1. Towards collaborative and integrative research in African environments
An introduction

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1.1. African environments in focus

The legacy of the colonial gaze at African environments has been an issue in critical studies in the humanities and some natural sciences for more than 30 years now. Fuelled by the emerging political ecology approach (see Robbins 2004), research and publications have radically challenged the way the post-colonial world views African environments. One of this view's cornerstones was the award-winning publication *Misreading the African landscape* (Fairhead and Leach 1996), in which it became evident that forest patches in the Guinean Savannah were not pristine remains of a large forest cover destroyed by local people. On the contrary, the authors showed that forest patches were planted and thus created by local people for multiple purposes. This new paradigm that so-called natural environments are not purely natural but cultural landscaped ecosystems has been an important narrative in ecological anthropology, with its roots in the 1980s and 1990s (see Roy Ellen's 1982 milestone book on subsistence production or Netting's *Smallholders, householders* in 1993). However, this paradigm shift remained bound in the sub-discipline and did not extend into other disciplines or even interdisciplinary arenas.

Fairhead and Leach's 1996 book was vital for a paradigmatic and discursive shift. It marked a wider recognition in the interdisciplinary and transdisciplinary worlds, because it combined sound social anthropological qualitative research with historical archive research, and more quantitative data stemming from air photography, including digital satellite images from geographic and remote sensing. This mixed methods approach established the basis for data, contributing to a wider recognition of the paradigm shift and challenging

previously held views - views that were based on negative labelling of people in African environments as trapped in a tragedy of environmental degradation; views that were very deeply rooted in the colonial discourse regarding the need to protect forests and wildlife from damage caused by the overuse of natural resources by local people (see Haller and Galvin 2011, Neumann 1998); views that called for the preservation of "pure" nature, which had to be carried out by outside "civilized" actors and was part of colonial legitimacy, which is carried on today among many conservationist views (see Brockington et al. 2008, Galvin and Haller 2008).

For looking at African environments, their reading through scientific, societal and political lenses, and interpretations about their emergence and use, the merit of the book lies not only in its mixed methodology; it lies in the integrative turn in social anthropological research which created room for the way research was conducted on the ground. Fairhead and Leach (1996) were very open to different local views and conceptualizations of the so-called environment in their research and to local explanations of why the forests looked like they did. From that emerged a more participatory research agenda, being open to the way local people viewed the environment and developed cultivation strategies for these forests. Without such an approach, these new scientifically ground-breaking insights could not have been discovered. The authors learned about how people perceived themselves symbolically and made analogies to different animals such as termites in the environment, while at the same time indicating techniques and reasons for forests ranging from shade to economic, religious and political reasons (such as defence). These views were embedded in spiritual worldviews, which placed local people in a world interacting with spirits and ancestors, and so being aware from their own animistic religious perspective (the emic view) that they are not alone in this cultural landscape ecosystem but that there is a need to interact and communicate ritually with this spiritual world (see Haller 2019a, 2019b).

1.2. Spiralling (mis)interpretations

The colonial and post-colonial conservation gaze on the environment and on people living in that cultural landscape ecosystem was not simply misread but was coupled with an incomplete and biased analysis, which, however, became politically important. The idea that drought in the area was caused by local clear-cutting of an anticipated full pristine forest covering the whole zone led

to repressive colonial and post-colonial policies and the labelling of people as forest or savannah people. It is part of what James Scott (1998) called "seeing like a state", by which he meant numbering, standardizing and labelling the environment and its people for policy action and control. This process created, and still creates, rules which are not only not adapted to local contexts, but that also led to political subordination and, as a consequence, to more degradation, creating what is called a "positive feedback loop" in system theory. The reinforcing of wrongly labelled pristine nature in peril led to repressive policies which, as a reaction from local stakeholders, leads to destructive counter-reactions as property rights are taken out of the hands of local people. When local people lose their common property rights to land and land-related resources as a form of colonial and post-colonial commons grabbing, they lose their sense of ownership and belonging. The reaction is like the one described by Hardin (1968), yet not as a tragedy of the commons but as a tragedy of the grabbed commons, leading to state control and, as states are not efficient at controlling, to the tragedy of open access. Cases in Africa such as in Guinea, Tanzania, Cameroon, Zimbabwe and Zambia show that local people rather destroy forests and wildlife under these conditions of grabbing before others take the resources, and without wildlife present, for example, conservationists will leave the land to the people as there is no longer any reason for protection (see Murphree 2001, Haller 2010, 2016).

Such counter-reactions unfortunately can then again be taken by conservationists as proof that Africans only see charcoal and game meat for the pot behind forests and wildlife, reinforcing a process of fortress or top-down so-called participatory approaches to conservation (see Galvin and Haller 2008, Haller et al. 2016). Thus, the African environment and the people living in and from it deserve adequate research and analysis that is translated into adequate policies. This is then a political process to be addressed. We need not be naïve and think that the paradigm shift will change all, as this view produced gains and obligations since colonial times which could not and still cannot today be challenged quickly. We would have to focus on authoritative power and considerable financial implications, and internationalized and interdependent spheres of environmental policy and economics.

1.3. Fragmented knowledge

Regarding the paradigm shift, it needs to be highlighted that the main problem with the ideology of pure nature is the separation of nature and culture (see Descola 2013). This separation has been a main feature of Cartesian thinking and logical reasoning since the time of enlightenment. We do not argue here that insights in that historic period are necessarily wrong, but that they led to the hegemonic view that modernity produces scientifically objective knowledge, while all older and other forms of knowledge and views are seen to be backward and tied to a dark age. Previous or other societies are labelled "traditional", while other ways of looking at what we call the environment are overlooked and their heritage remains largely unaddressed, without history and knowledge.

This view also begs a historical and environmental reality check. Wherever one studies the state of a common pool of resources - irrespective of how bad the figures and numbers might be - one must acknowledge that the biggest loss of landscapes and biodiversity occurred *after* and not before the age of enlightenment and the ages of colonial expansion. This basically means that the biodiversity which is lost now was there before colonialization with the presence of local peoples - and the work of Fairhead and Leach (1996) and others suggests that this biodiversity existed because of local people's management of resources.

Around the globe, cultural landscape ecosystems have been developed over centuries based on the views, regulations (institutions) and uses (practices) of local peoples. The term "institution" refers to formal and informal dos and don'ts, or to the rules of the game (see North 1990), as well as property rules, regulations of use, norms and practice-induced values (see Ensminger 1992, Haller 2010). These institutions are also full of condensed knowledge and serve as an orientation for collective action to maintain cultural landscapes based on the wisdom that interactions with the environment (the cultural landscape ecosystem context) need coordinated action with other humans and other groups of humans (the political environment) as well as with the world of spirits and souls of the material and immaterial and ancestors (the spiritual environment) (Haller 2007, 2010). Not taking this knowledge into account during colonial and post-colonial times, however, did not only reduce sociocultural aspects; it also had a negative impact on the environment on several levels. It reduced knowledge on how to deal with the created landscapes and how to maintain and manage them (see Bornemann et al. 2017). A reduced

knowledge base results in degradation of these cultural (and natural) landscapes.

Therefore, there is a claim to recognize knowledge among local groups. Alexander von Humboldt (1852, Lubrich 2009) was not so much the one discovering and "inventing nature" in the Americas - as Wulf (2016) makes us believe - but the one discovering complex interrelationships between different factors such as climate, topography, vegetation and soils, as well as animals and humans transforming these environments. On his journeys through Latin America, Humboldt realized that landscapes had been inhabited and that colonialization left massive tracts in the landscapes and altered them. He was therefore interested in the views of local people in the same way as he was interested in the data gathered by his instruments and the information he received from other scholars. He realized before the debate on the nature-culture divide in humanities and natural sciences that local indigenous groups did not make this division, a fact highlighted later on by scholars such as Tim Ingold (2000) and explicitly by Philippe Descola (2013). Their emphasis, especially by Descola, on animistic and totemistic worldviews, characteristic of local peoples' environmental worldview, was to show the notion local groups had of not being alone but rather embedded in a much larger environment. The result of that relationship is an emic view of mutual interaction between the material and the spiritual.

On the other hand, the Cartesian separation on which natural science is based created a new construction of nature as not influenced by humans. Humboldt was exceptional as he was not guided by this divide in his scientific curiosity but thought in terms of interrelations and was interested in different views. On the one hand, he focused on natural science methodology and gathered quantitative data, but on the other hand, he was interested in the views and knowledge other peoples had on how the environment functioned. In addition, he paid attention to their practices and rationales by gathering information on their views on processes in the environment, which he considered to be information as important as the natural science data. What is unclear with Humboldt is the question of whether he considered local people as creating cultural landscape ecosystems. However, on his journeys throughout the Americas he recognized the infrastructure created by the Incas as equal to the infrastructure created by the Roman Empire, and he explained environmental changes such as low water levels of lakes as stemming from the colonial practice of plantation economy, and thus the altering of forest cover as a major cause. Similarly, he described the use of guano (a natural fertili-

zer stemming from bird dung on islands) as being sustainably managed by the Incas, which means he knew the impact local peoples had on a resource that can be overused if not managed carefully (Humboldt 1853). Therefore, we argue that he was also attentive to the historical processes of altering of the landscape by humans, both indigenous and immigrants through the colonial process, and he criticized the latter for their unsustainable resource management.

1.4. Longitudinal knowledge guidance for researching African environments today

By allowing plural views and putting them into historical contexts, Humboldt was the first scholar to use what we call a participatory research orientation. This orientation is the basis of Fikret Berkes' (1999) work, who gave sense to Humboldt's thinking without actually referring to Humboldt. Berkes tried to show the differences and similarities between the scientific and local indigenous peoples' thinking, and reached the following conclusions by studying the knowledge systems of First Nation peoples in the US and in Canada. The basic difference between the natural scientific and local indigenous knowledge is that the latter is not expert knowledge: it is not developed by someone distant, but is locally embedded, and it is related to practice and transmitted through generations. It thus has what natural science knowledge often lacks: a longitudinal basis of accumulated knowledge that can also be very adaptive through time. The basic similarities between natural science ecosystem knowledge and indigenous ecological knowledge can be seen in the way both knowledge systems try to reduce complexity and are interested in experimenting. By this, Berkes - like other scholars, such as Paul Richards (1985) - means being engaged in processes of trial and error in the field, for example in agriculture, by trying out different crop varieties, irrigation patterns, etc. Both knowledge systems deal with practical notions, but the indigenous system focuses centrally on the issue of risk management to secure livelihoods, as some authors have shown in relation to hunter-gatherer societies (Sahlins 1972, Winterhalder and Smith, 1985, and many others), pastoral societies (Homewood 2008, McCabe 1990), agriculturalists (Ellen 1982, Netting 1993, Richards 1985), and many mixed forms (hunting and horticulture, agro-fishery-pastoralism, fishing-agriculturalists), as well as resource-based occupational groups being interrelated (arrangements between farmers, fisheries and nomadic pastora-

lists) (for a summary, see Haller 2007, see also Haller 2010, 2013, 2016, Haller et al. 2013).

There is a lot of accumulated practical knowledge handed down over generations and adapted to local changing conditions in these societies, which basically work on the principle of longitudinal knowledge of dynamics and expected variability in the cultural landscape ecosystems. The basic common strategy is not to drive for the best but for maximization of the minimal needed yields, catches, game hunted etc. Such a mini-max strategy (see Haller 2007) can only work by diversifying uses and accumulating generational knowledge on environmental dynamics in cultural landscape ecosystems. Complementarily, local peoples have developed worldviews which help to explain uncertainty and often provide ritual practices to bring (from an emic perspective) an unbalanced human-spiritual world relationship back into balance. These elements - knowledge, resource management and practices on the one side, as well as worldviews - are interconnected on the level of what Berkes (1999) calls social institutions.

Where this works, the results of adapting to changes such as economic and climatic changes produce better solutions on several levels. Firstly, local actors have a more longitudinal knowledge of their environments, and interacting on a shared level with scientists can only be beneficial for both sides if science shows more openness. Secondly, adapted rules based on older solutions and knowledge reduce transaction costs in a tremendous way, as feeling a sense of ownership of the knowledge production and crafting processes creates among local people the feeling that the new institutions are theirs and derive from their knowledge. This embodiment of a sense of ownership of the institution-building process, which has been labelled "constitutionality" (as a counter-position to Foucault's "governmentality" and Arun Agrawal's "environmentality") as a collective conscious way of creating institutions (see Haller et al. 2016, 2018) shows very positive effects in a new more sustainable way for resource management. As new literature on Africa shows (Chabwela and Haller 2010, Faye et al. 2018, Haller et al. 2013, Haller and Merten 2008, 2018), supported for other places in the world (see the 2018 special issue of *Human Ecology*, volume 46, issue 1), a process of shared research is needed to develop locally rooted and sustainable institutions.

Therefore, shared research is a central step to such institution crafting, and a process where we still need to learn more. In the history of anthropology, we find such approaches in what was called action anthropology (since 1950, but discontinued; see the work of Sol Tax in Foley 1999) and applied an-

thropology (from 1980 onwards; see Bennett 1996, Rylko-Bauer et al. 2006). Researching African environmental contexts with explicitly inclusive lenses regarding co-researching and co-learning can fuel this learning process.

1.5. Towards shared research

When organizing the conference "Towards Shared Research: Participatory and Integrative Approaches in Researching African Environments: Opportunities, Challenges, Actualities in Natural and Social Sciences" in 2015, we hoped to profit from rare cases of in-depth insights into the research process and the diversity of knowledge and perspectives about African environments. The conference participants openly debated and challenged their shared research experiences, wherein lies a learning potential with paradigmatic dimensions. All the papers included in this book stem from a deep reflection on and a curiosity in local contexts, but they also show the challenges and turning points in interdisciplinary research and local people-researcher interactions. Researchers in this edited volume have different social and natural sciences and engineering backgrounds, in which an interest in the practice of the "other" and challenges were central to reaching more collaboration and mutual learning. The learning in researching African environments happens on at least two levels: 1) among disciplines of different science domains; and 2) between researchers and the researched. Co-experimenting at these two levels is something which we see in all the papers. It allows reflection on political-historical and power-specific contexts and enables a better understanding of other positions and views (see Zingerli 2010). That again facilitates the notion of co-learning as a basis for shared research. Coming back to the contributions by Fairhead and Leach (1996), shared research might continue to trigger paradigmatic shifts, indicating that numerous variables and different views are of value and shape the way we perceive what is important about the environment and development in African environments today.

For our interpretation of shared research based on the contributions united in this book, we used a framework according to which the presentations can be positioned. It includes the following four elements:

- Learning as multidimensional and multilevel processes in extended time and scale.

- Dimensions of participatory research.
- Role of language and translation in interdisciplinary and intercultural research settings.
- Turning points in collaborative research processes.

In the last chapter, we address each of the elements as a stimulus for further thought and exploration towards collaborative and integrative research in African environments.

1.6. Overview of contributions

The following four original contributions are grouped under two headings: 1) Contextualizing soil fertility; and 2) Negotiating knowledge and technological inventions in intercultural settings.

The two articles by Prudat et al. ("Soil classifications: Between material facts and socio-ecological narratives") and Oyama ("Action research and reverse thinking for anti-desertification methods") both take a focus on soil, soil fertility and soil management in arid sub-Saharan African environments. Prudat et al.'s geographical context is north-central Namibia, while Oyama's study sites are in south-west Niger.

Prudat et al. set out in 2014 to compare local knowledge on soils with two international soil classification systems. They had designed their study from a natural science perspective, focusing on describing soils in a scientific way. The long fieldwork enabled them to delve deep into the complexities of local knowledge about soils and to reflect thoroughly on what it means to give justice to the diversity of local perspectives and to make use of complementary knowledge of soil and soil management. The paper shows what a shared research offers, acknowledging soil as part of a human-made landscape and soil knowledge as part of a socially constructed knowledge. On the other hand, the emic, i.e. local way of understanding soil characteristics has limits that an objectivized soil classification can counterbalance in soil management decision-making. Prudat et al. offer an honest reflection on environmental scientists that enhance their natural sciences' "socialization" through participatory research methods and observation among the Oshikwanyama in north-central Namibia.

Local knowledge of soil and soil management is also a focus for Oyama, who draws on a series of research stays in south-western Niger spanning mo-

re than 15 years of participatory research. Oyama's contribution evolves in the context of combating desertification, but it draws attention to wicked problems that manifest in local settings, including the pressure for farmland that reduces pastureland, with ever more livestock and lingering social conflicts. His contribution to enhancing soil fertility and land management can be read as a quest to mitigate a situation of environmental and socio-political stress. Because the author demonstrates high engagement in actual fieldwork and participatory observation, he creates social relations to experiment with and scientifically measures local techniques for improving soil conditions. What he refers to as "reverse thinking" is to apply and test a locally emerging soil management technique for its potential to create plots for enhanced soil fertility and more productive biomass production for livestock herding. What is counter-intuitive from an environmental point of view is the application of solid waste from the city to abandoned and degraded soils. Oyama portrays positive effects on both soil fertility and land management between Hausa farmers and Fulbe herders. Despite large scale programmes to combat desertification in the region, local communities organize themselves for higher productivity. Oyama's action research approach is an interesting and puzzling contribution to dealing with a wicked problem.

The two contributions by Jewitt et al. ("Energy and the environment in sub-Saharan Africa: Household perceptions of improved cookstoves") and Slezak et al. ("Fishing for food and food for fish: Negotiating long term, sustainable food and water resources in a transdisciplinary research project in Burkina Faso") emerge from European-African research collaborations in which the negotiation of knowledge and technological inventions in intercultural settings plays a big role. The paper by Jewitt et al. presents an excellent opportunity to discuss the development of technical innovations based on a health-environment-technical approach. The article explores the evolution of improved cookstove initiatives and looks at initiatives promoting clean fuels and cookstoves. Its analysis evolves against the background of specifically designed events called "bake/cook-offs". The international group of researchers organized cooking events in three largely different settings in order to collect end-users' views. The first bake-off took place in England, with the participation of immigrants and refugees; later, the bake/cook-offs were organized in Malawi and Zambia as well as in Benue state, Nigeria, the latest accompanied by fieldwork. This participatory approach to experimenting and testing makes contributions beyond the health-environment-technology approach. It shows the potential of end-users' views and cultural considerations in pro-

cesses aimed at introducing new or alternative technologies. It is helpful in understanding the level of adoption of a technology and the power of co-creation of knowledge.

Co-creation of knowledge is a key focus of Slezak et al.'s contribution. It provides a thick account of shared research activities in the fisheries in Burkina Faso. It also shows that merely trying to be interdisciplinary and transdisciplinary in a European-African research collaboration does not suffice, as hegemonies from male-dominated natural science and hegemonic postcolonial biases prevail. The case shows that such problems can remain unrecognized and that conflicts are perhaps needed to draw attention to these issues. The paper also addresses other views, which appear in the discussion of differences regarding gender, culture and multiple languages involved. The paper shows that the richest experiences and learnings stem from joint workshops and storytelling approaches, along with long-term interactions in the field. However, these require time and intensive interactions diverse participating actors in international, interdisciplinary and transdisciplinary project collaborations.

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