Energy Trajectories and Solar Energy Imaginaries of the Maasai

Turner Adornetto

Abstract

Solar energy development in Tanzania is steeped in discourses of Western technological transfer whereby the devices themselves are lauded as central innovating agents—the "doers"—that are solutions to local poverty. The trend intensifies in Maasai spaces, where a long history of marginalization in development projects has shaped the narratives of energy change around the practices and perspectives of pastoralists. In this paper, drawing from ethnographic work on Tanzania's solar energy landscape, including 50 unstructured interviews with Maasai herders, city-dwellers of Arusha, Tanzania, and representatives from foreign solar energy firms, I show how the Maasai reconfigure incoming solar energy devices through locally generated knowledges, philosophies, and technologies in calculated efforts to chart their own futures. Using a sociotechnical imaginaries approach, I analyze interviews, historical literature and other relevant documents to underscore how Maasai pastoralists are central innovating agents in a shifting sociotechnical landscape who engineer and inscribe their own meanings onto solar power. The Maasai repurpose solar energy technologies as tools of negotiation between modern development initiatives prioritized by the national government and foreign solar companies and their own desires to remain anchored to elastic ancestral traditions grounded in the special relationship between herders and livestock. By discussing how solar energy is used and imagined in Maasai communities and combining that analysis with a history of top-down energy imaginaries in Tanzania, I hope to provide new platforms for (re-)imagining solar energy, pastoralism, and Maasai participation in technological futures.

In September 2017, at an international training center in Arusha, Tanzania, a Maasai land rights activist delivered a presentation framing the state of development in the region. He began his talk with harrowing news from home. 185 Maasai *bomas* (homesteads) were burned at the edge of Serengeti National Park in a government-sanctioned attack designed to preserve the ecosystems in the region and attract more tourists. People were displaced, food was destroyed, and livestock were lost.[1] The activist positioned the event as a point of departure in a critical reflection on development, its trajectories, and its effects. He recounted Maasai history, highlighting how Maa-speaking ancestors found success herding cattle along sections of The Great Rift Valley between Northern Tanzania and south-central Kenya. He called the Maasai masters of adaptation for refining seminomadic patterns of mobility across locally conserved grassland to exploit multiple, shifting localities of plant-based energy.[2] He also spoke of disruption, noting how Maasai pastures became sites for political and economic debates that staged the utility of pastoralist praxes against colonial, state, and international development visions.[3] Stressing the loss of inherited land to schemes crafted abroad, the activist's talk congealed around a call to imagine and enact development from within Maasai philosophies of coexistence between people, livestock, and wildlife.

Despite underscoring the centrality of land and land-based resources to pastoralist success, the activist took care to consider development beyond notions of place. His call treats development as an imaginative process: tenable, even amid displacement. Whereas land can be figured through the lens of dispossession—a saturated trope in accounts of Maasai victimhood[4]—imagination provides an analytical framework linking philosophy to practice in other narratives of endurance, experimentation, and futurity. Indeed, as the spatial arrangement of Maasai communities adjusts to a shifting field of opportunity, outlying pastures and large metropolitan centers create the precarious condition for emergent imaginaries of pastoralist development. While the Maasai and their allies fight legal contests to restore the right to graze on ancestral land,[5] ordinary people engender uniquely Maasai forms of development by imagining alternative livelihoods in new social, ecological, and technological orders.

In this essay, I discuss how solar energy appears in locally generated sociotechnical imaginaries (STIM) as a way to augment pastoralist livelihoods, work with ancestral traditions, and promote pastoralist versions of development around and with national and international trends. According to Jasanoff and Kim, STIMs are the "collectively held, institutionally stabilized, and publicly performed visions of desirable futures, animated by shared understandings of forms of social life and social order attainable through, and supportive of, advances in science and technology."[6] STIMs acknowledge that the technological configurations envisaged by a group co-produce values, politics, and notions of belonging in collective articulations of good and possible futures. Building from Tidwell and Tidwell's position that the sociotechnical imaginary can be used to engage values, goals, and social groups at different scales,[7] I use the concept to understand how Maasai philosophies of coexistence shape the terms of local solar energy proliferation.

In unstructured and semi-unstructured interviews conducted in the first five months of 2018, I asked residents of Arusha Region to narrate their energy histories and to offer their hopes for future energy configurations.[8] Under the mutual agreement that participant names and precise locations are withheld, I asked interviewees about uses for solar energy and about their opinions of the institutions that support rural electrification. I also performed participant ethnography as an engineer for a foreign solar energy firm and as a team leader for a solar energy design summit. In conversations with herders who described how solar energy and other inbound technologies are applied in ways that build from local knowledge of livestock and ecosystems, I began to see Maasai philosophies of coexistence at the center of sociotechnical transformation.

Drawing on my fieldwork and a brief review of the history of energy development in Northern Tanzania, I address gaps in energy research and African studies by contributing a focus on the coalescence of Maasai energy innovation and sociotechnical imaginaries of solar energy. Much of this work was conceived in response to a persistent trend in the development and electrification arenas to describe rural people as recipients of technological progress rather than actors. In the mainstream, solar energy fits into a narrative of electrification that positions outsider

intervention as a driver of vital technological transfer.[9] Writers and analysts from the United States and Europe praise renewable energy entrepreneurs for lighting up Africa with clean technologies poised to address the continent's dismal state of energy poverty.[10] Within the continent, government agencies operationalize distinctions between proper economic participation and life at the periphery to champion the modernizing effects of grid electrification.[11] In each case, energy change is steeped in the notion of technological directionality[12] whereby the devices themselves are figured as agents of progress beholden to top-down imaginaries of ideal techno-futures.

In Maasai spaces, narratives of electrification are complicated by a long history of marginalization in development projects and a tendency in scholarship to focus solely on manifestations of Maasai despair. According to the literature, energy and resources in Maasai communities are either insufficient,[13] impacted by exogenous forces like climate change,[14] or improved by initiatives that originate elsewhere.[15] Rarely are accounts of energy and resource development on Maasai land imbued with insight from scholars like Dorothy Hodgson—who writes of the exchange between outsiders and the Maasai as an "interplay of ideas and practices" from both groups[16]—or D. A. Masolo—who presents ongoing processes of refinement in spear design as just one example of how the Maasai "know selectively what kind of technology can be positively incorporated into their value systems."[17]

Thus, my research also responds to a growing body of work pioneered by scholars designing new methods and perspectives for interrogating the study of science, technology, and innovation in and from Africa. Historian and science and technology studies (STS) scholar Clapperton Mavhunga has attended closely to this area. In addition to his explication of the biased tendencies of contemporary development discourse, Mavhunga has identified new analytical methods that grapple with ways to decenter the Global North in narratives of African technology and African design. Mavhunga has argued that an analysis of language, beliefs, and technologies coming from Africans clarifies ways that indigenous intellectual traditions permeate "knowledge encounters" with outsiders.[18] Through these encounters, ordinary people participate in and influence top-down strategies for development such as pest management[19] and nature conservation.[20] In *Energy (and)*

Colonialism, Energy (In)Dependence, Mavhunga introduces the *longue durée* approach to studies of energy in African history that re-center human mobilities, locally managed infrastructures, and multispecies ecologies in historical accounts of energy transition.[21] The move is ontological as well as epistemological, questioning what counts as energy across contexts.[22]

In this essay, I build from Mavhunga's strategy and rethink Maasai solar proliferation as an extension of the local longue durée. Specifically, I figure pastoralist praxes as central subjects of study to show how energetic processes involving people and animals are developed and refined over time to influence the ways that Maasai people encounter solar energy devices and imagine proper forms of solar electrification. Ultimately, many Maasai families prefer solar energy configurations that retain the ability to mobilize, protect livestock, and enable alternative income streams that resist pressures to sell their herds.

In the next section, I attend to national imaginaries of energy and resource development in Tanzania—following independence in 1961 and structural adjustment in 1985—through which energy was deployed to support particular projects of identity and becoming. I then show how counter-imaginaries of energy development have emerged in Maasai communities marginalized by the state's strategies for development. Finally, I complicate technical and economic framings of energy, leading to a description of pastoralist praxes that inform the STIMs of local energy practitioners who generate their own methods for integrating inbound solar energy devices with pastoralist sensibilities. By discussing how solar energy is used and imagined in Maasai communities, and combining that analysis with a history of top-down energy imaginaries in Tanzania, I hope to provide new platforms for (re-) imagining solar energy, pastoralism, and Maasai participation in technological futures.

Post-Colonial Energy Imaginaries

For Tanzania's early political leaders who engaged directly in the process of national reconciliation, energy resources were a focal point in the implementation of particular, post-colonial imaginaries of development. Julius Nyerere—the leader of Tanzania from 1961 to 1985—emphasized popular cooperation, national

self-reliance, and indigeneity under a nascent brand of African Socialism called *Ujamaa*. Meaning "familyhood" in Swahili, Ujamaa policies drew from romanticized conceptions of traditional life and livelihood to facilitate mass reorganizations of people and environments around nationalized economic assets.[23] At the center of these reorganizations stood the village, Nyerere's principal unit of development.[24] Over the course of Ujamaa's multi-year implementation, millions of people were coaxed into relocating and later forcibly relocated to concentrated settlements in an initiative called "villagization."[25] For early statesmen, village living, sedentary agriculture, and mechanization were elements of a consolidated national imaginary committed to expressions of indigeneity, economic growth, and the potential for interconnectivity along an emergent energy infrastructure:

> If you ask me why the government wants us to live in villages, the answer is simple: unless we do, we shall not be able to provide ourselves with the things we need to develop our land and to raise our standard of living. We shall not be able to use tractors; we shall not be able to provide schools for our children; we shall not be able to build hospitals, or have clean drinking water; it will be quite impossible to go on depending on the towns for all our requirements; *and if we had a plentiful supply of electric power, we should never be able to connect it up to each isolated homestead.*[26]

The choice to use the village as a strategic reference for structuring society and its energies reflects Nyerere's intention to incorporate the values, traditions, and skills of the everyday Tanzanian into the fibers of the new state.[27] But by mobilizing the nation around specific conceptions of traditional life and livelihood, early political leaders sidelined other imaginaries of progress.

Beginning under British colonial rule, confusion about nomadism by a group of disconnected administrators stigmatized Maasai pastoralists as practicing a less evolved form of subsistence. Geared heavily toward economic interest, colonial development policies codified these confusions to regulate land, water, and livestock commensurate with British sensibilities. Hodgson and James Scott contend that Ujamaa embraced elements of the modernist narrative and aesthetics of progress espoused by the British, writing that the new administration regarded the Maasai as primitive

and backwards and shielded development management from the influence of Maasai knowledge and practices. This tendency culminated in the Conservation Act of 1974, which removed large areas of grazing land from Serengeti, Ngorongoro, and Tarangire National Parks and circumscribed authority over natural resources to state governance.[28] Summarizing the Maasai's response to colonial and state development policies, Hodgson writes the following:

> [Maasai people] recognized and resented the cultural messages conveyed by government officials and technical experts that privileged 'modern' ideas of progress and prosperity and stigmatized Maasai ideas and practices. Furthermore, and perhaps most important, Maasai were offended by the ways in which development projects were repeatedly implemented: the lack of consultation, the overblown promises and disappointing results, the misdirected blame and the incessant diatribes about changing their ways, all of which they understood as a lack of enkanyit, or respect.[29]

Withstanding socialism's dissolution and an embrace of the free market in the wake of structural adjustment, Tanzanian development policies continue to align with ideological and infrastructural facets of Ujamaa.[30] Developed under the tutelage of John Magufuli, Tanzania's fifth president, the Rural Energy Agency (REA) leverages private-sector funding for the expansion of the national electric grid through well-settled towns and city boroughs.[31] In practice, the grid is quick to reach former Ujamaa villages where state legitimacy is couched in popular calls for village-based industrial production.[32] Regarding REA, non-Maasai interlocutors from towns and cities often expressed the same sentiment: that with a strong electric grid, factories would put their kids to work. They champion the expanding grid for its ability to run the machines that enable business and industry to flourish.[33] By casting "the revival of factories," one of Magufuli's most popular slogans, against a vision for indigenous participation in small and medium scale industrial activities, the national electric grid is welcomed as an extension of the nation's ability to address fundamental economic issues and to succeed as an equal and distinct collective of proper Tanzanians.[34]

In many towns and cities, wildlife conservation and grid electrification are central in popular imaginaries of progress. But for

Maasai people committed to pastoralist praxes, who watch neighboring communities receive REA electricity at unaffordable rates, along class lines, and/or at the expense of cherished values and trusted forms of subsistence—and cognizant of the controversial history of outsider intervention on Maasai land—the electric grid, much like the Ujamaa village, is precarious in sociotechnical imaginaries of the ideal life. In the following quote, a Maasai interlocutor expresses these sentiments and envisions the effects of grid expansion through his hometown:

> A lot of times, where you know [grid] electricity will arrive—a lot of times in villages—it means there is an addition of people. The population grows and comes to be comprised of various tribes. . . So yes, it is true, a Maasai person wants his home to have light but, at the same time, they do not feel safe. Because they are with that population of people, and from those people that have come there will be many cars. You realize that now children do not have the freedom to even cross a street. Or cows come and they are given a grazing limitation. . . So, it is as if [grid electricity] does not give them the freedom to be able to live.[35]

Tanzania's national electric grid is imagined, designed, and deployed vis-à-vis the values and goals of its developers. As I have shown, these values and goals align with specific but narrow conceptions of indigenous life—a distillation of perspectives processed in the post-colonial era that sidelined Maasai imaginaries of progress. Although the grid's expansion dominates popular narratives of national energy development, Maasai people like the interviewee quoted above resist pressures to conform to a singular electric template. In the next section, I show how STIMs generated in Maasai communities resist marginalization by strengthening the special relationships between people and their livestock. Inbound solar energy devices are the latest energy technology deployed and configured to align with Maasai pastoralist praxes and local imaginaries for good and possible futures.

Maasai Energy Trajectories

In a description of Maasai subsistence, Hodgson writes that semi-nomadic patterns of mobility were designed "to exploit multiple and shifting localities to counter inherently unstable

micro-ecological differences in rainfall, disease and pasture."[36] To ensure resource plenitude, "they implemented and enforced strict controls over access to pasture and water based on section, clan, and residence."[37] For protection against predatory animals, Maasai warriors provided security with deadly spears.[38] Against illness, herders and their families cultivated knowledge of the signs and treatments for dehydrated, starved, and sick livestock.[39] The boma, not the village, codified spatial arrangements of society and its energies in lives lived with livestock; interspersed with people, pasture, and predators; and within the bounds of social and ecological constraints.[40]

But over the last hundred years, colonists and statesmen accorded land and wildlife alternative significance under conservation: an ongoing process that has pushed the Maasai from traditional grazing areas and criminalized the use of lethal force against livestock-killing predators. Cattle, too, were made subject to national economic scrutiny and reevaluated within the logics of efficient modes of production—often by advocates of "improved, "modern" cattle who disparage the Maasai for amassing large herds over other forms of wealth.[41]

Although brief, the scene described here illustrates opposing imaginaries of pastoralist development and the spectrum of factors contributing to their respective salience. Whereas national economic interest informs the implementation of top-down imaginaries for rural land use, interconnections between people, cattle, and ecosystems constitute a basis for Maasai visions for the future. In each case, imagined approaches align with a partiality to economic, social, cultural, and ecological dynamics attributed, in different degrees, to agreed-upon forms of prosperity and collectivity.

How then, are Maasai imaginaries leveraged amid displacement? And how might scholars read the local longue durée against the meaningful ways that the Maasai's pastoralist interconnections have experienced disruption? In his introduction to *Transient Workspaces*, Mavhunga argues that in studies of technological trajectories, "our choices of the subject of study and the starting points matter."[42] His charge aims to decenter the Global North in narratives of African technologies by framing the continent as both a spatial traveler, "whose mobilities are not merely conveyances. . .[but] people engaged in work-in-transit," and as a time

traveler, "already embarked on a journey."[43] Rather than moments of erasure or salvation, the arrival of colonial and state energy projects ought to be understood within the landscape sketched by Hodgson—where knowledge and management of livestock organized communities and activities. With this as a starting point, I engage two pastoralist praxes—mobility and protection—as principal subjects of study. Over time and space, Maasai people refine mobility and protection to negotiate the energetic utility of pastoralist interconnections and outsider-led initiatives in a shifting field of opportunity. Pastoralist praxes are not passive but active—called upon to shape the terms of sociotechnical transformation in ways that synthesize new energy systems with familiar modes of being.

Despite the exclusionary nature of many of Tanzania's earliest development policies, Maasai people appropriated inbound technologies like the national electric grid and battery-powered flashlights in careful, specific ways commensurate with the needs and imaginaries of pastoralist communities. Since mobility and protection enabled livestock to flourish across spatial and temporal variations in leafy growth and proximal to deadly predators, they remained important elements in the acquisition of new technological capacities. Cellphones and other portable devices, for example, took well to transience, but required electric energy offered exclusively in densely populated, grid-connected villages. Unable to embrace permanence along a rigid and crowded electric grid, herders resolved energetic tension between livestock and electric devices by adjusting their own mobilities: sourcing electric charges during weekly visits to regional livestock auctions.[44] For many Maasai, scattered living remained both essential and practical for electronics-carrying herders.

Regarding protection, Maasai people applied electric energy in ways that worked around the criminalization of lethal force used to defend livestock against lions, leopards, and hyenas. In one interview, a Maasai graduate student noted the use of battery-powered flashlights by herders who travelled at night:

> Starting in 2005. . .people were using hand-held electric torches. You would find each person, especially the teenagers, each person wants to have a torch because they were walking at night with livestock. For example, me. There was a time

> period I was with livestock starting around noon and until early the next morning I was still in the bush with livestock. Or I slept in the bush with the livestock. Or I was walking to transport them because where they went to get water was very far—until they got home it would be 1 or 2 am. So, it is necessary that you have a torch—they help to illuminate all sides of the cows and the cows liked the light. But also, when the wild animals of the bush saw the light, they were afraid to invade the livestock.[45]

Amid political and economic hierarchies structured against pastoralist forms of development, Maasai people continue to prioritize the nutritional and protective needs of healthy livestock by energizing their communities in novel ways. The national electric grid and battery-powered flashlights became components of the local energy landscape through national and international initiatives, but they acquired values-based utility in the imaginations of local people who remained committed to the philosophies and praxes that sustain and inspire pastoralist interconnections. By managing livestock as energy technologies, with the embodied means to store and convert the vegetation of Northern Tanzania's fluctuating ecosystems into milk and meat for human consumption, the Maasai have put other energies to work. The energetic relations mediating people and their animals, when imagined through the capabilities of and interactions with exogenous systems, tie future technological trajectories to the local longue durée.

Maasai Imaginaries and Solar Proliferation

The story continues through solar energy. Brought to Maasai spaces, people configure home solar systems as pastoralist technologies fully equipped to mobilize and protect the herd. On houses built with transience in mind—constructed with locally available materials like sticks and cow manure—many Maasai have installed roof-mounted solar energy systems. As the following quote illustrates, people and animals move solar energy systems in accordance with local sensibilities, giving the devices new space and new reach beyond the intent of their creators:

> We pastoralists, we are people who do not really have residence. Today you are here, tomorrow you are over there due to the livestock. Now, [solar energy] has a lot of benefits,

> because it is electricity that you can leave with. There, where you finally arrive, you continue using it. . . If I want to leave with it, I will migrate. Because it is just to unplug a part, there is not any wire that must be cut that requires you to request a technician. No. Our things are just to unplug. . .and you continue on.[46]

In nearly every interview with Maasai interlocutors, solar energy was praised for its ability to protect livestock from predatory animals that inhabit the secluded grazing environments traditionally sought by herders. The threat is especially real at night, when these animals use the cover of darkness to infiltrate Maasai bomas to steal small members of the herd. In response, many Maasai have configured home solar systems as livestock security modules. Panels and batteries are fixed to a sheltered living space while bright LED lights are positioned to illuminate the large holding pens usually built at the center of the homesteads.[47]

Seeing solar energy applied in alignment with the longue durée of energy and innovation in Maasai communities provides an opportunity to evaluate the ways that local imaginaries change solar energy systems themselves. As in the previous section, centering Maasai praxes in narratives of energy change requires showing not just how solar energy works, but how solar energy is made to work. Anna Tsing's notion of translation is helpful in this task. In ethnographic studies of the matsutake mushroom, Tsing argues that supply chains are woven in acts of translation that link the logics and praxes of diverse social, political, and economic spaces.[48] Contrary to narratives espoused by private enterprise—who, like the state and its colonial predecessor, tend to obscure the Maasai and their creative energy solutions in favor of a conception of people who need help—solar energy proliferation ought to be understood in acts of translation negotiated by people who imagine and facilitate collaborative exchange between the private sector and local modes of being. Nowhere is this process clearer than in the encounter between pastoralists and commercial proprietors of pay-as-you-go home solar systems.

The pay-as-you-go model is a hallmark of Tanzania's privately-owned, internationally managed solar sector—understood by many outsiders as an enabling force in the uptake of

solar energy technologies by people with limited available funds. During participant ethnography as an engineer for one of Africa's largest providers of pay-as-you-go home solar systems, I found this model contentious and controversial, often serving the interests of international solar energy firms over the interests of clients who, burdened by contractual contingencies, develop their own mechanisms for assuring solar energy proliferation.

A peculiar twist to narratives of decentralization that so often characterize solar energy in Africa, the ability to remotely disconnect a home solar system exists on the cutting edge of private sector innovation. Enabled through partnerships with the region's largest telecommunications companies, remote disconnect happens when a household has reached the end of its grace period for late loan payments: usually three months. The solar system provider, from its in-country headquarters, sends an electromagnetic signature to suspend the use of electric power at a single node in its array of client households. Following remote disconnect, a company representative visits the delinquent home, repossess the solar energy system, and returns to company headquarters to test and repackage the used system for new customers. Despite the household's inability to continue loan payments, a circumstance that often signals the presence of a financial emergency, the money that the client has already paid is not returned. As the founder of an international solar energy firm declared, this practice is the basis for business in the region:

> It is the one place where we make money. I hate to say it. If we take a system back, we refurbish it and we add components that need replacing, most likely a new battery. And we are able to put it out there, you know, eighty to ninety percent the original cost. And if someone has paid a million shillings [five-hundred U.S. dollars] you have actually made more money than you would have.[49]

To circumvent this form of revenue collection, some Maasai people draw upon local knowledge systems for the means to encounter foreign firms with secure financial footing. While investigating these methods, I met a Maasai doctor of medicinal plants. The doctor lives with his father-in-law, the head of their boma, who pays monthly installments on a privately sourced, pay-as-you-go home solar system. Like many Maasai interviewees, the

doctor described how home solar systems are deployed to align with pastoralist sensibilities. With the proper appliances, home solar systems can power lights that discourage attacks from the region's predators. And these systems are portable, so families can continue to define appropriate patterns of mobility by the well-being of their herds.

For the doctor, solar energy provides an additional advantage. He is an entrepreneur and spends two weeks of every month in Arusha's busiest towns marketing his knowledge of locally sourced medicines. With his cell phone, he receives calls from a vast network of clients who ask him about his inventory and his availability for an exchange. When approached by a new customer, the doctor presents two laminated menus that describe his offering. He uses his cell phone to speak with family members and to send them money via M-pesa, a digital money transfer service. After two weeks, he returns home. In constant communication with his clientele, he uses his cell phone to maintain business relationships and to take orders for his next trip into the city. His father-in-law's home solar system enables these conversations kilometers away from the nearest connection to the national electric grid. Balanced between medicinal tradition and the unforgiving demands of life in a capitalist economy, the doctor has carved out a unique space of his own primed for protecting the cornerstone of pastoralist life: livestock. In his own words, the doctor is "searching for a life":

> TA: Why did you come to town?
> D: I came because I am searching for a life. . .. And this way to search for a life is not bad.
> TA: Why aren't you able to search for a life [where you live]?
> D: There. . . I cannot give Maasai people this [medicine]. Each one already knows. But me, I know Swahili people. I have stayed with Swahili people for a long time. . . I want a bit of money for my family. . . [My family] gets food, we stop selling our livestock. If a person is overcome with hospital costs, there is not a need to sell a cow—there is a bit of money, it is used. Now, those livestock just reproduce. . . It prevents me from taking cows and goats to the market on account of a problem. If someone says there is a problem, I have a bit of money and I send it to them. . . So the livestock, they sit and eat grass. I herd and make medicine. . . I want to have quite a few animals.[50]

The expertise that the doctor carries is the product of a formalized system of medical knowledge acquired, practiced, revised, and taught in the home and in the pasture. Within this context, the doctor has configured a cell phone and a home solar system as technologies of Maasai pharmacology in an effort to make cheap, effective medicines available for city-dwelling Tanzanians. As a result, the doctor has transformed a home solar system, a cell phone, and generations of Maasai pharmacology into an agile form of healthcare that has returned not just revenue, but resiliency to his life as a pastoralist.

Still, the doctor is aware of the financial risk in the pay-as-you-go model. Imagining his future, the doctor describes the terms of a successful solar energy system:

> I will buy one, but not yet. I want to build an office there in the village, and I want to open my own business. I would like to use solar, but I know that I will have to pay for it. There are systems to buy with cash and others to buy with a loan. The one to buy with a loan is good for a person that likes business. You get it and you pay bit by bit. . . Solar enables me because if I start a livestock medicine business, I would have installed electricity. . . It should not be dark. A person is able to come at any time, lights are on, I charge their phone, there is a saloon there. And the solar system pays for itself. Not, okay, you install the solar system and you do not have any business, it just sits there and you sell cows.[51]

The doctor's ambition to open a livestock medicine business is a mixture of his two trades: herding and pharmacology. His goals incorporate a vision for official business and a large, healthy herd of animals. The doctor's entrepreneurial efforts are evidence of his readiness to adopt tactics and techniques poised to better position himself, his family, and his livestock to succeed amidst changing socioeconomic conditions. In confronting the risks and vulnerabilities in the market and as a client to international solar enterprise, the doctor is paving the way for new conceptions of contemporary Tanzanian society and for the devices he wields. Maasai people like the doctor merge imaginaries of solar energy futures with tradition in the creation of innovative new spaces for capitalism, technology, infrastructure, and pastoralism to coexist.

Although its material origins are external to Maasai communities, solar energy is manipulated by endogenous values and practices deeply embedded in Maasai ways of life and bolstered by knowledge systems misunderstood by dominant powers of the day. As Maasai people traverse sociotechnical regimes shaped by nationalism, capitalism, and electrification, livestock are an energetic pillar—used to establish transformation in the local longue durée and to align solar energy proliferation (and other kinds of energy change) with local imaginaries for development.

Conclusion

As energy garners renewed attention in the face of climate change, the perspectives and tools gathered to create energetic futures will shape the landscape of possibilities. Scholars have interrogated histories, ethnographies, and imaginaries to reframe energetic discussions to include actors and technologies often pushed to the margins of popular development discourse.[52] In this essay, I have contributed an analysis of locally generated sociotechnical imaginaries of solar energy to acknowledge the ideas, values, and technologies developed from within Maasai communities that facilitate lasting solar electrification. I attend to pastoralist praxes between the Maasai and their livestock as principal subjects of study to show how social, cultural, and ecological interconnections are imagined and leveraged in values-based energy development.

Pastoralist praxes are not passive. They create a set of elastic terms that the Maasai use to encounter, imagine, and appropriate inbound systems vis-à-vis local modes of being. Development is an imaginative process that combines new and old ideas and materials into testable synergies. However, the importance of the power to imagine is often overlooked. On the ground, ordinary innovators experiment in the imaginative space between philosophy and practice to create new possibilities for their families and communities. I write inspired by this space and eager for a future where radical sociotechnical forms emerge in development projects that integrate the skills, knowledges, perspectives, and imaginaries of the Maasai.

Notes

[1] Anuradha Mittal and Elizabeth Fraser, *Losing the Serengeti: The Maasai Land that was to Run Forever* (Oakland: The Oakland Institute, 2018), 9.

[2] Dorothy Hodgson, *Once Intrepid Warriors: Gender, Ethnicity, and the Cultural Politics of Maasai Development* (Bloomington: Indiana University Press), 116.

[3] James Scott, *Seeing Like a State* (New Haven: Yale University Press); Mittal and Fraser, *Losing the Serengeti*; Hodgson, *Intrepid Warriors*.

[4] Mara Goldman, "Strangers in Their Own Land: Maasai and Wildlife Conservation in Northern Tanzania," *Conservation and Society* 9, no. 1 (2011): 65-79; Parselelo Kantai, "In the Grip of the Vampire State: Maasai Land Struggles in Kenyan Politics," *Journal of Eastern African Studies* 1, no. 1 (March 2007): 107-122.

[5] Mittal and Fraser, *Losing the Serengeti.*

[6] Sheila Jasanoff and Sang-Hyun Kim, *Dreamscapes of Modernity: Sociotechnical Imaginaries and the Fabrication of Power* (Chicago and London: University of Chicago Press), 4. On the ground, interlocutors offer *kutafuta maisha* (searching for life) and *kusoma ramani* (reading the map) as descriptive analogs for sociotechnical imaginaries—subjective processes for enacting *ubunifu* (creativity) at the intersection of visions for the not yet and available resources.

[7] Jacqueline Tidwell and Abraham Tidwell, "Energy ideals, visions, narratives, and rhetoric: Examining sociotechnical imaginaries theory and methodology in energy research," *Energy Research & Social Science* 39, (May 2018): 103-107.

[8] In these conversations, the characteristics of imagined energy futures were described using Swahili, a second language for many Maasai interlocutors. In *The Mobile Workshop*, Clapperton Mavhunga shows how language constitutes an archive for lived experience—a reservoir for knowledge and meaning. While my own Swahili and English proficiencies provided an exciting opportunity to engage directly with groups of diverse actors in northern Tanzania, it required from some participants a conveyance of perspective without a mother tongue.

[9] Clapperton Mavhunga, *Transient Workspaces: Technologies of Everyday Innovation in Zimbabwe* (Cambridge: MIT Press), 9.

[10] Bill McKibben, "The Race to Solar Power Africa," *The New Yorker,* June 26, 2017.

[11] "About REA," Rural Energy Agency, United Republic of Tanzania, accessed February 3, 2021, http://rea.go.tz/aboutus/aboutrea/tabid/144/default.aspx.

[12] Mavhunga, *Transient Workspaces,* 7-17.

[13] Haikael Martin, Pammla Petrucka, and Joram Buza, "Low macronutrients intake and associated factors among Maasai women of reproductive age in Ngorongoro Conservation Area, Tanzania," *American Journal of Research Communication* 2, no. 12 (2014).

[14] Kathleen Galvin et al., "Climate variability and impacts on east African livestock herders: the Maasai of Ngorongoro Conservation Area, Tanzania," *African Journal of Range & Forage Science* 21, no. 3 (November 2009): 183-189; Nicholas

Mariita, "The impact of large-scale renewable energy development on the poor: environmental and socio-economic impact of a geothermal power plant on a poor rural community in Kenya," *Energy Policy* 30, no. 11-12 (September 2002): 1119-1128; Henri ole Saitabau, *Impacts of Climate Change on the Livelihoods of Loita Maasai Pastoral Community and Related Indigenous Knowledge on Adaptation and Mitigation* (Nairobi: National Museums of Kenya).

[15] Magne Vegel, "Solar-power eases Maasai tribe's hunt for water," *World Pumps* 1998, no. 376 (January 1998): 36-38; Truphena Mukuna, "Gender-Sensitive Clean Energy Technologies for Sustainable Development amongst Pastoralist Maasai Communities, Kenya," in *The Gender-Energy Nexus in Eastern and Southern Africa,* ed. Paschal Mihyo and Truphena Mukuna (Addis Ababa: Organisation for Social Science Research in Eastern and southern Africa), 222-261.

[16] Hodgson, *The Church of Women: Gendered Encounters Between Maasai and Missionaries* (Bloomington: Indiana University Press)*,* 18.

[17] D.A. Masolo, "The Place of Science and Technology in our Lives: Making Sense of Possibilities," in *What do Science, Technology, and Innovation Mean from Africa?* ed. Clapperton Mavhunga (Cambridge: MIT Press), 35.

[18] Clapperton Mavhunga, *The Mobile Workshop: The Tsetse Fly and African Knowledge Production* (Cambridge: MIT Press), 49.

[19] Mavhunga, *Mobile Workshop.*

[20] Mavhunga, *Transient Workspaces.*

[21] Clapperton Mavhunga, "Energy, Industry, and Transport in South-Central Africa's History," in *Energy (and) Colonialism, Energy (In)dependence,* ed. Clapperton Mavhunga and Helmuth Trischler (Munich: RCC Perspectives), 9-16; Mavhunga, *Transient Workspaces,* 17.

[22] Mavhunga, *Transient Workspaces,* 16-17.

[23] Priya Lal, *African Socialism in Postcolonial Tanzania* (New York: Cambridge University Press); Erik Larson and Ron Aminzade, "Neoliberalism and Racial Redress: Indigenization and Politics in Tanzania and Fiji," *Research in Political Sociology* 16, (2007): 121-166; Hazel Gray, "Industrial policy and the political settlement in Tanzania: aspects of continuity and change since independence," *Review of African Political Economy* 40, no. 136 (June 2013): 185-201.

[24] Hodgson, *Intrepid Warriors,* 153.

[25] Scott, *Seeing Like a State.*

[26] Scott, *Seeing Like a State,* 230 (my italics).

[27] Julius Nyerere, *Education for Self-Reliance* (Dar es Salaam: Government Printer).

[28] Hodgson, *Intrepid Warriors*; Scott, *Seeing Like a State.*

[29] Hodgson, *Intrepid Warriors,* 276.

[30] *The Tanzania Development Vision 2025,* United Republic of Tanzania (1999).

[31] "About REA," Rural Energy Agency.

[32] Interview with Tanzanian-Chaga entrepreneur, January 4, 2018.

[33] Interview with Tanzanian-Iraqw driver, April 26, 2018.

[34] In one ethnographic encounter, citizens of a former Ujamaa village east of Arusha explained that they did not consider solar power a necessary feature of local life. They added with assurance, "REA is coming soon."
[35] Interview with Tanzanian-Maasai tour guide, March 23, 2018.
[36] Hodgson, *Intrepid Warriors,* 116.
[37] Hodgson, *Intrepid Warriors,* 116.
[38] Masolo, "The Place of Science."
[39] Interview with Tanzanian-Maasai village leader, April 18, 2018.
[40] Hodgson, *Intrepid Warriors,* 21-39.
[41] Hodgson, *Intrepid Warriors,* 211.
[42] Mavhunga, *Transient Workspaces,* 17.
[43] Mavhunga, *Transient Workspaces,* 17.
[44] Interview with two Tanzanian-Maasai solar entrepreneurs, March 2, 2018.
[45] Interview with Tanzanian-Maasai graduate student, March 12, 2018.
[46] Interview with Tanzanian-Maasai village leader, April 18, 2018.
[47] Interview with Tanzanian-Maasai doctor, April 14, 2018.
[48] Anna Tsing, *The Mushroom at the End of the World: On the Possibility of Life in Capitalist Ruins* (Princeton: Princeton University Press), 62.
[49] Interview with American solar energy firm founder, May 2, 2018.
[50] Interview with Tanzanian-Maasai doctor, April 14, 2018.
[51] Interview with Tanzanian-Maasai doctor, April 14, 2018.
[52] Richard White, *The Organic Machine: The Remaking of the Columbia River* (New York, NY: Hill and Wang); Stephanie Rupp, "Considering Energy: $E = mc^2$ = (magic * culture)^2," in *Cultures of Energy: Powers, Practices, Technologies,* ed. Sarah Strauss, Stephanie Rupp, and Thomas Love (New York: Taylor and Francis), 79-95; Jessica de Boer and Christian Zuidema, "Towards an Integrated Energy Landscape," *Urban Design and Planning* 168, no. 5 (October 2015): 231-240; Jasanoff and Kim, *Dreamscapes of Modernity*; Tidwell and Tidwell, "Energy Ideals"; Mavhunga, "Energy, Industry, and Transport."