People and Land

Volume 1, January 2016

Forgotten peace,

Lost archives,

Dung, Mud,

and more.

A publication by the RESILIENCE IN EAST AFRICAN LANDSCAPES research group

REALers scoping the landscape for research ideas. Photo credit: Geert van der Plas

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Introducing People and Land

One hundred thousand years ago. Sapiens was sitting in the shade under an acacia tree overlooking the vast open savannah of East Africa. A group of gazelles was darting through the tall grass towards the river that meandered endlessly through the landscape. In the distance he spied a group of moving figures. Human hunters, from another group living to the north. He got up and hurried back to the village. His own group of hunters had to move out fast, to join their neighbours in the hunt.

The East African Rift Valley holds the vast history of humankind's interaction with nature. Here, we built our culture. We taught ourselves to hunt, to control fire, to use the landscape for our own benefit. Here we learned to coexist with other people who share the land, and we learned to fight with those people over it. Still today, people have a deep connection with the land. And still today, there exists an endless struggle to survive.

We – the researchers of the REAL project – came together from seven countries to explore this connection between the land and people. We form a diverse group of researchers, bringing in knowledge from Denmark, Kenya, Tanzania, Slovenia, Ethiopia, Canada, and The Netherlands. We each bring our own field of expertise to the table. We have knowledge of the soil, the vegetation, the climate, the people, and nature.

Our research covers a wide range of topics, and here we have pooled our work and distilled it into these articles. It is a difficult task to melt our sometimes chaotic thoughts into a whole, but through constant self-reflection we forge ahead down our individual paths. Our goal is the same: to understand how people have shaped the land and how the land has shaped the people. We delve into the past to see how we arrived in the present. And from there we take a leap into the future.

It is not an easy task to accomplish. Books have been written about the complex connections that exist between people and land. And we do not presume to bring the answers. But we do hope to shed some light on the problem from our own different perspectives. We struggle, we follow dead ends and occasionally we falter. Such is the way of the researcher. But in the end, when we combine our talents we will present a body of work that will enlighten others who work on the intersection of people and land. This magazine represents our first step towards that goal. It is our first true collaborative effort, where all our voices come together. Keep following us, as we are bridging the gaps between worlds of nature and culture, customs and modernity, and conflict and harmony.

In addition to our contributions to the scientific community, this work will be a way for us to bring our research back to the place where it originated, the local communities. We hope it will inspire local people and scientists alike to continue the hard work, to pick up where we left off and to use it to make everybody's life a little better.

We are very proud to present you this special magazine. Within these pages you will find a collection of articles, produced by this enthusiastic team of young researchers. We hope you enjoy reading them as much as we enjoyed writing them!

Resilience in East African Landscapes Initial Training Network

Find out more about us at:

www.real-project.eu

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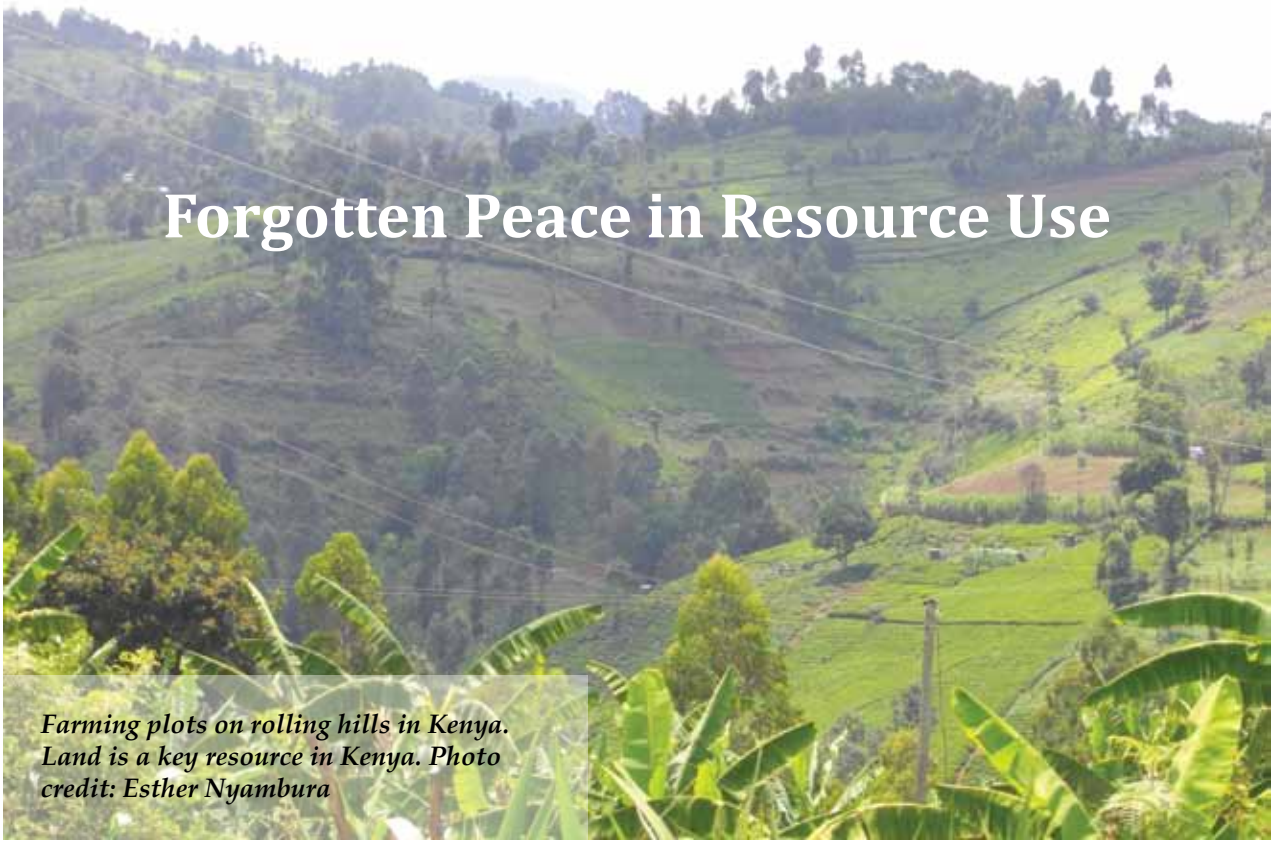
Forgotten Peace in Resource Use



Farming plots on rolling hills in Kenya. Land is a key resource in Kenya. Photo credit: Esther Nyambura

Mwaka wa elfu moja mia tisa tisini na tatu (1993), ming'ang'anio ya rasilimali za ardhi ilipelekea ghasia kati ya wamaasai na wakikuyu kusini mwa bonde la ziwa Naivasha katika (sehemu zinazoitwa) Maiella na Enosupukia. Walakini, kwa kushangaza, siku hizi uhusiano kati ya Wamaasai na Wakikuyu ni wa amani. Majirani hawa sasa hutumia vilivyo juhudi zisizo za aina moja, za kijamii na kiuchumi, pamoja na maelewano ili kupunguza au kudidimiza mizozo. Pia, wakitumia kamati za amani kama wazee wa usalama (local peace commitee) na mpangilio wa Nyumba Kumi, majirani hawa wametilia maanani utimizaji au utekelezaji wa azimio la utulivu kuhusu mambo ya ardhi na mizozo mingine ya aina hii, na pia migogoro.

Licha ya vipingamizi visivyoweza kuepukika ambavyo hufanya sehemu ya muundo wa jamii, uhusiano wa kijamii na kiuchumi kama vile miingiliano katika ndoa, kodi za ardhi (kwa mfano umilikiaji wa ardhi), biashara (kama ya mifugo), huwawezesha majirani hawa kutumia, wote pamoja, rasilimali za ardhi zilizozozaniwa hapo awali, na kuchanganyikana, kwa amani katika kujihusisha kwenye uchumi wa masoko. Zaidi ya yote, mikakati au mienendo hii ya uhusiano huhimiza mshikamano na kuishi kwa pamoja.

Have you ever wondered why scholars and the media have so much passion for violence? Especially social scientists show overwhelming interest in studying resource-based violence in many parts of Africa, the majority seeking to explain the causes of violence. The anthropology of conflict boasts a wide collection of studies in the last century, compared to the anthropology of peace and nonviolence. Anthropologist Leslie Sponsel considers this uneven interest in warfare as strange.

In the run up to the 2013 general elections in Kenya, a peculiar kind of tourism landed in Nairobi. Here, a UK-based journalist observed how international journalists came to 'hunt' for violence, eager to link it to state failure. Violence between communities, which often coincides with general elections in

Farm plots in Mpeuti village, Enoosupukia. The land is mainly owned by Maasai (including Dorobo). Landowners lease farmland mainly to Kikuyu from Central Province (Kiambu, Murang'a, Nyeri). Photo credit: Esther Nyambura

Kenya, seemed inevitable in 2013. In addition, the 2007/2008 post-election violence gave hope to the interested audience for the possibility of violence in 2013. However, the elections were peaceful. The UK-based journalist noted that the turn of events caused frustration among those who had already predicted violence.

Of course, there are widespread instances of conflict and violence in much of the continent. Resources such as land and ethnic-based politics top the list of causal factors in Kenya. Nevertheless, studies have shown that nonviolence and peaceful relationships between communities are the rule rather than the exception in much of Africa (and Kenya) and the post-Cold War world. Leading authorities in East African studies interpret community relationships as wavering between conflict and coexistence, where, generally, coexistence overtakes conflict.

Indeed, the existence of a community largely depends on people's ability to cooperate. This often happens through day-to-day social and economic interactions. Individuals and groups share resources, including land, which, for many scholars, is the main cause of violent conflicts. They interact to earn a living, mostly with little regard for ethnic notions, which 'should' set them apart. They intermarry and raise children with mixed blood who, arguably, strengthen the bond between groups, resulting in what anthropologists term conflicting loyalties. In many ways, ethnicity has not been a divisive tool but rather a unifying one.

In fact, groups do not actually have to be 'peaceful' to guarantee cooperation. For instance, some commit to nonviolent behaviour following painful lessons of engaging in violent conflict. Studies show that conflicting groups find non-violent ways to prevent and resolve pertinent problems affecting them, to enhance survival and adaptation. Cooperation is therefore an important aspect of adaptation. Anthropologists refer to these social and economic relationships and networks as cross-cutting ties, which encourage nonviolent behaviour. Although ties and networks may breakdown, as expected in a normal society, community members often rebuild them or nurture new ones. It is therefore no surprise that violent conflicts may not necessarily account for permanent displacement of populations.

Intercommunity relationships do not necessarily diminish with instances of conflicts or violence. Likewise, antagonism, conflict, and violence do not always account for lack of peace because peace is not the absence of violence. In fact, scholars interested in peace and nonviolence and those interested in conflict resolution agree that antagonism may coexist with, and even help to construct, systems of peace and nonviolence.

Kikuyu daki (temporary home) in Mpeuti village, Enoosupukia. Farmers negotiate with their Maa-speaking landlords to settle in rented farm plots. Photo credit: Eric Kioko

Maasai herder moving small stock from the cultivated areas of Enoosupukia in search of pasture. Photo credit: Eric Kioko

Disputed, but peaceful Maasai/ Kikuyu borderlands

The Maasai of Kenya are well known – at least for their culture, which attracted the attention of early explorers, colonial chiefs, tourists, and scholars. Historians have shown the friendly coexistence between Maasai and their Kikuyu neighbours at least since the nineteenth century. Apart from exchange, intermarriage and adoption, the two groups borrowed many aspects of culture, including language, age organization, and belief systems from one another. Nevertheless, conflicts were also part of the social order. Especially the search for grazing spaces evoked occasional feuds between Maasai and Kikuyu. However, the value they attached to coexistence enabled the two groups to resolve emerging conflicts through nonviolent means.

Nowadays, the Maasai and Kikuyu harness much of the previous relationships more than ever before despite numerous social, political, and economic changes. Oscillations between coexistence and conflict define the groups' social order, and perhaps they are reasons for the continued adaptation to numerous environmental and man-made disasters today. Therefore, violent conflict between Maasai and Kikuyu may not be interpreted as lack of peace. This is the case in the borderlands of the Lake Naivasha basin (Maiella and Enoosupukia) where the two groups live.

In 1993, politically instigated violence against Kikuyu farmers in Enoosupukia led to a massive attack by a non-official Maasai militia with assistance from game wardens and administration police. The violence accounted for about twenty deaths of Kikuyu farmers and forceful eviction of thousands of Kikuyu from Enoosupukia. About a dozen Maasai also lost their lives at the hands of Kikuyu fighters. The popular narrative was that Kikuyu migrants from central Kenya (e.g. Kiambu, Murang'a, Nyeri) had since the 1900s invaded and destroyed hunting grounds of the Dorobo and pasturelands of the Maasai through intensive cultivation. The political message was very simple: "kick them out".

Today, the situation is surprisingly different. Hundreds of former evictees not only farm in the former conflict area, but have also established settlements there. A good number even became in-laws to the Maasai, redirecting attention to the earlier interactions in the colonial times. Among other benefits in intermarrying with Maa-speaking landowners, the Kikuyu enhance their security of land tenure. The majority farmers lease land for cultivation from Maasai landlords. Land rentals open a new world of interactions and benefits, some touching on trade. The Maasai utilise returns from land rentals to increase their herds, to invest in cultivation, to pay school fees for their children etc. For many Maasai, the Kikuyu tenants constitute their main source of income.

Landless farmers have access to land without being the legal owners; they can now invest in commercial cultivation. Some commercial farmers have used their returns from sale of produce to buy land within the Maasai area. A few bought tractors for farming, which have often been rented by Maasai wishing to join the lucrative business of commercial cultivation. Of course, cultivation enhances food security, especially among the Maasai. Consequently, Maasai do not have to slaughter livestock for food or sell cattle, goats, or sheep to pay school fees.

As one would expect, conflicts between herders and farmers are many, but they play a minor role in disturbing coexistence. These and other conflicts involving land are increasingly resolved at the local level through application of local norms, values, and institutions.

Neatly divided plots in Enoosupukia each with its own owner and lease. The people nevertheless grow similar things. Photo credit: Eric Kioko

What is Local?

What does it mean that something is local? Is it the contrast with the bigger global and regional that determines it or does it exist in its own right? Is something local if it links to the regional or global? Or is it only local if it can be seen in isolation from the outside world? Is it actually meaningful to talk of something local today when it is no longer meaningful to talk of closed systems where contact with a bigger system of governance and contact to relations outside the community is lacking? Today, even in the farthest corners of Kenya networks reach far outside the enclosed space with mobile phones and more interaction on different scales and ways than before. So perhaps we need a new term to denote 'the new local.'

A Samburu woman in her local attire. However, both beads and cloth that adorn her were and are part of the global trade. Photo credit: Marie Gravesen

Who belongs here?

To be able to belong to a certain place or a piece of land means to be able to claim ownership of it. There are different ways to argue for such an ownership claim. One way is to use statutory law with private property rights and another one is to use customary rights with historical arguments that prove presence for the longest time period.

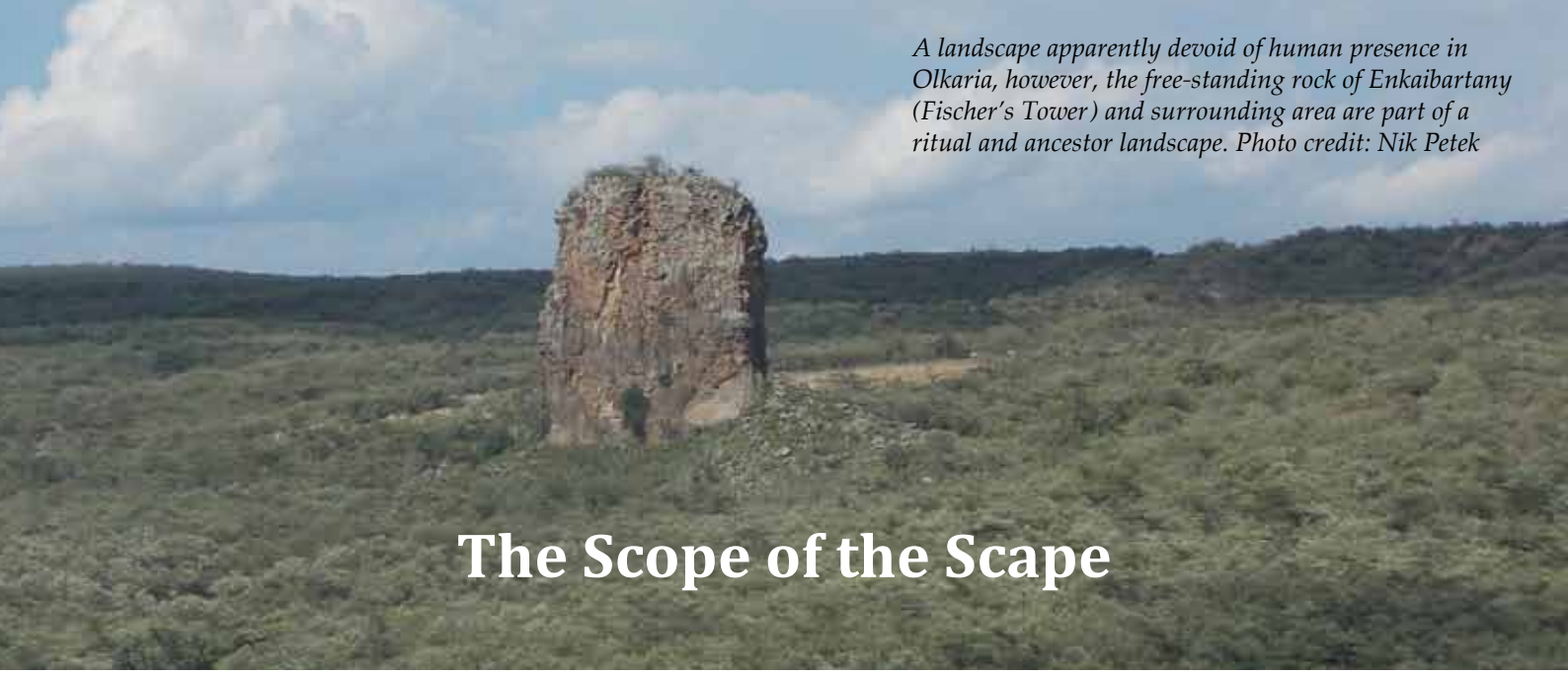
As for the customary argument, if someone is evicted by others they could claim their land back by tracing their belonging further back than the new holders of the place. In this case the evicted could trace their 'belonging' with burial sites, space for ritual practices or important meeting places.

On both sides the parties could strengthen the argument by claiming the landscape in different ways. The ethnic group Samburu, who are related to the Maasai, are present as pastoralists in Laikipia, northern Kenya. For them, you claim land by grazing it with your animals. This creates a landscape with few trees and bushes but much grass, as this is what is useful for the purpose of grazing. The idea of private ownership is meaningless to the Samburu, because user rights traditionally belong to the community as a whole. Instead, it is important to acquire and maintain access to a place. Contrastingly, for Kikuyu farmers in Laikipia, their ways of claiming to belong to the land is by following the dominant discourse of statutory law that was established under colonial rule and simply buy land. By virtue of a piece of paper with a place and a title deed they could then claim to be the rightful owners of the land. They would not claim ownership by creating grazing land but rather by creating agricultural land with fencing to mark the boundaries. The terms for these two arguments, customary and statutory, are fundamentally different. This complicates and continuously ignites conflict. These conflicts can be either passive through processes of inclusion of some individuals, e.g. through community functions while others are excluded, or at times the conflict may turn into violent clashes.

Example: Before colonialism, the land in Laikipia was predominantly used by pastoralists. During the colonial period, the land was exclusively controlled by 'whites' as part of the White Highlands. The colonial administration had little understanding for pastoralism because it was based on mobility, moral codes of access and community ownership rather than stable settlement and individualism. As the pastoralists did not 'own' the land in the western sense, they evicted them and gave priority to the non-pastoralist Kikuyu as farm labour. The Kikuyu had already received basic western education from the missionaries and had a good understanding of cultivation - they were thus more like the whites in many ways. Towards independence, in 1963, the interest among African communities in (re)gaining access to the large ranch areas for various livelihood practices was very high. After Independence the Kenyan and the British Governments designed a range of settlement schemes to buy out the white landowners and subdivide the land to meet the demand for small-scale farming. Many Kikuyu bought land through these schemes and are now in conflict with other communities with the other sense of ownership and way of claiming to belong to the land, such as the pastoralists who claim to have been present before the colonial power holders forcibly moved them.

Fencing is used to ascertain a claim to land and to border off the land, restricting access. Photo credit: Marie Gravesen

But which argument is better? Who belongs? Those who can historically claim to belong 120 years ago or those who bought land from the colonial settlers as private property?



A landscape apparently devoid of human presence in Olkaria, however, the free-standing rock of Enkaibartany (Fischer's Tower) and surrounding area are part of a ritual and ancestor landscape. Photo credit: Nik Petek

The Scope of the Scape

It is a very human characteristic to be preoccupied with the categories into which we sort the world around us. Defining the space and time in which our lives unfold gives us perspective and brings meaning to our existence. For instance, some scholars have named the time period that we live in today the Anthropocene. The age of humankind.

Just like the Anthropocene is one unit of classification for the time in which we live, landscape is a unit of classification for the space in which we live. Landscapes are studied from the perspective of geographers, urban planners, philosophers, environmentalists, paleoecologists, artists, and economists to name but a few. Yet landscapes are more than just parcels of land, they are symbolically imbued and multi-layered. People are constantly recreating and being redefined by the landscapes they inhabit, and landscapes exist in our minds and memories just as much as they exist in space. Perhaps now, more than ever, is the concept of landscape relevant, as all landscapes are equal parts cultural and natural in the age of the Anthropocene.

Landscapes can stretch on to any number of horizons, and sometimes they are classified by what the eyes can see, the ears can hear, the nose can smell, and the body can touch. For example, gazing up from the Amboseli basin in southern Kenya, the greens, blues, greys and snowy whites of Mt. Kilimanjaro form a majestic landscape feature the senses cannot fail to take in. However cartographers and politicians do not consider Mt. Kilimanjaro to be a feature of any Kenyan landscape, as since 1886 the volcano has been positioned within the borders of Tanzania. This is despite the fact that Mt. Kilimanjaro plays a tremendously important role in regulating rainfall and water resource availability in Amboseli, and without Kilimanjaro the basin as we know it could not exist. The features of a landscape are sometimes determined by our senses, and sometimes decided by our systems.

The scope of a landscape varies so much depending on where it's being conceptualized from. Recently, the severe outbreak of Ebola in 2014/2015

Gazing up at Mount Kilimanjaro from the Kenyan foothills. Photo credit: Anna Shoemaker

The Kenyan Tanzanian border since 1886. Photo credit: Google Earth Pro

that concentrated in Liberia, Sierra Leone, and Guinea prompted many in the international community to expose their perspective that Africa is more of a country than a continent. As the tragedy of the Ebola outbreak unfolded, tourism to Africa's renowned wildlife safari destinations such as Tanzania, Kenya, and South Africa faced troubled times as waves of travellers cancelled their trips over fear of contracting the virus. The association of the West African Ebola epidemic in the minds of tourists to the savannas and rangelands of Eastern and Southern Africa was inconceivable to many tourism operators, who were powerless to convince clients that there exist vast geo-political boundaries separating them from the virus.

Another volatile issue in East Africa is landscape ownership, with accusations of land-grabbing being directed at a host of actors. One form of land-grabbing includes foreign companies and governments leasing or acquiring staggeringly large and strategic tracts of land to grow crops or extract resources. This phenomenon has increasingly come under international scrutiny and is reminiscent to some of a second scramble for Africa. Others defend these land deals saying they are facilitating development through foreign investment. Immediate problems arise when higher powers sign away the rights to 'unused land' only to meet resistance from the people who consider these landscapes their homes and do not recognize the validity of contracts negotiated without their consent. The stakes are high when competing ideals regarding landscape utilization and possession come to clash.

The lived experience of inhabiting a common space can also vary enormously depending on the circumstances individuals are born into, this being particularly true in urban landscapes. For instance, Nairobi is considered one of Africa's most politically, financially, and culturally influential cities. Nairobi is home to both Kibera, the largest urban informal settlement in Africa, and Karen, an affluent suburb known for its European expatriate population. Access to education and healthcare, even electricity and running water is a virtual impossibility for many residents of Kibera. Karen is the location of the Nairobi Polo Club, houses sit on large leafy plots many with their own crystal clear swimming pools, and children here attend some of Kenya's best schools. Remarkably, the two neighborhoods are situated side by side, buffered only by the Ngong Forest Sanctuary, the last remaining indigenous forest in Nairobi. Like many urban environments, Nairobi is a city of sharp contrasts, where lives are shaped to a profound degree by the landscape.

Landscapes also do not only exist in one dimension of time. Some landscapes are experienced as modern and new while some can be experienced

The Anthropocene

According to officials at the International Union for Geological Sciences (IUGS) we here on planet Earth have all been living in a time period called the Holocene for the past 11,700 years. Holocene is a word of Greek origins for the current geological epoch (holos meaning entire, and cene for new). However, debate is heating up over whether or not a newly proposed term, Anthropocene (anthropo for "man" and cene for "new") would be a more appropriate moniker for the time period in which we live. Those in favor of the name change believe that Anthropocene better reflects the fact that human activities are impacting the environment on an unprecedented and planetary scale. A specially commissioned group of the IUGS is currently hard at work deciding on the merits of the Anthropocene proposal, and has promised to rule on the validity of the name change by 2016.

Maeneo hufanyiwa uchunguzi kulingana na mtazamo wa wanajiografia,wakuu wa mipango ya miji, wanafaisafa, wanamazingira, wasanii na wachumi-hawa wakiwa ni wachache tu miongoni mwa hao wanaohusika. Walakini maeneo siyo tu sehemu za-au mapande ya-ardhi bali yamejazana na ishara na pia yametokana na mipangilio ya safu nyingi chini ya ardhi. Watu wanaendelea kugeuza maeneo muda wote, na vilevile kutambulishwa na maeneo yenyewe wanamoishi-na tena maeneo hukaa katika fikra na kumbukumbu zetu sawa na kama vile yalivyo katika ardhi. Pengine sasa kuliko wakati mwingine wowote, mtazamo ule uliopo juu ya maeneo unahusika kwa vile maeneo yote ni sehemu zilizo sawa kwa utamaduni na uasili wakati huu na katika kipindi hiki. Maeneo ni aina za ardhi ambazo uzoefu wetu daima huunda, hubadilisha na hufanyiza tena. Eneo lolote lile lina hali ya-au uwezo wa-kuwa: huria, pa kushangaza, panapojulikana, pa hatari, salama, mjini, patupu, pako au penu, pangu, na petu. Maeneo yametokana na mipangilio ya safu chini ya ardhi, na upeo (au uwezo) wa eneo hutambulishwa na idadi yoyote ya viungo (au viunganishi), yaani yale yanayojihusisha pamoja na kuunda eneo.

as contemporary but imbued with historical, forgotten, and even mythical character. For instance, Stone Town in Zanzibar is best known as a historical site, a 19th century center for the spice and slave trade. Also in Tanzania, Olduvai Gorge is a landscape of discovery from which remains of some of the earliest human species have been found. Mount Kenya figures into Kikuyu religious traditions, as it was believed to be a sacred place inhabited by the god Mwene Nyaga. Of course all of these spaces endure today, but knowledge of their past continues to shape them.

This imprint of time highlights another important aspect of the landscape: It is not a static entity, but a continuously changing and continuously evolving one. These changes occur across all of its facets; from ecology to culture, from local land use to political boundaries. When looking at the landscape as a whole it is important to keep this in mind. The various impacts that have shaped the landscape over the centuries continue to do so now and in the future. Changes in climate will influence the composition of the vegetation. Migration of pastoralists will decrease or increase the pressure put on the landscape by grazing. Political decisions can change the purpose of a piece of land. These changes can be slow or abrupt, they can be marginal or they can influence the lives of thousands of people. When speaking about the concept of landscape it is important to understand this multidimensionality. A landscape is a continuum, a series of changes strung together and influenced by a multitude of factors both natural and cultural. What we see today is but a snapshot of a larger whole.

The measured distance between the former tourist and ebola hotspots of Africa.
Photo credit: Google Earth Pro

The proximity and void dividing Nairobi's Karen and Kibera neighborhoods.
Photo credit: Google Earth Pro

Landscapes are categories of space that our experiences endlessly configure, renegotiate, and remodel. Any one landscape has the capacity to be wild, beautiful, strange, familiar, dangerous, safe, urban, empty, yours, mine, and ours. Landscapes are layered, the scope of the scape is defined by any number of constructs.

Sunbirds on the banks of the Victoria Nile River in Murchison Falls National Park in Uganda. Photo credit: Nik Petek

About to find its next prey, the fish eagle flies out over Lake Baringo in Kenya's Rift Valley. Photo credit: Geert van der Plas

Raiders of the Lost Archives: We are what we collect, we collect what we are

Njia mojawapo ya kuelewa na kutambua historia ya nyakati mbalimbali katika maisha ya binadamu ni kwa kutumia makavazi. Kuna imani iliyojengeka miongoni mwa watunza nyaraka kwamba kilichomo katika nyaraka ndicho kinachoonesha namna jamii fulani ilivyokuwa wakati nyaraka hizo zikitengenezwa. Hii ni kwasababu kile kinachokusanywa na kuhifadhiwa katika nyaraka kinatokana na vitu ambavyo jamii husika inavifanya. Imani hii ya watunza nyaraka inafanya makavazi kuonekana kama sehemu au chanzo kizuri kujifunzia na kuelewa mabadiliko ya jamii katika nyanja za kijamii, kiuchumi na kiutamaduni ambavyo jamii husika imevipitia. Makala hii inatoa maelezo kidogo kuhusiana na makavazi. Mkazo zaidi umejikita katika kuwafanya wasomaji wa makala ambao hawajawahi kutumia makavazi na wangependa kuzitumia baadae kwa ajili ya utafiti waweze kuelewa maana ya makavazi na aina zake, matumizi na changamoto za kuzitumia taarifa kutoka katika makavazi. Pia, makala hii inatarajia kuamsha ari ya matumizi ya makavazi kuvuka ulingo wa nyanja mbalimbali za kitaaluma.

One of the ways used to understand people's history through time has been through the use of archives. There is a shared belief among archivists that what is stored in the archives represents a particular past of a society, as what is collected for preservation in the archives comes from what the society was doing. This makes archives good sources for understanding the social, economic and cultural diversities that a certain community has passed through. This article provides anecdotal information about archives with emphasis on meaning and types, uses and challenges. The article hopes to inform readers who have not used archives before and would wish to use them for research. It is also expected to stimulate the use of archives across disciplines.

Meaning and types of archives

Archives are simply documents that were produced by individuals, governments, companies or Non-Governmental Organisations (NGOs). The documents were not meant for research but for the daily running of private and institutional activities. Any individual can create his or her own archive. For example, when individuals decide to keep their examination papers and records, love letters, daily diaries etc. We can even ask ourselves, for who do we create archives? Archives are there for everybody. Anybody can create them and anybody can use them for various purposes.

Because of the philosophies that guide the creation of archives, researchers need to be extra careful when dealing with archival documents. The person creating a particular document, let's say a field diary, had certain motives for doing so. Such motives were not necessarily the same as those being researched and they will not provide absolute information on a particular issue. Expressions provided in archival documents should be subjected to contextual understanding to grasp the intention of their creation. Without this, our research may end up reproducing the voices of authors, instead of unravelling the information which we can use to strengthen research arguments. Therefore one should attempt to read the minds of the authors before entirely dealing with the documents. This will simplify understanding the reasons for production of some documents. What should one expect when reading archives on cold war involvements? One is unlikely to find anything positive about America in Russian archives and vice versa. But this does not mean that there were no positive things on either side. This is where the researcher's eye needs to come in. The researcher should not throw out the documents and just conclude they are one sided. It's better to use them in close reference with other sources – corroborate the sources.

Archives can be classified into different categories. We may classify them by the people and institutions that created them, or the themes contained in

A tranquil room in bustling Nakuru with archives spread out. Researchers go through hundreds of documents in the hope of discovering something new. Photo credit: Marie Gravesen

them. For example, based on who created them we can have private and individual archives. Private or individual archives are created by individuals and are sometimes stored in private repositories or, if the creator was an influential member of a particular society, they can be stored in public archives. They may include travel accounts, field diaries, personal letters, etc. Private archives can be used for people's biographies or, in other cases, they may carry information about a particular community. In most cases when these are stored in private repositories, the accessibility of these types of documents depends on the relationship established between the owner of the archives and the researcher. But when the same archives are taken to the national or regional archives, access often becomes less of a problem.

On the other hand, institutional records, which might look something similar to the documents used by NGOs or commercial companies, are produced by institutions and carry their histories, development records, challenges, future prospects and so on. For example, if your research concerns Christianity in Eastern Africa, you will be required to locate the Missionaries' records in different archives, which may include early records of Africa, owned by Missionary Societies and visiting the Church Missionary Society (CMS) archive in Birmingham. However, if the research is the on early experience of East African environments, it might be a good thing to visit the Royal Geographical Society in London. But for all types of archival resources, it is never surprising to find nothing relevant to your research, as the creators had no intention to prepare them for this purpose. Also, as with individual archives, access to companies' and NGOs' archives may also be complicated. Some of these institutions are not comfortable opening up their history to outsiders.

The only reliable types of archives are the government archives. Access to these is granted subject to you following the rules and regulations governing them. Government archives are produced based on daily government activities. But they will still be politicized. Government documents are not "clean," they just offer a different perspective

on events than personal or institutional archives. They are also written by government officials for other government employees with either hidden or open intentions. It is the duty of the researcher to understand the documents.

In most cases such documents are stored in the national archives (buildings created for the specific purpose of storing records – public or private). In the case of the African continent, archives for the colonial period can be easily accessed in the archives of the former colonial powers. For example, for Anglophone countries in Africa, the materials are found at the British National Archives – in Kew, formerly Public Records Office. Not all files are in England but they are better preserved than in the former colonies and can easily be obtained and used.

Archival sources for all?

Traditionally, archives have been a working place for historians but contemporary academia encourages the use of a wide range of sources for academic works. Some people may ask, for example, what use are archives to a social anthropologist, archaeologist, linguist or even a natural scientist. The answer is as simple as asking the role of sources of information in research. Archives contain different information that can be used in various disciplines. They contain records, for example, that may have information on different diseases, occurrence patterns and treatment. They can tell crop or plant histories which are important and can provide anecdotal information useful to palaeoecologists, archaeologists, ecologists botanists and so on. In that way, the use of archives can contextualize historical and non-historical data and thereby be used to triangulate/validate data. However, it is always a challenge to be specific enough in how to search in the archives.

Challenges of using archives

It is not easy working with archives. This is not because the materials are diverse and might be confusing, but as a result of technical and special challenges. A researcher needs to have some basic skills to work with them and not everybody can interact with archives successfully. The researcher needs to understand how certain archives are organized, how they work, and how the documents are arranged. It is a little bit easier to work with archives that provide an online catalogue because the researcher can find out what is housed in the archive without visiting the archive physically. If the researcher visits the archive unaware of this basic information, archival work can end up being frustrating and back-breaking. Archives are arranged into topics, regions, classes, series, folios etc. All these arrangements are not there because of fashion, but they stand out to help researchers simplify their search of documents. However, even if one follows all the requirements as pre-requisite for starting archival research, it can rarely be guaranteed to get the documents as indicated in the catalogues – especially in the developing countries. Some archives in developed countries are well endowed with information from within and outside their physical boundaries. Sometimes, a little bit of courage and hope need to be taken along when dealing with poorly organized archives.

Researchers should work with the materials available in the archives and find other sources elsewhere to complement their work. There is no source in research that can be considered superior or inferior over another.

Archives, more than just being a document storage, have also been a source of antique photographs of people and landscapes, like this one from Rhodes House in Oxford showing the ridge of the Rift Valley

Dung! - Landscape modeller and archaeologist whisperer

A view of Lake Baringo from the cliffs above Kiserian, where the first British colonial outpost in Baringo once stood. Photo credit: Nik Petek

When did you last think about poo? Poo does not make its way into mainstream conversation easily, but perhaps it should. It is fascinating and holds the interest of many researchers who recognise that the most common occurrences are our most defining, even though they foster little attention. Poo is such a defining occurrence in humans and animals alike, and it plays an ever more important role in our lives. For example, poo is a readily available source of manure, it is a source of biogas energy when digested by bacteria, and it plays a vital role in the transformation of the landscape.

Thanks to elephant droppings, there is now a plentitude of Borassus palms dotting the savannah of the Murchison Falls National Park in Uganda. Elephants were consuming the fruit of the palm in South Sudan before making their way to Uganda, transporting the seeds in their guts. Once in the park the seeds were expelled with the droppings, giving the seeds a head start with extra nutrients. In just a few decades, the Borassus palm has become one of the most common trees in the park. Similarly in Baringo, Kenya, the plant *Prosopis juliflora* spread at an incredible pace because the plant's pods are tasty fodder for goats. The seeds germinate as they pass through the goat and flourish when they are deposited with goat droppings. In only 30 years Baringo became completely unrecognisable and goat excrement played an important role in the spread of the plant.

Livestock dung, particularly that of cattle, also exhibits considerable force when shaping the landscape. Cattle are the most commonly kept livestock in the world and to pastoralist communities in East Africa they are synonymous with wealth, prestige, and identity. A common practice among pastoralists is to enclose their cattle within their homesteads into livestock pens, where dung accumulates for a few years. After the homestead is abandoned, the mound of dung decays and

Uwezo wa mavi ya ng`ombe yaani samadi na mengi yanayowezekana na ambayo tunapata kutokana na samadi yenyewe, mara nyingi hupuuzwa. Samadi ina matumizi mengi, kuanzia utoaji au uzalishaji wa umeme hadi kurutubisha ardhi na kadhalika. Zaidi ya hayo, inazidi kuwa kitu muhimu kama kitu kimojawapo cha kufanyia uchunguzi au utafiti wa mazingira kwa vile ambavyo urundikwaji mwingi wa mbolea hubadilisha maeneo ikikuza zaidi ukuaji wa nyasi kadhaa zinazopendelea hewa ya nitrojeni na kupunja mimea mingine, ikiyageuza maeneo kuwa mahali panapopendeza au kuvutia sana. Samadi imekuwa sehemu ya kipekee iliyo muhimu itumikayo katika kujifunza tamaduni na desturi za kale za wafugaji. Watu wanaosomea majengo, vifaa, makaburi na vitu vingine vilivyotumiwa na watu wa kale ili kujua jinsi maisha yao yalivyokuwa, yaani wanaakiolojia, wanaweza kutumia chembechembe za samadi kutafuta mahali ambapo watu hao waliishi, malisho gani yalitumiwa kwa mifugo na jinsi hali ya kuchunga ilivyobadilisha maeneo na kuwa pa mimea, nyasi na miti vilivyonawiri pamoja na kuwa mahali pa wazi na uoto wa kijani. Kuchunguza samadi iliyokaa kwa miaka mia moja kunawatambulishia wachunguzi wa mambo ya kale mambo mapya kila siku.

provides the soil with much needed nutrients. A few years later, the plants will colonise the abandoned homestead in a specific pattern, which will create a large circular and open feature in the landscape. The exact appearance and the vegetation within the abandoned homestead varies depending on where in East Africa you are. The best known feature is called a 'glade', which is an open space characterised by juicy grasses surrounded by bushes and trees.

Landscapes, characterised by bare lands or dense bushes, can become remodelled with plant-rich patches dotting the land. Areas in Baringo in the Kenyan Rift Valley, inhabited only 20 years ago, are now full of trees growing in circular fashion, making it clearly visible where people built their homesteads. In general, these features enhance environments. For example, the nutritious grasses of the glades attract large grazers like Thomson's gazelle and wildebeest, and small animals like insects. The grasses and animals combined create biodiversity hotspots, which promote the environment's resilience against biodiversity loss. This is particularly important when scientists are warning of the upcoming sixth mass extinction. More than just being an agent of vegetation change, dung can have a real impact on whole ecosystems, shaping animals' habitats and increasing their chances of survival.

The features born from abandoned homesteads can measure from tens of metres to over 200 metres wide. While most remain visible only for a few decades, one such feature in Laikipia extraordinarily survived for a few centuries. The enduring visibility of abandoned homesteads on the landscape is extremely useful for archaeologists interested in the lives of pastoral people over the millennia.

Archaeologists study humans and the manifestations of the various societies and cultures they created across the world from the beginnings of the species Homo up until today, by looking at material remains left behind and the modifications to the land they lived on. A branch of the discipline is pastoralist archaeology, which is concerned with understanding pastoral communities. In Africa, pastoralist archaeology has long been preoccupied with identifying the first appearance of domesticated livestock, the first 'purely pastoral' community, and the spread of pastoralism across the continent. However, over the past decade, research interests have diversified and archaeologists are much more motivated to understand pastoralism over the entirety of its history, rather than just its beginnings.

The oldest evidence for pastoralism in East Africa comes from the shores of Lake Turkana and dates to 4500 years ago. The practice spread quickly south, reaching southern Kenya and Northern Tanzania by 4000 years ago, and by 3500 years ago pastoralists also settled in what is now Tsavo. Pastoralists have left behind some remarkable archaeological sites, such as Prolonged Drift, south of Lake Nakuru in Kenya, where over 225,000 stone artefacts and 165,000 bone fragments were found, or the stone pillar sites around Lake Turkana in Kenya, which are the oldest found instance of monumental architecture in East Africa. Unfortunately for archaeologists, such sites are exceptionally uncommon. Over millennia, pastoralists have left very few easily identifiable traces of their presence in East Africa. Many possessions were made from organic materials. Bodies were adorned with leather, berries, ochre and clay, while houses were built of mud and thatch. These materials quickly

Mother and baby elephant passing through Murchison Falls National Park, Uganda, occassionaly checking Borassus palms for fruits. Photo credit: Nik Petek

degrade, leaving behind little for an archaeologist to find. Hence, even though pastoralism in East Africa has been studied by archaeologists for several decades, we know less about them than we do of the life in Swahili stone towns that dot the East African coast.

However, the introduction of new scientific techniques to archaeology and a wider availability of aerial photos and satellite images have allowed archaeologists to find more traces of pastoral archaeological sites and to gain novel insights into this part of history. The attention shifted from the first domesticated cow or the first pastoralist site, and emphasis is given to the entire history of pastoralism in East Africa. Images generated by satellites are sharper and of higher resolution than ever before, and in combination with easy-to-use applications such as Google Earth and Bing Maps, features such as abandoned homesteads (recognizable all thanks to the large accumulations of dung) can be easily identified. Archaeologists are now able to scan large areas quickly and at low cost, leaving their office only when they are ready for excavations. When an abandoned homestead of interest is spotted, archaeologists select a particular place within it and excavate a trench a few metres big. Excavating slowly and precisely, they collect artefacts like pottery, bones and beads, and record anything and everything that will help them interpret who lived at the site, and how.

A mound of white soil from decayed dung. Photo credit: Nik Petek

Vegetation circles like this one dot landscapes where pastoralists once lived. Photo credit: Nik Petek

Densely scattererd pottery tells archaeologists where to find settlements. Photo credit: Nik Petek

Better satellite and aerial images also allow for the identification of features associated with pastoralist settlements which can only be seen from a bird's-eye view and are easily overlooked on the ground. For instance, at the site of Ilchamus Leabori in Baringo, where pastoralists also farmed extensively, easily visible lines of dense vegetation running across the landscape are signs of irrigation furrows. But these are only clearly visible from the air, and are hard to spot on the ground. Satellite images with clearly visible glades now allow archaeologists to study population movements across the landscape, building on understandings of how people come together, spread out, and relocate through time. This kind of information is important when reconstructing the evolution of environments, which have been shaped by humans, an important topic today in the age of increasing population pressure.

Pastoral archaeologists have also long been interested in the bones of animals that have been excavated from a site. People are trained to identify the specific animal a bone is from and even how old the animal was, its health and how it was killed. Of course this skill was needed to find the oldest domesticated livestock. Additionally, bones and particularly teeth, are used in sophisticated isotopic analyses to help archaeologists understand where an animal lived, what it ate, and even what the weather was like during its life! Archaeologists are also very keen at spotting changes in sediment texture, colour, and composition, and all of these help to piece together what was happening at pastoralist sites centuries ago. Understanding the chemical signatures and microscopic appearance of soil from various parts of recently abandoned homesteads, like house floors and livestock enclosures, gives the basis for comparison with very old glades. Because dung impacts soil formation in a very unique way, archaeologists are also able to identify old and disappearing features based on their chemical signature.

Working together, environmental researchers and archaeologists are able to do and know so much more since the importance of poo in ecosystems was realized. So, next time you are discovering the marvellous East African landscape and you come across a big pile of dung think to yourself: "In some years this could make beautiful grazing land for elephants, gazelles, and cattle. This area is going to change because of dung." Many of the things we consider commonplace and ignore, can be, and usually are, important for maintaining or transforming the world around us. So in the future do not underestimate the power of dung.

Sunset over Lake Baringo. Photo credit: Geert van der Plas

History in the mud

If someone asked you to tell them what the environments of northern Kenya looked like hundreds of years ago and how people lived in those environments, it is more than likely that your face will become perplexed by the request. How could you know, when you have never seen or lived it. Your grandparents could have passed on to you some stories of the past, but those are only snippets of the whole story. Luckily, there is in fact a way to see that past! This text will take you, in search for answers, down to your nearest lake. However, it is not at the lake shore, but the lake bottom that the treasure is hidden.

These days we know a lot about lakes. Lakes are important components of any environment. They provide habitats for aquatic organisms, such as fish, which are an important source of protein for many humans. Lakes also serve as sources of water, a crucial resource and a basic necessity for the survival of land animals and plants. The outstanding beauty of such large bodies of water makes them ideal spots for tourism and leisure activities, while hydroelectric dams and irrigation agriculture using lakes support various economies around the world. The list of socioeconomic, ecologic and aesthetic values that lakes provide for humans and for the wider ecosystem are countless.

Naturally, lakes are formed when local depressions or basins are filled with water. The basins and depressions are formed by geological activities, such as volcanic eruptions and tectonic movements, which break the earth's crust resulting in bowl shaped basins. The Great East African Rift Valley is a unique example where geologic forces shaped

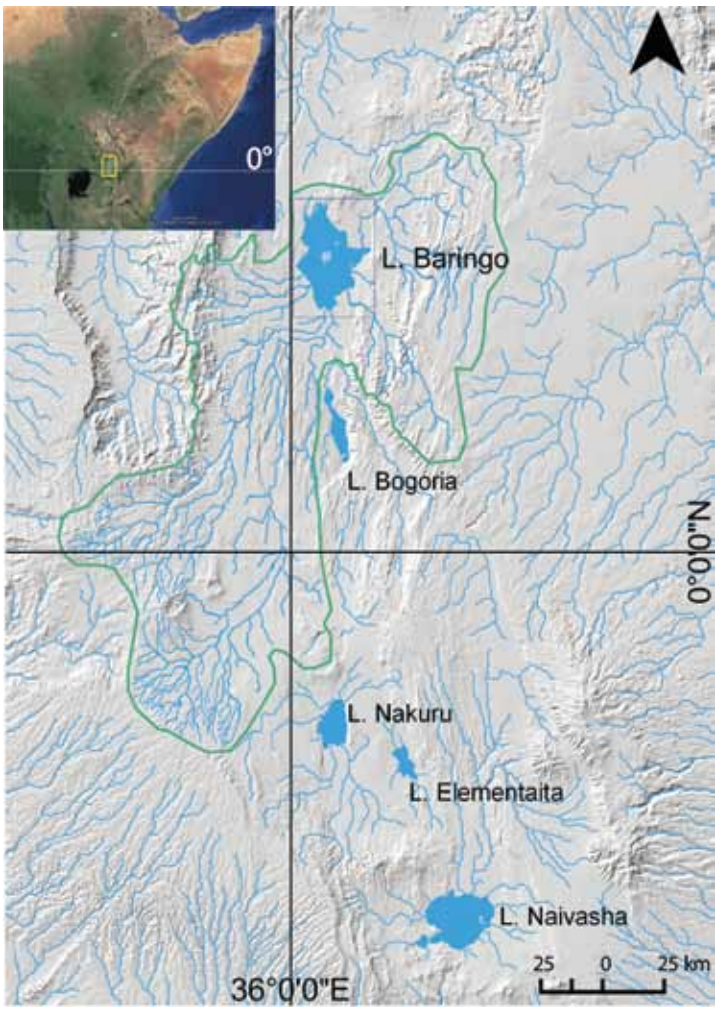


Figure 1. Digital topographic map showing lakes and major drainage in northern Kenyan rift valley (ASTER GDEM a product of METI and NASA), and the inset Google Earth satellite image (Google © 2015 TerraMetrics, access on 29-08-2015) showing the location of the lakes in the general East Africa region.

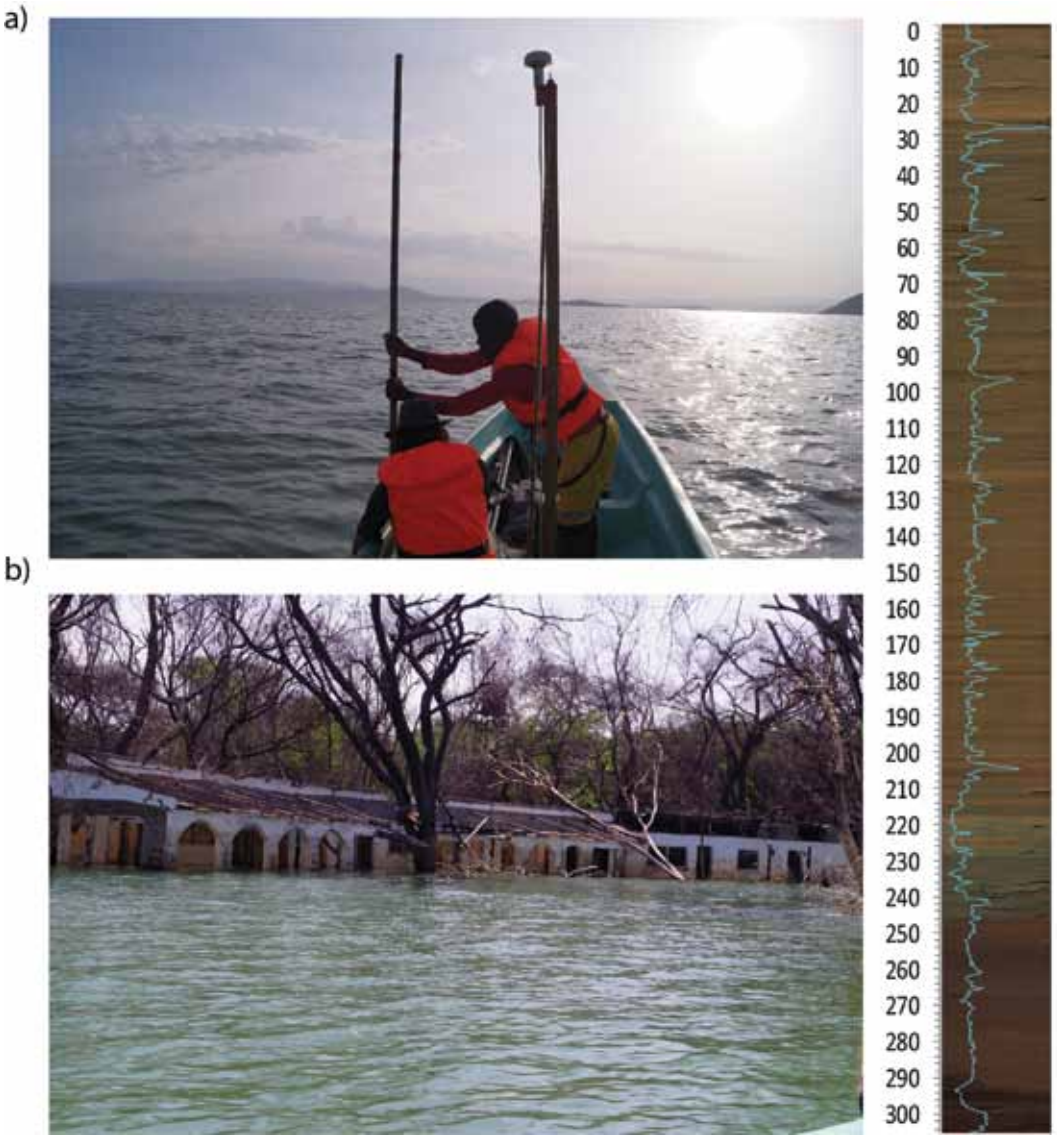


Figure 2. Lake sediment coring from Lake Baringo (a), Extent of lake level rise and subsequent flooding and damage to lodges (b), and 3m long lake sediment core from Lake Baringo bottom, with overlying magnetic susceptibility curve which can be interpreted as change in sediment influx in to the lake (c). Photo credit: Aynalem Zenebe

basins, which were later filled by fresh and saline water. For instance, Lake Turkana, Lake Baringo, Lake Bogoria, Lake Naivasha and Lake Nakuru are some of the lakes in northern Kenyan Rift Valley (Figure 1). It is among these Rift Valley plains and lake shores that scientists believe our first human ancestors evolved and started producing and using tools to become great players in the shaping of the landscape.

As part of the global hydrologic cycle, lakes are important reservoirs of readily available water on continents. Following the natural slope of the landscape, water flows into tectonic depressions, the low-points of landscapes, and through time develop into lakes. Lake systems receive water from river flows, groundwater seepage and from rainfall. Transported with water are also sediments and dissolved minerals, which end up in the lake basin. Based on how lakes receive the materials from the surrounding landscape, they can be an open basin lake, with materials entering and partly leaving the basin through river outlets, or a closed basin lake without a way for the sediments to flow out. Because lakes are so intricately connected with the surrounding land surfaces, of which they are the lowest point, they become the final resting place for organic, inorganic and mineral matter transported through the river courses. Alongside water, winds also transport small particles from around the lake basin in to the lake. Through time, the transported matter gets deposited on the lake bed, making up layers and layers of colourful lake sediments (Figure 2c). Seen through a profile, the sediment makes up a rainbow mud cake, made up of various greens, browns, blacks, greys and yellows.

The mud cake is a treasure trove in terms of wealth of information, especially for people interested in the past. The layers and sediments at the bottom of the lake have been accumulating for centuries and

contain stories from our history, with the youngest stories at the top of the lake bed, and the oldest at the bottom. Since the sediments that rush into the lake rarely leave, the information that they bring is locked at the bottom of the lake until the arrival of geologists and ecologists. These scientists take out the undisturbed sediments from the lake bed to undertake a wide range of analyses that will help them unlock the environmental history of the lake catchment (Figure 2a).

First they establish the age of the sediments in the core by radiocarbon dating. Establishing the time frame is essential to know the chronological sequences of events. Next, they record the magnetic behaviour, colour, texture, and chemical characteristics like the concentration of minerals and organic matter in the core. Plant pollen are also preserved within the cores, as well as animal and plant remains which were deposited in the lake with the sediment. The physical and chemical characteristics of the sediment, and the biological remains trapped inside act as indicators of past environments. For example, higher concentrations of grass pollen and smaller amounts of tree pollen in a particular area of the core can indicate that the region was once more open and grassy than it is today. Minerals present in the sediments can also tell us how the soils around the lake were once eroding, or how organically rich they were.

You may ask why we are so concerned about the past. Based on observations of today, we have to understand the past to come up with sustainable solutions for the environmental problems that our generation is facing. Understanding the past is key to our understanding of the environmental and climate variability we witness today. As the Scottish geologist James Hutton explained: "… from what has actually been, we have data for concluding with regard to that which is to happen thereafter…".

Take for instance Lake Baringo in north central Kenya. This lake has seen large fluctuations in recent lake levels, at times receding and at times flooding. This has led to the question whether this was caused by human activities or natural processes. To understand more about past lake level fluctuations, human activities, land degradation and soil erosion, we can use the techniques described above. From historical records we know that in the early 20th century, recurrent droughts and pressure from pastoralism caused severe soil erosion, in which large amounts of soil were being deposited in the lake bed. Measuring the magnetic susceptibility and analysing the geochemistry of the mud from Lake Baringo showed an accelerated sediment deposition. This started around the 1920s, when people started accumulating larger herds of cattle and especially goats. Goats are particularly adapted to dry environments and droughts, and can degrade the small vegetation that acts as an important cover for the loose soils of the Baringo lowlands. The information obtained from lake sediments can be crosschecked with historical records, which have documented similar stories. Such studies are interested in retrieving uninterrupted information about past landscape changes.

Figure 3. The winding Perkerra River transporting mud to Lake Baringo and trapping a glimpse of the past along its way. Photo credit: Geert van der Plas

Learning from past environmental changes can help strengthen present day policy and decisions about infrastructure development around lakes. An exemplary case from the recent Lake Baringo flooding can be seen from the damage it caused to lodges, schools and farm lands in the surrounding lowlands (figure 2b). Long term environmental data is needed to have robust and informed policies on the use of the lake and the surrounding ecosystem. Historical and meteorological data sources are

Je, unajua jinsi hayo mazingira ya kaskazini mwa Kenya yalivyokuwa mamia ya miaka iliyopita? Kama ukijibu kuwa 'nitajuaje wakati ambapo huko sijawahi kukuona ama kukaa', basi katika kutafuta majibu yapasayo, habari hii itakupeleka hadi chini kabisa ya ziwa lililo karibu sana nawe ambapo ni mahali palipofichika hazina ya maarifa. Maziwa huhifadhi(au hutunza)elimu ya thamani kuhusu mazingira, katika sehemu ya chini kabisa ndani ya matope. Na hii inaweza kutufahamisha kuhusu mabadiliko ya kale yaliyotokea katika maeneo ya karibu-yaani maeneo yanayozingira au yanayozunguka mahali. Katika eneo la Afrika ya Mashariki tunaishi katika maeneo yasiyo tulivu. Tunahitaji kuelewa jinsi ambavyo mazingira ya asili yamekuwa yakibadilika huko nyuma na kutabiri au kukisia hali ya mbeleni. Maziwa yetu ni makavazi za asili zilizo muhimu na matope yaliyo chini ya ziwa yanaweza kuchukuliwa kama ni kitabu ambamo ndani yake imeandikwa historia ya mazingira.

fragmentary in this part of East Africa. As a result, such scientific research on lake sediment archives can provide crucial data about long term lake behaviour and more importantly, to understand the interaction between the lake and the surrounding landscape.

From the perspective of environmental research, lakes are very crucial sites and storytellers. When the right natural conditions are fulfilled, they hold key information about the surrounding landscape changes and land use practices of past generations. The mud in lake beds can be regarded as a natural archive, a book in which the environmental history of the landscape is written.

Figure 4. Cattle herded in the swamps of Lake Baringo, which hold some of the valuable history in the mud. Photo credit: Aynalem Zenebe

Life of a Pollen Grain

East Africa as it was a few thousand years ago is described as a lush green landscape with many large lakes. It looked very different from today's comparatively dry landscape. But how do we know what the landscape looked like thousands of years ago? We take a look at the life of a pollen grain, and how it will help us uncover the past.

Someplace, somewhere, sometime, a beautiful flower releases its pollen grains. They are the carriers for the plant's next generation; tiny, microscopic reproduction cells that are released by the thousands. Pollen are picked up by the wind or by insects and taken to fertilize other flowers. Some pollen will land into a female flower and thus fertilize it and produce the seeds that will grow into a new plant. But most of the pollen is blown away by the wind and never finds another flower.

Most plants produce a lot more pollen than needed to ensure reproduction and this fact is useful for us - the scientists who are interested in plant life. The pollen, spread across kilometers by the wind, will sometimes end up in lakes or swamps. And if the conditions in these places are right, it will be preserved there for a very long time. What makes lakes and swamps such excellent storage places? It is their ability to build up a record of everything it collects over time. Pollen lands in a lake and sinks to the bottom. Here it will stay together with other material such as sand and clay to form the lake sediments. Year after year a new layer will be added, storing the remains of plants for hundreds and thousands of years. We can access this natural archive with specialized coring equipment, taking out a tube of mud from the bottom. Because the newer layers are placed on top of the older ones, we can journey back in time through the core with the youngest material at the top and the oldest at the bottom – the geologic law of superposition.

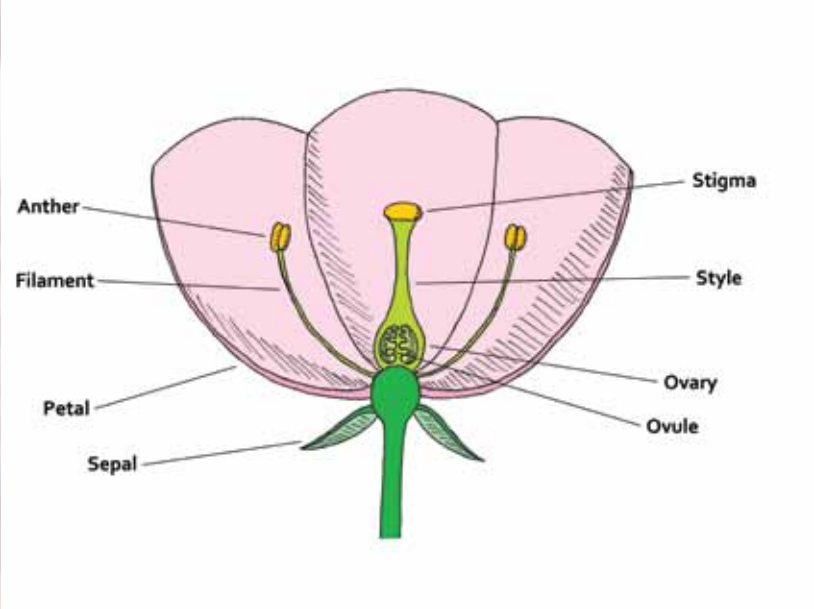
Every flowering plant produces pollen and for every plant the pollen looks differently. These differences allow us to link the pollen to the correct plant. When we look at the modern vegetation we can also recognize different types of vegetation that are driven by environmental differences. These include savanna, montane forests, rainforests, mangroves, tundras. These different types of vegetation are characterized by different plant types. It is important to sort the plant species we find in these separate vegetation types, as they can give us specific information about various environmental conditions. Each type can be linked to factors such as rainfall or

Coring: is the drilling of the sediment/soil to obtain a core sample (usually a cylindrical section). There are different methods of coring used depending on the environment. For example, use of a Russia D-corer in a small swamp or a Livingstone corer in a lake. The cores are retrieved in overlapping sections. When a core is retrieved radiocarbon dating can be carried out at different levels to determine the age of the organic material.

Processing: pollen processing involves use of various bases (KOH, NaOH) and acids (HCL, H2SO4) to breakdown the organic matter and have better visualisation of the POLLEN.

From the swamp to the lab and then under a microscope. This is how pollen, a tiny piece of evidence, is retrieved.

Photo credit: Nik Petek



Afrika ya Mashariki kama ilivyokuwa miaka mingi iliyopita inaelezwa kama ni mahali palipokuwa na mimea, nyasi na miti vilivyonawiri, pamoja na maziwa mengi makubwa. Ilionekana kuwa tofauti sana na jinsi ilivyo hivi sasa ambapo ni eneo kavu. Lakini tunajuaje jinsi maeneo yalivyokuwa mnamo maelfu ya miaka iliyopita? Hivyo tunachunguza chembe ya mbelewele pamoja na jinsi itakavyotusaidia kutambua au kubaini hali ilivyokuwa zamani.

Identification and counting: using a high powered microscope to observe the pollen and preserved samples or photographs to identify the pollen, the pollen grains are counted. The data is then used to develop pollen diagrams which describe vegetation change along the layers and if the sediment is dated this gives vegetation change over time. Vegetation information is useful in inferring climatic and other climatic changes.

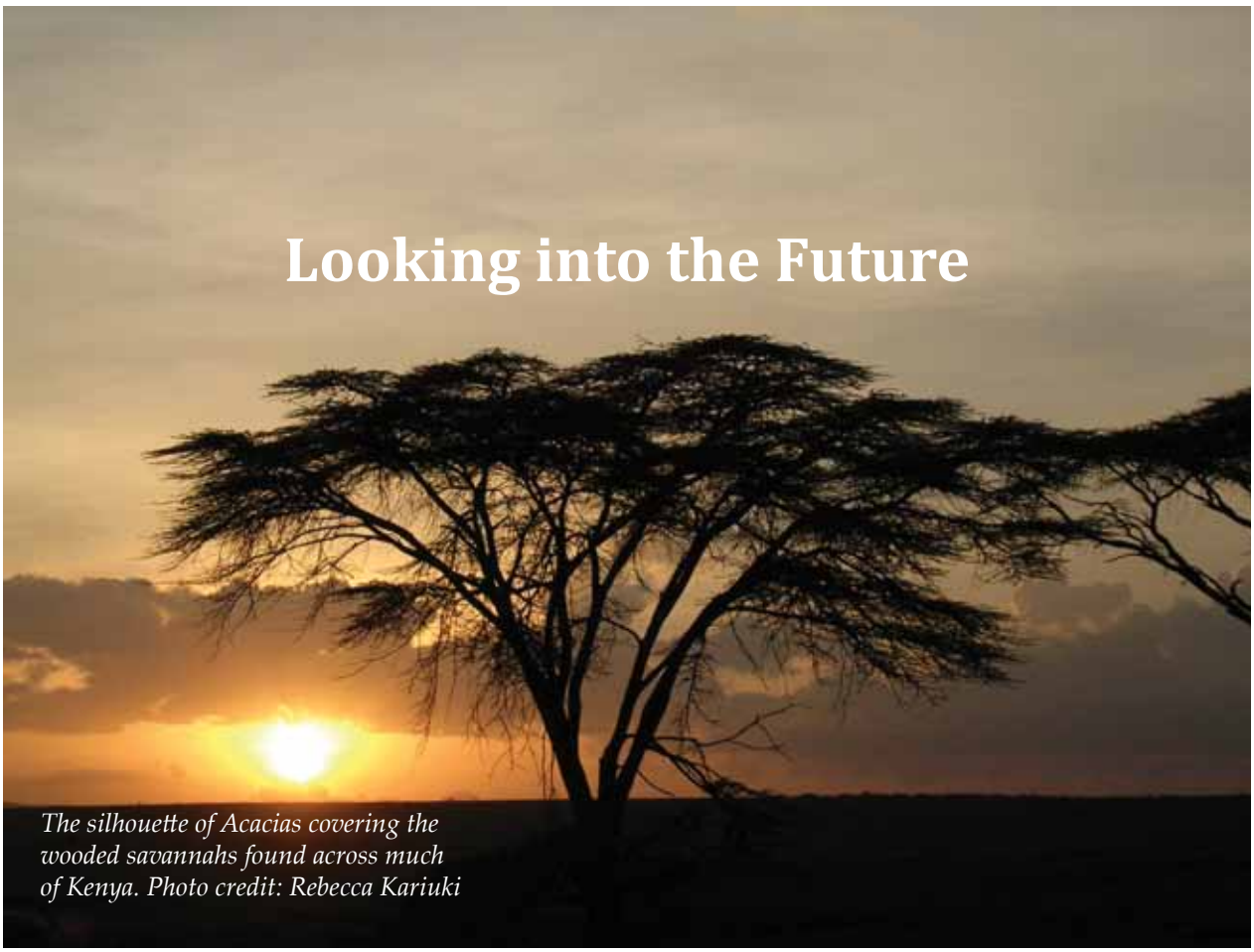
drought, temperature, and elevation. It can also indicate human impact in the form of grazing, agriculture, or urban development. This information is vitally important to understand how an area has been changed in the past and what may happen in the future.

If we now take a slice out of our sediment core and look at the different pollen types, we can see all the different plant species that lived in the area at that time.

Then we link them to specific vegetation types to reconstruct the vegetation in an area over time by analyzing slices of our core at regular intervals as we move down the core and back in time. After our analysis the composition of the vegetation is shown as the proportion of these different vegetation types and we can see them change over the length of the core and thus over the course of time. The way the proportions of the vegetation types change relative to each other can now tell us something about the changes in the environment. Expansions of the montane forests can indicate a climate that gets wetter. Cultivated plants appearing show the appearance of agriculture in the area. When we take all this information together we can get a good idea of the history of an area. If we combine our information with other sources, other information taken from the core, historical records and archaeology, we can reconstruct the vegetation, the climate and the history of human occupation in a region.

Photo credit: Esther Nyambura

Looking into the Future



The silhouette of Acacias covering the wooded savannahs found across much of Kenya. Photo credit: Rebecca Kariuki

Why is it important to predict future environmental changes? How do you even go about forecasting these changes? What is the appropriate temporal coverage of future predictions? What outputs best describe future projections of change? The need to answer and understand these important questions has led to a growing body of interdisciplinary research with an objective to better predict future environmental changes. Environmental forecasting is a process based on assessing past and present environmental conditions and the processes of change which can then be used to inform the future on potential changes. It is mainly done to increase the understanding of past and present events and to help in decision making and strategic planning of future events. Specifically, it provides practical information on the direction, speed and intensity of environmental change.

East Africa is known as the cradle of humankind, with Kenya having the oldest and largest collection of human fossils in the world. It is home to a diverse group of people who are characterized by multiple languages, cultures, livelihoods and religions. Ecosystems in East Africa range from mountains, rivers, the great lakes and deserts, and are distinguished by varying climates, geology, topography, flora and fauna. Most of the lakes are found in the Great Rift Valley; which defines a significant portion of the East African landscape running from Ethiopia through Kenya and Tanzania into Mozambique. Additionally, East Africa is also home to the big five: lion, leopard, elephant, rhino and buffalo; and records a number of endemic plant and animals species (Figure 1) with varying conservation status.

Like other regions around the globe, East Africa has experienced rising temperature and changing rainfall patterns which affects the flow of ecosystem functions and services. In addition to changing climate, its population density has been increasing rapidly over the years. According to the Population Reference Bureau, the current (2014) human population in Kenya, Uganda and Tanzania is 43.2, 38.8 and 50.8 million people respectively. The projected population for these three countries in 2050 will be 81.3, 104.1 and 129.4 million people respectively. More than half of this population lives in rural areas and depends on natural resources for their livelihoods. For example, local communities in

East African rangelands have maintained pastoral livelihoods for thousands of years (Figure 2). Through their migrations, which were dependent on the cyclic patterns of rainfall, they maintained the integrity of the rangelands by allowing the system to recover after use.

Over time, however, due to the increase of human population, change in land tenure systems and socio-economic development, most pastoral communities are now practicing mixed subsistence farming while others have completely changed to subsistence or cash crop farming. Moreover, pastoralists are now building permanent settlement structures and social amenities further reducing their movements and changing their livelihoods. Changes in human population density coupled with climate and land use change by pastoral communities in rangelands leads to modifications of the land-climate dynamics of this ecosystem (Figure 3).

A study on the long term dynamics of East African ecosystems in relation to changing climates, land use and human population can be used to show the resilience of the ecosystems over time and space. This study can best be described using a multidisciplinary approach in combination with agent and process based models that would show long term changes, spanning over several centuries, over space.

The EU funded REAL project aims at unearthing the changes in time and space of human-environment interactions in East Africa using a multidisciplinary approach. Socio-ecological interactions are being studied over a range of temporal scales, starting from the past millennia until the present day. Palaeoecological data from lake and swamp sediment archives are being used to generate past ecosystem changes related to natural and human influences. Past human settlement and landscape modifications will be added from archaeological data input. The goal of these data proxies will be to provide information on past human-environmental interactions and coupled with present social-ecological dynamics, future scenarios of change can be created using models.

Let's talk about models

Models are representations of real systems. They are used as practical substitutes for real systems when it is easier to work with a substitute rather than a complex actual system. Many of us have used models consciously or subconsciously. For example, the simplified pictures of the complex environments that we carry in our minds, or an economist's graph, or an architect's blueprint are examples of models. Models explain how systems work, the interconnections in a system, the patterns and trends observed and they project future changes in a system when some aspects of the system change. They are not meant to predict reality as it should happen but are created to give possible directions and intensity of change if the current state of affairs continues or if it changes. How do we tell the characteristics of a real system that can be included in a model? And what is the best temporal coverage of a model? To answer these questions, the purpose of the model should be well defined, at the beginning of the research, and used as a filter that will ignore unimportant characteristics of a system or treat them lightly.

Figure 1. Grevy's Zebras (Equus grevyi) at Lewa Wildlife Conservancy, Laikipia, Kenya. The largest of all wild equines is endemic to northern Kenya and parts of Ethiopia. Photo credit: Rebecca Kariuki

Models use equations to show the interconnections in the system. There are different types of models using different approaches and language. Environmental and social studies, which are conducted by the REAL project, use agent and process based models to show the interactions between climate, landscapes and societies. Agent based models treat individuals or agents independently in their interactions with each other and with the local environment. Process based models use theoretical understanding of environmental processes and simulate detailed

Contrary to common belief that models are complicated and George E.P. Box's 1987 cliché "All models are wrong, some are useful", models can be correct and fun to create and tweak especially if the system is well defined on paper first, before being simulated on a computer. Take for example the vast and spectacular savannahs that cover more than 50% of East African land surface and support large numbers of people, wild and domestic animals. Pastoral communities have lived on and/or used these ecosystems for millennia. For us to know what may or may not happen to these savannahs in the next 50 years, judging by what has been happening in the last 200 hundred years, we would use an agent based model to show the changes in the behaviour of pastoralists and the environment over time and space. To show the effect of climate change on vegetation distribution, physiology and the biogeochemical cycles, we would use a dynamic vegetation model. Combining the two models would make an interesting narrative of the changing interactions between climates, landscapes and societies in East African savannahs. From the outputs of the models, mainly maps and data, we can use present (social and ecological) data and past (archaeological and palaeoecological) data to validate and calibrate these outputs. See, models are simple but not stupid! Ultimately, such a study would provide information on the response of natural vegetation to land use and climate change. Thus contributing to knowledge and informing policy.

physical and biological interactions in the system. These models can be used independently or coupled together. They are useful in environmental forecasting due to their ability to be calibrated and validated by past and current data. This means that hindcasting can be used for testing models using past data which is then used to inform the present and the future. This is very vital as according to Steve Jobs, 2005 "You cannot connect the dots looking forward; you can only connect them looking backwards. So you have to trust that the dots will somehow connect in your future". Connecting these dots leads to practical environmental forecasting and creating future scenarios of human-environmental interactions in East Africa. Ultimately, completing the fascinating and informative story of the resilience of the magnificent East African landscapes and its lovely inhabitants.

Figure 2. Pastoralists' cows in a movable cattle enclosure (boma) at the Lewa Wildlife Conservancy, Laikipia, Kenya. Cows spend the night in a boma and graze in other areas during the day. Photo credit: Rebecca Kariuki

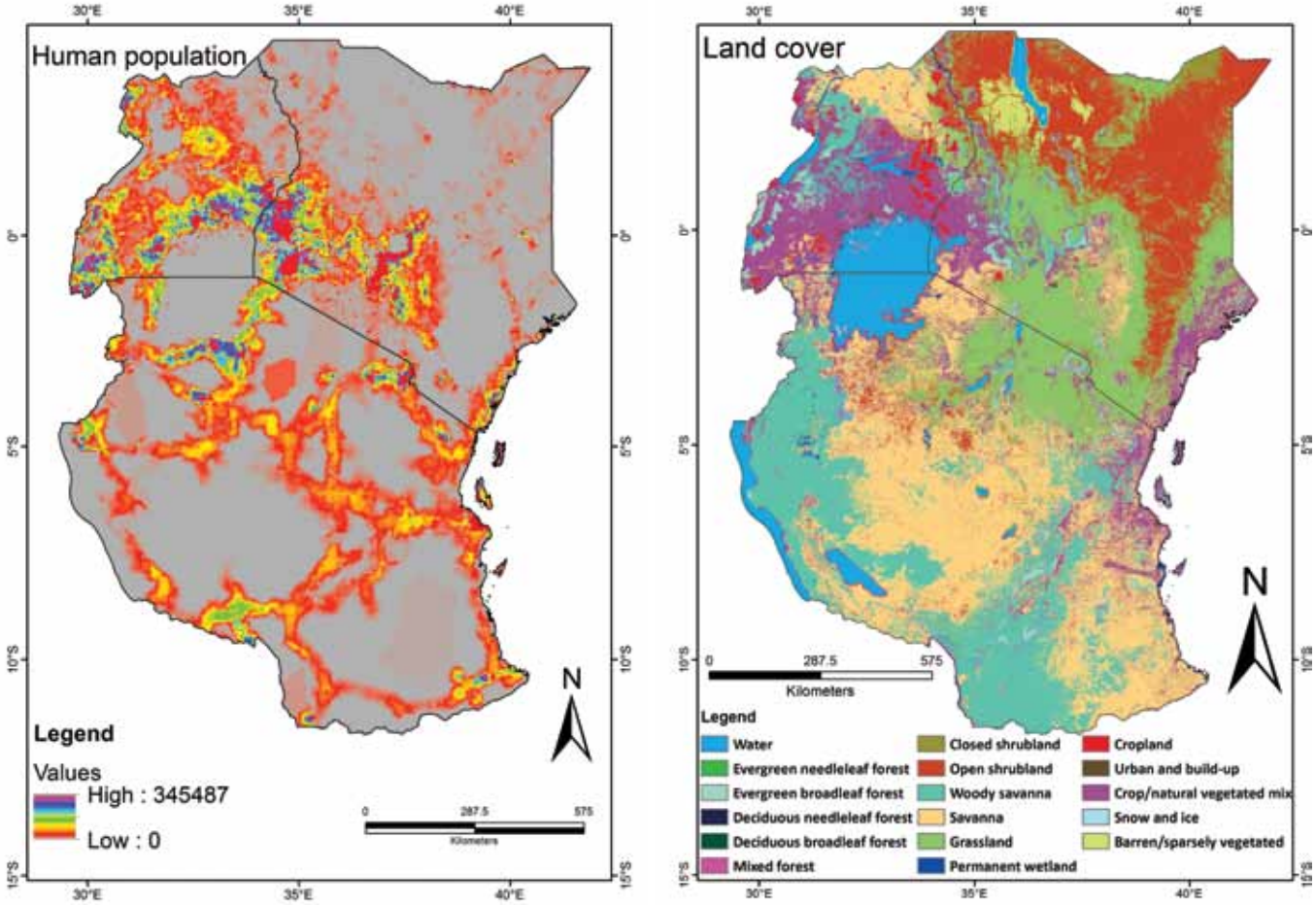
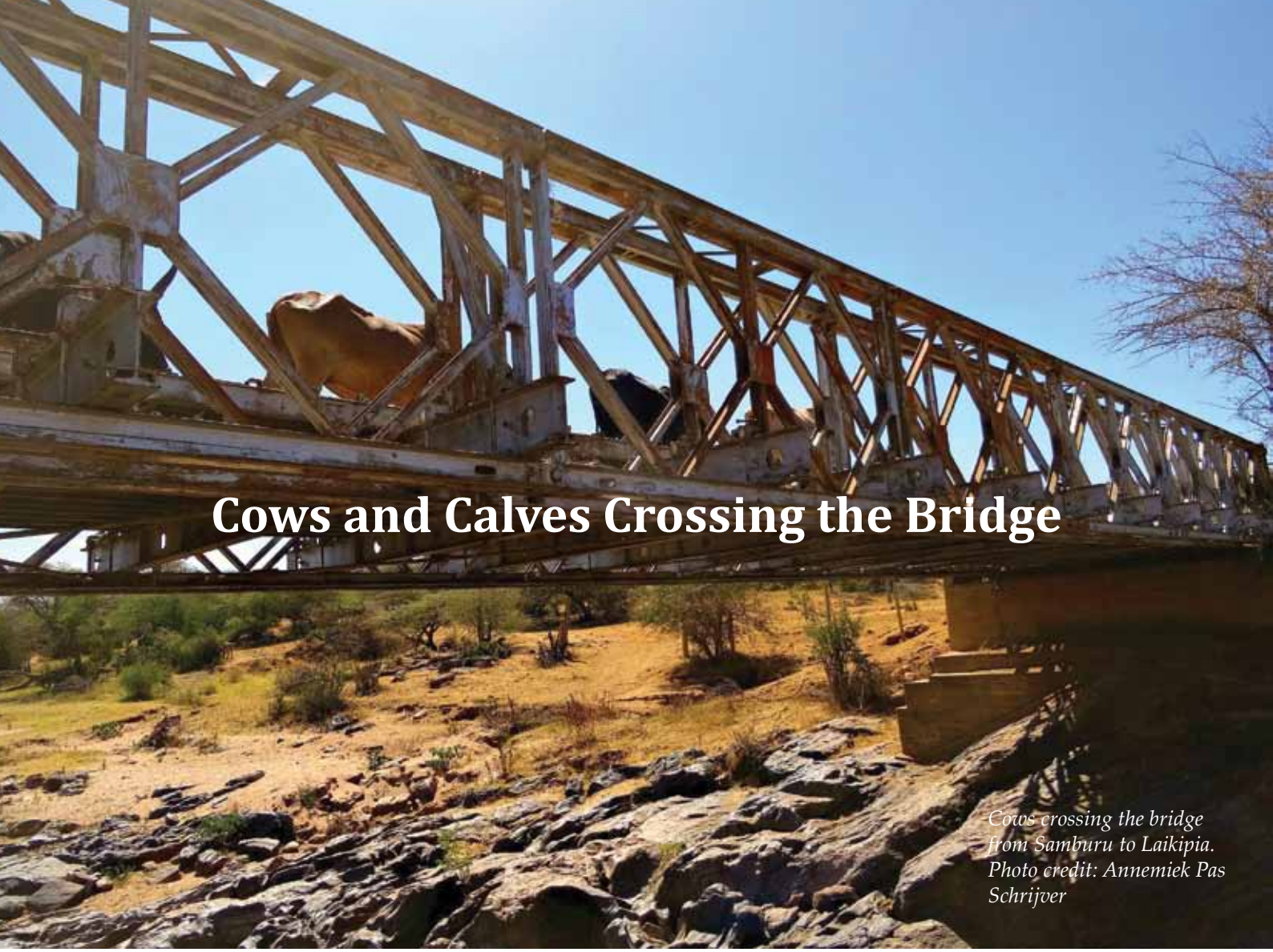


Figure 3. East African population density and land cover types. Maps created by Rebecca Kariuki
Data source – UNEP/GRID, resolution - 2.5km; MODIS land cover, resolution - 0.5km

Kipingamizi kimoja kikuu kinachowakabili wanadamu na mazingira yao katika karne ya ishirini na moja ni badiliko la hali ya anga. Na je,lilianza lini? Ni mambo gani yanayolileta,matokeo yake ni nini? Maswali haya yanaweza kujibiwa kwa kutumia vifananishi. Vifananishi ni mifano kamili inayowakilisha mifumo inayoshughulikiwa inapoonekana kuwa ni rahisi kushughulika na kitu fulani badala ya kingine kuliko kutumia kile kilicho na utata au ugumu zaidi. Hueleza jinsi taratibu za uchunguzi zinavyofanya kazi na pia miingiliano baina yake vikitumia milinganyo. Tena hutoa mifano ya sampuli na mielekeo vilivyokwisha kushuhudiwa katika mfumo fulani pamoja na kukisia hali ya siku za mbeleni kwa kubuni mambo yatakayotokea.

Uchunguzi wa mazingira na jamii unaoedeshwa na mradi wa REAL hutumia vifananishi vinavyowakilisha hali na vile vya taratibu za hatua kwa hatua kuonyesha miingiliano baina ya hali ya hewa (au anga), maeneo na jamii katika Afrika ya mashariki. Vifananishi wakilishi huibua au hutoa mifano ya vitu binafsi au vifananishi huru katika miingiliano kati yake na mazingira ya mahali. Mifano inayoegemezwa kwenye taratibu hutumia ujuzi wa kawaida wa mazingira,mambo ya mazingira na huchipua(au hutoa) mifano fananishi ya kimaumbile na ya kibiolojia katika mfumo wenyewe. Na yanayopatikana kutokana na mifano yenyewe,hasa romani na vielelezo,vinaweza kuidhinishwa na kupimwa kwa kutumia vielelezo vya wakati huu na viwakilishi vya huko nyuma na hatimaye kubainisha miingiliano ya hali ya hewa,maeneo nazo jumuia kuhusu wakati wa zamani, wakati huu na wakati ujao.

Cows and Calves Crossing the Bridge



Cows crossing the bridge from Samburu to Laikipia. Photo credit: Annemiek Pas Schrijver

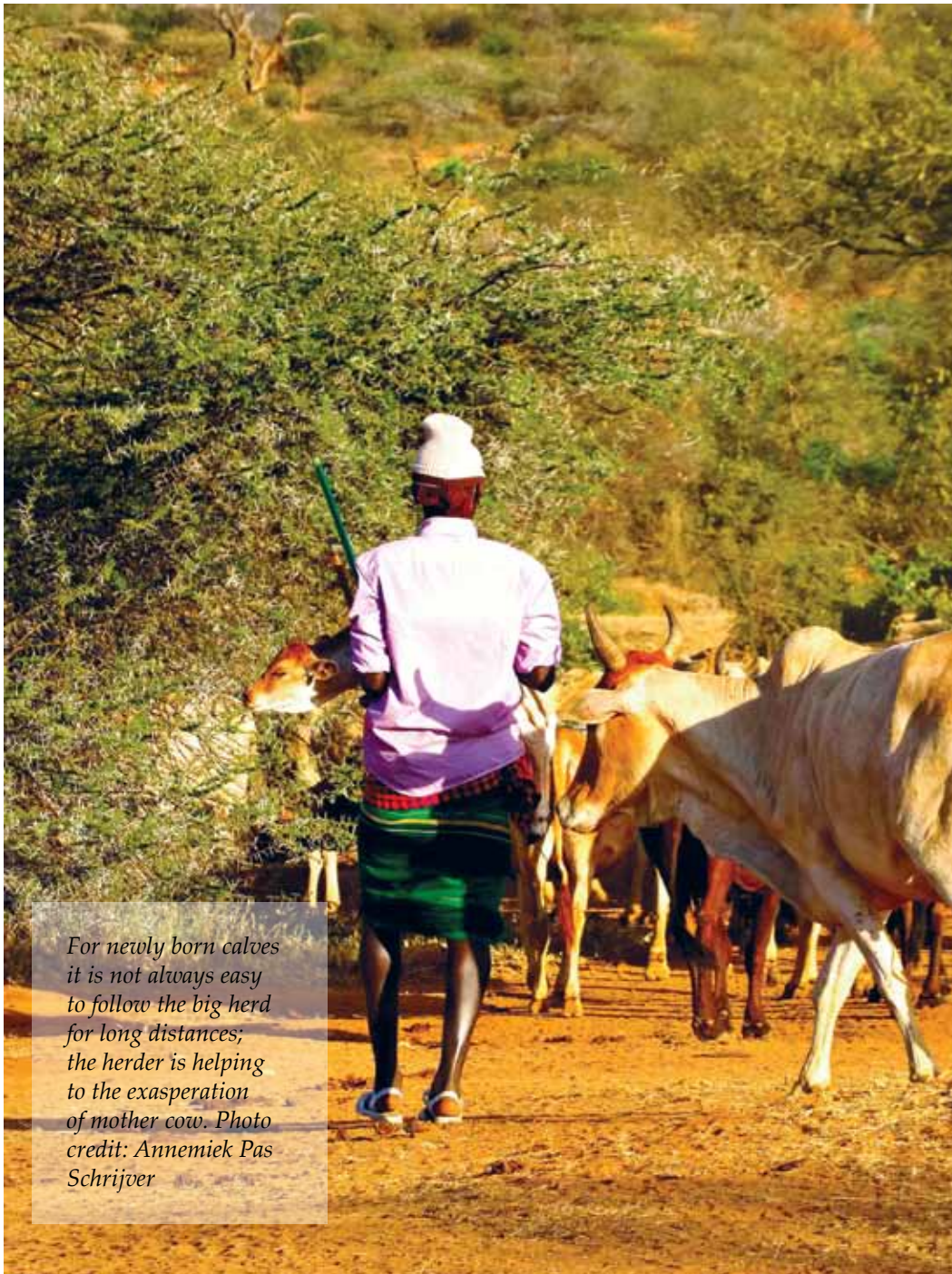
Cows need grass. Cows need water. And cows need salt. The same goes for goats, sheep, camels and all other livestock, across the world. These resources are found on specific areas of land distributed over the landscape, and are not always available at the same place or at the same time. Pastoralists move with their livestock across these landscapes traversing distances in order to find the exact places for pasture and water for their herds and flocks. Pastoral landscapes are often divided into wet season and dry season grazing areas. The wet season grazing areas have green grass only during and shortly after the rains have started, whereas the dry season grazing areas have permanent water stocks, a higher rainfall, or a different grazing management system and therefore grass availability throughout the year. Dry season grazing areas can be found, for instance, along rivers or on higher altitudes where more rainfall occurs, but also on land that has been managed in such a way that grass is still available after a period without rain. Pastoral movement, then, occurs between these so-called wet season and dry season grazing areas and also between dry season grazing areas, when pastures and water are exhausted.

Pastoralists have plenty of reasons and motives to follow certain routes - the pathways between the wet season and the dry season grazing areas - to reach specific places. The ecological motives, such as available water points and abundance of grass to graze along the way; but also the existence of diseases which need to be avoided. Or economic motives, such as livestock markets. There are also social motives. For instance pastoralists often move together and group their herds with others, especially when routes are followed by family and clan members. Lastly, political motives, when important and influential political leaders support their constituents to follow certain routes and to reach particular places, which is sometimes used for political gains; or to avoid routes and regions that are used by other clans so as to evade conflict.

This piece will focus on temporary pastoral movement and mobility encompassing the seasonal search for grass and water throughout the landscape resulting in specific pathways taken by people, and their animals. Let us take the case of the Samburu pastoralists living in central-northern Kenya, in Samburu, Laikipia and Isiolo County. The Samburu are pastoralists closely related to the Maasai. They both speak Maa and share ceremonies and traditions such as the circumcision of their boys into warrior-hood and a social system promoting the power of elders. Obviously, there are major differences between the Samburu and the Maasai as well, of which the main difference is the distance moved with their cattle to find green pastures.

Although the highest percentage of Samburu live in Samburu County, over time a number of Samburu have moved southwards from Samburu County to settle in Laikipia County. In contrast, the Maasai of Laikipia live predominantly in Laikipia. The landscape, vegetation, environmental conditions and land use in Samburu County, which is considered lowland where less rainfall occurs, demands an increased level of mobility in search for water and pasture. This is in contrast to the short distances moved by pastoralists living in Laikipia County, where the higher altitude and a different rainfall pattern allow grass to grow throughout the year. As a result, the Samburu pastoralists travel further to reach grass and water, and, hence, make use of large tracts of land to move through.

The Samburu pastoralists move seasonally to faraway places, but will return to their homesteads when the rains fall in their areas. It is the Samburu warriors who are responsible for herding the cattle further afield. Before stepping out to move, the warrior will acquire information on where to go. He will find out where his relatives are going, where the good grass is, where the water points are, and where disease and conflicts can be found so as to avoid these places. In the past, such 'scouting' was often done by the young warriors moving around to see with their own eyes where the grass and water could be found, while at the same time listening to the news and information from the people that they met while being on the road. This allowed informed decisions to be made before bringing the cattle on this journey. While the scouting is still done by warriors, the final decision on where to go is based on the advice given by the elders. As a common saying among the Samburu community states: "The neck can never be on top of a head (memurut emurt endukuya)", denoting that a father's statement is



For newly born calves it is not always easy to follow the big herd for long distances; the herder is helping to the exasperation of mother cow. Photo credit: Annemiek Pas Schrijver

final and conclusive. The 'scouting' these days occurs rather differently. With the existence of mobile phones and proper network all around Samburu County and beyond, information is exchanged between the young warriors by texting and calling. Therefore, the warriors do not physically check the situation anymore but rely on their friends', age-mates' and clan-affiliates' opinions. Still depending on the advice given by the elders, the warriors will spend less time scouting the route and will decide where to go.

The warrior takes cattle in grouped herds, including his own cattle, the cattle of his father, and often cattle of uncles and brothers as well. Warriors often go together in groups of about four or five herds. Each warrior is responsible for a herd, and often a sibling will assist him looking after it. Warriors moving together come from the same area and move together because of safety issues. It is better to have a bigger herd and more eyes when moving through areas with a high number of wildlife for example. Moreover, in conflict areas warriors group together and alternate herding and surveillance so as to improve security for both cattle and warriors. Along the way, phone calls have been made to relatives to ask if it is ok that some warriors with cows are coming, and if they can sleep at their enkang (homestead) for a night. This is often not a problem, as long as the warriors do not stay with their cows for more than two to three days. As such, the group keeps on moving until they find the grass that they were looking for. The movement from homestead to the desired pasture takes about seven days and during those seven days government, community and private land are passed. Hence, depending on the relations and negotiations with these other land owners, the warriors may be allowed to graze their cattle on their land for a few days. These community grazing areas can be found when the Samburu warriors move to the north and north-east of Samburu county.

Also, a large group of Samburu pastoralists will move southwards, to Laikipia County. Land in Laikipia County however is mostly private land, used for farming, ranching, nature conservation, cities, infrastructure and urban development. Especially the ranch and conservation areas hold grass for longer periods of time and are therefore useful and popular areas by the Samburu pastoralists during the dry season.

Hence, Samburu pastoralists are not the only land users in Laikipia. Moreover, they don't only pass through this highly diverse landscape but also need to use it for the provision of grass and water. As a result, there is a struggle over access to grass between private land owners and the Samburu, capable of causing conflict during the dry seasons. In most cases, however, the Samburu successfully negotiate with the land users, such as the Maasai, the commercial cattle ranchers and nature conservancies and the maize farmers, to allow grazing. Good relations are needed so that the temporary visiting Samburu can access grass and water for a limited price per month per cow. In other cases, entering private or community land without permission creates conflicts. When the rains fall again, back at home, the Samburu warriors will return to Samburu County, as there will be grass available and only daily movement with the cattle is needed. This is also the time when most of the weddings and other ceremonies will take place, as there is milk and meat around, as well as the warriors who are needed for the ceremonial songs and dances.

When moving to and through such a diverse landscape from Samburu into Laikipia, the pastoralists, on their way to pasture, have to adapt, organize, and reorganize their movement and access strategies to find grazing for their livestock. Sometimes this happens through negotiations, sometimes through clan and family affiliations, and sometimes through entering 'illegally' by night. Such seasonal mobility is part and parcel of the Samburu way of life. Mobility is embedded in the social, economic and political order of daily life, and persists throughout both internal and external changes, difficulties and risks.

Wafugaji husafiri na mifugo yao katika maeneo, wakitembea safari ndefu ili kuwatafutia ng`ombe, mbuzi na kondoo wao malisho na maji. Ingawa maeneo, maarifa na matumizi ya ardhi na usimamizi wake vinabadilika, safari hizo bado zinaendelea kufanywa na ni muhimu kwa maisha. Makala hii inatumia mfano wa wafugaji wa Kisamburu wanaoishi Kenya-kaskazini ya kati, kueleza jinsi wafugaji hao wanavyosafiri katika maeneo yenye uasili tofauti mno na kisha yenye mipaka mipaka-kati ya nchi yao na nchi zingine na katika nchi yao kwenyewe.

Farmers transplanting rice in an area irrigated by canals they built themselves in Kaloleni in the Kilimanjaro region. The productivity of this area far surpasses that of the government planned scheme downstream. Photo credit: Hans Komakech

The power of numbers

Mara kwa mara watu husema mifereji iliyochimbwa na wakulima katika Tanzania, siyo imara na isiyofaa na inahitaji kuimarishwa ili kuzuia upoteaji wa maji bure. Kwa sababu hii, zimeanzishwa juhudi nyingi za kujenga mifereji na mabomba kutokana na sementi au saruji. Hata hivyo, utafiti au uchunguzi kuhusu mifereji hii ni mfinyu au pungufu na ujuzi wetu kuhusu jinsi inavyotumika, bado haujakamilika, yaani tunajua machache tu kuhusu matumizi yake. Kwa mfano, mara nyingi tunasahau kuwa maji yanayopotea bure katika sehemu au mahali fulani, yanaweza kutumiwa tena katika sehemu nyingine (kwa njia ya chemichemi, mifereji na visima). Hii ina maana kuwa kwa kweli hayakupotea bure! Ni lazima tufikiri kwa uangalifu au kwa hadhari kuhusu jinsi tunavyojaribu kuboresha njia za umwagiliaji wa maji kwa sababu-vinginevyo-tunaweza kutoa suluhisho kwa tatizo ambalo kwa kweli si baya kama tulivyofikiria.

When watching the evening news, they seep into our mind without you even realizing it. They shape the way we view the world, the actions we think should be taken and the priorities we have. They can incite action, justify the status quo, scare, give hope, or even destroy. They are numbers. And not just numbers, but numbers that are meant to reflect the state of our planet, naturally and socially. They tell us how our education system is functioning, how the labour market is doing, how many species are going extinct, or how many tons of CO_2 we can safely emit. These numbers have become part of our lives and of the way we think about the world. But how much do they really say about the environment, human suffering or people's wellbeing? And how did scientists and other experts arrive at these numbers?

In the best case, these important figures are the result of thorough and transparent research, in which there is room for discussion and uncertainty. Subsequently, this research is communicated to us, with all its complexities and uncertainties, and forms the basis for any interventions. In the worst scenario, the numbers are taken up, not only by the general public, but also by policy makers and the larger development community without knowing their origin or appreciating their level of certainty. The latter seems to be the case in the discussion on irrigation development in the Pangani basin in northern Tanzania (Figure 1).

For centuries, farmers in this area have dug irrigation canals, diverting water from the many streams running down the mountains. In the majority of these irrigation systems the technologies used for diverting and conveying the water have not changed much over time: stones, mud and branches are used to divert the water from the river, while a system of earthen channels carries the water to the fields (Figure 2). Intricate rules, evolved alongside the technology, govern the allocation and timing of water – both within a system and increasingly so between systems.

Figure 2. Farmer dug canals leading water to the fields. Photo credit: Chris de Bont

However, their existence is not uncontested. Already in colonial times this system of water abstraction was accused by colonial powers of worsening water shortages. At that time, the situation was remarkably similar to the current challenges: water was a scarce resource, with different sectors claiming a stake. Downstream hydropower generation was given priority over agricultural and urban use, and there was a continuous search for more water sources. Even more so, the water department already indicated in 1952 that no more water use permits should be given to irrigation systems, something which has proven untenable in the decades after. Apart from searching for new water sources through repeated hydrological research, a strong focus lay on monitoring and controlling water abstraction. The farmer built systems did not fit well into this strategy. Their multitude, interconnectedness, and unofficial character made it difficult for the authorities to measure or control water flows. In addition, many canals leaked large amounts of water, which ran back to the river, into another canal or seeped into the ground.

This apparent lack of structure and "proper", western engineering caused colonial engineers to label these farmer built canal systems as inefficient, meaning that the percentage of water that is lost is high. This label has proven to be surprisingly persistent, showing up in plan after plan, report after report, leading up all the way to the most recent irrigation policy from 2010. It is frequently mentioned as the main reason for intervening in these farmer managed systems, resulting in water fees, concrete structures and government initiated water management organizations. All in all, large sums of donor and government money are being spent, under the assumption that this will improve these low efficiencies.

Now here is the catch: when going back in the literature in an attempt to find the original research showing these low efficiencies (10%-30%), one runs into a dead end. Almost no empirical studies were done to analyze the efficiencies of different irrigation canals in Tanzania; the rare exceptions often being vague about their methods and specific research conditions, so it becomes difficult to generalize. Reports make references to other reports, which reference again another, but at the base of it all is nothing more than an impression from a single author. Through repetition, this impression becomes a fact, informing government

and donor policy and spending and rigorously impacting water management on the ground.

This is not to say that these farmer-built canals do not lose water along the way, but that we do not really know the extent and impact of these losses. Water might return to the river, be used by another farmer or resurface further downstream through springs (Figure 3). If this is the case, what does efficiency really mean? If the argument of enhancing low efficiencies is that, by changing farmer-managed irrigation systems to match western ideas of proper engineering we save water, a better understanding of when water is actually lost could have a major impact.

Furthermore, is the focus on preventing losses the only right one? What about the farmers' capability to make sure that water is delivered according to schedule, so that water delivery is reliable and can enable planning of crops? What about the overhead costs of managing water? What about the fairness and equality of water access within a system? All these aspects are as much part of the overall irrigation performance as the amount of water that seeps from the canals, and are at the heart of whether a system is successful or not.

The focus on doubtful numbers of efficiency of farmer-built irrigation canals is a powerful political tool in supporting certain ideas of what good water management looks like, but it obscures the complexity of these canals and the challenges of researchers in assessing their performance.

So next time you hear a number, a number which tries to tell you something about the world and possible pathways to improvement, consider this: who came up with that number, how did they do it, and does it tell you the whole story?

Figure 3. One farmer's loss is the other one's gain. Photo credit: Chris de Bont

The harvesting of geothermal springs in Olkaria gives the appearance of smoke coming out from the ground, but the geothermal plant also creates a noisy environment. Photo credit: Christin Adongo

The Steaming Landscapes

Electricity is one of the most significant inventions ever made. It is crucial in our everyday life regardless of our status in society. Electricity is used for running machines in industries for the production of goods that we require, in hospitals for medical equipment, in agricultural production, lighting and for domestic purposes such as cooking and heating. Those who live or have experienced life in Eastern Africa are familiar with, or perhaps have their own, 'blackout' stories: From students studying for final examinations the night before; academics hoping to submit their research grant applications online before the deadline; an individual taking a hot shower on a cold morning when the blackout hits, to corporate entities that run into millions of shillings worth of losses due to power outages. Power rationing and frequent blackouts disrupt schedules, cause inconveniences and great losses.

Kenya has for many decades contended with electricity shortages. There are two explanations for this situation: one, Kenya derives most of her electricity from hydropower, which is dependent upon climatic conditions. For example, during droughts, water levels in major dams decline and electricity production subsequently deminishes. If this drought persists, measures such as rationing have to be put in place to balance between power production and supply and to ensure that electricity is distributed fairly among the entire population. The droughts of 1998-2000, 2004/2005 and 2009 resulted in big economic losses of more than $2.8 billion. Secondly, the electricity production also utilizes fossil fuels. Due to fluctuations in global oil prices, this is often very expensive. Today, only 8.1% of the population in Kenya has access to electricity.

The Kenyan government, through its ambitious Vision 2030 policy, has stipulated that the pathway to economic prosperity, environmental and social well being, is by adopting green energy solutions. Green energy here refers to methods of electricity production that have low or no carbon emissions, meaning that less fossil fuels or none, will be used. As a result, renewable energy sources such as solar, wind and geothermal are promoted. The other advantage is that with this kind of energy it is possible for the country to be involved in the global carbon market, which refers to trading in carbon with, for example, developed countries whose carbon dioxide emissions exceed the internationally required standards. The thought behind this is that electricity production from green sources is the most cost effective; this means that the cost of electricity will decline and therefore more people will have access to it. Also, the current problems

Ili kutoa au kuzalisha umeme, nchi nyingi katika eneo la Afrika ya Mashariki ikiwemo Kenya, hutegemea nguvu za maporomoko ya maji na za vitu vinavyotupatia moto kama vile makaa ya mawe,mafuta (petroli) na gesi ambavyo vyenyewe vimetokana na mabaki ya kale ya wanyama na mimea. Hata hivyo hali ya anga inayobadilikabadilika mno, ikipelekea kutokea kwa ukame mwingi wa mara kwa mara ukifuatana na kushuka na kupanda kwa bei za mafuta duniani, vimekuwa na matokeo kadhaa katika uwanja au sekta ya nishati, yaani nguvu kama zile za umeme, gesi na kadhalika. Basi kwa ajili ya kuwa na hali au njia ya kudumu na salama katika maendeleo ya uchumi, hali nzuri ya mazingira na jamii, Kenya imo katika mpango au mchakato wa kutoka katika chanzo chake cha nishati (au nguvu) na badala yake kufuata njia zingine zilizopo ambazo ni za kulinda au kuhifadhi uasili na mazingira kama vile nguvu za mvuke kutoka ardhini, nguvu za jua na za upepo. Utoaji wa umeme kwa njia ya mvuke katika bonde la ufa la kati ni aina ya nishati iliyokwisha kukua na kuendelea zaidi kuliko aina nyingine yoyote katika Kenya. Na hili halilingani tu na hoja inayotolewa sasa juu ya upunguzaji wa mabadiliko ya hali ya anga duniani bali pia inatarajiwa kuimarisha usalama wa mazingira. Hata hivyo utekelezwaji wa miradi hii ya mvuke umekuwa na matokeo kadhaa ya manufaa na ya madhara kwa wakaaji wa maeneo.

of power rationing will be reduced or better still, eliminated.

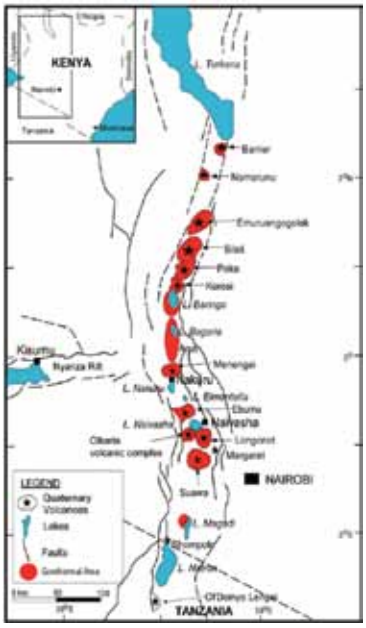
One way that the government is trying to switch to green energy is by encouraging geothermal power production in the central Rift Valley. Research has indicated that the potential of this region for sustainable electricity production is high. This is due to the unique volcanic geological formations, which makes it possible to harness steam in sufficient quantities for electricity production. Of the potential geothermal areas, the Olkaria geothermal field, most of which lies within the Hell's Gate National Park, is ranked first. It is also here in Olkaria where geothermal power production is already ongoing. To date, there are five operational plants in Olkaria, which contribute about 180 MW. This by far is still low compared to the Kenyan population electricity demand of 1,354 MW.

Plans to increase this production are already being implemented in the Greater Olkaria Geothermal Area, which comprises the Olkaria volcanic complex, Longonot and Mount Suswa. It is expected that by 2018, electricity production will reach 1260MW. This energy development is anticipated to benefit not only the local communities but also the country as a whole.

However, these scenic, literally steaming landscapes, which are also potential geothermal project areas, have been home to communities who have lived off it for generations. The Kikunyuki, a Maasai sub-clan, for instance, occupies most of Olkaria and Suswa. These Maasai still move between the lowlands and highlands with their livestock, in search for water and pasture depending on whether it is rainy or dry.

In Suswa, the geothermal steam is also the major source of domestic water. Red and white ochre formed in association with this steam is a significant requirement for Maasai rituals and ceremonies. The production of electricity by geothermal sources requires extensive pieces of land. Its implementation, therefore, no doubt impacts not only the ecology of the area but also, the social organization, livelihood and cultural practices of these inhabitant communities.

Already, the pastoralists of Olkaria have lost more than 1700 ha of their grazing land and five villages have been resettled in contested and fragile areas,



The current and potential geothermal areas in Kenya. Source: AFD, 2014

A displaced woman in Olkaria. Photo credit: Christin Adongo

which do not support pastoralism. A particular concern for these Maasai is the inaccessibility of their cultural areas, which they used during ceremonies, prayers or rituals. Some of these significant areas have also been renamed. This to the Maasai means that their sites have been stolen from them. For example, the stone tower called Enkaibartany, named after the mythology of a marriage procession and where child-naming ceremonies would be performed, has been renamed Fischer's Tower. Several other sites, including an important gorge – Orjorowa, that links the highland and lowland and which served as an important livestock grazing route – are now inaccessible. There are also health concerns from pollution: high sulphur dioxide emissions, brine spills and prolonged noise exceeding 105db.

The fact that the Maasai occupying these areas do not legally own the land has brought a lot of contention especially insofar as compensation and resettlement for geothermal harvesting is concerned.

The ecological environment has not been spared either; the long winding networks of pipes, wells and road networks construction for the industry have already reduced the vegetation cover by more than 30%. Drilling activities in sensitive ecological areas have destroyed the nesting grounds of the bearded Vulture, which has now disappeared from the area. Ruppels Vultures on the other hand have been pushed to the endangered list. The Hell's Gate National Park, a protected biodiversity conservation area where drilling for geothermal began, is already so degraded from the geothermal industry that it faces degazzetement threats.

Although this development has been largely associated with undesirable impacts to the local communities, some positive initiatives have been appreciated. A new road network to the drilling sites connects the previously cut-off Masai population, to nearby markets, a few casual jobs are available to the inhabitants and the companies are promoting education by paying some teachers and offering limited sponsorship to bright but poor students. The locals view these benefits, compared to the other social, environmental, cultural and economic concerns of the geothermal production as negligible.

This geothermal development, seen as a pathway to development, has re-ignited the struggle and conflict over natural resources, experienced since colonial and post-independence times in Kenya. The question then begs, is there not a way for geothermal development and the local communities to coexist? As much as this project is of immense significance both at the global and national scales, its implication for local livelihoods and environment should not be ignored.

Livestock in Olonongot village, Olkaria with geothermal steam in the background. Photo credit: Christin Adongo

The REAL Early Stage Researchers at the mid-term meeting in Gent, Belgium

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