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ORIGINAL ARTICLE

# Formal education as a contested pastoral adaptation pathway: insights from southern Kenya

**Edwige Marty**[1,2]

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## Abstract

In dryland pastoral environments, political and geographical marginalization has historically led to development strategies that poorly account for individual and communities' spatial and socio-economic realities. These development legacies, including long-standing epistemic biases in defining what should be adapted, are often insufficiently considered within adaptation research and practice. This article sets out to analyze the historical emergence and enactment of formal education as a contested adaptation pathway in southern Kenya. For this, I combine the strengths of the historically situated analyses of the pathways scholarship and feminist political ecology's attention to the performance of intersectional relations of power in everyday livelihood practices. I bring together both archival data and qualitative primary data from focus group discussions ($n=16$) and individual interviews ($n=122$) conducted in three pastoral communities. The results exemplify the ways that non-climatic factors, such as increased formal school enrolment, (re)shape everyday livelihood practices and social aspirations, molding the current adaptation space. Notably, enacting formal education as an adaptation pathway requires one to navigate increasing cash pressures, mobility, and labor constraints. Wealth disparities, gendered norms, and geographies intersect to shape patterns of vulnerability, with poorer pastoralists residing further away from school centers facing difficult trade-offs on their time and resources. Understanding pathways enactments contributes to problematizing current logics of development and adaptation needs, while yielding important information on socio-spatial differentiation processes in pastoral systems. It also opens the space for further research to use these critical insights to identify alternative adaptation pathways that support more just transformations towards sustainability.

**Keywords** Adaptation pathways · Feminist political ecology · Pastoralism · Climate change adaptation · Education

## Introduction

What climate change adaptation implies in fast-changing agrarian environments continues to be the subject of many scholarly and policy debates. Recent critical adaptation scholarship advocates to start inquiries from the perspectives of what change matters the most to rural smallholders adapting to profound changes in livelihoods, of which increased climatic risks are only one part (Ensor et al. 2019). Approaching climate change adaptation as part of multiple development and socio-political processes yields practical insights into how specific agrarian environments are produced and what transformative adaptation might then imply in different contexts (Quealy and Yates 2021; Taylor 2014). Such analyses problematize the often-narrow framing of adaptation as linear technical actions through which "static communities" adapt to external climatic stressors (Burnham et al. 2016). The need to understand complex intersecting relations underlying drivers of vulnerability has also been made visible in the Intergovernmental Panel on Climate Change AR6 report (IPCC 2023). In the pastoralism scholarship, recent work emphasizes the necessity for research and practice to engage with both climatic and non-climatic drivers to understand shifting patterns of vulnerability in pastoral settings (López-i-Gelats et al. 2016). A growing body of research also emphasizes social differentiation processes, challenging dominant representations of adaptation as a straightforward process and of pastoralists as homogenous groups (Caravani 2019; Ng'ang'a & Crane 2020).

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✉ Edwige Marty
edwige.mty@gmail.com; edwige.philippine.marty@nmbu.no

[1] Norwegian University of Life Sciences: Norges Miljo- Og Biovitenskapelige Universitet, As, Norway

[2] International Livestock Research Institute, Nairobi, Kenya

Pastoral livelihoods among the Maasai communities of southern Kenya are undergoing multiple socio-ecological changes, which have both deeply rooted historical origins and more recent developments (Marty et al. 2023; Unks et al. 2023). Among these are heightened land fragmentation and privatization, growing levels of urbanization, and sedentarization (Rotich et al. 2023; Unks et al. 2023). Moreover, scholars point out at increased diversification of herds and livelihoods and higher rates of school enrollment (Marty et al. 2023; Rotich et al. 2023; Unks et al. 2023; Wangui 2008). Climate change is also predicted to lead to higher temperatures and rainfall variability (Matsaba et al. 2021). The combination of these factors engenders livelihood changes that both complement and reshape pastoral production, as well as vulnerabilities, in the face of a changing climate. In the study area presented below, formal education was overwhelmingly reported by people as one of the most important historical changes. In this article, I analyze the relations between increased formal education and changing pastoral livelihood dynamics, at both material and symbolic levels, and for differently situated individuals and groups. Understanding the complex linkages between evolving livestock management practices and other aspects of life, which shape everyday decision-making processes and livelihood priorities, underlies the production of knowledge that can inform contextually and socially relevant adaptation planning efforts.

The topic of formal education in pastoral systems has received some attention in the last decade (Dyer 2012; Krätli and Dyer 2009; Ng'asike 2019). However, there have been few attempts to investigate its significance for and relationship with adaptation in pastoral settings (Walker et al. 2022). Formal education is often mentioned as a determinant of adaptative capacities, as it can facilitate access to information and improved technologies (Ng'ang'a et al. 2016; Silvestri et al. 2012). Facilitating access to formal education in pastoral systems also ties with diversification efforts which enable non-climate sensitive employment (Headey et al. 2014; Lenaiyasa et al. 2020; Opiyo et al. 2015). But in long-marginalized pastoral environments, the introduction of formal education also appears as a key historical driver of change, reflecting a legacy of colonial and post-colonial development strategies that sought to alter pastoral livelihoods (Datzberger 2022; Dyer 2012; Krätli & Dyer 2009; Ng'asike 2019; Sifuna 2005). Increased school enrollment reshapes husbandry practices, for instance affecting intrahousehold decision-making and labor roles related to livestock herding and migration (Unks et al. 2023; Wangui 2008, 2014). Continuing questions around formal education based on the mainstream schooling systems, beyond physical and financial accessibility, also revolve around the fit with mobile pastoral production and the space accorded to local knowledges (Krätli & Dyer 2009; Ng'asike 2019; Walker et al. 2022). In Kenya, recent research questions the widely assumed efficacy of formal education, as currently implemented, for pastoral climate resilience (Opiyo et al. 2015; Walker et al. 2022).

In this article, I investigate the emergence and enactment of formal education as an adaptation pathway in three pastoral communities in southern Kenya. Formal education refers here to the national state schooling system that is classroom and teacher-based. My analytical approach draws on the strengths of the historically situated analyses of the pathways scholarship and on feminist political ecology' attention to the intersectional power relations (re)produced in everyday livelihood practices. Framing increased formal education in pastoral systems as an enacted pathway, as opposed to analyzing it as a static determinant of adaptive capacity or as an isolated adaptation practice, facilitates a historically rooted understanding of the decision-making processes that underlie the development of specific pathways in different contexts. Moreover, insights from feminist political ecology are instrumental to articulate the (re)production and performance of intersectional power relations within adaptation, thus shining a light on how socio-spatial differentiation is (re)produced over time, with ramifications for the (re)production of patterns of vulnerability.

In the southern Kenyan context, formal education becomes "enacted" as an adaptation pathway, meaning that it emerges as a desirable adaptation pathway and comes to be performed in everyday practices by differently situated individuals and groups. Given the focus on one aspect of several co-constitutive historical socio-ecological changes in a specific geographical context, the objective is not to provide a generalizable and global understanding of processes of change and adaptation in southern Kenya. Rather, I show how considering key non-climatic historical changes and their interlinkages with everyday practices over time is an important entry point to understanding adaptation as "a contested socio-political process" (Eriksen et al. 2015, p. 524), one that is embedded within historical development trajectories but also reflective of fast-changing values, norms, and aspirations.

The following question guides the analysis:

- What can we learn about the development and enactment of formal education as an adaptation pathway in southern Kenya through an analysis of the historical context and socio-spatial differentiation dynamics?

First, analytical insights from recent works on adaptation pathways and feminist political ecology are discussed for their potential to help the examination of the intersecting relations of power embedded within enacted adaptation pathways. Then, the study area in southern Kenya and the qualitative data collection methods used are introduced. The

results section starts by historicizing the emergence of formal education as an adaptation pathway in southern Kenya. Second, I pay attention to how increased formal education is now enacted within contemporary pastoral livelihoods in the locality examined. In the discussion, I reflect upon the relevance of the approach for further research that seeks to develop the understanding of adaptation pathways and their everyday ramifications. I conclude the article with reflections on the wider policy and practice implications.

## Conceptual connections: adaptation pathways and socio-spatial differentiation in feminist political ecology

In this article, insights from the pathways scholarship and feminist political ecology are combined to advance the understanding of the power dynamics inherent to the emergence and unfolding of adaptation pathways in diverse contexts. By focusing empirically on formal education as an enacted adaptation pathways in southern Kenya, analytical attention is paid to how demands associated with formal education interact with pastoral production practices that respond to climatic variability and uncertainty, as well as to the associated power relations that shape spatial and social differentiation.

Since the 2010s, pathway approaches to climate change planning have become popular to think about how cross-scale decision-making processes shape alternative trajectories in various contexts (Werners et al. 2021; Wise et al. 2014). The concept of "pathways" functions primarily as a metaphor, representing trajectories of change that result from different decisions being made over time (Wise et al. 2014). Most of this scholarship is forward-looking, aiming to conceptualize pathways towards climate-resilient development (Werners et al. 2021). But some of the scholarship on adaptation pathways adopts a retrospective lens (E.g. Câmpeanu and Fazey 2014; Fazey et al. 2016; Burnham and Ma 2018; Fischer 2018). Retrospective pathways analyses situate climate change adaptation within wider processes of change and response in agrarian environments (Câmpeanu and Fazey 2014; Fazey et al. 2016). These approaches are instrumental in highlighting the interplay of structural conditions and development legacies that shape pathways, sometimes locking in maladaptive ones (Fazey et al. 2016; Gajjar et al. 2019; Wilson 2014). They also align with calls for more consideration to be given to the historical power relations (re)producing vulnerabilities (Adamson et al. 2018; Ribot 2014). In dryland pastoral areas in Kenya, sedentarization and modernization pressures have played an important role in altering migration patterns and thus adaptation strategies to rainfall variability (Letai and Lind 2013; Semplici & Campbell 2023).

Pathway approaches put power at the center of their analyses to focus on the role of actors and institutions in shaping livelihood trajectories (Gajjar et al. 2019; Leach et al. 2010). This interest is also central to political ecologists, with key contributions unpacking how dominant techno-managerial framings of global environmental changes have influenced and continue to influence the types of policy and institutional responses that are enacted in different contexts (Adger et al. 2001; Taylor 2014). In Kenya, scholars have noted that colonial misunderstandings of desertification and land degradation in drylands as resulting from improper local land use by pastoralists rather than non-equilibrium ecological conditions in drylands provided the rationale for enforcing grazing restrictions and destocking policies (Ellis and Swift 1988; Munei 1991). Approaching narratives of changes and their impacts through a pathway lens helps to further understanding of decision-making processes — and the important normative biases and uneven power relations that these reflect — through which some pathways come about and are then enacted in different contexts, ultimately restricting the "adaptation space" (Gajjar et al. 2019, p. 224).

However, the adaptation pathways scholarship has been criticized for failing to adequately recognize intra- and inter-community social differentiation dynamics within pathways and the role of evolving socio-cultural values, norms, and worldviews in shaping experiences of changes (Câmpeanu and Fazey 2014; Marks et al. 2022). Most retrospective pathway approaches focus on mapping paths followed for an entire group, community, or area, which makes analyses of changing and socially differentiated norms, values, and aspirations enacted within pathways uneasy (Câmpeanu and Fazey 2014; Marks et al. 2022). One exception examines the pathways of response to key moments of change of five different socio-ethnic groups in a rural Transylvanian village (Câmpeanu and Fazey 2014), detailing the different pathways followed, and their interrelations, but also showing how one normative narrative becomes dominant, sustaining social hierarchies in the locality examined (Câmpeanu and Fazey 2014). Another in the Kenyan context reports multiple adaptation pathways being enacted within one transitioning pastoral community, with age, gender, and age critically influencing trajectories (Ng'ang'a and Crane 2020). Taking stock of the current body of adaptation pathways research, Marks et al. (2022) advocate for more intersectional analyses of livelihoods and life courses as well as of the cultural beliefs and values that underlie processes of change and the production of differentiated patterns of vulnerability. In this case, by analyzing one key historical change — increased formal education and associated responses — the social and spatial differentiation dynamics that form part of this pathway and are reflective of both material and symbolic changes in pastoral livelihood trajectories can be made visible.

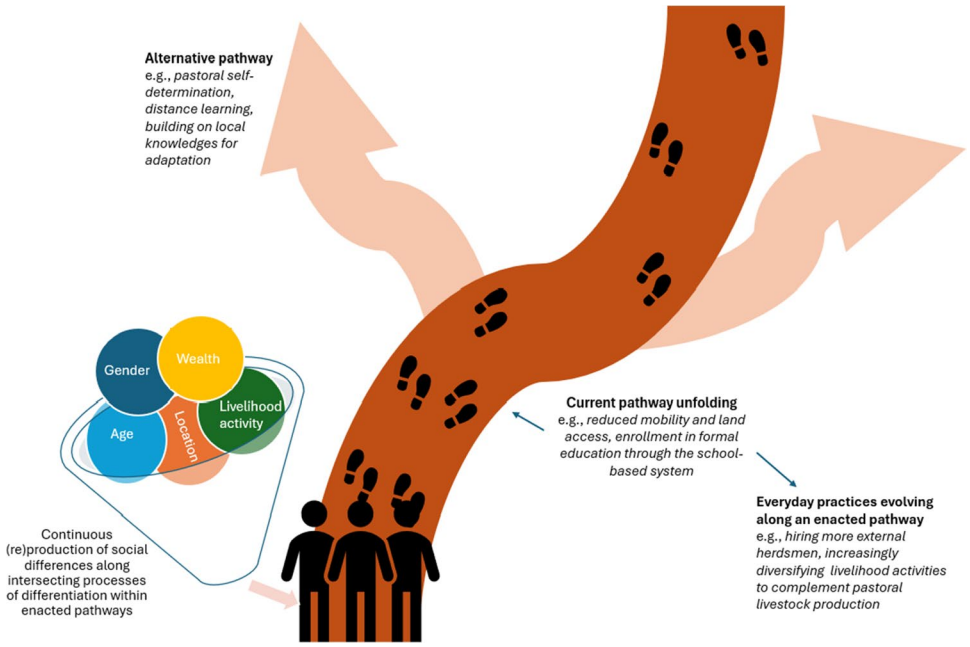


**Fig. 1** Illustration of the analytical framework representing the current pathway unfolding and the differentiated experiences of this pathway as shaped by intersecting markers of social differences. It also shows that other pathways are possible but were not enacted historically

Feminist political ecology (FPE), with its attention to cross-scale power relations, particularly gendered ones performed at intimate levels such as intra-households (Elmhirst 2015; Rocheleau 2008), has much to contribute to intersectional analyses of increased formal education as an enacted adaptation pathway. FPE scholars shine a light on the relational social norms and values which are continuously produced through and emerging from differentiated labor roles, decision-making processes, and resource access attached to everyday practices in different spaces — notably along gendered lines in pastoral contexts (Truelove 2011; Wangui 2014; Marty 2024). Recent work has focused on analyzing the intersecting and mutually constitutive social relations of power that shape social identities and people's experiences of change (E.g. Elmhirst et al. 2017). FPE research on intersectionality has pushed further the examination of power through paying attention to the ways "social subjects are constituted in and through diverse and interlocking processes of differentiation such as gender, sexuality, race, ethnicity, class, and livelihood" (Sundberg 2017, p. 7). Intersectional research on climate change is especially important to move beyond taking gender as a fixed category and to help better appreciate the agency of people often portrayed as vulnerable within processes of change (Djoudi et al. 2016; Kaijser and Kronsell 2014; Mikulewicz et al. 2023; Marty 2024).

Moreover, the FPE scholarship has highlighted the value of examining embodied experiences as a way of understanding the wider socio-politics at play (Elmhirst 2015; Sultana 2009; Truelove 2011), which can enrich the understanding of how an enacted pathway and the multiple responses it engenders are lived through and reflected on by people living through these changes. This implies looking at the performance of complex and historically embedded social relations of power in everyday material practices (Nightingale 2011; Truelove 2011). Wangui's study (2014) for instance focuses on the renegotiations of labor linked to livelihood shifts among Kenyan Maasai to analyze changing gendered performances. Intra-household dynamics critically affect patterns of inequalities in pastoral areas in Kenya, but they are difficult to assess (Yurco 2022). In this article, by looking at the ways that formal education is "enacted" as an adaptation pathway, attention is paid to how the associated power relations are performed in everyday practices that facilitate engagements with formal education. The analysis also sets out to consider how changing everyday practices are reflected on by differently situated local resource users, thus making visible evolving social norms, roles, values, and aspirations. Looking at these dynamics is especially important in the context of "Maasai pastoralists," who are often represented as having static communal values that are immune or resistant to change (Hodgson 1999). The pastoral literature has also long suffered from overlooking pastoral agency within broader transformations (Greiner 2022).

Building on Fazey et al. (2016), the following schematic illustrates this analytical framework (Fig. 1).

Historicizing and unpacking contemporary differentiated livelihood practices and associated experiences of increased formal education as a key driver of change and as an enacted adaptation pathway is a way to broaden the understanding of the current contested adaptation space in southern Kenya. It notably allows one to contextualize and problematize top-down logics of development and adaptation needs while yielding important information on current processes of social differentiation and (re)production of vulnerabilities

in pastoral systems. In the following section, the methods and material used for this analysis are presented.

## Methodology

### Description of the study area

Southern Kenya is a fast-changing pastoral environment, in which individuals and communities are responding to multiple climatic and non-climatic stressors. This article focuses on the south-westernmost part of Kajiado County, comprising Olkiramatian, Musenge, and Shompole, within Magadi ward (Fig. 2). This area was often described during interviews at the county government level as presenting unique challenges due to being one of the county's most remote and arid locations. It is also one of the few areas within Kajiado County that is still mostly communally managed[1] for pastoral production with rotational grazing systems. Focusing on the above area as a case study presents an opportunity to explore further how patterns of historical marginalization and socio-spatial differentiation manifest in practice within a delineated area, probing further into the cross-scale power dynamics. Most residents are Maasai from the Iloodokilani section — and Ilpurko section in Musenge, but other communities also live in small towns and around the wetter areas in which crop farming is practiced. Average annual rainfall is below 500 mm within the Magadi ward (Bobadoye et al. 2014), with increasing rainfall variability and temperatures being noted within Kajiado County (Matsaba et al. 2021). The landscape's main natural resources include grassy plains, forests, and the Ewaso Nyiro river (Ontiri and Robinson 2018). Droughts have occurred at regular intervals and historically have been managed through migration. Besides pastoralism, complementary livelihood activities include small businesses, small-scale fishing, crop farming in the wetter parts of the landscape, and revenues from tourism in the communities' designated wildlife conservation area in between Shompole and Olkiramatian (Brehony 2020; Marty et al. 2023). Previous research has highlighted low levels of formal education attainment (Brehony 2020). Formal education occurs within primary and secondary schools located in different parts of the landscape, but pursuing any form of higher education necessitates the learner to migrate beyond the locality.

### Data collection and analysis

During preliminary research conducted between November 2020 and February 2021 as part of a broader PhD project, increased formal education emerged as a key historical driver of change deserving of more attention given its ramifications on everyday practices and broader adaptation processes in the study area. The material used in this research draws from both secondary and primary data. Ethical approval for the study was received from the International Livestock Research Institute's Institutional Research Ethics Committee, accredited by the National Commission For Science, Technology & Innovation (NACOSTI) in Kenya.

To build a historically grounded understanding of the emergence of formal education as an adaptation pathway, available data on education and archival records on development plans for Kajiado County kept at the Kenya National Archives in Nairobi were consulted. In parallel, primary qualitative data collection was conducted in several stages between November 2020 and May 2022. Table 1 presents a summary of the focus group discussions (FGDs), and interviews conducted. Many people who participated in the FGDs were also individually interviewed later.

The FGDs followed broadly the GENOVATE Ladder of life methodology (Petesch et al. 2018) and aimed to generate insights on livelihood changes and associated shifts in perceptions, norms, well-being, and values over time. The groups were disaggregated by sex, age, and locations.[2] Insights from the FGDs on existing social differentiation dynamics were used to refine the selection of individual interviewees. Purposeful and snowball sampling was used to query further how intersectional relations of power shaped by contextually relevant differences in age, sex, wealth, and geographies are performed within efforts to enact formal education as an adaptation pathway. Individual interviewees were asked to reflect on the significance of formal education amidst multiple livelihood stressors, including for different household members, and on how it affects everyday practices and social aspirations, including labor roles, norms, and values. Community leaders and elders, including school board chairmen and teachers, were also interviewed.

Present narratives of changes and responses linked to increased formal education are necessarily mediated by evolving normative discourses. They were also produced in response to questions from two visibly highly educated

[1] While communally used in practice by the different resident communities at the time of writing, there are multiple on-going land contestations. For instance, in Musenge, the land area was subdivided and sold to different owners in 1993 and this sale is highly debated to this day. Moreover, Tata Chemicals, now running the Magadi concession, legally controls half of Olkiramatian and Shompole's land areas. Olkiramatian also intends to subdivide the wetter part of the landscape increasingly used for crop farming.

[2] More detailed information on this data collection activity is available in Marty et al. (2023) and Marty (2024).

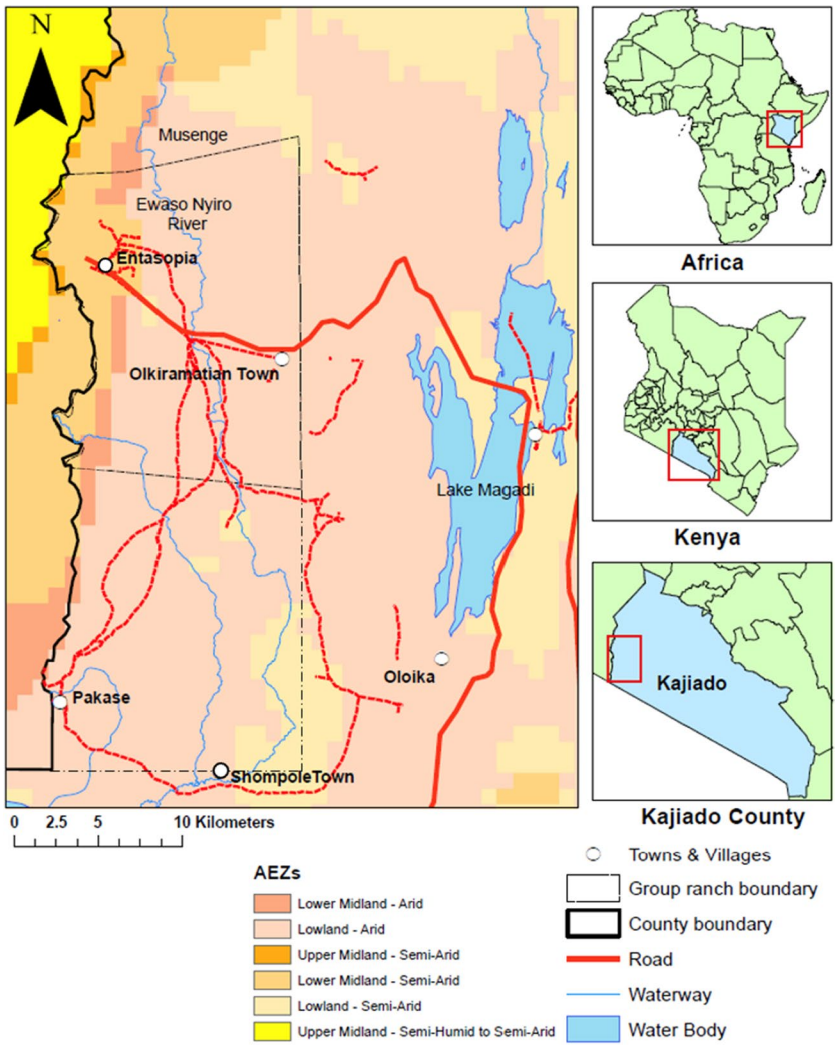


**Fig. 2** Map of the study area — scale: 1:210,537. Nairobi, Kenya: M. W. Graham, 28th April 2023

outsiders: the author, a young white woman, and a young Maasai woman from another part of Kajiado who assisted with translation in English as all data collection was conducted primarily in Maa. The positionality of the research team might have led to respondents being more inclined to speak positively of formal education, for instance. To address this, we explained our research interests and independence from development or governmental organizations as clearly as possible and highlighted that we also wanted to hear about challenges related to education. Prolonged presence in the study area also enabled observations of everyday practices and provided opportunities for informal discussions, which helped to contextualize the interview data. In May 2022, small sex-disaggregated validation meetings ($n=2$) were also held with selected interviewees, who had previously been engaged in the research process and were from different locations. These meetings allowed the researcher to present preliminary interpretations of the data, with participants elaborating on some dimensions further. As these final meetings also took place during the onset of a drought, the reflections shared touched on the then-current difficulties too.

All the empirical material was recorded, transcribed, and then analyzed in the qualitative data analysis software, NVivo20. The data analysis process relied on a mix of deductive and inductive coding. The overall conceptual interests — namely perceptions, development, and implications of formal education for everyday practices — acted as guiding markers for the coding. Further codes were created in relation to the empirical evidence examined — for instance creating a code to categorize references to changes in mobility associated with education.

**Table 1** Overview of the data collected and used in this study

| *Interview types* | *Men* | *Women* |
|---|---|---|
| Focus group discussions (# of participants in each) | | |
| *Olkiramatian* | 1 (6) | 1 (6) |
| *Adults — wet area* | 1 (6) | 1 (6) |
| *Youth < 35 years old*[1] *— wet area* | 1 (6) | 1 (6) |
| *Adults — drier area* | 1 (7) | 1 (6) |
| *Youth < 35 years old — drier area* | | |
| *Total number of FGDs (# of participants — Olkiramatian)* | =4 (25) | =4 (24) |
| Focus group discussions (# of participants in each) | | |
| *Shompole* | | |
| *Adults — wet area* | 1 (6) | 1 (6) |
| *Youth < 35 years old — wet area* | 1 (6) | 1 (6) |
| *Adults — drier area* | 1 (6) | 1 (6) |
| *Youth < 35 years old — drier area* | 1 (6) | 1 (7) |
| *Total number of FGDs (# of participants — Shompole)* | =4 (24) | =4 (25) |
| Individual interviews | | |
| *Olkiramatian* | 26 | 27 |
| *Shompole* | 26 | 23 |
| *Musenge* | 5 | 4 |
| *Total number of individual interviews* | 57 | 54 |
| County government employees | | |
| *Kajiado town* | | |
| *Individual interview* | 3 | 1 |
| *Group interview (# of participants)* | 1 (1) | (1) |
| Extension officers for Magadi ward | | |
| *Group interview (# of participants)* | 1 (2) | (2) |
| NGOs/CBO employees | 4 | 1 |
| Validation meetings (# *of participants*) | 1 (8) | 1 (6) |

[1]This demarcation follows the Government of Kenya's definition of youth (Government of Kenya 2019)

## Results

### Historicizing the emergence of formal education as an adaptation pathway[3]

In this section, the historical emergence and development of formal education based on the schooling system is traced and analyzed to show how it is inscribed within long-term top-down efforts to change the Maasai, as well as how these efforts contribute to reshaping intersectional social relations of power over time. This section is instrumental to link historical developments to the present dynamics, furthering the understanding of how formal education is now framed and recognized as an adaptation pathway in southern Kenya.

In colonial times, investments in formal education were closely tied to development and missionary efforts across Kenya (Sifuna 2005). In southern Kenya, the first schools were opened in the 1920s by the British colonial government (Knowles & Collett 1989). As archival records show, schools were also seen as spaces to educate on controlled grazing schemes (Office of the District Commissioner 1949), while planning of resources, such as the building of boreholes, was also meant to support the educational policy and worked to further settlement within the delineated Kajiado sections (Ellis 1948). As scholars note, formal education efforts were also inscribed within efforts to reform the *ilmurran* institution (Knowles & Collett 1989; Kibutu 2005). The *ilmurran* institution refers to the warrior age set of the Maasai, constituting an important milestone for newly circumcised young men, and coming with specific roles, restrictions, and responsibilities to take on for several years. Facilitating long-distance livestock migration to access pastures

[3] This section draws from on literature referring to Maasailand, a space spatially and socially constructed to refer to southern Kenya and Northern Tanzania, but with specific references to southern Kenya drawing on relevant sources and archival data consulted for Kajiado County. From independence, only scholarship pertinent to the Kenyan context is used.

and water points during dry seasons and droughts has historically been one, for instance (Wangui 2008). *Ilmurran* were also expected to spend time at the manyatta — camps which served as educational institutions on traditions and expectations under guidance from the junior elders (Kibutu 2005). However, Europeans often saw the *ilmurran* age set as violent and wild, responsible for cattle raids (Knowles & Collett 1989), and tended to collaborate with, and thus solidify, the authority of Maasai elder men across Maasailand (Hodgson 1999; Kibutu 2005). For instance, in a letter to Narok and Kajiado's district commissioners, the officer in charge of the Maasai writes "As regards for the Moran, I think it is agreed that we want to try and obtain the support of the Maasai Council to making the system more regular and to the reintroduction of the control of the traditional elders" (Sweatman 1949). The British colonial administrators also critically overlooked Maasai women and their livelihood contributions, especially to livestock keeping, thus strengthening elder men's authority and reshaping Maasai masculinities in the process (Hodgson 1999; Kibutu 2005).

Popular narratives of the Maasai framed them as in urgent need of modernizing their socio-cultural and pastoral production practices (Hodgson 1999; Knowles & Collett 1989; Lado 1993). The formal education system introduced is widely thought to have been mostly unsuccessful during the colonial era, with few pupils enrolled despite forceful measures being taken[4] (Knowles & Collett 1989). The support for crop farming and undermining of the age-set systems within the colonial education fueled increased rejections among Maasai[5] (Kibutu 2005). Maasai's actions and resistance to development efforts were often explained with claims of irrationality, including a misguided love of cattle, rather than with attempts to understand the underlying decision-making processes (Lado 1993). In a speech to Maasai representatives in 1960, the Kajiado governor, for instance, declared, "In my country, parents consider the education of their children the very first call upon their wealth" (Press office 1960, p. 4). Notes from the same speech show that the Maasai representatives had requested improvements in educational facilities and the hiring of Maasai teachers (Press office 1960). These records contradict the overarching colonial narrative of total Maasai resistance to education, showing that questions of limited investments and infrastructures, and perhaps of modes of delivery more broadly, were also at play. A few younger, educated Maasai men had nonetheless started to be integrated into the administration and were commonly used as examples (Press office 1960), displacing the earlier sociopolitical standing accorded to Maasai elder men (Hodgson 1999). As Gatheru notes (2005, p. 175), the formal education system brought forward in colonial Kenya promoted a specific kind of social stratification by aiming to produce an elite who could do clerk work, under colonial supervision.

Following independence in 1963, the Kenyan government saw formal education as the key to social and economic development and spearheaded important investments in the sector (Buchmann 1999; Wangui 2008). Yet, given limited resources, the state encouraged communities themselves to fund new schools and pay teachers through *Harambee*[6] (Buchmann 1999). With less experience in self-help groups, peripheral regions steadily lagged behind (Buchmann 1999), notably exacerbating imbalances between agricultural and pastoral regions (Sifuna 2005). Continued low enrollment among the Maasai was tied, beyond physical and financial accessibility constraints, to insufficient consideration of specific needs and priorities — for instance labor requirements in pastoral systems, as well as continued patronizing attitudes by the postcolonial elite which created resentment (Sifuna 2005). Formal education was, for instance, long seen by the national government as an exit strategy from pastoralism (Opiyo et al. 2015). Moreover, from the start, and not unique to Kenya (Dyer 2012; Krätli & Dyer 2009), policy narratives in Kenya amalgamated education with formal schooling based on a schooling system that is fixed, competitive, exam-based, and focused on individual learners (Buchmann 1999; Ng'asike 2019; Sifuna 2005). The school curriculum has also been criticized for continuing to reflect Western ideologies, with examples in textbooks drawn from the cultivated highlands, showing pictures of green fields and concrete houses, that are at odds with children's realities and socio-cultural experiences in the drylands (Kibutu 2005; Ng'asike 2019). Borona (2020) notes that school curricula cement specific ways of thinking about natural resources, such as water, that are removed from Maasai's traditional knowledge systems and cultural practices.

Nonetheless, several governmental and non-governmental efforts significantly raised enrollment rates in pastoral regions over time (Sifuna 2005). Successful ones include attempts to scrap school fees in disadvantaged regions, culminating in the nationwide Free Primary Education policy in 2003, but also school feeding programmes and the openings of boarding schools (Sifuna 2005). Challenges around financing and accessibility continued across pastoral regions

[4] Forceful measures included the instauration of a yearly quota of children that had to go to school and threats of cattle fines at the section level (Kibutu 2005).

[5] It became common for Maasai to meet the imposed school children quota requirement by selecting children with disabilities, as they were seen as not contributing as effectively to pastoralism, as well as children of mixed ethnicity (Kibutu 2005).

[6] Kiswahili for "let's all pull/work together" now is commonly used to refer to self-help/community projects, often involving fundraising (Njuguna 1983).

and in southern Kenya (Sifuna 2005; Kibutu 2005). But as several signs point to, educating one's children has become a key livelihood priority for most across southern Kenya, especially during the last two decades (Archambault 2011; Marty et al. 2023; Ole Seno and Tome 2013; Unks et al. 2023; Wangui 2008). For instance, negotiations with conservation organizations now often include the provision of school bursaries in exchange for the lease of land to set up wildlife conservation areas (Brehony 2020; Unks et al. 2023). Recent research also reports that Maasai in Kajiado now perceive educating their children as a long-term adaptation strategy in the context of increased climatic stressors and land fragmentation (Bobadoye et al. 2016; Rotich et al. 2023). At the global scale, education, which has long been seen as a key development imperative (Dyer 2012; Krätli 2001; Krätli & Dyer 2009), is now also commonly emphasized as necessary for climate change adaptation — or at least as leading to higher adaptative capacities (Walker et al. 2022).

The current Kenyan policy discourse reflects some old and some new debates on formal education in pastoral systems. Policies developed for arid and semi-arid areas have started highlighting challenges associated with the formal education system in pastoral areas. For instance, some policies highlight the labor mobilization difficulties that the current set-up creates, in addition to potentially exacerbating estrangement from pastoral production in the context of high youth unemployment (Government of Kenya 2012b, 2012a). Continued gender differences in education levels are also highlighted (Government of Kenya 2012a, 2012b). However, the challenges raised are left unaddressed. They are also not reflected in adaptation policies that target the country's agricultural sector, which remain focused on technical solutions to climatic risks. Low literacy levels are pointed out as barriers to adaptation, but recognition of existing local ecological knowledges is often lacking. The Climate Risk Profile for Kajiado County states that a high level of illiteracy "hinders access to information, speed of recovery from climatic events, and constrains options for livelihood diversification" (MoALF 2017, p. 1). In some ways, the focus on education can be seen as now tied to neo-Malthusian management discourses that remain at the heart of some climate change narratives (Adger et al. 2001), with diversification away from pastoralism seen as a solution to population growth in pastoral areas and perceived resource scarcity.

The above section allows us to contextualize the emergence and deployment of formal education as a development imperative and now as necessary for pastoral adaptation in southern Kenya. Below, I situate contemporary differentiated experiences with formal education, unpacking how enacting formal education as an adaptation pathway contributes to reshape everyday pastoral livelihood practices and (re)produce intersecting power relations in both material and non-material ways.

## Enacting formal education as an adaptation pathway in southern Kenya

In this section, I turn towards examining the contemporary enactments of formal education as an adaptation pathway.[7] According to elder respondents in the study area, sending one's children to school became more widespread in the last 30 years. The *Ilmemiri* age set, referring to people now in their 30/40s, is often identified as having been more widely formally educated, including beyond primary. Others mentioned it starting with some being sent from the *Ilkishili,* an age set of people now in their late 40s–50s. Geographical proximity to Magadi town and main access roads influences enrollment patterns. Several respondents recall or remember their parents describing how the District Officer[8] would tour homesteads to pressure families to send their children to school, with some families sending their children to hide during such visits.[9] Formal education is remembered as a development imperative that was externally imposed but progressively embraced amidst other processes of change, such as the spread of Christianity and wildlife conservation efforts. Enacting formal education as an adaptation pathway nonetheless contributes to reshaping pastoral production practices and associated labor roles, norms, values, and social aspirations in different ways, as the following subsection exemplifies.

### The impact of school fees on enacted pathways

As most respondents explained, the school system generated unprecedented monetary demands. The 2003 Free Primary Education policy did not reduce the financial burden, as there remains a critical lack of public schools within the area, posing accessibility issues for many. To fill this gap, some private schools located closer to homesteads in the less connected areas have been set up over time with the teachers[10] and infrastructure mostly paid for by parents. Each term's school fees vary between 1500 to 3000ksh (the latter

[7] Defining a clear timeframe was challenged by the fact that formal education became progressively more important and that Maasai commonly do not use calendar year. Probing using age-set categorizations allowed us to identify the period when formal education became more widespread in the study area. Quotes and experiences related in this section are from people's living memory — that is from what interviewees themselves remember or have observed.

[8] Before the 2010 constitution, which heralded devolution and the setting up of county governments, Kenya was administratively divided into districts.

[9] Some of that history has been carried over to the present as children who were herding during the day would sometimes hide when seeing us passing by.

[10] These are sometimes younger educated people living in the locality who have completed secondary school.

being the local price of a large goat or equivalent to USD 13–27[11]) per child, in addition to other needed expenses such as buying uniforms. Paying for education was consistently reported as one of the biggest financial burdens amidst growing needs for cash to cater to one's family and livestock herd.

The increase in children being sent to school and the associated costs are seen by many as having significantly contributed to reducing the number of cattle and shaping people's preferences for sheep and goats. Narratives of increased school enrollment and its impact on herd sizes were also interlinked with references to droughts, showing the co-constituting effects of multiple socio-ecological stressors in shaping experiences. Longitudinal data show that cattle numbers have considerably declined in the south rift, while sheep and goats have slightly increased since the late 1970s (Brehony 2020, p. 193). Sheep and goats are seen as easier to breed and sell, while also feeding on a wider variety of forages. Several respondents noted having become more interested in experimenting with different breeds and fattening to sell at higher market prices to fund school fees. Importantly, declines and shifts in herd sizes and composition are not only shaped by cash pressures linked to education, but are also linked to increasing land use changes, as well as market dynamics.

To avoid further sales of livestock or to rebuild herds, most respondents also diversify their livelihood activities. Diversification takes many different shapes and is highly spatially and socially differentiated in the study area (Marty et al. 2023). For those with access to the wetter areas and farmlands, crop farming may be preferred — it may also enable one to pay for school fees in kind. Fundraising events to raise money for schools are also now prevalent, reflecting relations of solidarity, but as Mohamed notes (2023) in another Kenyan pastoral context, they can also be political events. Moreover, saving groups are a widespread financial management mechanism reported, sometimes being encouraged by external actors such as NGOs and formally registered with the government. Small self-help groups are predominantly formed by women — they are either women-only or women-led groups, sometimes formed by women of one age group. Husbands may, however, support their participation and/or contribute financially to such groups. However, as several respondents noted, sustained participation of women in these groups is contingent upon access to regular cash income, which is challenging in more remote locations and/or for those with less opportunities to earn money. Saving groups formed locally at the neighborhood level or by younger married couples were also reported, as well as clan-based saving groups for school fees. Being part, whether for men or women, enables one to take a loan from the group. Livestock may be used as communal assets in these saving groups, being bought and herded together or split across households before being sold:

> We have one group where we buy male goats at Ksh3000 to 4000 (USD 27 to 36). We graze them and take good care of them. At the end of the year, we would sell them at a very high price of about Ksh8000 to 12000 (USD 72 to 107) […] We run it as young men because we will not have problems with each other […] If someone is going astray, you can tell them this is the way to go, but you can't tell that to an elder man. […] It is each man with his wife(s) in the group. *Young man, Olkiramatian.*

While all respondents reported struggling to provide for school fees, gender, wealth, and geographical dynamics intersect to shape the enactment of schooling. For example, relatively wealthy households can better afford both direct and indirect expenses such as the hiring of labor to replace that of individuals enrolled in school. On the issue of which children are prioritized for schooling, sending both girls and boys is now the stated norm but is in practice, more nuanced. There are economic incentives for equal treatment, as the dowry price is reportedly higher for girls who have been formally educated, in expectation of their increased income-generating capabilities. Yet, some women respondents reported difficulties in securing the necessary fees as husbands felt they could not financially support all children. Boys may then be prioritized, notably to continue to higher levels of education. Continuing to higher levels was rarer for girls, who may also face early marriages. In isolated locations, long walking distances to school also act as a deterrent to educating girls as parents worry more about their safety. Intra-household inequalities within polygamous households also influence decision on education. Husbands may support financially or through livestock allocation some of their wives more than others and thus contribute more to meeting the costs of one *enkaji*.[12] There were also reported cases of children refusing schooling, notably because of fears that it would lead their parents to destitution or because they are tempted by herding or other paid casual jobs.

Dry seasons and droughts also compound the financial challenges. They make it harder for men to trade livestock at reasonable prices or for women to generate income from selling milk. High seasonal school absenteeism is thus expected and is more pronounced in out-of-town and non-farming areas, and within households that migrate. Moreover, as some women respondents explained during validation

[11] All exchange rates are based on 2021 and retrieved from (https://www.oanda.com/currencyconverter/en/?from=KES&to=USD&amount=1500).

[12] Unit composed of one wife and her children.

meetings, girls drop out of school and are married off at higher rates during droughts to secure dowry payments and reduce expenses.

### Changes in mobilities associated with facilitating formal education

Mobility is a defining feature of pastoral production systems (Scoones 2021), and a risk management strategy in the face of climatic uncertainty in dryland environments (Tebboth et al. 2023). However, as scholars have recorded over time (Coast 2002; Fratkin 1994; Rotich et al. 2023; Rutten 1998), historical sedentarization pressures, alongside current land fragmentation amidst accelerating land subdivision, enclosures, and land use changes, have considerably reshaped mobility patterns within Kajiado County. In the study area, various types of mobility and settlement arrangements have always co-existed (Coast 2002). Some households move in their entirety with the livestock, some rotate seasonally between different established temporary settlements, and some split household members temporally or permanently between different locations. Nonetheless, most respondents now make migration and permanent settlement decisions based on their children's school enrollment.

The majority of respondents reported no longer migrating with the whole household once a child reaches school age. Instead, it is common for some family members, often elderly ones, as well as one wife or several (with co-wives sometimes alternating), to stay in a permanent settlement close to the school all year long. A middle-aged woman in Olkiramatian for instance explained:

> I have a young co-wife who would usually move with the livestock while me, as the elderly wife, I would move closer to the school and take the children with me.

These more permanent settlements are situated closer to emerging small towns or in farming areas. Who stays or accompanies the migrating livestock depends on the children's ages, the labor available, financial means, and the household head's perceptions of different members' livestock-keeping skills. Some respondents no longer move the household at all, instead sending the livestock with a herder or keeping fewer animals for whom feeds, hay or maize stalks can be bought when needed, notably in the farming areas.

Many parents reflected on the inherent challenges in trying to meet competing needs, especially during dry seasons and droughts. The continued importance of facilitating the migration of livestock was stressed by many respondents, highlighting the need to access sufficient and quality pastures, which are often no longer found near permanent settlements. Accessing water also remains crucial, for both livestock and people. Most constructed water points that are near small town centers experience seasonal shortages, and community rules may reserve water supply during such periods exclusively for household use or sometimes for schools.[13] For some families, especially those less well-off living further away and who cannot afford to pay for water or dig a water pan,[14] difficult dry seasons necessitate moving completely.

> If you can't do either [*using a water pan or buying water*], you have to find a way of going to the river to get water. You also have to find a way of leaving the kids under the care of someone else or you move closer to the river with them, and they would have to miss school during that period *Middle-aged woman, Shompole.*

Assessments of the needs and well-being of the different family members, in addition to the quality and level of education available in different schools, also shape mobility decision-making processes — notably with regard to different household members' place of residence. Older children may be sent to boarding schools. Sending children to boarding school was also regarded as safer for girls and better for pupils generally as they can concentrate on their studies without having to worry about water and food shortages at home; nevertheless, it is significantly more expensive. Pupils may stay with a relative living closer to a school, especially if the school is seen as providing a better education. However, some parents, notably mothers given gendered childcare responsibilities, expressed uneasiness about leaving their children in the care of someone else. The designated caretaker must be paid in advance for the costs incurred. Respondents also sometimes felt that children are less well cared for and thus less likely to do well in school. For household members left behind in permanent settlements during dry seasons or droughts, finding water and food becomes more challenging, but is often seen as a necessary struggle:

> Everyone who has a school-going child stays and struggles with that life and is left with a few goats and if they have all migrated you stay and struggle with that life so that these children can be able to learn. *Elder man, Shompole.*

### Labor dynamics and challenges in relation to education

Reduced households' mobility and labor scarcity result in the professionalization of herdspersons. Herders are often

[13] Tata Chemicals also sometimes deliver water through trucks to schools as part of its CSR project, responding to demands by the school boards — composed of teachers and neighbouring parents.

[14] Refers to ponds that are dug to collect rainwater by individuals.

hired from outside the family or the area, often *ilmurran* from Tanzania who did not go to school or from neighboring households who cannot afford to send their children to school. In addition, older respondents noted that the expected payments for herding have increased significantly in the last 30 years, being also primarily monetary while previous arrangements could involve exchanging livestock or sometimes making marriage arrangements. Many elder respondents also noted going herding themselves because of limited labor availability, with women of all ages herding smaller stock. Less well-off households may keep one child, often a boy, or several to go herding.

As noted in other studies on the Kenyan context (Opiyo et al. 2015), labor shortages pose significant challenges to pastoral production. Outsider herders have less local knowledge of the landscape, for instance of carnivores' usual movements. They are also reported as being less trustworthy, not checking frequently enough whether animals are lost and sometimes selling livestock without approval. Some households send their cows grazing without herders, which was sometimes referred to in negative terms, indicating that one does not care for livestock properly. Unattended livestock are also unlikely to follow grazing rules (Hemingway et al. 2022), which poses problems in the farming areas where penalties for encroaching on a farm are stiff. Loss of girls' labor was also felt by women, who reported increased chores burden. Responses to shortages in labor still rely on pooling labor, for instance through giving livestock to a neighbor or to a relative living somewhere else to manage together with his own. Some parents also indicated the necessity for children to go herding after school hours/during the weekends/school holidays to contribute to the pastoral production on which they rely for subsistence. Labor losses associated with education may become permanent, notably because of different livelihood priorities among younger generations, which are sometimes deplored by elder respondents.

### Changing social aspirations shaping desired pathways

Despite the challenges touched on above, educating one's children is seen as a pathway enabling social mobility given that most formal employment opportunities now require some level of formal education. Responses to questions around social aspirations often centered on the hope for educated children to secure paid positions, with remittances allowing to restock the herd following shocks, including droughts, along with supporting other desired developments such as the building of more permanent housing structures. Interestingly, some interviewees made a distinction between choosing to become a Moran as the traditional Maasai education system and formal education, implying that it represents two different livelihood pathways. Formal education is now often preferred for younger generations and highlighted as a status marker. Kibutu (2005, p. 223), observed in another part of Kajiado that "formal education, itself a state development objective and which many Maasai have embraced, has replaced moranhood masculinity previously nurtured in the manyatta." For girls, for whom the *Ilmurran* institution does not apply, formal education is seen as leading to more choices over livelihood opportunities and marriage. Yet, marriage arrangements are also key to further social networks, enabling continued pasture access in the context of increased land fragmentation (Archambault 2011, 2016).

> I hope that they [*referring to his children*] will join school next year. I didn't go to school, I went to moranhood. *Elder man, Olkiramatian.*

However, it was also sometimes expressed as a disappointment to see a young man who completed secondary education go herding as education is an investment which is meant to pay off in other ways. Educated youths were noted to have less knowledge of their environment and thus to be less skilled herders, a view that seems to be prevalent in other parts of Kajiado as well (Unks et al. 2023). High formal unemployment rates nonetheless make it easier for *Ilmurran* to find work, including in other parts of southern Kenya which also face labor shortages:

> Q: So, there is a lack of opportunity for young people?
> R: They are not there completely. It is even better for those who have not been educated who go herding, for the educated ones there isn't work. But for these ones who herd, people employ them to herd their shoats even in Keekonyokie, in Narok. That one is even better, but the one who has finished school does not go. *Elder woman, Musenge.*

Young unemployed educated men who have finished or are close to finishing secondary education are more likely to seek casual jobs in crop farming, fishing, or other sources of employment in small towns than herding positions, sometimes temporarily to save enough to go on to tertiary education and to then secure a formal employment position.

> Right now, we are doing together [*farming*] with my son who has completed secondary school. But before I used to do it alone. I haven't gotten the money yet for him to go to the next level of education, so we decided to cultivate the farm together for the time being. *Middle-aged woman, Olkiramatian.*

In one of the validation meetings held with men, some respondents stated that given the growing feeling of having made important efforts to educate children through the school system and of social aspirations not realized, people might start disinvesting from formal education as a livelihood adaptation. Two interviewees from a local civil society

organization also interrogated the quality and suitability of the education provided in relation to on-going losses in local knowledges and generational shifts in the valuation of natural resources.

## Discussions

This historically situated analysis made visible some of the narratives and normative expectations that have shaped and continue to influence the implementation of formal education as an adaptation pathway in southern Kenya. Focusing on how formal education is enacted as an adaptation pathway highlights the multiple associated changes it engenders in everyday practices and how these are reflected locally by differently situated resource users in the study area examined. It also makes visible the intersectional power relations that shape socio-spatial differentiation within the enacted pathways. Such an approach is important as Câmpeanu and Fazey note (2014, p. 14), pathways develop from "what people have historically expected to be normal, desirable, and socially valuable responses to change, which in turn influenced daily practices, knowledge transmission, and social relations."

In the case presented, the prioritization of formal education from the colonial model to the current school-based system has had multiple, interlinked effects in southern Kenya. School fees form an important part of the increasing cash pressures that weigh on pastoral households in a context of declining and shifting herd sizes and composition. Despite formal education being praised externally as an adaptation pathway, apart from a few bursary initiatives linked to selected schools in farming areas or small towns, it is mostly individuals and communities who have to make it work, financially and practically in southern Kenya. This reflects the neoliberal policy orientation that was prioritized since the 1990s (Nori 2022; Sifuna 2014), and communities have themselves funded the building of new schools, and they often pay the teachers. Fundraising efforts to afford school fees encourage changes in everyday practices such as setting up small businesses and/or saving groups. Further, increased enrollment in schools also contributes to reshaping mobility patterns and labor roles as observed in different parts of Kajiado County (Wangui 2008; Unks et al. 2023). Difficult trade-offs emerge between furthering pastoral production and facilitating formal education for one's children, and these trade-offs become starker during droughts. Finally, formal education is also part of changing social and livelihood aspirations, being now seen as the key marker of a generational and occupational shift. Facilitating formal education for some, especially young men encouraged to go on to higher levels, is now more widely seen as desirable and something to aspire towards because of the increased difficulties in meeting subsistence needs through pastoralism in southern Kenya (Archambault 2011; Bobadoye et al. 2016; Galaty 2013). Yet, investing heavily into one's children's education does not guarantee the desired normative outcome of the pathway as locally defined — the educated youth finding a suitable employment that can financially support other family members and potentially further their pastoral production. As Rao et al. (2019) point out, changing social aspirations among younger generations are not always met by job market realities in the global drylands, leading to growing signs of frustration, in itself a signal of maladaptation.

Moreover, by analyzing one enacted adaptation pathway using a feminist political ecology lens, the findings exemplify some of the important socio-spatial differentiation processes that underlie efforts to enact this pathway in practice. This is important because research on adaptation pathways has often failed to recognize these social differentiation processes (Câmpeanu and Fazey 2014; Marks et al. 2022), including those (re)produced at the micro level. In the study area, wealth disparities critically shape enrollment rates, intersecting as well with gendered norms and geographical and environmental realities. Poorer families that reside further away from farming areas and urban centers face difficulties in facilitating formal education and may then prioritize some of the children to go on for higher education, and notably boys over girls, given patriarchal gendered expectations and roles. Other non-material aspects, such as assessments of care and well-being needs of different family members, for instance, also underly decisions to send children to stay with others or to walk long distances to access schools. The combined FPE and pathways analytical framework thus generates crucial insights on differentiated embodied experiences of intersectional power relations while highlighting formal education's complex relationship with evolving socio-cultural responsibilities. As Archambault reflects (2011), decision-making processes on schooling transcend easy binaries between tradition and modernity, as well as collective culture and individual rights. Rather, they are the result of attempts to decide what can work best for each child and the rest of the family given uncertain socioeconomic and environmental conditions.

Finally, investigating empirically what a pathway means in practice, for who and why — including the intersectional relations of power that are (re)produced within — is essential to ensure that research and policy do not further entrench or create new patterns of vulnerability. While "off-farm" forms of livelihood adaptations can be supported by increased education levels, the relationship between the current education systems and pastoral livelihoods is a fraught one and may engender both adaptive benefits and disbenefits. Despite some of the policy discourse acknowledging these challenges, notably labor scarcity and high formal youth

unemployment, formal education continues to be primarily seen and supported as a pathway towards non-pastoral livelihoods for young Kenyans (Opiyo et al. 2015). As Semplici and Campbell (2023) note, most development projects, now often framed as "climate resilience," tend to continue to prefer funding projects — education programmes being one of them — that foster alternatives to pastoral livelihoods. These lingering biases preclude consideration being given to how education systems themselves could be made more responsive to, and supportive of, pastoral livelihoods. Planning for climate-resilient development pathways necessitates the integration of diverse forms of knowledges (Schipper et al. 2022), but worryingly, there is some evidence that the curricula tend to ignore and devalue the place-based and local knowledges that are crucial for pastoral adaptation (Ng'asike 2019; Borona 2020; Walker et al. 2022). Understanding these power dynamics opens the space to support more just alternatives, and further research could further investigate different forms of education which may better support both pastoral livelihoods and other livelihood pathways while recognizing existing and supporting plural knowledges — suggestions and experiments have for instance been made for distance learning systems (Siele et al. 2013).

## Conclusion

This article focused on tracing the historical and contemporary drivers and ramifications of one enacted adaptation pathway: increased formal education in the context of multiple socio-ecological changes in the southern Kenyan pastoral systems. The analytical framework brought forward combines conceptual insights from retrospective adaptation pathways approaches and feminist political ecology. This framework was instrumental in drawing out the intersectional relations of power that are performed within this adaptation pathway. The analysis critically exemplifies the emergence and enactment of formal education as a contested adaptation pathway that reflects historical legacies and contemporary priorities, shaped by evolving gendered and generational norms, values, and social aspirations. As the results illustrate, the socio-spatial differentiation processes associated with formal education complicate assessments of formal education being a case of successful adaptation or definitive maladaptation. For policy and practice, especially in marginalized pastoral areas, this implies that there is a need to move beyond static and normative understandings of desired changes and continuously reflect on how these understandings were and are continuously produced and enacted and by who. Non-material dynamics shape everyday decision-making processes and adaptation choices, notably changing livelihood aspirations among younger generations. This reinforces the need to move beyond a single understanding of "pastoralists" or "pastoral communities." Looking at different forms of enacted livelihood adaptation offers a counterpoint to approaches that focus solely on technical responses to climatic risks and are unlikely to address root causes of vulnerability or to understand altering markers of well-being in fast-changing agrarian environments.

The approach brought forward in this article also has broader relevance for the adaptation research field. It joins other works in making apparent that one should resist thinking about and analyzing adaptation as an isolated goal that is performed or should be supported in isolation from other livelihood priorities. Instead, this research exemplifies how non-climatic and seemingly mundane factors, such as social aspirations for increased formal education, shape everyday livelihood practices and adaptation pathways and thus also need to be considered within climate change planning efforts. It also draws attention to the high dynamism of livelihood practices in fast-changing pastoral environments. Starting from what people with relevant lived experiences see as the main changes, opportunities, and difficulties is also needed to deconstruct epistemic biases in defining what matters and what should be the focus of research and policy attention in marginalized environments. The historical pathways analysis further underlines the continuities in thinking between long-standing development orientations and what is currently supported and enacted as an adaptation pathway. These critical insights pave the ways for further research to see beyond established pathways to identify and enact alternatives that support more just transformations towards sustainability, notably in pastoral areas which are at the frontline of increasing climatic risks.

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