/surgery in urban hospitals after initial diagnosis and treatment in the interior. Local communities, such as Kwamalasamutu, would also benefit from microscopes, mapping and data storage devices, rapid diagnostic tests, and solar-powered refrigerators for perishable medicines that shamans need to gather deep in the forest.

The clinics in Suriname could be used as models to be replicated elsewhere. However, one thing should be clear: neither western medicine nor TM has all the answers to all the problems. There are cases where TM is more effective, as there are cases where western medicine may be a more appropriate therapy; therefore, it would be advisable to integrate the two to provide optimal health care for remote indigenous communities.

## Challenges and opportunities

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Countries face major challenges in the regulation of TM. Such treatments have always maintained popularity worldwide; however, their safety and efficacy has become an important concern for health authorities and the public. In order to meet these challenges, the WHO passed resolution WHA62.13 on TM that was adopted at the Sixty-Second World Health Assembly in 2009. The resolution requested the WHO to support member states by providing internationally acceptable guidelines and technical standards derived from empirical evidence to assist in formulating policies and regulations. In 2013, the WHO went a step further by drafting the Traditional Medicine Strategy 2014–2023 with two primary objectives: harnessing the potential contribution of TM to health, wellness, and people-centred health care; and promoting the safe and effective use of TM by regulating, researching, and integrating TM products, practitioners, and practice into health systems, where appropriate.

There are many differences in the definition and categorization of TM. In different countries, depending on the regulations applied to foods and medicines in each country, a single medicinal plant may be defined as a food, a functional food, a dietary supplement, or a herbal medicine (WHO, 2005). This makes it difficult to define the concept of TM for the purposes of national drug regulation; it also confuses patients and consumers.

Requirements and methods for research and evaluation of the safety and efficacy of TM are more complex than those for conventional pharmaceuticals. For example, a single medicinal plant may contain hundreds of natural constituents, while a mixed product may contain several times that number (Ekor, 2014). The time and resources required to isolate and analyse every active ingredient would be tremendous.

Genetic research is becoming more sophisticated; plants and animals are being used to develop new drugs and modify crops to address food security. This research often takes advantage of indigenous and local knowledge of plants, animals, and other resources. Biopiracy is a term used to describe the interaction when researchers, governments, or corporations use traditional knowledge and products without permission. Although biopiracy might happen within a country, with elite groups or government officials taking resources from marginalized peoples, this form of extraction and exploitation primarily occurs between countries of different socio-economic status (Rose, 2016). Researchers and institutions that attempt to find biological resources in a legal and respectful manner are called bioprospectors (see Guérin-McManus et al., 1998 for more information on bioprospecting in Suriname).

Biopiracy has historically been linked to colonialism, with colonized countries having many of their resources forcibly removed. Pepper, tobacco, sugar, coffee, quinine, rubber, and other materials have significant impact on the world economy (Rose, 2016). Each has a colonial past. At the heart of the matter is the idea of ownership. International trade organizations and multinational groups hotly defend patents and trademarks, but for many traditional farmers and indigenous groups, owning land, plants, and other resources is illogical, as is assigning ownership to one person instead of a community (ibid).

Since 1994, the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) has required WTO member countries to develop legal frameworks to protect varieties of plant and animal resources in two systems: one for agricultural contexts; and the other for pharmaceutical, chemical, textile, or other commodity contexts (Correa, 2000). However, many countries consider this to be counterproductive to protecting their bioresources (Rose, 2016), choosing instead to follow the 1992 Convention on Biological Diversity with the objective of conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources (Burhenne-Guilmin and Casey-Lefkowitz, 1992; UN, 1992).

Biopiracy is not likely to disappear, nor is TM. As climate change continues to accelerate, many agribusinesses are patenting drought-, heat-, and salt-resistant genes for future use in crops (Rose, 2016). Since indigenous and local communities hold a vast storehouse of knowledge and genetic material, it behoves them, and institutions that support them such as the ACT and the WHO, to counter this trend by working together to enhance intellectual property and land rights.

## Conclusion

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Indigenous communities face significant health risks associated with climate change. A first priority for intervention must be the protection of individuals and communities from exposure to new diseases. This is especially important in instances of forced migration and first contact, which can be devastating for indigenous peoples. Even after contact, indigenous communities continue to suffer from increased rates of cancer, hypertension, and diabetes from new diets that include a lot of sugar and cholesterol.

Immunizations and other medical technologies from the outside can be helpful, but they should not replace TM. Any clinic established in indigenous territories should also include measures to

maintain and encourage the use of TM and healing techniques. In many cases, the medicinal plants that can be found in the nearby forest are equally, if not more effective, than generic derivatives synthesized in labs to benefit large transnational pharmaceutical corporations.

In order to maintain cultural identity, diversity, and balance, medical clinics and practitioners should work closely with traditional healers such as shamans. Villages, governments, and development workers should also utilize partnerships and new technologies to create and maintain maps, medicinal plant gardens, and encyclopaedias in dialect to protect local knowledge and treat ailments such as aches, pains, fever, diarrhoea, and malaria. These maps, gardens, and medicinal plant records should be the intellectual property of the village and function as repositories for traditional knowledge and medicine to be used and researched further in collaboration with others, if the community so chooses.

As demonstrated by the ACT's Shamans and Apprentices Program, there is much to be gained from partnerships that focus on traditional knowledge and practice, particularly with regard to health and healing. Further research in the health sector should focus on the linguistic, psychological, and ritual techniques and associate plant, animal, and spirit forces used by shamans. Additional research should also identify ways for indigenous communities, governments, and international organizations to establish clear definitions and regulations of TM, and the establishment of durable and enforceable intellectual property and land rights.

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## 8. Pastoralist journalists: Producing reports, knowledge, and policy from the pastures

*By Allison Hahn (City University of New York)*

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### Introduction

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Pastoralists around the world make use of new and social media technologies to produce, analyse and distribute knowledge and information valued by their communities. This paper collects, examines and discusses the journalistic work of pastoralist nomadic community members. Focusing on one of the world's largest pastoralist communities, the Maasai of East Africa, this paper argues that evidence of pastoralist journalism is neither unusual nor rare. To the contrary, a diversity of voices, projects and publications are available to development organizations and policy-makers from which it is possible to better understand pastoralist knowledge, beliefs and opinions.

In this paper, pastoralist reporters are referred to as “pastoralist journalists”. While the role of citizen journalists has been much studied, reports made by pastoralists together with their fund of knowledge are frequently either overlooked or filtered through so many organizations that they become diluted or else unacknowledged. This paper searches for the new media origins of pastoralist journalists in East Africa, asking in what ways are these pastoralists working to engage policy-makers, development planners, scientists and government agents in the production of new and improved policy regarding land and climate change. The examples collected are used to argue for the recognition of pastoralist journalism as work, and the need for scholars to attend to the needs of these workers to record, edit, and distribute their reports for national and international audiences. In addition, this paper argues that the work of pastoralist journalists must be recognized as meaningful, informed and on a par with the domestic and international agents working with and alongside pastoralists. Problematically, such work is often overlooked or ignored by policy-makers, aid organizations and outside observers, being regarded as either uninformed traditional practice or an activity running counter to environmentalist or development projects.

New and social media have made the work of pastoralist journalists both possible and of increasing importance. The research reported in this paper is necessary as many scholars have addressed the communicative norms and pathways of individual pastoralist communities, yet few have studied the ways in which these networks are changing through access to new and social media. Problematically, the presumption within academia and development organizations that pastoralist, indigenous and tribal peoples are unequipped to utilize modern communicative technologies has produced a blind spot in our understanding of pastoralist work, employment and communication. Rather than focusing on the numerous ways that pastoralist communities are misrepresented or misunderstood, this paper instead looks in depth at a few of those organizations and projects that have taken a positive, pastoralist-centric approach to understanding emergent communicative networks.

In what follows, this paper first explores the development of communicative networks for pastoralists. A detailed case study of Maasai activism is then presented. This case study examines the ways by which Maasai pastoralists in East Africa have participated in debates and petitions

about land rights through the production and distribution of petitions and videos. Focusing on engagement in Tanzania since 2009, this case study highlights the work of pastoralists and their supporters in advancing community knowledge and demanding a space in decision-making forums.

From the outset of this paper, it is important to note that not all reports by pastoralists, development organizations or governments agree. In many locations there exist strict power hierarchies, economic interests and other factors that call into question the validity of specific reports, ideas and representations. This paper does not attempt to authenticate one voice over another, nor does it claim that pastoralist communities never highlight specific facts and opinions out of self-interest. Instead, this paper argues that statements made by pastoralist communities, self-interested or not, must be considered on a par with, and of equal weight as, statements made by all other organizations and interest groups.

## Why communicative networks matter

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Communicative networks are the ways that information is transferred across long distances and have always mattered to human communities. Contemporary networks, which make use of multiple technologies, occur at quickening speeds and are impinged by a diversity of social norms. Access to and use of these networks provides a special advantage to rural communities, such as pastoral nomads, who have a history of difficulty in engaging with national politics and the type of decision-making that takes place in urban centres. Now, through access to new and emergent media, those community members working in urban centres are able to remain in close contact with their communities, pastures and herds, while at the same time ensuring that their communities' voices are heard and can affect national politics. However, this form of participation is at times overlooked by politicians and scholars who mistakenly expect pastoralists to be unable or unwilling to participate in such deliberations. Consequently, pastoralists are frequently at a disadvantage. On many occasions, they have had first to prove that they can or should be recognized as stakeholders before being invited, or indeed permitted, to participate in deliberations and negotiations affecting their lives.

## Building new communicative networks

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Since the mid 1990's, a wide variety of communicative networks has become available to pastoralist communities. In Tanzania, these networks were not purposely designed for pastoral nomads, but they advantage these community nonetheless. These networks are enabled by a market in refurbished technologies and re-purposed equipment such as cellular phones. Additionally, pastoralists often work in multiple jobs; young Maasai men who migrate temporarily to urban centres to work as security guards are an example. Community members such as these have access to the newest technologies and social media forums; an access that they then bring home to the pasture lands.

Often, these new technologies are used to produce media projects that record, share and promote community knowledge and opinions. This paper argues that the journalistic framing of

this collection of information, reports and opinions should be considered as work. In the same way as contemporary scholars and protest movements have come to recognize the term “citizen journalist”, there is evidence to support and space for the concept of “pastoralist journalist”. Labelling the production of media by pastoralists as work is important, as demonstrated through their engagement with development agencies and urban policy-makers. When pastoralists are framed as recipients of aid and their labour overlooked, they become regarded as dependants of an organization or state. This results in inequality when new policies are being considered and deliberated upon. This might take the form of pastoralists not being consulted because they are presumed to be ignorant; or assigning a large amount of information gathering work to pastoralists without providing compensation for that labor. The effect of this is seen when organizations presume pastoralists incapable of making decisions affecting their communities, and need not therefore to be consulted during the planning and decision-making processes. In contrast, the case study that follows asks what we might find when we look for evidence of pastoralist journalists working alongside other development organizations and governmental offices.

### Case study: East Africa

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In East Africa, a number of organizations are working with pastoralist nomadic communities. One example is Pajan Kenya: Kenya Pastoralist Journalist Network, which works both sides of the border between Kenya and Somalia to organize workshops in media literacy, education, human rights and the development of information and communication technologies (ICTs) (Pajan, 2018). Another is Survival International, a London-based non-governmental organization (NGO) working in both Kenya and Tanzania to provide consciousness-raising programmes, as well as supporting activists demanding an independent investigation into land grabbing (Survival International, 2018). In Tanzania, the Pastoralist Indigenous NGO Network (PINGO’s Forum) brings together 53 pastoralist and hunter-gatherer organizations to facilitate new knowledge production and exchange. Most recently, these organizations have begun producing and distributing documentaries to project the voices of pastoralist and hunter-gatherer communities to the wider community (PINGOS, 2018).

In Tanzania, pastoralist groups such as the Maasai make use of new communicative networks to engage in political activism, conservation projects and early alert systems designed to protect both herd and herder from wildlife. These communicative infrastructures have been developed in support of both the national tourism industry and its urban communities. Because of their wide coverage, cellular signals are often also available further out in the pasturelands. Some signals are provided by Tanzanian cellular phone providers, but others by foreign carriers; for example, in one contested area, the Loliondo Valley, cellular phones connect to a United Arab Emirates (UAE) provider (Gardner, 2015).

Maasai community members benefit from an increasing level of access to the Internet, social media, to digital tools provided through improved cellular networks, second-hand technologies and to digital infrastructures designed to support the regions’ tourism sector. By 2005, more than 97 per cent of Tanzanians had access to a cellular phone. This has radically changed the networks of communication and power throughout the country and the East African region in general (Owiny et al., 2014). Transnational cellular networks, coupled with access to electric generators and solar technology, mean Maasai community members can call, text and email from

their pasture lands. This has allowed more Maasai voices, often unauthorized by either the state or community elders, to emerge into the public sphere.

Access to communicative technologies has fuelled the production of documentaries, arguments and protests by pastoralist communities such as the Maasai. These productions often cross borders such as that between those Maasai community members who live in Tanzania and those in Kenya. The same networks also allow community members to keep in touch with international organizations and tourists they have met. Direct connections with tourists are particularly important because they give additional social and political leverage to pastoralist information and opinions. Tourists who visit Tanzania often head to the Serengeti, and while there meet pastoralists working at tourist camps and cultural parks or selling trinkets by the roadside. Tourists who spend time with pastoral nomads in this way may be encouraged to continue connecting with international tourists and discussing pastoralist issues, even after they have returned to their home countries.

One result of these international connections are the signatures collected through Avaaz.org petitions. The first Avaaz.org petition in support of the Maasai was launched in 2012. Avaaz.org designed a series of online petitions and protests against the leasing of land bordering the Ngorongoro and Serengeti conservation areas. These land leases had been sought by the Emirati hunting company, Ortello Business Corporation (OBC), and the American company, Thomson Safaris Ltd (Aburawa, 2012). It was proposed that, once leased, the land would be developed to include hunting lodges, tourist complexes and hunting grounds. Hunting grounds are a high value commodity as hunting is not currently permitted within government-owned lands such as the Ngorongoro and Serengeti parks. At issue are the rights of Maasai pastoral herders, who use the land surrounding the Ngorongoro and Serengeti to herd their cattle and participate in subsistence agriculture. While the Maasai have specific rights inscribed into the creation of the Ngorongoro Conservation Area, their rights in the surrounding areas are unclear. Problematically, the park lands are not walled or fenced. This results in conflicts over both the legality of leasing the land to foreign corporations, but also over which areas are within the park and which can be leased to a corporation.

In 2012, an Avaaz.org petition was addressed to President Jakaya Kikwete, stating:

As citizens from around the world, we call on you to oppose any attempt to evict Maasai from their traditional land or require them to relocate to make way for foreign hunters. We are counting on you to be a champion for your people and stop any attempt to change their land rights against their will (Avaaz.org, 2012).

The petition was bolstered by reporters and bloggers who shared the link to the Avaaz.org petition, often accompanied by an expanded explanation of the risk posed to Maasai communities. Below is an example of such an email exchange with Avaaz.org highlighting both the experience of past evictions and the efficacy of international protest.

The last time this same corporation pushed the Maasai off their land to make way for rich hunters, people were beaten by the police, their homes were burnt to a cinder and their livestock died of starvation,” explains Avaaz via email. “But when a press controversy followed, Tanzanian President Kikwete reversed course and returned the Maasai to their land. This time, there hasn’t been a big press controversy yet, but we can change that and force Kikwete to stop the deal if we join our voices now” (Aburawa, 2012).

In this exchange, Avaaz.org went on to outline its plan to create a press controversy that would force the Tanzanian government to change its domestic policies. To promote such a controversy, Avaaz.org played on two pre-existing communicative networks. First, they focused on the role of tourism within the Tanzanian economy. Through networks forged by tourists, the Maasai were able to create a boomerang effect, whereby under-represented or abused Tanzanians, such as the Maasai, might utilize old colonial communicative networks to form new methods for protesting and exerting international pressure on the Tanzanian government. Avaaz.org facilitated connections between Maasai community members and those communities that were part of the old colonial network, such as the Australia, Canada, United States, and Western Europe. By collecting signatures, tweets and written letters, Avaaz.org was able to put pressure on the Tanzanian government.

In its call for participants, it is possible to draw a comparison between Avaaz.org and other petitioning organizations, such as Amnesty International. However, the online nature of Avaaz.org petitions allows for a much quicker response, and potentially threatens the Tanzanian government with a loss of international support and tourism, thereby giving them special leverage. The effectiveness of this method was hailed by Avaaz.org, who were quick to report the success of their campaign.

Wow! More than 400,000 of us have signed in 24 hours! And President Kikwete's inner circle is starting to react – a few hours ago, the President's close confidante, Mr January Makamba MP, tweeted saying he would send our voices to the President himself. Keep up the pressure by signing now and forwarding to others (Avaaz.org, 2012).

Makamba MP responded first to petitioners via Twitter, stating “To all who’ve sent me tweets on “<https://twitter.com/hashtag/Maasai?src=hash>” issue in “<https://twitter.com/hashtag/Loliondo?src=hash>”: I’ve heard you. I’ll look at the facts & take up the matter with the President” (Makamba, 2012a). Three days later, Makamba MP tweeted again, this time claiming that there was no conflict in Loliondo: “Minister for Natural Resources and Tourism refutes claims of eviction of 48,000 Maasai from the Serengeti “<http://t.co/UeUjYysY>” (Makamba, 2012b). At this point, OBC – the company accused by Avaaz.org of purchasing the land – responded, claiming they had no intention of purchasing land in either Ngorongoro or Loliondo because foreigners were barred from purchasing land in Tanzania. This was technically true; foreigners cannot purchase land. However, foreigners can lease land for a term of 99 years, which is what OBC was attempting to do. The response of OBC’s Country Director in Tanzania, Issac Mollel, to the Avaaz.org protest takes as a given the legality of OBC’s position and questions the “realness” of the protests:

Honestly, there’s no conflict whatsoever at Loliondo area, save for the social media...We have been the development partner with the Loliondo villagers since our inception. Apart from these baseless campaigns, we haven’t encountered any problem with the real people in our area of operations (IPP Media, 2012).

In this statement, OBC claimed there was no conflict, that locals were not upset, and that the only problem was non-locals and social media. This directly contradicts statements collected by David Smith, a reporter for *The Guardian* newspaper in the United Kingdom, who spoke with Maasai community members, such as Samwel Nangiria. In response to news that the government was planning to create a corridor of 1,500 sq. km for use by UAE hunters, Samwel Nangiria stated: “This is a shock. The government is telling us to compromise but people say they have given up enough. Giving up the Serengeti national park was a lifelong compromise for them. They will not be pushed again” (Smith, 2012). Mzee Orosikos, a Maasai elder, said: “For us, our land is

everything, but these Arab princes have no respect for the animals or our rights. Many of us would rather die than be forced to move again” (Smith, 2012).

This clash between government, industry and Maasai speakers highlights the potential for international activism through organizations, such as Avaaz.org, and its limits. Each stakeholder attempts to authenticate its claims to an international audience that for the most part is reliant on the textual, verbal and visual evidence made available through the Internet. At stake is the verification and validity of each stakeholder’s claims; a determination of the “realness” of the situation in Northern Tanzania.

One way in which the petition proved the “realness” of the Maasai speakers and protesters in Tanzania was through images of Maasai cattle herders and references to their lifestyle. These media and documents might be produced by pastoralist journalists, but the problem remained: how could these Maasai herders be authenticated by outside observers as actually living and working within the areas in question? The divisions made by Issac Mollel of OBC between real conflict and social media conflict, and between “baseless [social media] campaigns” and “real people in our area” highlights one of the difficulties faced by pastoralists working to advance their reports, arguments and advocacy. How can these pastoralists prove that their work is authentic? And how can outside observers find, request and engage in the authentication of that work? A diversity of NGOs and Maasai community groups have attempted to answer these questions through documentation, promoting community-made media, and the distribution of pastoralist journalism.

## Verification of Maasai claims

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One method of authentication is through verification and documentation by outside organizations. This had proved successful previously for Maasai communities in Northern Tanzania, beginning in 2009, when they protested against forced evictions from their traditional grazing lands. At that time, international NGOs, such Kenya-based FEMACT, launched fact-finding missions to the Loliondo valley and the Ngorongoro Conservation Area to determine and document the “realness” of Maasai community accusations and protests. In meetings with Arusha District Commissioner Lali, FEMACT was assured that there were no conflicts between the Maasai, the government and private corporations. Instead, Lali alleged that Maasai community members were misinforming both the media and their own communities about such threats so as to create political turmoil and gain parliamentary seats at the next election. Further, Lali suggested that the Maasai community was burning its own homes to create dramatic images and perpetuate their claims of turmoil (FEMACT, 2009). FEMACT was then invited to visit Maasai communities to validate Lali’s claims.

What FEMACT found was radically different from Lali’s allegations. FEMACT’s report indicated that the Maasai’s claims were indeed real: “Generally speaking, the Maasai communities in the Loliondo villages are internally displaced persons. They have no land to settle, no shelter, no food, no water for even their livestock, no clothing or any other form of social services” (FEMACT, 2009). FEMACT’s interviews directly contradicted the government’s report. However, although they may have been successful in authenticating Maasai claims within East Africa, they garnered little attention from elsewhere. What they did do, however, was prompt additional international observation projects, such as the European Parliament’s investigation into northern Tanzania.

The findings of the European Parliament's investigation were outlined in the resulting report. It is fascinating to note that the EU Parliament and FEMACT reports are extraordinarily similar, and build upon one another in an attempt to garner international attention for, and a response to, Maasai issues. The 2015 EU Parliament Resolution on Tanzania report states as fact:

[I]n 2009 in eight villages bordering the Serengeti National Park evictions were conducted by the Paramilitary Police Field Force Unit, together with security forces of OBC; whereas more than 200 Maasai *bomas* (homesteads) were totally burnt, women were raped, more than 3000 people left homeless without food and other social basic needs and more than 50,000 cattle were left with no grass and water; Those Maasai communities in the Loliondo villages were internally displaced persons without land to settle, shelter, food or water for even their livestock, no clothing or any other form of social services (EU Parliament, 2015).

These findings received far more international attention than had the FEMACT report, and more so than the reports produced by the Maasai themselves beginning in 2009. The EU Parliament report also indicated that the Tanzanian government had not stopped from attempting to remove the Maasai from their lands. “[I]n September 2013 government officials promised to shelve this project due to negative media exposure and international outcry, the government is now renegeing on their promise and moving ahead with the plan” (EU Parliament, 2015).

What is most important, however, is drawing this narrative together. From Maasai protests to international petition, from reporting by local NGOs to findings by international observers, each of the pieces of media presented in this case study is part of a larger narrative of Maasai activism and a quest for protection from land grabbing. When we track back to the work of Avaaz.org there are signs that their petition played a critical role in advancing Maasai rights and recognition. This organization and its petition is acknowledged in the 2015 *European Parliament Resolution on Tanzania, Notably the Issue of Land Grabbing* which states in clause E: “whereas a petition by the Maasai community of Ngorongoro district has been signed on line on the AVAAZ platform by more than 2 million people worldwide” (EU Parliament, 2015).

## Community video and documentary

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The work of petitioners and international observation organizations is both prompted and then supported by Maasai-produced videos and documentaries. The development of new and social media has encouraged and enabled some pastoralist community members to revise protest strategies through the incorporation of filming, petitioning and outreach campaigning. One of the earliest Maasai videos is the *Nogorongoro Conservation Area Food Crisis 2012* protest video (NCA Residents, 2012). This event, filmed and then made accessible via YouTube, features a diversity of speakers from the Maasai community, as well as local doctors who discuss the lack of food in the region. Utilizing a diversity of visual and rhetorical forms to advance their argument, these Maasai community members strive to prove, beyond doubt, that their arguments are valid and that their community does indeed lack the food and resources necessary for survival.

Later videos go further and show that Maasai community members follow national and international politics and engage actively with deliberations about conservation, overgrazing, land policy and cultural events (Hahn, 2016). They provide the type of evidence that the Avaaz.org petition could not; yet it is important to view them not as a separate body of work, but rather as part

of a larger narrative. Video evidence showing Maasai pastoralists doing the work of information gathering, analysis and protest is critical to a local and an international understanding of Maasai community needs. The production of images and documents by Maasai pastoralist journalists are a critical part of the larger tapestry of East Africa and the quest for pastoralist rights.

## Melding multiple methods of pastoralist journalism

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Internet search engines reveal a rich and powerful collection of pastoralist journalism. These documents are readily available to online audiences, yet they are not always included in contemporary development projects and conversations. For example, although pastoralist-produced documentaries have become increasingly available online, they are seldom linked to ongoing petitions. When Avaaz.org launched new petitions in 2013, 2014 and 2015 they were accompanied by a photograph and supporting information, but without the type of authenticating evidence and engagement with the Maasai available elsewhere online. This lack of inclusion could at first seem to be problematic, or could even make these Avaaz.org petitions appear to lack local support. However, when these petitions are seen as part of a larger protest, the organization can be seen as working to get international supporters to sign its many protest letters, as well as to make donations, and to bring supporters together as a “powerful collaborative force” through on and offline activism. Those same activists might be encouraged to look elsewhere for additional information, possibly then to find the documentaries and reports produced by Maasai pastoralist journalists.

This search for Maasai-produced media is not always an easy one. Some of the highest quality documentaries produced by community members have received few views on online viewing platforms, such as YouTube. While organizations are indeed working with pastoralists to develop media, work still needs to be done to ensure that these productions are viewed, analysed and appreciated by development organizations, government officials and other decision-makers. However, the continued production and distribution of videos and productions made by pastoralists is an indicator of the success these communities have had in moving beyond some international organizations and advancing their own causes and arguments.

## Facilitating new networks

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The example of Maasai pastoralist journalism discussed in this paper shows the ways in which one community is working to engage in decision-making and deliberation. Similar efforts are being made within pastoralist communities across the world.

Combined, the organizations, productions and reports discussed in this paper together indicate that pastoralist communities are eager to participate in the production, distribution and analysis of multiple forms of knowledge, including about the climate, land and environmental issues. In many cases, community members already have the training and technology necessary for participation. What is needed is for other stakeholder groups to take these contributions seriously, to look for engagement by pastoralists and to act on the information and opinions gathered. Beginning to acknowledge the work of pastoralists in producing and distributing such media is one crucial step towards this goal. By accepting that these projects are produced by experts from

knowledgeable sources, development organizations and government officials will be one step closer to inviting pastoralists to take their place as equal stakeholders in deliberations about their land, environment and communities.

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## 9. Augmented realities: The digital economy of indigenous knowledge

*By Daniel Cooper (University of Oxford) and Nina Kruglikova (University of Oxford)*

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### Introduction

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Modern knowledge and technology enable us to observe and affect nearly every corner of the planet. Rapid developments in information and communication technology (ICT) are making it possible to solve development and climate change challenges in ways that seemed impossible just a few years ago. Computers, tablets, smartphones, apps, and participatory mapping programmes that utilize drones, remote sensing technology, global positioning systems (GPS), and geographic information systems (GIS) are helping clarify and secure land tenure in customary settings, and much more. Communication systems enable more effective coordination among local, regional, and global networks. New tools and partnerships are already making it easier for individuals, local communities, and governments to efficiently measure, report, verify, and manage the knowledge and resources embedded in landscapes. However, these tools and infrastructure are not yet fully developed for the proper management and optimization of indigenous knowledge (IK, the knowledge held by an indigenous society, as opposed to scientific knowledge; Ajibade, 2003).

Indigenous communities contribute little to greenhouse gas emissions; however, climate change poses significant risks for these people (World Bank, 2014), the landscapes they inhabit, and the knowledge that holds it all together. Humans are inseparable components of the many ecosystems that constitute landscapes. Recent research shows that people have unique capacities to not only destroy their environments, but also to enhance the resilience of these co-evolutionary systems (Balée, 2013). Indigenous people perceive and react to environmental change in creative ways, drawing on their knowledge and technology to find solutions for the rapid change that is occurring on local and global scales.

Modern technology has already proven to be helpful for isolated communities. For example, Rupununi Learners, a social enterprise dedicated to environmental conservation in Guyana, utilizes computers, cameras, GPS systems, camera traps, and the Internet to facilitate the preservation, transfer, and development of knowledge within Makushi indigenous communities. Several low-income countries and villages have adopted the One Laptop per Child programme in order to enable children to have access to tools, content, media, and computer-programming environments. However, there is little research on the effectiveness of such programmes, and the few studies that do exist show mixed results (Kraemer et al., 2009; Cristia et al., 2012).

Scientific knowledge and its associated technologies represent one system among many. Acknowledging other ways of knowing and being leads to the reconsideration of many fundamental notions about development, conservation, climate change, and access to information. IK is part of a complex that encompasses language, biodiversity, land, naming and classification systems, rituals, spiritual beliefs, and diverse world views. It provides the basis for local decision-making about fundamental aspects of day-to-day life, including subsistence, hunting, fishing, gathering,

agriculture, animal husbandry, water management, health, and many other forms of landscape perception, identification, modification, and management. Some forms of IK find expression in places, stories, legends, folklore, rituals, objects, songs, and celebrations. In many cases, knowledge has been passed down orally from generation to generation and is therefore seldom documented. The lack of documentation is often due to the absence of literacy, infrastructure, and tools in the remote and often politically marginalized geographies where IK exists. This paper describes and analyses a recent Aboriginal start-up (Indigital) that integrates IK with modern science and technology in order to preserve indigenous heritage and contribute to the digital economy in innovative ways.

## Indigenous knowledge

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Indigenous societies harbour a repertoire of knowledge that is closely linked to the practical needs and management of local socio-ecological systems. Not only do they have detailed knowledge of plants, animals, fungi, and certain microorganisms, but they also identify specific types of minerals, soil, water, snow, topography, and vegetation, as well as climatic and astronomical cycles (Berkes et al., 2000). According to Berkes, IK refers to “a cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment” (2012, p. 7). As explained by anthropologist Virginia Nazarea, situated IK is a “priceless human heritage”, and we must “protect the vulnerable wellspring of this legacy” (1999, p. 10).

IK is an enchanting resource for development, though some argue that its value is romanticized (Gray and Morant, 2003). The body of literature on IK offers new and valuable insights into many current challenges (Reed, 1997; Posey, 2002; Briggs, 2005); however, the term IK and its role in development are still problematic issues. For example, what about other local bearers of knowledge that may or may not be considered indigenous, such as Maroons, the descendants of African slaves who escaped and formed independent settlements throughout the Americas with their own unique knowledge systems?

Instead of IK, some scholars use the term traditional ecological knowledge (TEK): the knowledge base acquired by indigenous and local peoples over many hundreds of years of direct contact with local ecosystems (Inglis, 1993). TEK includes intimate and detailed knowledge of plants, animals, natural and supernatural phenomena, the development and use of appropriate technologies for hunting, fishing, trapping, agriculture, forestry, healing, and much more.

Recent interest in bridging the philosophical tradition of phenomenology (Heidegger, 1927; Merleau-Ponty, 1945) with ecological issues (Abram, 2007, 2010; Griffiths, 2006) has brought renewed interest to the field of TEK, particularly within the context of overpopulation, environmental degradation, and climate change (Hinzman et al., 2005; Green and Raygorodetsky, 2010). However, the word “traditional” can have misleading and negative connotations. The ongoing stigma associated with this word can lead to dangerous framing that considers this knowledge antiquated or primitive. The reality couldn't be further from these characterizations. Much of the recent literature promoting TEK makes reference to its rigour, noting the novel implications this knowledge offers for diverse applications (Inglis, 1993; Menzies, 2006; Whyte, 2015).

The word “ecological” is also problematic. Indigenous people do not historically use this term to describe their knowledge (Berkes, 2012, p. 5). For them, there is no separation between ecological knowledge and cultural knowledge. In most cases, knowledge is inseparable from practice, so the separation of nature from culture does not make sense in this context. For example, to differentiate ecology as an area of study separate from farming practices is erroneous for many indigenous people who see a farmer and an ecologist as the same person.

While TEK does have the advantage of precision with reference to knowledge that is ecological (Nakashima, 2002), the term is ultimately unsatisfactory. Its inadequacy is a result of its exclusion of knowledge that is not considered ecological. These issues with TEK have not gone unnoticed; a plethora of other terms have been used in both academic and non-academic literature, including: IK systems, traditional knowledge, indigenous local knowledge, local knowledge, IK of the environment, farmers’ knowledge, folk knowledge, aboriginal knowledge, indigenous science, and native science (Berkes, 2012; Nakashima et al., 2012; Whyte, 2015).

There are also good arguments for going beyond the dichotomies of indigenous versus scientific and modern versus traditional (Agrawal, 1995). A more inclusive conceptualization of knowledge would incorporate the diversity of those who hold valuable place-based information. Within a broader analytical context, it may be more productive to replace IK and TEK with “local knowledge” that includes non-indigenous peoples and non-ecological knowledge. However, since a majority of the literature uses the term IK, and this paper focuses on a specific indigenous technology start-up, the remainder of the paper uses the term IK.

## Safeguarding indigenous knowledge and rights

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Research shows that many top-down development interventions have failed to induce people to participate in global climate initiatives because they lack both the will and the instruments to allow people to use their own knowledge and technology (Blaser et al., 2004; Clavero, 2005). Greater efforts should be made to strengthen the rights and capacities of local people to document, develop, and apply their own knowledge base in order to improve local livelihoods in a sustainable way. Many of these objectives are outlined in the UN Sustainable Development Goals (UNGA, 2015) to end poverty, fight inequality and injustice, and tackle climate change by 2030.

There is concern for the lack of protection and rights of indigenous peoples in global policy approaches such as the Paris Agreement (United Nations, 2015), especially because these communities have proven to be the best custodians of the land (Davis and Wali, 1994). According to a statement at the Paris COP21 by the UN Special Rapporteur on the Rights of Indigenous Peoples (Tauli-Corpuz, 2015): “Studies over the last year have shown that indigenous peoples outperform every other owner, public or private entities on forest conservation”.

The critical role of indigenous people in combating climate change is recognized in the Paris Agreement, but their rights are not protected. Article 7.5 (United Nations, 2015) acknowledges that:

adaptation action should follow a country-driven, gender-responsive, participatory and fully transparent approach, taking into consideration vulnerable groups, communities and ecosystems, and should be based on and guided by the best available science and, as appropriate, traditional knowledge, knowledge of indigenous peoples and local knowledge systems . . .

The rights of indigenous peoples were cut from the binding portion of the Paris Agreement, relegating the only mention of them to the purely aspirational preamble. Megan Davis, UN Permanent Forum on Indigenous Issues Chair, said in her statement to the COP (United Nations, 2015): “Sadly, the agreement asks States to merely consider their human rights obligations, rather than comply with them.”

In any effort to access, document, or scale up IK, due consideration must be given to intellectual property rights (IPR) in order to protect the interests of local communities against charlatans and pirates. The knowledge and technologies contained within landscapes, households, individuals, oral traditions, texts, and elsewhere, belongs exclusively to the individuals and communities that maintain these systems; therefore, access to such knowledge must be restricted. Unfortunately, IPR are weak to non-existent in many developing countries and rural areas where indigenous people live. One example of traditional knowledge that has already proven its value (without due compensation) is *urari* (curare), a traditional poison applied to darts and arrows in northern Amazonia that played a significant role in helping scientists understand neurophysiology and the modern use of anaesthesia (Foldes, 1993).

The relationship between IK and IPR is a complicated matter. Questions around IK protection present issues unlike any others that intellectual property law has had to consider. Indigenous concerns include legal questions involving copyright, patents, trademarks, designs, and/or confidential information. They also raise issues that are not always legal or commercial in nature but include ethical, cultural, historical, political, and spiritual dimensions. Intellectual property law, including the World Trade Organization’s 1994 Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), is largely European in derivation and promotes particular cultural interpretations of knowledge, ownership, authorship, private property, and monopoly privilege (Correa, 2000; Anderson, 2010). Indigenous peoples do not necessarily interpret or conceptualize their knowledge systems in the same way. These laws could affect over 370 million indigenous people worldwide, not to mention the researchers, development institutions, corporations, governments, non-governmental organizations, and others engaging with these communities, their knowledge and resources, and the land they occupy.

Research has proven that when infrastructure development, deforestation, resource extraction, agricultural and pastoral conversion, and climate change encroach on local communities, they often lose their land and the knowledge that protects and maintains its abundance (Godoy et al., 1998; Schwartzman and Zimmerman, 2005). A primary interest of indigenous communities is to get titles to more land and other resources, as well as to protect their rights to intellectual property, including within the digital domain.

## Augmented reality in the digital economy

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A “digital economy” refers to an economy that is based on digital computing technologies. Don Tapscott coined the term in *The digital economy: Promise and peril in the age of networked intelligence* (1995). This book discusses how digital computing technologies are undermining conventional notions about how information is stored and shared, and how businesses operate. More than 20 years later, in the new global economy, digital devices and software applications are enabling more and more people to access and exchange information. They are also changing

the way we perceive and engage with the world through new products and services that reimagine traditional boundaries and value propositions.

Augmented reality (AR) refers to a field in which 3D virtual objects are integrated into a 3D real environment in real time using optical and video blending techniques (Azuma, 1997). Such digital applications are revolutionizing medicine, manufacturing, education, entertainment, and the military. AR is a variation of virtual entertainments (VE) and virtual reality (VR). The primary difference is that AR allows users to see the real world with virtual objects superimposed or composited with the real world. As explained by Azuma: “AR can be thought of as the ‘middle ground’ between VE (completely synthetic) and telepresence (completely real)” (1997, p. 2). Papagiannis (2017) clarifies this differentiation by emphasizing how contextual information transforms the AR experience. Another subclass of VR is mixed reality (MR), sometimes referred to as hybrid reality (Milgram and Kishino, 1994). This merging of real and virtual worlds produces new environments and visualizations where physical and digital objects coexist and interact in real time via immersive technology such as the HoloLens, a pair of MR smartglasses developed and manufactured by Microsoft.

AR has the power to enhance a user’s perception of and engagement with the real world by providing information that would not otherwise be accessible. This phenomenon is often referred to as intelligence amplification (IA): using a computer as a tool to augment human intelligence and make a task easier to perform (Azuma, 1997, p. 3; Brooks Jr, 1996). IA is often contrasted with artificial intelligence (AI), an autonomous technological system such as a computer or robot that displays intelligence and is capable of learning and solving problems. According to Azuma, “At least six classes of potential AR applications have been explored: medical visualization, maintenance and repair, annotation, robot path planning, entertainment, and military aircraft navigation and targeting” (1997, p. 3). The class of AR that is most relevant for this study is annotation, where handheld devices such as smartphones are used for IA by providing additional information about indigenous objects and sacred sites.

The digital economy, and its associated devices and applications, poses significant opportunities for indigenous communities and those who are interested in learning about them and supporting their development. Despite the potential, there are also risks. For example, in many indigenous cultures, local knowledge and sacred sites are important forms of cultural heritage and power. Knowledge is not only held in local languages and dialects, it is also held in place; therefore the landscape itself becomes a repository of vital resources and identity for indigenous peoples. Using AR can indeed lead to IA within indigenous landscapes, but it can also exploit and distort cultural identity, land, and power in imbalanced and destructive ways.

The following section describes a software application that utilizes AR within indigenous landscapes in order to empower and generate income for indigenous peoples.

## Indigital

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Based in the Kakadu World Heritage Area in the Northern Territory of Australia, Indigital is an Aboriginal technology start-up that works with some of the most remote people and places on Earth. The Internet has enabled Indigital to stay connected to a team of coders in India who do 3D animation, and a graphic designer based in the Philippines, despite their geographical isola-

tion. This social enterprise uses cutting-edge digital technology (including 4D mapping software, image recognition technology, augmented and virtual realities, and HoloLens) to ethically digitize and translate cultural knowledge within Aboriginal and Torres Strait Islander communities. The company aims to empower these communities by helping them to showcase their knowledge and landscapes in compelling ways that create jobs in the digital economy.

Indigital's founder and CEO, Mikaela Jade, is a Cabrogal Aboriginal woman from Sydney, Australia. She grew up disconnected from her own cultural heritage and always wondered about the stories of the land and its people, so she became a ranger. She saw technology as a way to give people an opportunity to learn about indigenous culture and ways of being by bridging gaps in education, health, and job creation. In order to avoid fetishizing technology, she emphasizes the point that everything starts with culture before technology (Australian Government, 2016). Indigital works in partnership with indigenous communities and others to create digital products that are desirable and purposeful, and that honour past generations. This is all done through the Indigital Storytelling app for handheld devices (previously called Digital Rangers) and another app for the Microsoft HoloLens. The name reflects the nature and mission of their activities – telling indigenous stories in digital media.

The following is a list of Indigital's core principles (Jade, 2018a):

1. Intergenerational reconnections with cultural knowledge systems through cutting-edge digital mediums – knowledge keepers working with their young people to re-engage in cultural law, language, and land.
2. Economic development for indigenous peoples in the global digital economy. Indigital is leading the way with technology that is culturally appropriate and respectful of the law, language, and land.
3. Empowered communities for digital custodianship of knowledge systems and languages in the digital world – ensuring indigenous peoples have digital custodians in their communities that can help senior leaders navigate the changing digital world in a way that respects their cultural law, language, and land.
4. Intra-cultural connections between indigenous and non-indigenous peoples – the right people telling the right stories at the right place at the right time.

Everything begins with the elders of a given community who control both the front and back ends of the system. This ensures that traditional owners are aware of their digital IPR, including how their knowledge is represented, where it is stored, how it can be retrieved, and who can access it. Indigital asks elders to sign cultural protocols and licensing documents that protect traditional owners' digital and moral rights; they also give Indigital a licence to use the content in the apps. The content is non-exclusive to Indigital. Multigenerational arrangements for the content are secured, including details for what to do when senior traditional owners pass away. The licensing also details the monetary benefits that are derived from the content. For example, senior traditional owners are paid a set fee to paint, storyboard, and record their content for the app. Thus, the Indigital team ensures that each movement, body art animation, look, and feel of content is matched with the design of the traditional owners.

Jade felt very privileged to work with elders in Kakadu who entrusted her with bringing ancient stories to life in a new medium. The story of Namande, a 60,000-year-old personage in the landscape at Kakadu serves as a good illustration. Not only does the community – and Neville Namanyilk, an indigenous artist – support the project, but some have even sought permission to have Namande tattooed on their bodies as a renewed symbol of pride for their culture.

Getting the company started has been a challenge; however, it has received a number of grants and support, including finance from a Kickstarter campaign that attracted 115 backers who pledged 20,608 Australian dollars (AUD). The Kickstarter (2017) webpage explains Indigital Storytelling in the following way:

Imagine you are standing at one of the world's oldest cultural sites and seeing 20,000 year-old rock art. It has a story but you don't know it. You reach in to your pocket and grab your mobile phone. You open your Indigital Storytelling app and point your phone at the rock art. Your phone 'sees' the rock art, and the rock art comes to life in 3D augmented reality. You are told the story by the Traditional Owner of that place as the characters in the rock art come to life. Chills spread across your body as everything suddenly makes sense. The world's most ancient story has just been shared with you and your life has just been changed forever.

In addition to the content provided in the Indigital Storytelling app, the company also builds customized apps for clients that have various costs that depend on the platform they want and the number of holograms it would include. Basic apps cost about 3,000 AUD – more complex apps cost more. They specialize in apps for indigenous and rural communities that facilitate language learning, conferences and events, retail, arts, land councils, and schools. They also make zoo, aquarium, national park, and wildlife apps in order to enhance interpretation and visitor experience.

Indigital also creates merchandise such as high-quality AR t-shirts with images of dreamings – artistic representations of ancestral figures with supernatural abilities. These heroes are thought to exist in dreamtime, a “time out of time”, or “everywhen” (Spencer and Gillen, 1899; Lawlor, 1991). They are not worshipped gods that control the material world; they are revered ancestors of the land and its people. The concept of dreamtime has become widely adopted beyond its initial Aboriginal Australian context and is now part of global popular culture, though it is often misunderstood and misappropriated, especially because there is no direct translation for this complex yet integral concept.

More recently, the company attracted Microsoft as a sponsor to help develop an Aboriginal MR system using the HoloLens technology. They are currently finalizing the first version of the HoloLens-based system, which will tell the story of Namande. Indigital uses drones, 3D and 4D mapping, and smartphone apps to share indigenous insights, but HoloLens offers a significant step forward.

The Microsoft HoloLens is a self-contained, holographic computer that enables users to engage with digital content and interact with holograms. Microsoft is partnering with Indigital to use image-recognition technology to bring Namande to life from his image painted on bark ochre. As Jade explains (Microsoft, 2017):

So when you put on the HoloLens Namande is right in front of you and you're seeing him the way the Bininj people see him in the landscape, and his song and dance and his body paint and the dilly bag that's around his neck. And it will be translated into English, because currently the content we've developed is in Kunwinjku.

The partnership between the HoloLens and Indigital is the first instance of the technology being used in cooperation with an indigenous community. According to Jade (Microsoft, 2017): “The knowledge systems that go with it are the oldest living knowledge systems on Earth. One of the things I’m really keen to communicate through something like HoloLens is that these aren’t bedtime stories – they’re instructions for living on planet earth”.

In addition to making AR apps, standard apps, and merchandise, Indigital also advocates for indigenous digital rights through diverse media, fora, and events such as the Digital Campfire in New York City in 2018. As a member of the Microsoft Australia Reconciliation Action Plan Advisory Board, Jade brings indigenous people and corporations together to talk about digital sovereignty – the ability of individuals and communities to independently decide how their data can be gathered, distributed, used, and stored – and what indigenous people can do to take advantage of the digital economy. She is currently developing a partnership with indigenous social enterprise Shared Path on a program funded by Microsoft Philanthropies called Digital Custodians that will train 30 indigenous women from across Australia in digital skills.

Indigital works with an aboriginal intellectual property lawyer to ensure its activities are within cultural protocols aligned with and exceeding the requirements of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) (United Nations, 2007). According to Jade, this declaration does not do enough to protect indigenous digital rights since it was adopted in 2007 – well before the mass production and utilization of smartphones and ubiquitous data collection. Indigital is at the frontline of pushing the global agenda on the ethical digitalization of IK systems through the United Nations Permanent Forum on Indigenous Issues. They also work with the Tribal Link Foundation and senior indigenous leaders from all over the world to increase protections of their cultural knowledge systems in the digital economy.

In January 2018, Jade was named a finalist in the Veuve Clicquot New Generation Award 2018 as a female entrepreneur contributing to the preservation of indigenous heritage in ethical and innovative ways. According to Jade (2018b): “That is where the mixed reality magic happens. The space in between technology and people. The spark and inspiration for the teaching and learning moment”. This statement crystallizes two important approaches to her work: (1) the interconnectivity of technology and people with blurred boundaries between humans and non-humans; and (2) the importance of education outside the classroom environment with a hands-on experience of indigenous heritage.

## Discussion

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Indigenous stories offer a unique platform for establishing emotional connections with landscapes by fostering a sense of place and belonging (cf. Fernández-Llamazares and Cabeza, 2017). Given the declining role of traditional institutions that pass knowledge on from one generation to the next (Papworth et al., 2009), there is a growing tendency towards the loss of connection with the land and its associated knowledge systems.

Indigital Storytelling uses new technologies to digitize and translate knowledge and culture from Aboriginal landscapes. Although the target demographic for the app is largely young people and tourists, it promotes intergenerational connectivity by documenting oral histories passed down

from one generation to the next. Elders, who contribute as artists and traditional owners, play an integral role in this initiative by ensuring the continuity of tradition and the social memory of landscape (cf. Davidson-Hunt and Berkes, 2003).

Indigital has a significant educational component that is linked to its use at schools, both in and out of classroom settings. IK is brought to life with the help of AR and MR tools embedded in apps that help broaden the mental horizons of students and encourage their interest in pursuing further knowledge. The performativity of Indigital Storytelling provides compelling and engaging ways of reconnecting with indigenous heritage that shapes the perception of IK by modern society. Such knowledge is co-produced (Jasanoff, 2004) through the lens of modern technology, indigenous narratives, and contemporary interpretations of Aboriginal stories. Linguistic aspects are also important for Indigital Storytelling, since stories are narrated in both English and dialect.

Indigital has significant potential to provide income and employment opportunities. Not only does it create jobs and training for the digital economy, but it can also empower local tour guides to learn more stories and be rewarded for their knowledge by tourists. The company is a 100 per cent indigenous-owned and operated for-profit social enterprise; however, it addresses the challenge of profit-sharing by committing 50 per cent of profits to the indigenous communities that participate in its initiatives. They also ensure the participation of the local community by working directly with village leaders to digitize sacred stories and sites.

Despite the benefits of Indigital Storytelling, increased connectivity also brings risks. One challenge associated with such technologies is that they require a modest amount of capital and infrastructure to remain sustainable. Many bearers of local wisdom remain beyond the reach of much of the existing transportation and communication infrastructure; therefore, more investment is required to establish a connection. In such circumstances, care must be taken to avoid radically disrupting existing practices and behaviour. There are also many gaps in local, national, and international legal frameworks for intellectual property, land rights, and profit-sharing mechanisms that must be clearly delineated at all levels. Last but not least, AR implies a modification and distortion of the original object, individual, location, song, or story that may have unintended consequences such as cultural misappropriation.

## Conclusion

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There is a wide scope for knowledge and technology transfers and partnerships that benefit indigenous communities, the private sector, and the climate. Indigital serves as a model for other indigenous start-ups and communities, as well as further development and climate change initiatives that support the UNFCCC COP 21 Paris Agreement (United Nations, 2015) and the UN Sustainable Development Goals (UNGA, 2015).

What is abundantly clear is that indigenous people must shape appropriate frameworks for access and use of their land, resources, and knowledge. IK can no longer be considered a commodity from which others benefit. Indigenous people are increasingly threatened and must be recognized as the custodians of the land that they occupy and its constituent knowledge that is valuable within and beyond local contexts. Critical evaluation of existing norms and frameworks that have been taken for granted is crucial for developing new strategies. A rethinking is required to under-

stand how to appropriately conduct research, conceptualize and share knowledge, and develop a framework for the role of law to influence knowledge exchange.

Education – within local communities and among development practitioners – is key to safeguarding IK and landscapes. Empowering individuals through education in both local and global knowledge helps maintain cultures, landscapes, and livelihoods; it also mitigates migration for work. When indigenous people have sustainable livelihoods and secure land tenure, they are more likely to stay on their ancestral land, thereby maintaining the continuity of their culture, and the health of their communities and the planet.

Modern technology does not have to replace local traditions; rather it can function to maintain and secure it, most importantly through education and the strengthening of intellectual property and land rights. The successes of Indigital should inspire other entrepreneurs to proceed with similar start-ups. These initiatives should also encourage communities to establish mentorship schemes to facilitate the storage and intergenerational transfer of knowledge.

Much like the Aboriginal concept of dreamtime, augmented and mixed realities have the power to blur the lines between the past, present, and future of indigenous landscapes. As demonstrated by Indigital Storytelling, the digital economy has the potential to not only preserve IK, but also to reward its owners and share it for the benefit of local, regional, and global communities. Further research should evaluate the longer-term effects of these initiatives on indigenous communities, particularly with regard to conservation, education, health, intellectual property and land rights, profit-sharing, and the creation of sustainable livelihoods.

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# 10. Sustaining and preserving the traditional knowledge and institutions of indigenous communities: Reflections on the way forward

*By Uma Rani (International Labour Organization) and Martin Oelz (International Labour Organization)*

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## Introduction

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Indigenous and tribal peoples' ways of life have contributed very little to climate change, because they depend on local biological diversity and ecosystem services for their sustenance and well-being, although they are among those most affected by it. The eight case studies presented in this compendium from different parts of the world show how indigenous communities cope and manage their livelihoods when confronted with the impacts of climate change and its variability. These case studies show that, while indigenous peoples live in a world of formalized constitutional and legal systems, their social and cultural practices continue to be regulated by customary norms. The adaptation and coping strategies adopted by these pastoral and agricultural communities are guided and supervised by traditional customary institutions and practices. These communities rely on traditional knowledge for weather warnings, selection of species, diversifying livestock and shifts from pastoral to agropastoral production systems.

There is a generally held notion, which also emerges from the case studies, that the customary norms and practices of indigenous peoples go unrecognized by policy-makers when decisions are made that affect their livelihoods. Some of the studies in this compendium give concrete examples of how when traditional knowledge is documented at the grassroots level, these customary practices could be an excellent resource for both raising awareness as well as for informing policy-making at the national and international levels. The experiences of some of the indigenous communities studied illustrates how traditional and non-traditional knowledge can be effectively combined to ensure livelihoods and to promote development. It also shows how these communities are open to embracing modern technologies, such as digital technologies, to preserve traditional knowledge or to use media and communication effectively to communicate with people about the importance of these traditional sources of knowledge, and to defend their rights.

Although these studies only provide a glimpse into emerging research, they do shed light on some of the challenges faced by these communities and how to further an agenda of climate action which is inclusive and sustainable; one shaped by the traditional knowledge of these communities. While more research of this kind is needed in the future, with a strong focus on gender issues, this concluding chapter points to a number of paths for the way forward, taking into consideration the detailed and rich observations and findings made in the studies contained in this compendium. This chapter will focus on how to ensure rights over resources and lands among indigenous communities, how to sustain traditional knowledge and institutions, and what role can be played by technology. Finally, it will focus on the adaptation and coping strategies required to reduce the impact of climate change. This chapter will also link to the ILO Indigenous and Tribal Peoples Convention, 1989 (No. 169), which, if effectively implemented, can go a long way towards securing an environment in

which indigenous and tribal communities can maintain and develop the customs, occupations and institutions which are indispensable if their traditional knowledge is to be sustained.

## Ensuring rights to common property resources and intellectual property

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The identity of indigenous communities is inextricably linked with their lands, be it common property resources for pastoral or for agricultural activities. These lands may be located in tropical forests, high-altitude zones, coasts or deserts. Common property resources have increasingly come under pressure over the past few decades due to an ecologically destructive demand for fossil fuels (see the paper by *Ahearn*). This further contributes to environmental degradation (see the paper by *Cooper*) and the release of toxic emissions that pose additional challenges for pastoral communities. There is a need to address the rise in fossil fuel extraction and the issue of the ownership and access to resources (Satgar, 2018). In the context of economic globalization, land reform efforts often favour private and individual tenure rights over a recognition of common forms of tenure rights based on traditional occupation and use; and, in certain instances, common property resources are also redistributed. To support grassland ecosystems and common property resources for pastoralists and other indigenous communities, it is therefore important that governments secure a tenure system that supports their practices. In addition to securing tenurial rights, governments should also seek to ensure that these communities have access to adequate basic infrastructure, such as drinking water, sanitation and health care, which are congruent with attaining the 2030 Sustainable Development Goals (SDGs).

In addition to having access to lands and other resources, the preservation of traditional norms and practices is especially important in maintaining common property resources. The case study on traditional water management in Timor-Leste (see paper by *Burns*) points towards the role that women play in managing water resources. Because traditionally women have borne the burden of fetching water for household purposes, they have a vested interest in managing water, therefore their involvement and participation in water management and policy-making would lead to a better outcome. The study by *Burns* shows how the custodial practices of women have helped them to identify more reliable water access in interior mountainous region, and formed the basis of extended land use and facilitated the re-emergence of subsistence practices, allowing them to take the decision to move from coastal to highland areas, and at the same time reducing dependence on coastal environment through protecting fish stocks and some of the species.

Coleman (1987) argues that shared norms and practices around the utilization of common property resources are sometimes internalized by individuals. This assertion seems to be even more true in the case of indigenous communities, where shared norms and practices allow indigenous communities to protect, maintain and preserve common property resources. The paper by *Burns* in this compendium shows how customary laws that protect particular areas and species in traditional lands are re-appropriated for coastal environment to manage fish stocks. Because these indigenous communities reside together and interact in many situations other than the sharing of their common property resources, they are able to develop strong norms of acceptable behaviour and convey mutual expectations to one another. This helps in the effective management of common property resources, as nonconformity can lead to sanctions, which is an internal cost to the individuals concerned in terms of guilt or anxiety, or social displeasure (Ostrom, 1990).

One area of concern with regards to indigenous knowledge raised in this compendium relates to intellectual property rights (IPR). This is a complex issue (see the paper by *Cooper and Kruglikova*). It is complex because such rights in the case of indigenous knowledge cannot be scientifically proven, as much of this knowledge has been transmitted over generations through oral history. This makes it difficult to appropriate rights to an individual as such knowledge belongs to communities. The forum in which the intellectual activity of the traditional knowledge of indigenous peoples has been most thoroughly addressed is the World Intellectual Property Organization (WIPO). WIPO defines traditional knowledge as “the content or substance of knowledge resulting from intellectual activity in a traditional context, and is not limited to any specific field, extending to agricultural, environmental and medicinal knowledge, and knowledge associated with genetic resources” (quoted in Sawakar, 2017, p. 60). The WIPO Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore is the venue in which countries and indigenous nations and communities from around the world have been negotiating an international instrument, or instruments, providing for the protection and promotion of traditional knowledge. Sawakar (2017) identifies 20 biological resources with a medicinal value in a tiger reserve in South India, similar to the *urari* (curare) documented in northern Amazonia (see paper by *Cooper and Kruglikova*). Sawakar argues that the potential of these biological resources for use in medicine cannot be patented and protected because it is difficult to identify an individual inventor and is largely used by tribal communities rather than individuals. To help protect and preserve traditional knowledge among communities, the notion of community rights to traditional knowledge instead of individual rights comes into play.

In the context of traditional knowledge, the critical role played by tribal women in identifying medicinal plants and vegetation from the forest, and then preserving and maintaining them cannot be ignored. There is a deep connection between tribal women and forests, as aside from residing in forests, they are dependent on forests for collecting water, fuel, fodder and food. As a result, women play a critical role in protecting and preserving the forest ecology. There seems to be evidence, for example, that tribal women in India use almost 300 forest species for medicinal purposes (Sawakar, 2017). However, more research is required to gain a better understanding of whether gender makes a difference to the nature of the traditional indigenous knowledge that is generated, preserved and protected. Initiatives such as the Traditional Knowledge Digital Library (TKDL) in India, a cooperative venture documenting traditional knowledge in five different global dialects, should be supported and extended to other regions, so as to push for an agenda of collective rights for indigenous knowledge, and to also acknowledge the role of women in creating and preserving traditional indigenous knowledge.

## Sustaining traditional knowledge and institutions

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Indigenous communities are excellent observers and interpreters of change in the environment. This is illustrated in the case study of north-eastern Ethiopia (see paper by *Balehegn and Balehey*) wherein the Afar traditional seers share their traditional rain-making and prediction techniques. These communities observe biophysical entities closely, such as trees, the behaviour of animals, birds, insects and the variations in weather – flooding, lightening, wind directions, and so on – to forecast future weather conditions. They adopt triangulation methods and observe changes repeatedly over space and time and, in the case of the Turkana herders of northern Kenya, this knowledge is not static and is influenced by climatic changes, as well as other factors such as

urbanization, increased pollution levels and so on (see the paper by *Semplici*). These communities do not follow any single rigid system, but instead select those systems that are accessible and effective for their particular climatic conditions. These studies show how traditionally and collectively held knowledge can offer valuable insights into changes in the environment, and how it can be built, transmitted and changed over time. There already exist “citizen science” and “crowd sourcing” projects as documented in the paper by *Cooper and Kruglikova*, wherein weather data is collected by those close to and familiar with indigenous knowledge. If such data can be complemented by scientific data, it could prove beneficial for verifying climate models and evaluating climate change scenarios on a much broader spatial and temporal scale.

New and emerging digital technologies, such as digital platforms, could be effectively used for collating and disseminating information related to indigenous knowledge. *Cooper and Kruglikova*'s paper points to new startups, such as Indigital, that provide a platform for documenting traditional knowledge and preserving heritage, which is then shared with the wider community to create awareness about traditional knowledge and practices. Similar efforts are underway in other parts of the world. One such initiative is SRISTI (Society for Research and Initiatives for Sustainable Technologies and Institutions) in Ahmedabad, India, which documents traditional knowledge practices through the volunteers of Honey Bee Network, and helps local communities to coexist with biodiversity and to spread traditional knowledge among communities. There are also other examples, among which is the bio-diversity portal, an open source portal wherein individuals voluntarily document and feed information that can be used by the wider public for different purposes. Digital technologies have ample capacity to document and preserve traditional knowledge as practiced in different fields, something which could prove beneficial for the greater good of society at large. Digital technologies could also provide employment opportunities for indigenous communities, which would help them to accumulate indigenous and traditional knowledge and could mitigate migration. It could also empower local people to learn more stories through the documentation of oral history and to disseminate them either through digital platforms or through tourism. This could serve to raise people's awareness about these practices, and this knowledge could become part of a wider discourse in society and also influence policy-making.

Social and visual media could also play an important role in empowering indigenous peoples by making their voices heard among the wider public, and among policy-makers and scientists. Media helps engage and create awareness by documenting practices and helping preserve the knowledge of indigenous communities. The case of Maasai pastoralists in Africa (see the paper by *Hahn*) illustrates how media can have an important role in claiming and defending land rights, in helping to advance community knowledge and in demanding a space in decision-making forums. There is, however, a need for further exploration within this context as to how the materials produced, for example the documentaries produced and distributed in Tanzania, could be widely used in similar other contexts and translated into policy-making reality. What, for example, has been the impact of these documentaries on policy-making within the Tanzanian context or other contexts? How can social media through platforms and networks have far-reaching implications for indigenous communities who are widely dispersed?

An important issue that unfolds within this context is the role of external players, such as non-governmental organizations (NGOs) and environmental activists, who are engaged in helping to pursue the interests of indigenous peoples. The entry of external players could cause conflicts

vis-à-vis local indigenous communities, should the respective interests and motivations happen to differ. This could, in certain instances, undermine the interests of indigenous communities. Another issue that is raised in some of the papers is the extent to which affirmative policies are discussed with the indigenous communities and whether they are integral to the process or policies imposed from outside. In this respect, one could envisage a larger project across indigenous communities, recording oral history and cultural knowledge and practices, as being of value, especially for influencing policy.

Efforts have been made at the global level to bridge the gap between traditional knowledge and climate science. As an example, the United Nations University's Traditional Knowledge Initiative (UNU-TKI) and the International Panel on Climate Change (IPCC) have partnered to organize a series of workshops allowing indigenous peoples at local and national levels to share their experiences and also have a greater say in policy-making. Indigenous peoples' experiences of climate change impacts, together with their mitigation and adaptation strategies, are documented in the IPCC assessment report (IPCC, 2014). A way forward would be to collate traditional knowledge and practices, which are quite dispersed, and create a platform, so that through this platform information can be shared more widely among a larger community. The UNFCCC's platform on this issue is an important step forward.

## Adaptation and mitigation strategies to climate change

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There is an increasing recognition that traditional knowledge needs to be taken into consideration within the discourse on global climate change. In this context, the IPCC assessment report clearly states that "Indigenous, local and traditional knowledge systems and practices, including indigenous peoples' holistic view of community and environment, are a major resource for adapting to climate change, but these have not been used consistently in existing adaptation efforts. Integrating such forms of knowledge with existing practices increases the effectiveness of adaptation" (IPCC, 2014, p. 80). However, despite possessing traditional knowledge, indigenous peoples are often excluded from the decision-making processes which are so critical for their livelihoods. For instance, their views are not considered when decisions are prepared and made regarding major development projects, including renewable energy projects. Such projects may be aimed at mitigating climate change impacts, but might also be detrimental to indigenous peoples' livelihoods, and could even exacerbate the impacts of climate change. The IPCC Assessment Report emphasizes that there is an increasing recognition of the "value of social (including local and indigenous), institutional, and ecosystem-based measures and of the extent of constraints to adaptation" (IPCC, 2014, p. 95). This would require developing effective strategies and actions to attain wider strategic goals that extend beyond the SDG agenda.

The case studies in this compendium also bring out the pressures felt by women as they are responsible for producing, processing and gathering food, fetching water and carrying fuelwood because of ecological degradation (see the paper by *Burns*). Indigenous women are often the custodians of traditional knowledge (ILO, 2017), and their empowerment is critical for climate action. Indigenous, women-led cooperatives have played an important role in many indigenous communities in building traditional knowledge systems, and additionally in creating employment opportunities, and in helping them attain collective rights.

Most of the case studies in this compendium allude to a lack of infrastructure and education preventing indigenous peoples from adopting modern techniques or technology. Furthermore, there is a dilemma among these communities about whether modern infrastructure, which, while providing access to basic needs, might take away some of the rituals that traditional customs have provided. However, some of the challenges that confront pastoralists, such as access to markets, pricing and credit (see the paper by *Ahearn*), could be easily addressed through the setting up of mobile and digital infrastructure; something which has proved of benefit to communities that are dispersed. Mobile networks not only provide access to markets and credit facilities, but also help in the coordination and communication between people.

A number of climate change adaptation programmes, such as those aimed at reducing emissions from deforestation and degradation, have been poorly designed and implemented and can weaken the customary rights of indigenous peoples to their lands and natural resources, thereby impairing their resilience. Indigenous peoples are facing these escalating pressures at a time when their cultures and livelihoods are already exposed to significant stress due to natural resource development, within the context of trade liberalization and globalization. Indigenous knowledge provides a crucial foundation for community-based adaptation and mitigation actions to sustain the resilience of socio-ecological systems at the interconnected local, regional and global scales.

Acosta and Martínez Abarca (2018) put forward the idea of *buen vivir*, meaning “living well”, which has different connotations in different parts of the world. They argue that this term has its roots in indigenous ancestral knowledge in Ecuador and in other countries in the region. The discourse of *buen vivir* calls for rethinking our values, social practices and our relationship with nature, and provides an opportunity to devise new ways of living collectively. In a sense, it questions the present capitalist treadmill of the productivist and materialist world; a world characterized by massive social inequality, dispossession from land, widespread poverty and environmental degradation (Pillay, 2018). It asks us to imagine a different world, one which is sustainable and respects nature and its finite resources, so as to overcome the “capitalist civilization of inequality” (Schumpeter, 2013, p. 425, as referenced in Satgar, 2018). The indigenous communities’ way of life offers an alternative to the concept of capitalist modernity and development (Satgar, 2018), and there is much that can be learnt by society at large from the values and practices in the possession of these communities.

## ILO Convention No. 169: A multi-pronged framework for sustaining and leveraging traditional knowledge

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Adopted three decades ago, in 1989, the standards set out in Convention No. 169, the only international treaty specifically addressing indigenous peoples’ rights, are highly relevant for local, national and international efforts to sustain the traditional knowledge of indigenous communities. This instrument calls for the respect and protection of indigenous peoples’ cultures, traditions and institutions, the recognition of the customary law of these communities, as well the protection of their rights to land and natural resources.

The Convention recognizes indigenous peoples’ rights to the land they traditionally occupy and use. It is thus the traditional occupation and use which is the basis for establishing indigenous

peoples' land rights, and not the eventual official recognition or registration of that ownership. These land rights comprise both individual and collective aspects. (ILO, 2013). The ILO supervisory bodies have underlined the importance of communally-owned land for indigenous communities and stressed the negative consequences of assigning indigenous land to individual or third parties (ILO, 1998). At the same time, the Convention calls on states to promote indigenous and tribal peoples' traditional economies and sustenance activities, which are based on their relationship with the land and which are essential for their livelihoods and for sustaining traditional knowledge.

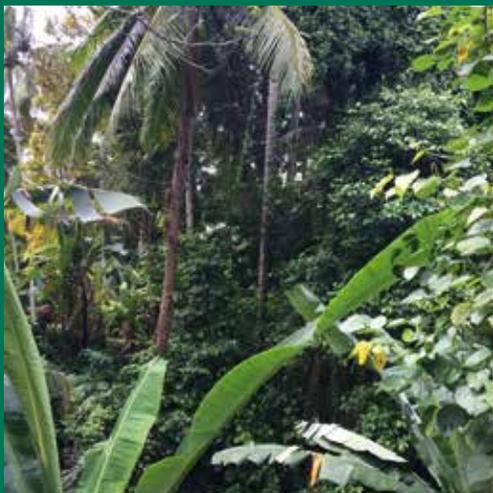
From a governance point of view, however, the Convention's approach to consultation and participation of indigenous and tribal communities needs to be highlighted. It calls for consultation with these communities with regards to legislative or administrative measures that may affect them directly, and, more broadly, requires their participation in the design, implementation and evaluation of regional and national development plans. In this regard, countries that have ratified the Convention have embarked on the process of building mechanisms, procedures and institutions for dialogue with indigenous and tribal peoples (ILO 2019; FILAC, 2019). Taking account of the contributions, knowledge and perspectives of indigenous and tribal peoples is indeed important for policy and for decision-makers in their efforts to design interventions that simultaneously contribute to the realization of human rights, inclusive and sustainable development and effective climate action. Though widely ratified within the Latin American region, further efforts to promote its ratification and implementation in other regions are needed.

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