ABSTRACT

Title of Dissertation:	RIKA RESILIENCE: INFORMING SUSTAINABILITY IN THE AGE OF SOCIAL MEDIA
	Elizabeth Muthoni Warrick, Doctor of Philosophy, 2020
Dissertation directed by:	Professor and Dean Emeritus Jennifer Preece, College of Information Studies

The consensus in systems science is that environmental sustainability ensues from resilience, i.e., underlying capacity for preservation of core functions through adaptation in changed circumstances; and resilience itself is only sustainable when built from internal attributes of the system. Impalpability of internal resilience to external agents contributes to failures of global development in Africa, calling for analysis informed from within.

This work proposes that African resilience is founded in Rika. Within Rika, ecological stewardship is integrated with noncompetitive elected representative governance and achieved through scaled modulation of systemic diversities. Eroded at macro level, Rika continues to drive grassroots enterprise. Causal attributes are, therefore, key to understanding sustainability and effecting structural reform of governance at all levels in Africa. Documented international usage of Rika concepts and terminologies has significance for research linking global expansion of Homo sapiens to the development of conceptual thinking in East Africa.

Findings are based in research with the Mbeere of Kenya, East Africa, a community of 195,000, whose name Mbeere, means First Peoples. Data extracted regionally from 750,000 social media users informs context. From an indigenist method-as-theory stance (Indigenist Maths), we leverage qualitative and quantitative tools, bolstering capacity of research and practice to serve indigenous goals at the intersection of social media and Place. A dynamic indigenous information world (iWorld) ensues through community interactions interconnecting local knowledge with global information to foster economic enterprise and social ecological stewardship. We term this iWorld, Rikamedia.

Examples of resilience attributes emerging from the data include: the Rika ideal of non-competitive governance, potentially impactful of conflicting democratic ideals centered in competitive governance; transcendence of natural hierarchies through unambiguous reciprocated interactions from micro to macro levels of society; design for participatory diversity, equality and inclusion with impacts on systemic divides of gender, age, and access, etc.; and lastly, a learning modality aligns governance with participatory process, emboldens risk tolerance; nurtures diversities and fosters innovation.

An entrepreneurial micropilot Bamboo project ensues from community-researcher interactions, with recommendations for agroforestry citizen science, technology, funding, and diaspora capacitation.

Findings are scalable in Africa South of the Sahara, and may have significance for resilience when projects incorporate Rika attributes in sustainability planning.

RIKA RESILIENCE: INFORMING SUSTAINABILITY IN THE AGE OF SOCIAL MEDIA

By

Elizabeth Muthoni Warrick

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Advisory Committee:
Professor Jenny Preece, Dissertation Chair
Professor Tammy Clegg
Professor Paul Jaeger
Professor Joseph Richardson, Jr., Dean's Representative
Professor Katie Shilton

Dedication

To my children Glory and Ben.

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In reflection of the indigenist viewpoint advanced in this work, I break with scholastic tradition to acknowledge my indebtedness to the community first and foremost, for without the remarkable people of Mbeere and Embu there would have been nothing to write about: I am grateful to my maternal cousin, the renowned Architect Bedan Nyaga Githae, for the groundbreaking role he played in facilitating the transcendent encounters of 2015 in Mbeere North; and for opportunities to observe integration of indigenous knowledge with digital tools for ecological accounting on his exceptional farms in Embu and Mbeere. Our relationship is a living testament to the strength of our shared heritage and the Rika tradition to which we all belong.

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List of Abbreviations

Acronym	Long Form
EC	Eastern Conservancy (national ecological zone of which the Mt. Kenya region is a part)
ECIDP	Embu County Integrated Development Plan
FB	Facebook
iCitSci	Ishiara CitSci
Indigenist Maths	Indigenist-method-as-theory stance.
iWorld	Information World (from Theory of Information Worlds. Plural iWorlds)
KNBS	Kenya National Bureau of Statistics
OED	Oxford English Dictionary
PTKCE Act	The Protection of Traditional knowledge and Cultural Expressions Act, 2016.
RETS	Returning Systems
Rikamedia	Rika Media.
SDG	Sustainable Development Goals
SES	Social Ecological Systems
STEM	Science Technology Engineering and Mathematics

Mīgambithia yīa Kīmbeere (Vowel Sounds).

The seven vowel sounds of Kīmbeere, *Mīgambithia, i*nclude the 5 commonly occurring in the Roman alphabet. The diphthongs ī and ū are the only ones not commonly encountered in the English language. Usage is illustrated.

Ndemūa *(Letter)*	**Similar Phonetic Sound** *(Underlined)*	**Frequently Used Kīmbeere Term** *(See Glossary of Terms for Definitions)*
a	**A**lpha	Akūrū,
e	**e**gg	Ambeere
i	**E**nglish	Irī, Ivate
ī	p**i**t	Kīrīra, Kīambeere
o	**o**range	Nduīko, Gachoka
u	y**ou**	Muuma, Mumo
ū	b**oa**t	UVA, Ūkūrū

1 Chapter 1: The Big Picture

1.1 Introduction

This work presents attributes of resilience building from an African perspective, leveraging an internal-systems approach at the intersection of social media and Place; where Place is defined as interdependent ecosystems within a geolocated territory inclusive of human systems (Tuck & McKenzie, 2014). The consensus in systems science is that environmental sustainability ensues from resilience (Walker & Salt, 2006/2019), defined as underlying capacity for preservation of core functions through adaptation in changed circumstances. Furthermore, resilience itself is only sustainable when built from internal attributes of the system (Zolli, 2012). Impalpability of internal resilience to external agents contributes to failures of global development in Africa (Walker & Salt, 2012/2016), calling for analysis informed from within to close significant knowledge gaps.

I propose that African resilience rests on Rika, a system designed to dynamically manage systemic changes through scales of time, distance, and socioecological diversities. The term is defined in the Oxford English Dictionary (OED, 2020) as a strong gender neuter[1] noun representing egalitarian autonomy or self governing jurisdiction. From an African perspective, rika drives multiple latent functions of resilience building across all scales of society. Modulating functions of the system have not been well understood; prior research

[1] *A gender neuter noun refers to an entity that is neither masculine nor feminine.*

has not thought broadly enough about Rika to reach the temporal and spatial scales needed to effect resilience thinking (Holling & Gunderson, 2002). The process is involved and takes more than mere comparative analysis of observed phenomena. It does not involve a return to past states, but rather dynamic and symmetric learning of temporal attributes of resilience embedded in Rika, and harnessing learned knowledge for application in governance of present day participatory projects and legislative, and policy frameworks.

The part that I offer in this work is at the very beginning of this process. I trace the concept of Rika from a time before documented history, as well as examine application of emergent factors in present day indigenous experience of environmental and community stewardship, termed socioecological stewardship in this work, deriving from terminology in Social Ecological Systems Science (SES), This temporal and spatial approach is necessary if we are to find patterns of resilience to inform elaboration of an internal African model that can be applied toward integrative structural reform and dynamic change management across all sectors.

Most research on Rika in African context only goes as far back to the late 1800s (Fiedler, 1996); and much of it uses alien micro level terminologies that hinder transcendence beyond the descriptive and the comparative. However, if uncovered, systemic attributes of Rika have potential to reactivate effective local self governance, foster diversities, modulate inclusivity, and reengage systemic mechanisms to bolster equal access to ecological resources, and just accountability preconditions for consumption.

In Africa, Rika was considered the biggest threat to colonial occupation (Ambler, 1989), and was therefore aggressively targeted for various programs aimed at assimilation or homogenization with colonial structures, in effect, neutralization, from the 1890s to the

1940s (Daniels, 1982; Fiedler, 1996). Our research shows that by the late 1950s, colonial governments and researchers had reached consensus that the rika system was defunct, and had been for at least two decades (Lambert, 1956). However, significant aspects of rika have survived. Eroded at macro level, Rika continues to drive grassroots enterprise. Causal attributes are, therefore, key to understanding sustainability and effecting structural reform of governance at all levels in Africa.

Findings are based in research with the Mbeere of Kenya, East Africa, a community of 195,000. The name Mbeere or Ambeere means First Peoples. To inform findings in the immediate research context, data is extracted from another 750,000 social media users in the surrounding communities of the Eastern Conservancy, augmented with data from textual analysis of historical research on Rika.

Using a mixed approach with qualitative and quantitative methods at the intersection of social media and Place, we examine interactions of Mbeere community members as they bridge local knowledge with global information to foster economic enterprise and social ecological stewardship within a learning modality that fosters participation in political process as well as bolsters meaning-making at the structural boundaries of Nationhood and Placehood. From the ensuring Information World, (Jaeger & Burnett, 2010), patterns of Resilience emerge, including structural attributes, change-bolstering mechanisms, and sustainability strengthening strategies.

An example is the Rika ideal of non-competitive governance by all, potentially impactful of conflicting democratic ideals centered in competitive governance. Another example is transcendence of natural hierarchies through unambiguous reciprocated interactions from micro to macro levels of society, designed to foster participatory diversity

and modulation of inclusivity mechanisms, with impacts on systemic divides such as gender, age, and access. A third example is a learning modality designed to align structures of governance with processes of citizen participation; embolden tolerance for risk; and foster diversity to encourage innovative grassroots enterprise.

We present examples of historic and present day sustainability thinking in Rika and illustrate this ideation with project cases. In particular, an entrepreneurial micropilot Bamboo project ensues from community-researcher interactions, with recommendations for indigenous species, agroforestry citizen science, technology, funding, and diaspora capacitation.

1.2 Why a study on Rika

In the last two decades, the world's attention has turned to Africa for interrelated reasons along separate paths. One of these siloed interests is historic anthropological research on African systems to inform emerging research in multiple disciplines interested in human origin theory. Resilience thinking has not been one of the disciplines interested in human evolution science, although it has been a major player global development theory on the African continent, providing numerous case studies to test theory with markedly lower degrees of success in African context relative to other regions of project application. (Holling, 1973; Walker et al, 2003; Holling & Gunderson, 2002; Walker & Salt, 2006, 2016). The reasons will be discussed in more depth shortly.

The idea of Rika as a resilience model links the two disciplines in the sense that by linking human expansion out of Africa to conceptual thinking, recent findings in evolution science provide a temporal and spatial understanding of Rika's evolutionary function as a conceptual system designed to undergird resilience of human systems. Such a link potentially

lends global significance to this work. My interest is not in evolutionary science, nonetheless, this research is informed by and may have significance for discoveries about the role of conceptual thinking. Science now agrees that the origins of present-day homo sapiens are traceable to Africa through genomic and paleontological evidence (Cann et al, 1987; Stringer, 2014, Henn et al, 2018) and moreover advances the idea that human expansion occurred consequent to the development of conceptual thinking in East Africa (Harari, 2016). As such, "....attention has now turned to discussion of what was happening within the continent before modern humans expanded their range globally." (Henn et al., 2018 p. 148). Toward this enterprise, I suggest here that in the time before documented history, the development of a rika resilience conceptual framework played a key role in human development. That is, the conceptualization of rika to continually build resilience of communities was a contributive factor, and joins in the enterprise of advocating for resilience thinking from an internal systems viewpoint, where resilience is understood to be a precondition for sustainability.

Secondly, there has been a growth driven interest in Africa. Economic growth projections of the last 10 years linked to experimental social media entrepreneurship, diaspora remittances, and capacity of diaspora to capacitate community networks. Attendant to market economies, increased capacities of research instruments in science, information, and technology to visualize data rendering previously impalpable phenomena accessible for systems science to an unprecedented degree.

1.3 Significance for Research, Participatory Projects, and Policy

Findings of this research may inform a number of areas. We add to prior resilience research from an Information World perspective, offering access as an overarching

framework within which to define attributes of resilience based in Rika. These include but are not limited to, groundedness of human stewardship in principles of ecological justice, autonomy, non-competitive elected governance, as well as taxonomic alignment between structures of government and participatory structures of the governed. Additionally, for resilience thinking, we examine issues of gender diversity and inclusion, areas that are not well understood in resilience and systems science.

Further, not only does Rika define structural aspects of resilience, but the system also offers mechanisms by which to dynamically change and reorganize structure to bolster resilience over time. For example, by increasing both age diversity and age correspondence, communities harness liminal transformative mechanisms, thereby capacitating learning modalities that embolden innovation. These mechanisms, together with increased gender diversity, bolster capacity for transcendence of hierarchies inherent in natural social systems, fostering autonomy and inter reliance rather than dominance. These attributes are necessary to undergird conditions of wellbeing necessary for effective stewardship. Findings have regional significance in Africa.

In the area of sustainability, findings have relevance for Africa South of the Sahara. From internal systems thinking perspective, sustainable development goals (SDG) are based in linear development thinking that, based in findings of this and prior research, has failed Africa (de Haas, 2-14, Walker & Salt, 2006). I now propose Rika, based in the knowledge that Africa is the coeval designer and knower of a Rika based resilience model. I've endeavored to tie the loose threads of our global knowledge regarding the role of Rika in global expansion of humans out of Africa. By inference, I submit that all other resilience models are based on Rika as the system was coevally designed in East Africa. Knowing that

sustainability ensues from internal resilience, Africa has priority of place to redefine the sustainable development landscape on terms that work for her peoples and their interdependent ecologies.

Chapter 6 demonstrates Rika structures and motivational value through iCitSci's project application of contextual understandings about what it means to collect data for individual enterprise, using technology platforms that allow for sharing with the science and information technology research. As such, we have illustrated approach in incorporation of indigenist maths (method as theory) for community project development. The recommendation ensuing from assessment of goals, process, and outcomes is an agroforestry citizen science framework, culminating in a business proposal commissioned from a third party company in the Rikamedia diaspora. Concepts are based on Rika socioecological values is based in findings about historical importance of Rika for seed protection in Mbeere, and integrality of livelihood with preconditions of ecological stewardship under Rika mandates, especially in reforestation and water conservation. Findings have significance for indigenous species reintroduction, riparian ecological restoration, integration into the local timber and plastic-alternative economies, and technology innovation to harness the wider Rikamedia network for capacitation.

Further, such Rika approach to participatory projects has significance for effecting constitutional and legislative mandate to protect indigenous seeds and ecological species. As well, due to socioecological centeredness, a Rika Resilience approach would support Kenya's ban on Plastic and a move back toward biodegradable sources of craft and woodworking materials, such as ornamental figurines and basketry, for which Kenya is world renowned. A micropilot in Chapter 6 evidences that indigenous species of bamboo proved best suited to

contextual site variability when tested for 30 months against alien species that were more favored by experts at the nursery where the first seedlings were sourced. iCitSci, a youth project with deep ties in the Rikamedia, is committed to natural propagation of the thriving indigenous species, with encouragement from supporting diaspora and Knowledge Expert Elders, Akũrũ a Kīrīra.

For the community under immediate research, findings may inspire a renewal of efforts toward redress for Mbeere's indigenous right of Place, particularly to stop widescale mining in indigenously protected areas, and in the right to local self governance as a Mbeere territorial jurisdiction. Most especially, I have presented evidence of illegitimacy in Embu County governance over Mbeere, using historical and present day data from government publications, reports, and empirical research. The research team, as well as many in the communities of Mbeere and Embu have family members whose identities straddle both Mbeere and Embu. The current climate of exploitation of Mbeere for the benefit of enterprise and standards of living in Embu Subcounties is both divisive, unsustainable and deeply self defeating on the part of the Gubernatorial and National governments. More importantly, it persists against the will of the governed indigenes, is coercive, and unconstitutional under protections of indigenous peoples and their inalienable traditional properties.

Outside immediate context of research, the restoration of the Rika mandate for relationships of autonomous inter-reliance between communities of Kenya and Africa at large is essential to safeguard human right to self determination. As we see in the last section of the this chapter under Research Setting, in Mbeere, much as is. the case elsewhere in Africa, there are deep ecological concerns arising from unsustainable ecological exploitation for external interests, with little benefit to the communities and/or nations in question.

Concerns include sustainability of water levels on rivers and dams due to loss of vegetation cover, rampant sand harvesting, and alienation of the community from affected lands, so that stewardship has become impossible. As is seen at the bottom of this chapter and throughout this work, the Embu County government as a case study evidences little to no restorative action. In addition the dominant actors in government are culpable in continued obstruction to gazettement (registration as national preservations) of traditionally preserved lands. This work has delineated at least 8 sites and the socioecological justice laws under which the identified ecological properties are set aside as sacred because they house endangered species, water catchment areas, medicinal plants and minerals, as well as sites of historical and cultural importance (Brokensha, 2007, Riley & Brokensha, 1989a, 1989b). As it has turned out, data strongly evidences a regional and perhaps global significance of Mbeere socioecologies. The predicament of these knowers ought to concern thinkers in a variety of scientific domains.

Further, uncovered ecological threats have deep though not yet apparent significance for the Eastern Conservancy (EC), county and national economy, and the energy sector. Additionally, Mbeere land resources are used, ergo, Mbeere ought to be a major sectorial player. This is not the case, despite community efforts post-devolution in 2010. Findings therefore also have significance for constitutional and legislative reform toward protections of indigenous rights, redefining of policy on Mbeere local self governance and fiduciary responsibility for its own territory.

The decision to devolve Mbeere into Embu has been deeply harmful of ecologies and will continue to impact sustainability ecologies for many years. All ecologies are interconnected, hence harm to traditionally preserved Mbeere ecologies on mountaintops and

hillsides will eventually harm the entire region. As of this writing, Extensive mining as is underway with Chinese companies, contracted by Embu County Gubernatorial government (BDN, 2019). This and other similar exploitative decisions are made against community will, and in defiance of community effort toward stewardship of already damaged ecologies, as is indeed reported in the 2019 County Planning (ECIDP, 2019).

The national government is culpable in this alarming situation and has a responsibility to protect its Mbeere citizens and their traditional properties on an equal basis with citizens of all other counties of the nation, some of which have far less to offer sectorially and yet enjoy many more benefits of citizenship than do Mbeere citizens. The will of the people documented within these pages in Chapters 4, 6, and 6 has significance in other rural communities of Africa who are similarly dispossessed of indigenous properties that may house resources of interest to dominant external agents. Economic gain and avarice are not a legitimate basis on which to disproportionately visit injustices on communities of citizens.

Secondarily, I have endeavored to present data by which OED may springboard investigation to extend the etymology of the term Rika and its variants to its rightful place, not in Germanic or Indo-European languages traceable through the non-European Frisians of 800AD, but in East Africa, most likely through settlement of Frisians and other communities in Europe prior to documented history. Findings will conceivably have significance for Africa, Europe, Asia, and possibly the Middle East.

The next few subsections outline knowledge gaps in the research on Rika, Sustainability, and Resilience, with emphasis on Panarchy, where Rika concepts may fill gaps on change management. From this discussion arises the research design at the intersection of science, information and technology for sustainability, redefined from internal

systems thinking from African perspective. Lastly, a discussion on the research setting sets the stage for the findings to come in Chapters 4, 5, and 6.

1.3.1 Overview of Rika Through Time and Domain

Virtually all communities of Africa South of the Sahara evidence variants of the rika system (Forde, 2017/1977). Societies of South, Central, and East Africa, widely use the term Rika, pronounced */r.ee.kuh/*, (Tew, 2017/1951; Forde, 2017/1977). North Eastern and West Central African societies may use both Rika and Ric. For example, the Dinka and the Nuer of Sudan call the system Rik, pronounced */r.ee.kh/.* (Burton, 1980; Evans-Pritchard, 1936, 1940, 1953; Hutchinson, 2000; McKinnon, 2000; Prins, 2017/1952;). Yet although Rika is a much researched subject, it has rarely been studied under African linguistic nomenclature, except when looking at micro level aspects of the system. Instead, the terms that have been favored by social anthropology in the African context are generational classes, age sets and kinship groups, among others.

On the extreme side of deficit-driven thinking, as early as 1962, Benson is cited by Saberwal (1970) using the term *gang* to refer to the Rika system. The term *gang* has recently been revived by David Anderson (2002) in political commentary of conflict associated with a specific Kenyan sociopolitical entity known as Mūngīkī. Given the complexity of Rika, generational and/or political treatments of Rika have been one-dimensional, uninformed, and in Anderson's case, tantamount to tearing down the house after perfunctory inspection of a broken door. My own assessment of the system leads me to believe that no single work can hope to cover the entirety of the structures and functions of Rika, unless such knowledge is captured in multiple volumes. Moreover, to achieve full working knowledge of the system, a

scaled multidisciplinary team approach is needed. This work crosses disciplines of research and domains of practice; however, it only handles the before beginning of a process of uncovering and applying concepts within ongoing participatory project cases.

As defined in African context, *the term rika does not just refer to a territory, but also to various levels, scales, and dimensions of governing polities within a given territory. Indeed, Rika refers also to a quality, attribute, or state of autonomy within inter-reliant relationships. When such a relationship is not evidenced, then it is said of the actors in question, that there is no rika between them. If the actors are mutually extant within epistemological and axiological understanding of Rika concepts, then each side seeks to establish a state of Rika, to facilitate reciprocated interactions whilst respecting inalienable right of self determination in the other.* Due to incomplete understandings of this key guiding principle or philosophy of rika, societies of Africa have been defined as "collective" or "communal" systems. Such has been the case with development of thought around the concept of Ubuntu (Mbiti, 1962, Nussbaum, 2003, Eze, 2008), an idea I also shared until recently. In this work I have outlined rika relationships, and the mechanisms by which dissonance and hierarchies are resolved so that Rika is established. As we see in Chapter 6 under strategic resilience, community projects experience obstacles when attempting to align with national and local regulatory mechanisms. Despite the best efforts of the Kenyan Government, so supportive of innovation and experimentation as to have provided the open-market risk environment that led to the first widescale, sustainable mobile banking with adoption of Mpesa at all levels of social and business transactions in 2007 a foundational aspect of cashless society adapted in the West after the fact. The significance of such a climate to foster diversities, particularly of age and gender is indubitable. The gender aspect

has been researched(Gustafsson, 2018). Gaps remain in understandings about the role of Rika Resilience concepts in fostering both governance and polity will to innovate; and much remains to be uncovered about latent aspects of the system that can be further leveraged to redefined development and stewardship in African terms.

The earliest documented usage of the term Rika in Europe has been traced by Bremmer (2009) to Frisian language and culture in the Netherlands and Germany. Bremmer defines Frisians as a society of Non-European ethnicity whose autonomous Rika territories coexisted with Roman colonies throughout Central Europe circa 800AD. He offers that Rika jurisdiction extended from Amsterdam and Prague in the West to Bern in the East and Florence in the South. Noting that the system predates documented records circa 800AD, Bremmer reports that Frisian Rika was characterized by non-hierarchical representative governance, elected yearly by the governed citizenry. Rika economies were centered in agrarian use of land-based resources. Bremmer's account gives body, dynamism, and context to a detailed Rika etymology on OED.

Despite a long etymology, the Oxford English Dictionary (OED, 2020) does not include African variants of Rika. Possibly a reason for this omission may be that, as just mentioned, social anthropology on Rika in Africa chose by and large to ignore African nomenclature of Rika and its variants. Knowledge gaps not withstanding, the OED is a rich source of definitions for variants of the term rika.

One of these is the word rikka, a transitive verb in Finnish, meaning to break, a concept in alignment with investiture of incoming Mbeere polity into a self-governing corporate body. The indigenous terminology is *Rika Rīa Ītuīka or Nduīko, meaning, the rika that has broken/become.* The term, *Ītuīka* or *Nduīko* has a double meaning of breaking and

becoming. Whereby a rika, sovereign government, embraces tensions inherent in breaking with incumbent structures of governance so as to become a new government. Nduīko engenders ascension of a Rika polity into governance by all, a first step in the journey toward qualification to stand for elective representative governance (in a non-competitive electoral process).

In yet another application with relevance to this work, in Japanese *Rikka* may refer to scientific knowledge and skill such as is acquired through natural sciences. This usage o*f the term rikka to mean science,* skill, or mastery of a body of knowledge, is in keeping with *Akũrũ A Kīrīra, where elders are seen as a* Rika, a corporate body with authority to curate knowledge and instruct community members based in a body of foundational knowledge centered in the environmental and natural sciences, as noted in prior research, traditional Mbeere featured a knowledge economy well into the 1980s *(Brokensha, 2007, Glazier, 1985; Riley & Brokensha, 1989, Saberwal, 1967 1970).* Also noted is the Chinese word Rikki, denoting strength, is also part of the extensive etymology of rika.

Most notably aligned with the goals of this research is the term *rike*[2], an ancient Swedish term that once formed part of the nation's name. The term Rike has been leveraged in socioecological Resilience Thinking. Walker & Salt (2019) define the term as referencing both a realm and the wealth within it. The authors apply attributes of internal systems thinking and local self-governance to assessment of *Kristianstads Vattenrik*e in Sweden,

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[2] *The pronunciation of rike in Walker & Salt (2019/2006) is similar to that of rika in this work. Both are phonetically spelled as /reek-ah/ or /reek-uh/; while Rik is phonetically spelled as /reekh/. A long etymology of the word rika on Oxford English Dictionary follows this rule across diverse World Languages, with exceptions where /ch/ or /x/ replace the /k/ sound, such as rich in Middle English, and rix in ancient Celtic/ Middle Irish. (OED, 2020)*

making a case for local knowledge translation to guide successful restoration this lake ecosystem. The area had been breached by misguided external interventions in prior decades, at one point reaching the abandonment as wasteland.

The authors document a transformative process whereby after local jurisdiction was given to the community, citizen taskforces ideated on solutions from a Rike stance, that is, applying whole system thinking to the threatened natural ecologies. In so doing, they placed community leadership at the center of the project, integrated ecological, social, and economic aspects of the restoration to build structural resilience; and thereby reclaimed the Rika as a socioecological resource. This is internal systems thinking, i.e., local knowledge translation using a whole system approach, as demonstrated in operationalization of the homonym rike and the ensuing capacity for the people of Kristianstads Vattenrike to motivate responsive change despite overwhelming systemic challenges.

Attendant to this now widely accepted understanding of Rike in socioecological science as adaptive governance of land based resources (Walker & Salt, 2016), the term Rika has a long etymology, with variants across the globe capturing different aspects of the comprehensive conceptual system of resilience thinking that I have found in Mbeere. At the very root, my research shows that Mbeere traces human origination in Rika, specifically in Nyangi Rika, identified in a specific geographic locale in Mbeere.

Moreover, as I report in more detail in Chapter 4, Nyangi Rika is deemed progenitor of *human society*. Thus, Mbeere is unique in that, from the perspective of our community members who identify as Nyangi, the function of human genesis is integral to community origination and is not assigned to a male progenitor with a specific identity but rather to an abstract organizing concept that, while leveraging bloodlines, is designed to integrate

disparate lineages under a structurally modulated societal system. As demonstrated through various data visualizations in Chapter 4, Rika is itself not a lineage system but an abstract conceptual framework leveraging natural social systems, as such, Rika is transcendent of universal law. That is, Rika is a system designed to dynamically manage systemic changes.

Mbeere ideation of Rika as the genesis of human society informs understandings of present day self-identity using terms such as tribe or clan. My thinking is now aligned with that of systems thinkers who believe that returning system structuring of African society into administrative tribes and clans under colonially appointed chiefs as a policy of subjugation, was the means by which African self-identity began to adapt toward the divisive constructs we know in present day as *tribalism and clannism* (Daniels, 1982). As Kenyatta (1938) submits Rika was the organizing, integrative structure uniting all functions in precolonial Gīkūyū society.

By applying standardized attributes of resilience in an integrative structural analysis of Rika taxonomy across several communities and synthesizing findings with textual analysis of historical research in social anthropology in the region (Glazier, 1976, 1985; Lambert, 1933, 1956; Saberwal, 1967,1970; Tew, 1952) I believe that Nyangi, with regional terminological variance (Glazier, 1985, Hazel, 2006), was and still is, a regional macro level Rika with regional corporate function including setting the stewardship agenda. Moreover, data suggests that a standardizing role and practices centered in reciprocated ecological accountability.

Moreover, I now believe that with further research findings are scalable regionally. This is not inconceivable, considering the wide occurrence of Nyangi in Uganda, Kenya and Tanzania. Quite late in the revision process I found a paper by Robert Hazel (2006), making

one of few dynamic and comparative analyses of the rika system. His term is cyclical generational classes.

Hazel's scope is wide and covers about a dozen of societies across East Africa (the number may be greater or lesser to some, depending on splicing of ethnicities). Hazel writes in French. I have not been able to secure a professionally translated version of this paper. In the meantime, to peripherally inform my conclusions in work, I have downloaded a PDF file from Google Scholar and then uploaded it onto Google Translate. Barring meaning lost in transliteration, Hazel has also arrived at the same conclusion as I have, regarding Nyangi's progenitive role in the Rika system (Hazel's genealogical classes). The paper promises further revelations for Rika research if translated. Yet, although data on Rika evidences clear systems resilience, incisive inquiry as presented in Glazier (1976; 1985), Hazel (2006), and Saberwal (1967, 1970) has nonetheless been limited by temporal and spatial scope as well as analysis in alien terminologies that reduce and therefore defy transcendent application despite remarkable insight on the part of the researcher.

A key reason Rika defies application in resilience terms may be that it is thought to be a lineage system, due to capacity of Rika attributes, as with other resilient organizing systems, to remain hidden. It does so by aligning with natural systems that guide interactions in human society: Rika embeds invisibly into bloodlines and kinships, which are themselves not rika but natural systems. Conversely, by coeval design, choice has been embedded into the Rika system to be initiated at any point by consensus of participants as we will see in Chapter 4. Data shows that members of the community have agency to move between Rika to meet individual and group needs. This is not the case with bloodlines, which are inherently natural systems subject to the laws of Panarchy.

1.3.2 Into Panarchy and Beyond

The term Panarchy defines a set of universal rules to which natural systems are manifestly subject (Holling & Gunderson, 2002;). A given system is more resilient if it submits to the larger experience of being part of the unpredictable Panarchy, Panarchy is named after the Greek god of nature, Pan, and captures a sense of panic that characterizes the initial experience of the need for disruptive change. Systems are constantly shifting as they get subjected to new environments.

If at any point a system maximizes on one part, for example to increase the production of wheat to maximum yield, then dysfunctional hierarchies will begin to form at different scales as the system attempts to reestablish natural laws of the Panarchy. The system is then vulnerable. One law of the Panarchy is that growth and development are cyclical, rather than linear. Seasons are part of the capricious cycle of birth, growth, and death, birth. Alignment with Panarchy acknowledges that systems are extant in the biosphere, the scale of the globe where life is possible, are subject to universal or natural law, which must be obeyed if the system is to remain in a desired state. One of those laws, is the that resilient systems engender adaptive cycles of nature reflecting the natural lifecycle, i.e., living organisms must undergo a process of invitro genesis, parturition, growth, decay, and eventual death. To leverage Panarchy is to bolster resilience.

Panarchists existed before the concept was taken up in 21st century thinking by Holling & Gunderson in 2003. However, in my review of the research, I have not found sufficient mechanisms by which the concept of Panarchy in resilience theory can be employed to resolve natural hierarchies of access, gender, age, religion, etc. As importantly, the concept has unfortunately been appropriated by research in SDG. As such, it has not escaped poverty driven modalities of project ideation in African context, and in fact, appears

to be more vulnerable to appropriation than SES concepts, although Holling and Gunderson's intent is not for projects to lean into but rather transcend uncovered hierarchies. These challenges are not new for Panarchy, due to a lack of modulated mechanisms by which to transcend recognized dichotomies.

The earliest documented use of the term Panarchy was by Fransiscus Patricius (1429-1597) a Croatian philosopher and natural scientist (Gaukroger, 2005) in consultation with the Holy See, to facilitate translation of an idea he termed an ancient Egyptian concept, which he fused with Platonic philosophy to fashion governance as we know it in the Catholic Church today. As he advanced the idea that good science and philosophy required the writer to have traveled to the source, we can assume he made the sojourn to Africa, hence the attribution. Patricius conceptualized for the Catholic Church the idea of non-competitive representative governance that was highly modulated at the top whilst being diversified at the bottom.

Apart from an obviously patriarchal context, the shortcomings I perceive with Patricius' ideation are, firstly that governance centers around deity. As such, access is compromised, because deity is inherently inscrutable and inaccessible. Additionally, man ascends into supremacy over other ecologies of Place, by reason of his privileged understanding of his own hierarchically constructed divine order. This order adds to the complexity of natural hierarchies, rather that flattening them for equal access and inclusion. Contrariwise, Rika allows for symbolic expression, but does so in a position of equality with other communities of Place.

Humans have responsibility of stewardship, rather than dominion to rule. More details on this idea are presented in Chapter 5 under socioecological values. When systems have fallen out of this perspective of non-competitiveness with natural ecologies, evidence of

inequities and hierarchies of dominance appear together with intolerance of expressions that differ from the perceived norm. This systemic imbalance in relational structures results in unaccountable ecological behaviors, because as a start, dominance precludes accountability to the dominated. In Chapter 4 and 7, I argue that an equalizing taxonomic structure is foundational to the process by which inclusiveness can be described and enacted.

The Panarchist most frequently associated with the concept, de Puydt (2015/1860), who ideated around privileging of Place as perceived by the citizen. The resemblance to Rika stops there. In Puydt's Panarchy, political parties compete for majority votes in elective office. In such as state, portions of the population are almost always unrepresented in governance once a winner is declared, and the government is in effect out of Panarchy when governance is not aligned with the will of a large portion of society. This is the case with the democratic ideal, contrary to the stated goal of democracies to achieve equality in representative governance. As I argue, accountability for stewardship of Place requires a non-competitive approach to governance, as governance of ecological resources is a key part of national governance, one that is often ignored with undesirable outcomes, Rika prioritizes the ecological aspect of governance, integrating stewardship process with electoral and legislative procedure to ensure effect.

According to my data, discussed in Chapter 4, Mbeere Rika conceptualizes an electoral body with two distinct coalitions. However, they do not vie for government over one another, and citizens do not competitively elect one rika into office. In Mbeere Rika, members of each Rika vote within their own electoral body. Each chooses an equal number of representatives. Elected officials form a single governing coalition, a non-partisan governing body at macro level. Elected equitably, representatives govern in a coalition of

equals, providing checks and balances for each other. This is what it means to modulate a system for access, equality, inclusive governance, and accountable stewardship: The concept may be stated as, cooperation before competition.

For the stated reasons, I do not use the term Panarchy in this work but prefer to think of resilience as a state in alignment with Rika, engendering equal access, striving to structure and effect inclusive, noncompetitive self-governance and accountable stewardship of shared resources as a precondition to consumption.

1.3.3 Sustainability Ensues from Internal Structural Systems

In this context, European, Asian, and other places outside of Africa are appropriately termed *returning systems* (RETS) in this work, based on my understanding of the role of resilience in sustainability and the need to frame sustainability goals in resilience terms so that internal systems give genesis to the structure while external systems play a secondary role as corresponding partners in indigenously originated goals.

From this understanding, resilience thinking does not hold with the concept of sustainable development as currently applied in growth models. African context, due to proven counterintuitive outcomes of projects and programs originating with this concept. Most especially, socioecological damage in support of a linear growth model has been shown to contribute to escalating ecological crises (Walker & Salt, 2019/2006).

As currently conceptualized, the SDG offers little realistic room for the possibility of a preexisting system of sustainable development based in indigenous resilience thinking. What we see instead is steady grafting of the term "resilience" onto sustainable development goals, targets, indicators and implementing structures (United Nations, 2019b; World Bank, 2020b) following the release of the book, *Resilience Thinking* by Walker and Salt in 2006.

Ironically, Resilience Thinking was intended to transcend the linear growth model (Walker & Salt, 2019/2006, 2016/2012). However, the ubiquity of the poverty narrative in the SDG has meant that not even resilience research has avoided depictions of African peoples in deficit terms when it has sought to address the deficiencies of the SDG as a rationale for reframing development in human and ecological terms rather than in economic terms.

As such, it is not surprising that the existing research on resilience in local places has successfully depicted internal attributes of resilience in many contexts but with less success in Africa, due to inherently deficit driven SDG goals, targets and indictors. Despite documented impalpability of SDG, low transferability in African context and difficulty of application in practice (United Nations 2019a, 2020) the donor culture driven by global institutions in Africa guarantees ubiquity of SDG in governance across all sectors makes it difficult to transcend the poverty narrative. In this work, I attempt to do just that. I suggest we turn the concept of sustainable development on its head using a Rika mandate. In so doing I charge that the development discourse as it stands today is counterintuitive and besides, offensive. Based on the morally uncomfortable, and somewhat ludicrous exercise of framing fellow humans as, a state of deficiency, by labeling them undeveloped, and poor.

This is especially important considering the consensus on resilience research regarding the link between indigenous systems of stewardship, multiple diversities, resilience of ecologies, stewardship practices of indigenous peoples as a counter narrative to linear growth model driving Sustainable Development Goals (Maffi, 2019). Underlying mechanisms are however, not yet well understood. Connected to these concepts is a view that resilience of biocultural diversity is a human rights issue (Mafi, 2019). Biocultural

diversity means diversity of living ecologies, human cultures, and languages. Maffi notes that the three types of diversities have been scientifically proven to either co-occur or to be co-threatened; and that indigenous strategies centered in intergenerational stewardship of ecologies are proven to bolster resilience. Observing that indigenous peoples make up a majority of the world's biocultural diversity, Mafi declares that,

> Losing one's linguistic and cultural identity means losing essential elements in people's connections with one another and with the natural world. The consequences are profound for both the well-being of people and the health of the environment. Forcing cultural and linguistic shift on indigenous peoples and local communities not only violates their human rights, it also seriously undermines the goal of protecting the natural environment for the benefit of humans and all other species. "Monocultures of the Mind" have the same end result as monocultures in nature. They make our planet more fragile and vulnerable to both natural disasters and human-made crises. But the dominant ideology today ignores this reality and seeks easy-to- control uniformity instead of organic unity in diversity. (Maffi, 2019: 14)

Between these interconnected viewpoints, I put forward in this work the role of information and knowledge at the intersection of social media; a Rika-centric endeavor toward restoration of social justice and inalienable human right to access and steward resources of Place.

We may say instead, that evidently all human systems are Rika systems, and the degree to which Rika structures have been breached over time and geographic distance, will determine the degree to which a system is able to dynamically re-adapt. We have seen these developments at various points in history, some of which are discussed here from the middle ages to present day experience in European countries.

When such a system undertakes a process of returning to Africa from Europe, Asia, and other places outside of Africa in search of land based resources and investment markets, in Rika terms this is a dynamically reorganizing system. I term it a *returning system* (RET, Plural RETS), undertaking a reverse process of expansion *into* rather than *out of* Africa in search of new territorial resources, similarly to pre-historic and historic expansion out of

Africa in search of territorial resources. Some returning systems, such as those with moderated competitiveness cooccurring with democratic principles, such as Sweden, will have a lower threshold toward full recovery as are societies such as Mbeere which still evidence grassroots application as well as retain much of the taxonomy even where functions have been lost.

When they are found to be aligned with gender diversity, equality, noncompetitive governance at all levels, ecologically accountable economic stewardship, and sociopolitical learning modalities to integrate all these systemic components, RETS may be seen as developing toward a state of Rika, i.e., a state of resilience in which a system recognizes the need for constant adaptative learning. Not a return to mythical times then, but learning how to restore desirability in our ecosystems, social interactions, political expression and economic pre-accountability. In Rika, society is in *a developed state.* All are learners, and the *most resilient* are also in continual stewardship.

Contrariwise, when RETS evidence exploitative cultural, gender, or economic practices resulting in projects that cause social ecological harm and loss of resilience, RETS may be seen as underdeveloped and in need of structural adjustment to build an ecologically sound state of Rika. Examples of underdevelopment are models of development with industrialization as an ideal, growth driven sustainable development; competitive elected governance, and alignment of SDG toward global institutional goals rather than toward the will of the governed.

I suggest that there is a need to think from a liminal transformative frame of mind, in the tradition of Rika-centric communities of Africa, as reported in the works of Turner

(1968). By applying existing knowledge in a new way, we can activate the dynamic[3] aspect of meaning-making, thus disrupting our conventional thinking in a potentially transformative fashion. This is an attribute of Rika that is foundational to resilience building.

Firstly, we may begin with purposive abstention from words like growth or development unless, after deliberation, the community finds that these are the appropriate words to use. For example, language development, curriculum development, brain development. These are appropriate usages. But when terminologies based on head count per earning are used to describe entire populations as "poor" and undeveloped, the SDG fails dismally on a humane level. Inevitably, the term development leads to growth. We must therefore be careful that we use it when an intention of growth is implied and is in alignment with the will of the governed. Otherwise, terms such as stewardship apply. So stating, the indigenous taxonomy introduced here in my own research is intended as a first step in this direct, a means by which to integrate siloed conversations on Rika on a multidisciplinary platform that may ultimately conceive an African alternative to a self-contradictory SDG agenda.

Resilience is, however not about an idealized return to previous times imagined to have been characterized by stability (Walker & Salt, 2006). Resilience thinkers recommend that communities undertake systems analysis such as we undertake in this work to render underlying attributes of resilience visible and applicable to bolster the system iteratively.

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[3] The root of the term dynamic dia, means through time (OED, 2020), as opposed to constant or static interactions which are rooted in the present. When Rika is considered from a historical viewpoint, the current approach in research has predominantly been comparative and bounded in historical context, lacking sufficient diametric analysis to make connections with with present day experience. This is not transformative internal systems thinking.

Without such systems approaches, Rika is more likely to be associated with ethnocentric and intergenerational political foment (Anderson, 2002; Kagwanja, 2003), deified ritual process (Wamue, 2001); and as generational classes, as historically studied in social anthropology (Evans-Pritchard, 1940; Glazier, 1976, 1985; Prins, 1952; Tew, 1951). Within these considerable bodies of work, the systemic function of rika to structure inclusive governance and bolster socioecological resilience sustainability has not been researched.

To achieve full legitimacy in Rika, governance would need structural integration between citizen understandings of self as participants in electoral process; legislative process and policymaking; as well as judicial control. Currently, there is a divide between structures of government and structures of citizen participation, leaving many feeling unrepresented. Governments describe their jurisdictions in SDG terms, derogatory and alienating forms of address to citizens, relegating them to perpetual status of poverty and dependence fostered in the epistemology of sustainable development goals (SDG).

As an example, community members participating in this research do not think of themselves as poor, but rather as hard working and entrepreneurial citizens. However codified policies and ensuing programs are driven by the SDG goal to "end poverty," an unachievable and unaccountable agenda of the United Nations and the World Bank, since their definition of poverty is very narrow, applied in earnings per capita and irrelevant to many of the contexts in which the SDG targets are applied. Nevertheless, citizens of recipient nations are perpetual deficit as a result of this nebulous framework of engagement, with great impact at grassroots.

In my 5 years working in Mbeere, there was a marked difference between the lexicon used in self-identity when community members worked with or received aid from the donor

industry, and the lexicon of non-recipients. The former used poverty markers despite sometimes being materially more well off than non recipients. They predominantly approached conversations about issues from a position of deficiency.

In addition to standardized attributes of Resilience (Walker & Salt, 2016) Two attributes are introduced here. From a perspective of science and information technology, we examine impacts of different levels of access to information and knowledge on ability to effect stewardship targets across shifting information worlds, iWorlds, that is, social systems in which information is exchanged, such as communities, called small worlds when on the micro level such as the project groups we encountered later in Chapter 4; and lifeworlds when on the macro level scale of the public domain, such as mainstream social media. We consider impacts of different levels of access to mobile devices and to indigenous knowledge on member ability to effect change in his small world and beyond (Jaeger & Burnett, 2010). These findings are presented in Chapter 4 on structural resilience.

From the Rika system we examine inclusivity as an attribute of resilience. Neither access nor inclusivity have been studied as attributes of resilience thinking. Access is a theme that comes up in connection to ecological resources such as potable water; but it has not been studied as an attribute of resilience by resilience thinking theorists per se. Resources in each of three books that influence this research. However, The latter has been identified as an under-researched area, and is listed in Walker & Salt (2006/2019; 2012/2016) These concepts will be detailed in Chapter 2 on background literature. Some of the concepts we will use to operationalize the Rika conceptual framework as is integral to Rika context are Harambee and Ubuntu. Harambee, meaning, “all pull together,” is a call to action of the Mount Kenya peoples popularized by Nobel Laureate Wangari Wa Maathai (2004) and

fostering unified stewardship of the natural ecologies on which rika is interdependent. integrate the rika conceptual framework with Ubuntu philosophy and Harambee ideology. The Ubuntu way of knowing about the nature of existence, encapsulated in the mantra, *"mūndū nī mūndū nūndū wa andū,*" is translated as, "a human is human because of other humans," and aptly expressed as, "I am because we are." (Mbiti, 1969). Rika conceptualizes this way of knowing as two human beings in an indivisible, reciprocal relationship. Moreover, rika reciprocation is centered in stewardship, fostering balance between caretaking of plant and animal ecologies while remaining neutral of hierarchical states of dominance that often arise from societal structures.

1.4 Research Design

In this work, I endeavor to demonstrate that the function of Rika is to conceptualize and continually bolster societal resilience in terms of abstract yet modular, quantifiable, and infinitely scalable interactions that render naturally inflexible biological systems malleable and adaptive in response to radically changed circumstances. In the context of social media, termed Rikamedia in this work, and understood to be a macro level dimension of Place, bridging small worlds with the global lifeworld. Together, Rikamedia and Place make up a complex, scaled, and dynamic indigenous information world. (Warrick et al, 2010)

Rika Resilience is defined as the capacity of information worlds to sustain indigenous identities across shifting contexts of social media and Place despite systemic challenges. It involves a cyclical process of dynamically bolstering areas of strength whilst also restoring areas weakened by systemic breaches. Rika Resilience building requires identification and application of underlying attributes of resilience, including, inclusivity, equality of access,

noncompetitive representative self-governance, reciprocal stewardship of shared ecologies; learning modalities to facilitate integration of knowledge with practice , an attribute that builds other attributes, such as tolerance for risk, curiosity, and motivation toward enterprising application of ideas in novel ways.

This definition encapsulates key findings of this work. Furthermore, this understanding of Rika is aligned with internal systems approach to resilience research (Holling, 1973; Walker et al, 2004; Walker & Salt, 2019/2006, 2016/2012; Zolli & Healy, 2012). More research is needed to refine and scale the definition beyond immediate research context.

1.4.1 Research question development

The overarching question we ask is, what structures, motivations, and strategies undergird environmental stewardship in an indigenous community with Place based and social media practices? My assumption is that a study on structure will reveal function, and that in indigenous context, the two are geared toward environmental stewardship (Warrick et al, 2016a). In resilience thinking, structure precedes motivation and strategy: structural attributes are first established, and then mechanisms of dynamic change management are identified as they interact with the different attributes. This then points the way to sustainable ideation in context, i.e., strategy comes after understanding. We may think of it in simple terms: inside the walls of a house (structure) there exist pipes (attributes) to deliver water for your use (function). Normally, you do not think about this structure and its function. Therefore its resilience or lack of it are latent factors, hidden to your consciousness. Until there is a problem. When the pipe bursts (systemic breach) you may see seepage, a flood, etc. These are structural feedback mechanisms, telling you to act. You will have your own

internal feedback mechanisms. You may panic and stop thinking, (loose) or you may have the plumber on speed dial (tight), whether or not you had anticipated and prepared for such unexpected/expected systemic threats (dynamic change management) will determine how fast you can manage this situation with minimal disruption (a missed dinner) return to a desirable state, i.e., you are resilient to the situation, e.g., sleep on your own bed that same night, without exceeding the threshold of your capacities and thus going into an undesirable state i.e., if you are vulnerable to the situation, you may have to check into a hotel, incur debt, etc. Of course, resilience to plumping problems does not indicate resilience to electric problems. Hence, the entire system must constantly be checked, assessed and dynamically responded to before the threat arrives. These questions are designed to determine your approach to managing the whole house from the point of view of a series of incidents with burst pipes around the house. The first study looks at the question of structure, that is, the component parts and functions, what they look like in their desirable state, what affects them, why, etc. The second study looks at the question of motivation, that is, the drivers and mechanisms of preparation for change management from various dimensions. The third study looks at the question of strategy, that is the mechanisms of effecting change. Where the pipes are the environment or ecologies of Place, Table 1-A outlines the research questions.

Research Phase	**Research Question**
Accessive	What are the underlying structures that support environmental stewardship in an indigenous community with place-based and social media approaches?
Adaptive	What motivates environmental stewardship in an indigenous community with place-based and social media approaches?
Applicative	What strategies drive environmental stewardship in an indigenous community with place-based and social media approaches?

Table 1-A: Research Questions

Below I present an overview of research design, which provides further insights regarding the phased, iterative application of research questions.

Beginning at an early phase of research, the community is conceptualized as an Information World that is made up of groups of people with varying levels of access to information on mobile devices. We expect that those who have access to technology in Mbeere will go about engaging in environmental projects in ways that may be different from those with limited or no access to mobile technology.

Conceptualization of the community as an Indigenous Information World further suggests to the researcher that the concept of access levels, first introduced through the Theory of iWorlds, can be applied in a novel way, based on indigenist knowledge (IK) theory. Indigenist knowledge refers to knowledge in service of indigenous community goals, regardless of origination. Indigenous knowledge is a subset of indigenist knowledge, and is more concerned with genesis in the community, whereas indigenist knowledge emphasizes service to community: rather than origination, indigenist knowledge measured by a cooccurrence in service to community of the following factors: intent, ideation, design, process, and outcome. These are inalienable from each other as indicators of the likelihood that a project will be of service to community. Findings suggest that service to community goals overrides genesis. Hypothesizing that an indigenous community will likely also consist of small worlds with different levels of access to indigenous knowledge, we additionally consider the ways in which differential access to indigenous knowledge impacts the environmental practice of small worlds within the Mbeere community.

IK conceptualizes indigenous communities as comprising of groups of people who tacitly possess indigenous knowledge at varying levels. If those who possess IK are

knowledge resources, in the same way that mobile devices are information resources, then an assumption can be made that members of the community will be able to access such tacit knowledge at different levels, depending on their access to the member who possesses the knowledge.

It follows that the level at which a group can access IK will affect how they perceive environmental needs and how they respond to them.

Thus, from the earliest stages when much remains to be learned about present day Mbeere indigenous context, I am guided by an underlying assumption of differential access at a basic structural level, engendered by access to information on the mobile device by youth and access to indigenous knowledge by elders, Akūrū.

However, at the beginning of inquiry much remains to be revealed about accessive impacts of these structural factors on environmental stewardship in present day Mbeere. To learn more, I have designed research questions to leverage known factors, whereby the first research question (RQ1), is itself an act of access and facilitates inquiry into subsequent research questions. RQ1 asks me to approach the community with the intent to uncover underlying structures that support environmental stewardship at the intersection of place and social media.

The level of interaction needed to arrive at meaningful structural understandings calls for an accessive methodology. By accessive is meant ability to be accessed and/or ability to facilitate another's access. Methods need to achieve both of these aspects of access-they must be accessible to both the research team and the community; and they ideally will facilitate entry into the community to afford trust and relationship building. The first research question is designed to help us better understand the structures of Place and will therefore focus on

place-based methods, i.e., talking circles and field observations at village level. On social media, an assumption is made that structures will reveal themselves in the form of user interactions as uncovered through content extraction, graphing, visualization, and statistical analysis.

At the beginning of research, I use the term "explorative" to describe the study that focused on structures of Place. However, as it becomes clear that the overlap with the other two studies is significant, I decide to adopt the term accessive, which is more descriptive of the processes of the study on structure. A few of the figures that are designed before the change is made may use the term explorative, which should be understood synonymously with accessive.

The second research question (RQ2) focuses on the motivational role of the structures of Place and social media. It is expected that the study on structure will inform how we approach the question of motivation. For that reason, we expect there to be interaction between Place and social media. Accordingly, we plan to work with the community in both dimensions. Rotman (2013) has examined motivation toward participation in citizen science across the globe and found gaps in knowledge about indigenous motivation and indigenous technology use. She finds that indigenous participants are perceived as less technology-abled and therefore marginalized in projects.

What differences might we expect to find on indigenous social media and other social technologies used by the community without external project supervision as were the participants studied by Rotman? How and why does rika handle the concerns of Place on social media? How can we characterize Mbeere social media by rika dimensions that go beyond ideas about the participants' age, such as the propensity for youth to use digital media

identified in Warrick et al. (2016a)? We expect to suggest that Place extends into social media. To do so, I set out with the expectation that I will need to adapt research design in response to findings so as to determine the nature of Place on social media.

Based on this expectation, for example, an early finding that the community is engaged in environmental stewardship on social media in Place leads to adaptation of research design to allow for observation of the ideation process, and later, to facilitate a participatory process when I decide to accept community invitation to co-design.

The third research question (RQ3) examines participatory project strategies at the boundary of Place and social media. Project strategies are applicative for several reasons: Firstly, projects offer the opportunity to apply the structures of Place as uncovered in the preceding chapters. In chapter 6, we examine these projects as cases whereby Rika standards come to bear in real-life stewardship situations.

As represented on the Timeline at the bottom of chapter 3 on methods, initial project design is geared toward descriptive empirical study with no expectation of involvement in participatory project ideation, design, and partnership. By the middle of the adaptive phase we have entered an applicative process, initiated by my decision to respond to invitations by community members to establish a space of mutuality on which I may contribute my skills and knowledge to projects already underway. The applicative phase thus extends the framework of the work beyond research and into practice.

As well there is utility in projects, to facilitate development of theory regarding an indigenist applicative process that is, the genesis of projects primarily geared toward community service and based in STEM research with the community. Based in my own

identity as part of the diaspora, I expect that on a broader scale, findings may inform diaspora studies on community service-leadership through research and practice.

For the stated reasons, I expect that data collected from project cases will build our developing theoretical understandings about rika on a practical level, linking findings in the previous chapters on structure, function, and motivation to real world ideation for problem solving. Strategies presented underpin indigenous ways of perceiving, understanding, and interacting with the world. Further, by documenting the applicative process used by the community in project ideation and design, this work builds on, tests, and challenges previous heuristic findings reported in Warrick et al (2016a).

Furthermore, the community participates in this research in the assumptive hope that that our joint process will provide insights for research and practice, into the overriding goals, priorities, and capacities of Place. These become particularly evident in indigenous application of science, information, and technology concepts, as delineated in Chapter 6 under context-based citizen science.

1.4.2 Research Setting

Mbeere or *Ambeere*, meaning *First Peoples*, are a community indigenous to the EC region of Africa and numbering about 195,000 people (KNBS, 2019). Kenya has an approximated 40 linguistic groups, 5 of which share in the EC heritage with Mbeere, namely Gĩkũyũ, numbering 8 million; Kamba, numbering 4 million; Meru, numbering 1.5 million, and Embu, numbering 650,000.

Figure 1-B below shows one of my favorite views of Mt. Kenya, from my grandmother M'Njaria's veranda in Kĩamũringa. I took the photo in December 2016. In the foreground are mango trees with young green fruit. In the mid distance is Mt. Kenya, missing

its characteristic snowcap. Although still present, the glaciers are now less visible and commonly believed by community members to have capitulated to global warming in the last 15 years.

Figure 1-A: A view of Mt Kenya

1.4.3 Mbeere's ecological importance to the Eastern Conservancy

Mbeere is home to 4 out of 6 major rivers serving Embu County, to which it was annexed in the 2010 constitutional structural adjustment devolving then districts into self-governing gubernatorial counties. The framework is popularly termed the devolution.

In addition, with 2/3 of the land mass that makes up Embu County located in Mbeere and a majority (9 out of 10) of features identified as physiographically significant in Embu County located in Mbeere, the importance of this territory in the EC is undeniable. "The most conspicuous physical features in the county are Mt. Kenya, Kīang'ombe hills, Kĩambeere hills, Mwea game reserve, River Tana, Masinga dam, Kamburu dam, Kindaruma dam, Kĩambeere dam and Gītaru dam" (ECIDP, 2019:3).

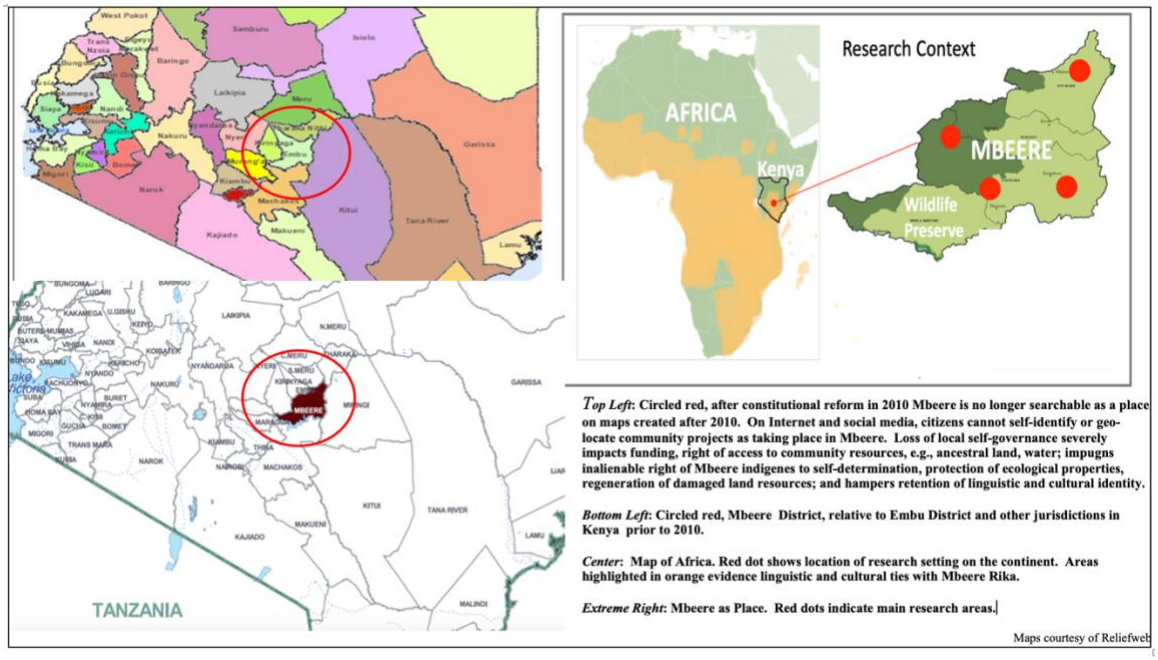

Figure 1-B: Erasure of Mbeere Identity on Kenyan Map, Loss of Ecological Properties.

As a matter of urgency, the named Kīang'ombe and Kīanjirū are part of a mountain range that includes Kĩambeere, and smaller hills. All these mountains feature non-gazetted (unregistered) indigenous preservations (Riley & Brokensha, 1989; ECIDP, 2019); which according to county planning documents, have deliberately been left unregistered so as to remain open for mineral exploitation, of which Mbeere produces more than 15 types of minerals including precious stones, graphite, copper, and building stones. (ECIDP, 2019).

This is but an introductory outline of key ecological assets in Mbeere, but even with this brief outline, it is reasonable that Mbeere perceive themselves as a riparian and mountain identified people who have been systematically dispossessed of their riparian and mountain resources as outlined below. Njeru (1979) also notes that due to privatization of Mbeere ancestral land for economic interest starting in the 1940s, the community lost its river extensive front properties on which it had depended for a good part of the year. Families routinely moved with their herds to second homes on river fronts to await *mbura ya mūratho,*

the first rainfall. This was a signal that it was time to return to primary residences on hillsides, for the agrarian business of planting and cultivating. More research in Resilience Assessment is needed (Walker & Salt, 2016/2012) to identify, catalogue, quantify, and establish goals for integrative programs, to bolster resilience of these and interconnected ecological resources, many of which are located in neighboring counties

1.5 Quantifying Traditional Properties of Mbeere.

Mbeere's Land-based resources earn Embu County and the Kenyan Nation in excess of 45 million in the form of form of energy, according to Kengen's annual reports (Kengen.co.ke). This is without counting additional earnings from tourism of hydroelectric dams, fishing, horticulture, mīraa, 8 types of ornamental gemstones, copper, iron ore, quartz, granite, etc.; quarry mining of building stones, ballast, murram, and sand (illegitimately harvested with County sanction as evidenced by taxation of harvester's trucks on exit from locality); bee keeping, legumes, watermelon, mangos, maize, beans, cassava, etc.

By comparison, the combined assets of Embu Subcounties at a generous estimate might make a1/10 of the earnings by assets of Mbeere Subcounties, with incoming stemming mainly from Tea, coffee, macadamia nuts, Mt. Kenya forest game reserve and other tourism, dairy farming, and other foodstuffs such as avocados, maize, beans, yams and passion fruits. (ECIDP, 2019)

The gubernatorial perspective on Mbeere is that "Embu County is a major stakeholder in the energy sector nationally. It is host to the regionally famous seven-folk project...." (ECIDP, 2019:15); however, no acknowledgement is given that energy is essentially a Mbeere resource, ergo no County Level accounting for lack of an electric grid to serve Mbeere Subcounties relative to Embu Subcounties, the neglected roads, the lack of access to

water, electricity, the neglected primary and high schools, and non-existent playgrounds. Embu County's largest source of income is in the form of shared equity from the national government, at approximately 4 billion annually, the lion's share of which, not accounting for donor funds and subsidies, is made through assets located in Mbeere.

Nevertheless, by a simple technicality of docketing, (part of the reason for this is that some earnings are accounted for at national rather than county level) it has appeared for decades in County reports as if Embu Subcounties hold larger assets than do Mbeere Subcounties, and by the same token Mbeere has been awarded a negligible amount of County returns; much of which is in actuality rescinded and put to other uses by the end of the fiscal year, per County budget reports from 2013 to 2019. (ECIDP, 2013, 2015, 2019).

As of June 2020, there is little recent work in Mbeere docketed in the County budget, albeit I have found many instances where allocated funds have been rescinded and the discrepancy not sufficiently accounted for. For example, page 67 of the 2019 ECIDP simply presents an illustrative figure showing that the county has failed to meet its mandate to spend 30% of its budget on development.

Yet, County documents reflect that while more than 21% of households in Embu Subcounties have electricity in their homes, less 5% of households in Mbeere have electricity; an insignificant amount given that a). Mbeere has a 1/3 the county population consisting of smaller households in the first place and b). The electric grid bypasses Mbeere Subcounties on its way to North to Embu Subcounties. Ironically, KenGen (Kengen.go.ke) reports heavy losses in a customer base despite efforts to attract more customers in other parts of the country; yet Mbeere residents are overlooked in its strategic development.

Certainly, most of the budgetary items against which the county notes insufficiency of funds at the end of the reporting period are for projects that would have been implemented in Mbeere, had they been funded. These include roads, which along with other environmental sectors were allocated 0.04% of the county's annual budget for 2018 (much of it rescinded at the end of the reporting period in 2019), schools, playgrounds, a planetarium on Kīanjirū hill, infrastructure to support access to the Mwea national game reserve, and many others.

Kenya Wildlife Fund, which has fiscal oversight over Mwea game reserve, reported local earnings of over 3 billion in 2019, including donor funds, but ran at a loss of 1 billion due to unrealized government funding (Mwea, 2019). County responsibility for this particular "County Asset" in Mbeere is not clear.

The crisis is clear when it is considered that the Mbeere community demands to steward its land based resources with little recourse outside of an assertive national policy oversight or a mitigative administrative restructuring to correct the jurisdictional error at national level. As data in Chapter 4 shows, the current situation is without legitimate grounds. Historically, Mbeere Rika that has responsibility of jurisdictional stewardship over Embu. It therefore should not be expected that a sense of responsibility for stewardship will course from the other direction in midstream, so to speak.

The outcome of this unsustainable Embu County governance structure is that Mbeere, as a governed county with no fiscal or legislative agency, has a growing list of environmental concerns that have emerged in the 11 years since devolution. However, most of the areas that are of environmental concern in Mbeere are listed as at county level as development sectors.

Extensively geo-mapped for precious and semi-precious stones, rivers dammed for electric supply; sand, building and ornamental stone varietals, and agricultural products such

as legumes, honey, and other natural riches. These are often reported as “under-exploited.” Many of the mineral resources in Mbeere continue to be slated for further expansion to support various national industries. As we will see in Chapter 4, the community pushes, to little effect, wide scale ecological damage from institutional practices such as sand harvesting, riparian irrigation, and large scale monocultivation are defined in county planning as an “industrial sector,” whilst riparian irrigation is termed "productive water resource allocation," monocultivation is regarded as production of "industrial crops," and perhaps most ominous of the “thematic areas” targeted for "strategic utilization” ((ECIDP, 2019: 87-90), the mining of various minerals off the mountaintops of Mbeere, historically important ecological jurisdictions of rika, as we found in this research; and recognized as in present day as contributive of biodiversity in EC forest conservation planning.

Regarding these ecological concerns, diligently reported in County Documents without accountability ECIDP (2019), a concluding remark is somewhat portentous in concluding that despite the community's efforts to steward Mbeere preservations, and despite voices calling for their gazettement, "county interests" have mounted effective administrative and regulatory obstructions. A simple internet search points to the underlying reason: Embu County partnership with Chinese mining companies (Business Daily, 2019) to exploit Mbeere's mineral wealth, now simply docketed as "County Assets."

To put this ground reality in perspective, the governor's office and the county assembly jointly take on average 43% of the annual county budget, which is listed as emoluments, although over a period of 5 years, the gubernatorial office has been decreasing its expenditures, cutting its original 2 billion to 300 million. Regrettably, in the same period, the county assembly has steadily increased its spending from 300 to reported 2 billion.

Additionally, the gubernatorial office records 2 million in expenditures on development from its share of the budget in 2019. The county assembly reports 0 expenditure on development from its share of the budget from the same year (ECIDP, 2019). In large part the gubernatorial office and county assembly pay themselves unsustainable amounts in salary, benefits, and allowances such as travel; whilst county workers earn relatively low salaries. The 47% of the budget that is left after the governor and the assembly pay themselves, appear to go to the development of Embu Subcounties, with marginal exceptions.

In addition to material disenfranchisement, Mbeere has steadily been dispossessed of its cultural and linguistic identity. It is clear that as a First Peoples of the EC region, Mbeere not only has a right to self-governance but is a custodian of a valuable heritage with regional and national importance, starting in 2010 Mbeere was increasingly written out of the political maps and in the 2019 census has also been written out of the housing and population census, so that there is less and less of a data trail to make the case for a return to self-governance.

The current ecological crisis in Mbeere then, is partially traceable to returning system processes and sustainable global development targets that nullified this and other stewardship mandates. Without benefit of oversight to facilitate a new cross-territorial mandate for stewardship preconditions in the period leading up to the 2010 devolution, the constitutional changes resulted in an implicit but constitutionally illegal jurisdictional gubernatorial exploitation of resources rightfully protected under the 2010 constitution and the PTKCE Act of 2016 as properties containing land based resources, knowledge and cultural expressions of Mbeere Rika and therefore by rights the responsibility of Mbeere indigenes under the

constitution, rather than public property for exploitation by Embu County or national level parastatals.

In Chapter 4, 5, and 6, data evidences Mbeere people's intent to protect their shared ecological and cultural heritage, despite loss of access. Community intent to stewardship is documented in county planning reports 2013-2019 (ECIDP, 2019). Implicitly, as a people, Mbeere have not manifestly given informed consent for exploitation of traditional properties, requisite to PTKCE Act of 2016, rendering County and third-party extraction of resources on traditional Mbeere lands since 2010 unconstitutional. The overwhelming will of the people as evidenced in this work negates any claims that could be made as to the legality of such actions, under the exceptions provisioned under PTKCE Act of 2016, conferring contingent jurisdictional authority to the office of the Cabinet Secretary for exploitation of traditional properties and expressions (See PTKCE Act of 2016).

1.6 Organization of the Work

Chapters are arranged thus:

- **Chapter 1**: Introduces our research space, defines key terms, outlines the central questions, and delineates the background of the researched community.
- **Chapter 2**: Presents the literature search starting with a discussion of the theoretical roots of our research and ending with a discussion on the methodological roots of the research.
- **Chapter 3**: Lays out the methods as they have been used throughout the research process, with an emphasis on the use of indigenist coding elaborative process to facilitate contextual relevance.

- **Chapter 4**: Addresses Research Question 1, on the structural role of Rika to support environmental stewardship.
- **Chapter 5**: P Addresses Research Question 2, on the motivational role of Rika structures to support environmental stewardship.
- **Chapter 6**: Addresses Research Question 3, on strategic factors that support environmental stewardship.
- **Chapter 7**: Presents a summary of , including areas of strength and vulnerability. Considers limitations of the research and suggests areas for future study. Ends with closing remarks, contemplates lessons learned in the course of research and personal significance.

2 Chapter 2: Literature Search

2.1 Chapter Overview

This chapter on the literature search is divided into three sections. The first section looks at the science and information technology literature that informs the entirety of this work. First, I will examine Information and technology aspects based in the Theory of Information Worlds (iWorlds), which looks at the role of information and technology in society, and from which we derive a differential access stance to enable an examination of different groups in the community based on impacts of access to information and technology on environmental stewardship. I will then examine Resilience Theory, delineating ways in which I am influenced by resilience thinking across several disciplines, including the concept of information value and the survival of small worlds as posited in the theory of iWorlds (Jaeger & Burnett, 2010), in social network theory (Zolli & Healey, 2012; Golbeck, 2013), and biocultural research (Maffi, 2001, 2019; Maffi & Woodley, 2012). The second section traces the roots of indigenist methodologies, on which this work is founded. The third section reviews other pertinent historical and current literature in which gaps have been identified. This section clarifies how identified gaps inform the research direction of this work.

2.2 Theoretical Roots in Science and Information Technology

The first section looks at science and information technology as it informs the entirety of this work, starting with The Theory of Information Worlds and moving on to Resilience Thinking from cross disciplinary perspective across scientific disciplines.

2.2.1 The Theory of iWorlds

This subsection covers Information Worlds (iWorlds) Theory. I will review foundations of the theory of iWorlds and then articulate how this work derives from it.

The indigenous community is conceptualized as an Information World, an iWorld as I term it for brevity. Founding theorists Jaeger & Burnett (2010) define an information world (iWorld) as any bounded setting which can be identified by shared norms, values, and concerns that impact information behavior. The theory is further developed in Jaeger et al., (2014) and Burnett et al., (2014).

iWorlds is a comprehensive theoretical framework that can be used to explicate movement of information from the smallest to the largest units in society. iWorlds can be as small as communities or political groups, which are small worlds with specialized norms, values, and concerns. Large iWorlds such as countries or, in our case, social media, can be termed lifeworlds, in the sense that they are macro level structures in facilitation of public exchange of information. In this sense, they are public spheres. Jaeger & Burnett (2010) tell us that iWorlds combines ideas about micro worlds in previous work by Chatman (1991) with ideas about the macro level public sphere put forth by Habermas (1991). The Theory of iWorlds should be not be understood as intersectional within the Chatman-Habermas spectrum, but rather integrative of the two theoretical worldviews.

To advance ideas about micro worlds, Chatman used a conceptual framework with four aspects that feature prominently in Jaeger & Burnett's iWorlds. These are social norms, social roles, values, and behaviors. However, Chatman analyzed the concerns of micro worlds to the exclusion of the larger contexts in which they were extant, for example, retired women or low skilled workers in specific micro contexts. From the opposite end of the spectrum, Habermas was approaching social information theory from the macro level, that is, the largest social structures. He did not concern himself with the individual, but rather with those structures of society that reinforce information control mechanisms, of which the individual at the micro level may be unaware, but which are deeply impactful to her/his daily life. iWorlds integrates the micro and the macro as well as adds a bridging meso level, the information resources system that bridges concerns of micro level with information about the macro level and vice versa.

For the age of social information technology, the meso level assumes an increasing importance as a means by which the individual can leverage access to previously privileged macro level structures and mechanisms, for example through social media, as has been examined in recent volumes such as, Is *Habermas on Twitter?* by Bruns & Highfield, (2015); and *Tweeting the Environment*, by Tong & Zuo, (2018). When Jaeger & Burnett first proposed the Theory of iWorlds in 2010, the social media revolution had decidedly taken hold, necessitating a framework to bridge the multiplicity of context (Jaeger & Burnett, 2014) that had begun to suggest itself. Since then, the ability of the Theory of iWorlds to frame interactions of actors across all levels of access in society has increased in relevance as social media has gained centrality in everyday life.

According to originating theorists, Jaeger & Burnett, iWorlds is conceptually closer to Chatman's work than to Habermas' perspective. Jaeger & Burnett borrow their conceptual framework of an iWorld from Chatman, expanding on it to include Habermas's ideas by showing how the micro worlds of Chatman interact with the macro worlds of Habermas. Through this blending of ideas, iWorlds "provides a framework for examining the place of information in social settings from the smallest and most localized through the often much larger and broader social contexts within which those localized settings are embedded" (Burnett et al., 2014. p. 2).

The concept of an iWorld is illustrated below. At the micro level is the individual and his small world concerns, which he approaches through a veil of normative behaviors (in keeping with his culture). At the intermediate or meso level is the information system, which could be anything from a library to a person with information to share (Krubu, 2013). At the macro level are politics, the media, and other public sphere dynamisms that the individual attempts to navigate with the help of the information system at the meso level.

Within an iWorld, information flows through the three levels of society; micro, meso, and macro, in a variety of ways and at different access levels. This idea of differential access is central to iWorlds and hence to this work. Jaeger & Burnett have explored the idea from many angles, notably by raising questions regarding economics, user education, and even political interference. Of interest to us, Jaeger and Burnett have conceptualized the idea of access for the digital age, in which the ubiquity of mobile technology has changed the way we access information. The authors tell us that access to information on mobile devices can be identified on different levels.

This is the idea that an iWorld is made up of groups of people with varying levels of access to information on mobile devices. Jaeger and Burnett (2010) tell us that members of a community interact with mobile technology at three levels, the physical, where they own a device but use it to meet the basic need of making phone calls; at the intellectual level where in addition to making phone calls, they can also access needed information from the device, for example by doing internet searches; and at the social level, where in addition to making phone calls and searching for information, they are able to use the device at the creative knowledge production level, for example to access social media and post original or shared content. We expect to come across unique questions of access that arise within an indigenous context (Warrick et al., 2016a).

Jaeger and Burnett (2010) further offer five concepts that characterize interactions of people who live within a given iWorld. These are, Social Norms, Social Types, Information Value, Information Behavior, and Boundaries. They are further delineated below. More recently, a study by Jaeger et al. (2014) has extended these concepts to include the concept of Bridges, which refers to mechanisms that bridge boundary areas. Jaeger et al. use the public library as their context; however, the idea of information bridges is transferable to other contexts. To give an example at hand, this work is a mechanism by which I endeavor to bridge a boundary between the iWorlds of my academic peers and my indigenous community. If I post the content online, that portal will become an additional bridge.

The growing body of studies that use the iWorlds framework is mainly centered in library and information science (Burnett et al., 2014; Gary, 2015; Jaeger et al., 2014; Krubu, 2013; Peterson, 2014; Thompson et al., 2014). In this regard our study takes a departure by applying iWorlds to an everyday indigenous context.

Definitions of the seven iWorlds concepts follows. I have adapted the original wording used in Jaeger & Burnett (2010) and Jaeger et al. (2014) in order to clarify their application in this work. However, I have endeavored to keep the original meanings of the concepts.

Access: Factors that limit or expand ability for information retrieval and use. In the indigenous context at hand, access to indigenous knowledge is assumed to be impactful, as is access to information and to social technology on the mobile device.

Social Norms: A shared sense of normative group expectations. Norms of a group also define its values, and thus bring to bear their priorities and concerns. In the work at hand, we saw that social technology use has become a social norm and is therefore widely leveraged to involve the public in environmental stewardship. There exist gaps regarding indigenous norms in the use of social technology and in environmental stewardship.

Social Types: The roles that define key players. In the work at hand, groups identified as engaging in environmental stewardship will be regarded as key players. Also regarded as key players are any groups that may control information in ways that limit or expand participation by other groups.

Information Value: A shared sense of the kinds of information that are held to be of importance in the community. This work assumes that an indigenous community places a high information value on environmental information.

Information Behavior: The full range of behaviors and activities related to information that are available to a world, that is, the ways in which members seek, retrieve, integrate, conceive, create, store, access, and exchange information. In this work, I examine information behaviors that are facilitated by access to information on the mobile device, such as in social media groups.

Boundaries: Places at which worlds come into contact. Communication and information exchange may or may not take place here, hence boundaries present both possibilities and limitations. The interaction of indigeneity and social technology on the mobile device is one such boundary space.

Bridges: The tangible mechanisms and channels that facilitate the exchange of information and interaction across boundaries. The work at hand assumes that groups and technologies may equally serve as bridging mechanisms.

(Definitions adapted from Jaeger & Burnett, 2010; Jaeger et al., 2014)

Each of the iWorld concepts is important in that they inform different aspects that speak to resilience. Social norms and values safeguard continuity, while access, boundaries, and

bridges undergird adaptivity. The ways we seek and use information fosters and is fostered by all the above.

Building on the iWorlds framework, Warrick et al. (2016a) conceptualized an indigenous community as an Information World consisting of small worlds or groups of people with varying levels of access to information on mobile devices and attempting to discover impacts of differential access on stewardship practices, such as citizen science. Intersecting a differential access stance with an indigenist methodological approach, Warrick et al. followed in the held assumption that in an indigenous community like Mbeere, they would encounter *Akūrū,* elders in the role of custodians of tacitly held indigenous knowledge (IK). This intersection suggested that the concept of differential access could be applied in a novel way in an indigenous community like Mbeere. That is, if those who tacitly held indigenous knowledge could be seen as knowledge resources, in the same way that mobile devices would be seen as information resources and a means of access to social media, it followed that depending on the level and nature of interaction with Akūrū, community members would have varying levels of access to tacit knowledge.

Similarly, with mobile devices effecting specific stewardship behaviors, interaction with Akūrū would impact member perception of environmental needs and stewardship behaviors in specific ways. Lack of it would equally be measurable by lack of the specific identified behaviors. This then meant that Warrick et al. needed to establish which stewardship perceptions and behaviors were specific to each domain, as well as to distinguish the structures of each domain.

Warrick et al. reported that after they clustered the community by varying levels of access to information on the mobile device, the result was two loci of knowledge, which they

termed philosophic Sagacity. Millennials appeared to steward on social media, using a mix of information accessed on the mobile device, and indigenous knowledge acquired from interactions with Akūrū in Place. At the other end of the spectrum, Akūrū appeared to steward in Place, using highly integrated practices that rested on Harambee, an indigenous crowdsourcing ideal by which they actively reforested their own and peers' land. Millennials also appeared to translate Harambee for reforestation campaigns on social media, however their stewardship extended into the public domain beyond their own private lands, and it also appeared to include activism, for example for water rights.

Based on the foregoing findings of Warrick et al., that access to information on the mobile device appeared to result in stewardship on social media, research question formulation for this work has focused on access to social media and Place, assuming that the younger a community member will be, the more likely he/she will be to steward on a mixed activist/indigenous platform through social media. The older he/she will be, the more likely that he/she will steward in Place on a platform oriented toward privately owned land. Thus, in this work, we similarly expect millennials and Akūrū to be on opposite ends of the differential access spectrum. Not much else is known about the deeper structures that undergirded stewardship along the differential access spectrum identified in Warrick et al., and not much is known about stewardship practice beyond reforestation and agitation for water rights. These unknowns have influenced the research question formulation for this work, with a goal to build on the findings of Warrick et al.

In the next section, we look at the origins of the indigenist research paradigm, where the methodological stance of this work originates.

2.2.2 Resilience Thinking

This work views the concept of resilience from a broad theoretical stance, Social ecology research and practice from a biocultural perspective posits that biodiversity and cultural diversity are both necessary for ecological resilience (Maffi, 2001; 2012). Biodiversity is the abundance of animal and plant life. Cultural diversity is abundance of myriad cultural expressions and languages within an ecosystem. Co-occurrence of the two types of diversities has been correlated with resilience, and moreover, found to predominantly exist in indigenous places and local places (Maffi, 2001, 2019). From this correlation has emerged biocultural research. Resilience is perhaps one of the most important buzz words within bioculturally informed social ecology research. Of interest to bridge social ecology science with information technology is Zolli & Healy's 2012 definition of resilience from a broad, scalable perspective that is inclusive of ICT systems and social networks. This provides bridges between ideas of resilience in biocultural, social ecological, and science and technology. This work perceives Rika interactions as traversing all human consciousness and best understood from a wide, inclusive lens to convey depth and complexity as originally conceptualized by the community. The authors posit that resilience is, "The capacity of a system, enterprise or a person to maintain its core purpose and integrity in the face of dramatically changed circumstances" (2012:7). The authors further posit that resilient systems share a set of mechanisms, which they delineate as:

1. Feedback mechanisms
2. Dynamic reorganization
3. Ability to detach, decouple, and reduce dependence.

The key point we take away from the definition and key mechanisms of resilience is that these are structures that can maintain their functions while at the same time being able to adapt to the unexpected. Indeed, resilience research agrees that the mechanisms just listed work in systems that possess reciprocal structures.

Within information science, resilience is understood as manifold, and encapsulating the ability of information worlds to foster continuity and multiplicity of context, while safeguarding recovery mechanisms in case of adversity. Multiple contexts are small worlds in which members of an information world interact. Information worlds are any networked social systems in which information is created, shared, and used. They may be large, such as social media, or small worlds, such as a community association (Jaeger et al, 2014). For small worlds, survival denotes the ability to converge around an information value, i.e., agree which information is important to preserve, as well as to spread this information value across other similarly disenfranchised small worlds so as to gain in collective strength, and to survive in the face of competing macro level interests. (Jaeger & Burnett, 2010:9).

According to Zolli & Healy (2012), resilient systems evidence the ability to cluster and share resources whilst at the same time allowing for diversity so that external threats can only target some but not all clusters. At the same time, entities within the system can act independently whilst also being able to replicate infinitely.

As social ecological resilience becomes a global priority (Walker et al, 2004; Walker & Salt, 2019/2006, 2016/2012), there has been a social media centered effort toward

motivating public participation in environmental stewardship using a variety of computer supported environmental stewardship activities, ranging from activism, governance and policy advocacy, on-the-ground cleanups, greening efforts, water monitoring, and biodiversity data collecting to support scientific research, sometimes referred to as civil science or citizen science when the public is involved (Preece, 2016; Bonney et al., 2009).

These efforts with mainstream publics are increasingly supported by various social computing applications, and the public exchange of information through various types of social computing applications that support environmental stewardship projects. This discipline, although still emerging, is widely researched (Wiggins et al., 2016; Newman et al., 2017; Preece, 2016).

However, despite wide interest in indigenous stewardship practices, and despite the widely acknowledged global impact of the mobile technology revolution in facilitating grassroots response toward public causes in political, governance, and social justice (Brown, 2019; Jaeger et al., 2014), there is still little research on indigenous grassroots computer supported stewardship efforts (Warrick et al., 2016). The overriding reason for this gap is that much of the research has developed along separate tracks. While both approaches may assume human agency without placing humans above other ecological systems that share the environment with them (Balancer, 2017; Briggs et al., 2019; Ekblom et al., 2019; Maffi, 2001, 2019; Williams & Claxton, 2019), it is less likely for indigenist approaches to look at social media as an authentic part of the ecology of Place.

However, perhaps because social ecological research from a biocultural stance is centered in Place and sees the environment as Place, i.e., the land, humans, natural ecologies, social, economic, and political relationships that are extant within it, the importance that is

placed on intergenerational human relationships has not been examined from the perspective that, in our present-day day reality, most of these social interactions are now taking place on social media and other social information technologies. Hence, within the indigene-in-place stance, human responsibility of stewardship has not been examined from a social media perspective.

Yet indigenous communities are participating in the social media revolution and taking the practices of Place into this new dimension (Awori et al., 2015; Tuck & McKenzie, 2014; Warrick et al., 2016a). One dimension of resilience in indigenous experience is also centralized in social media, which is intergenerational cooperation. This research will examine Rika at the intersection of Place and social media, using the context of environmental stewardship to springboard the investigation. In the process, we bring new understandings by applying systemic resilience thinking.

2.3 Toward Indigenist Theory

This work methodologically derives from quantitative indigenous methodology, defined by Walter & Anderson (2013) as *Nayri Kati*, translated as *Good Numbers* in diverse indigenous languages of Tasmania, Australia. Nayri Kati aims to fill a methodological gap in Indigenous Research Methodology (IRM), by incorporating quantitative instrumentation in applicative and project research with indigenous communities in the United States, Australia, and Canada. To achieve this goal, the authors implement an approach they have termed a

Method as Theory stance (***M**ethod **A**s **Th**eory **S**tance (*(Maths)), [4] a researcher positionality that facilitates access to a wide range of quantitative tools, a little utilized area of IRM, relative to the now standardized qualitative methods. *Nayri Kati* is not meant to replace but to augment the classical conversational methods toolkit, use of mixed approaches to increase cross disciplinary application is seen to reduce deficit-driven approaches to project research with indigenous communities. Walter & Andersen demonstrate a stepped applicative process and from which new perspectives emerge from previously misunderstood datasets and the ensuing misapplication, resulting in deficit centered ness of project research in indigenous community.

An example that also has significance in the work at hand is marginalization of indigenous language education projects in Tasmania, a process resulting from cumulative misunderstanding of responses to research prompts that also stem from systemic biases, with far-reaching impacts. A survey questionnaire prompting for contextually irrelevant personal demographic information may correlate responses from parents, for example, with responses of prompt based in researchers' assumption of low value for indigenous language development. From the vantage point of such systemic bias, a researcher will find meanings in the data that differ from community perspective. He may assume that high value for mastery of a given language of instruction negatively correlates with low value for

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*[4] The Acronym Maths is my own, based on my understandings of Walter & Andersen's **M**ethod **A**s **Th**eory **S**tance as the root contribution to research with indigenous peoples on a global scale. Walter and Andersen propose an indigenous paradigm for application in population statistics generated by research project in communities indigenous to so called first world countries. termed **Nayri Kati**, translated as, Good Numbers Theory,)*

indigenous language development, resulting in homogenizing language policy, funding cuts, programmatic changes, curricular content adaptation, etc.

Historically, such findings have been widely accepted as fact and applied to governance, policy, and project research with marginalizing outcomes for communities, as seen here among the Mbeere people, although the population statistics informing policy and research will differ between contexts. A secondary contribution of Nayri Kati is its potentially wide application, transference, and impact; issues that continue to deter adoption of Indigenous Research Methods (IRM) in the computational sciences.

In this work, I build on the idea that underlies the Nayri Kati paradigm; that is, Indigenist Method As Theory Stance (here termed Indigenist Maths), proposing that ability to *access, adapt, and apply* quantitative tools in a mixed methods approach increases the likelihood that quantified data, by reason of visibility of the quantified element, indigenous knowledge expertise is better leveraged to uncover beneficial latent aspects of rika, with implications for purposive projects incorporating applicative resilience building.

Indigenist research may be purely qualitative, involve a mixed methods approach leveraging Indigenist Maths, or only use quantitative methods, i.e., Indigenist Maths. In any case, the researcher is informed by the idea that method in and of itself is a neutral tool, given meaning by permutation of research design to align intent, process, and outcome, with the goal of service community. Accordingly, Indigenist Maths Theory as suggested in this work can be defined as a centralizing hypothesis that design and process incorporating Indigenist Maths is likely to lead to outcomes that bolster capacity of the researcher to serve community goals. All of these terms will be encountered in this work, although not always together.

I have applied these kinds of indigenist theoretical assumptions to data analysis and especially to participatory processes presented in Chapter 6, where data collecting and analysis to inform a mini pilot study occurs in a highly contextualized quantification process using Indigenist Maths. The resultant knowledge creation and project development is specific to stated community goals, whilst also applicable outside context. This is an instance when it is appropriate refer to project development, by which I mean the process of birthing a project and nurturing it through an adaptive process of organizational design and integration involving, ideation, planning, and implementation to meet stated community goals. Note that I do not mean community development a term which stems from assumptions in SDG that all communities was to grow their economies and are implicitly controlled by the motivation toward industrialization in alignment with a Western ideal.

The perspective of knowledge in traditional Indigenous Research Methods (IRM) is that knowledge is participatory, tacitly expressed, and embedded in Place (Chilisa, 2013; Smith, 2013). As a result, predominantly accepted methods are conversational and qualitative in keeping with experiential orality of delivery. Moreover, Akūrū are integral to the process, being custodians of said knowledge (Oruka, 1983, 1985, 1990).

Bang encapsulates eight cornerstones of indigenist research design as, “elder input, use of traditional language, community participation in research agenda, staff selection, and budget, community payoff, respect of cultural value, and informed consent” (Bang, 2012, p. 1012). The Elder and Place are integrally situated; and hence indigenist methods consider the locus of knowing to be the elder in Place. These tenets are meant to underscore that indigenist research should set out to benefit the community rather than the researcher.

2.3.1 Impacts of "knowing" on indigenist methodology

Going further, Chilisa (2011, p. 235), emphasizes the collective nature of information gathering in an indigenous community. The author demonstrates how to conduct research using collective methods of data gathering. These include, use of storytelling, song, talk circles, and personal lived histories. The researcher who uses talking circles asks a lead question and then lets the respondents speak as they are led. Sometimes the conversation goes around until the circle is complete, and other times more prompts are needed from the researcher. The idea is to make discoveries about: (1) a knowledge area that fully engages the circle and (2) the locus of philosophic sagacity within the circle or the expert on the topic at hand (Oruka, 1985, 1990).

Chilisa is detailed in her instruction, providing guidelines about how the indigenous researcher should approach quantitative tools. She further suggests that if survey tools must be used, they should be indigenized, that is, adapted with consideration for local protocols from various dimensions. However, Chilisa recommends that quantitative tools should be avoided as much as possible. Leading indigenist thinkers hold with Chilisa's view, including Kovach (2012), Smith (1999, 2013), and Wilson (2008). In IRM, unsuitability of quantitative methods is not just seen from indigenous orientation toward conversational information sharing methods (Kovach, 2009, 2010, 2013, 2015). IRM additionally responds to the tendency of macro level institutions to disenfranchise indigenous communities through quantitative research instrumentation whereby, when presented with questionnaires from survey tools, for example, community members are likely to feel obligated to provide answers even when questions are not well understood, with dire consequences. For example, survey responses may point to a different set of educational resources than is actually needed or desired; an outcome that could potentially impact on funding allocation, or lead to a shift

toward educational frameworks that relegate community priorities to the margins of society (Walter & Andersen, 2013). Thus, IRM is influenced by arguments on the power of skepticism toward quantitative instrumentation as a mitigative mechanism.

One of the most influential theoretical perspectives for IRM is decolonial research, particularly perspectives in Ngugi Wa Thiong'o (1992). Posited from a decolonizing theoretical stance, WA Thiong'o urges the researcher to be skeptical of assumptions and conclusions of returning system era research with indigenous peoples, and to assume it contains damaging language, assumptions, and conclusions that were used to justify the returning system machinery. He also urges the researcher to assume that many research paradigms have inherited these biases and so should continually be interrogated and reshaped for the indigenous context. Echoed within this outlook is the argument that any situation that causes adverse consequences, even if the situation itself is not fully known, provides enough ethical grounds on which to establish skepticism. Researchers on skepticism who are outside of IRM or decolonial research also concur on this point (Absolon, 2016; Cohen, 2000; Cascardi, 2017).

Based on this argument, reasonable skepticism toward quantitative methodologies in indigenous context is warranted within IRM. However, as a consequence, indigenous researchers have placed a heavy emphasis on methods, leading to methodological vigilance, whereby indigenous research is centered on form, and particularly on form in qualitative methods almost to the exclusion of quantitative methods.

Questions have arisen about the impact of the emphasis on form and method in IRM research. Most especially, a charge has been made that not enough attention is paid to actual findings; and that exclusive use of conversational methods such as talking circles reinforces

marginalizing stereotypes of indigeneity as synonymous with antiquity. Gone (Gone 2014, 2019) cautions that indigenous research should endeavor to integrate indigenous worldviews into scientific and everyday thought as well as reflect the mixed nature of indigenous experience in all areas of life, academic, professional, and personal. To do any less, as Gone posits, is to historicize indigeneity. It must be pointed out that even outside of IRM, the debate about form over outcome is not a new discourse but is a recurring theme in qualitative research in general. When Geertz, the renowned interpretive anthropologist, introduced his idea of thick descriptions, that is, extracting layered contextual meanings from data (2008[1973]), he leveled a similar criticism against undue focus on the aesthetics of presentation, especially classification schemes that proved to have no practical, usable meanings beyond novel appeal. It appears that because IRM has emerged out of these disciplines, this discourse naturally arises within the discipline.

Another work that concurs with Gone's criticism of IRM is Walter & Andersen's book on indigenous quantitative methods (2013). The authors suggest a Method-As-Theory stance on IRM, and argue for an *indigenist* stance that considers research design origination and actual research outcomes, rather than a focus on tools per se. As they posit, this is where research is designed in such a manner that questions, methods, and findings originate with the community. In this approach, form is secondary to origination and actual outcomes. The authors differentiate methodology from methods, i.e., the research standpoint (epistemology, axiology, and ontology) which drives methods. For this reason, indigenists ought to put methodology to task, not methods. They argue that quantitative methods in and of themselves are neutral statistical, mathematical, and computational tools. Seen thus, even conversational methods such as storytelling, can hold untenable biases, depending on the originating

methodology. Hence, the focus ought to be on origination over method, and moreover, aim to accomplish the two objectives outlined in the next paragraph:

First, extend research instruments beyond the conversational methods such as talking circles, elder consultation, storytelling, and immersive lived experience, to include surveys and other quantitative mathematical and statistical analyses that can increase representation of indigenous worldviews in the sciences. Second, legitimize the reinterpretation of indigenous worldviews in existing research where these worldviews may have previously been cast in negative terms, thus facilitating the possibility of transcendence over research bias in existing literature as well as making way for new conversations about indigenous knowledge contributions.

Explaining these aims, Walter & Andersen further argue that when indigenist research uses indigenist maths, they illustrate that, "indigeneity is not synonymous with the non-computational." (2013:105). To demonstrate their stance, Walter & Andersen demonstrate a process by which they challenge government policy through analysis of preexisting indigenous demographic and literacy datasets.

Applied to qualitative datasets, Saldaña's in vivo coding methodological approach may be a useful way for indigenist research to approach a process by which ultimately indigenist maths can be applied. Saldaña (2016:105) urges researchers in indigenous settings to code in vivo, meaning, use the actual "'indigenous terms,' or words that are used by the participants as the coding themes at the outset of the coding practice. This safeguards the analysis process, reducing researcher bias by using terms that manifest participants' own understandings of their world. This is an important indigenist mechanism for our rika

modeling process, as much rika thinking appears to be couched in terms that are not indigenous to context, resulting in misapplication or disregard of the concept.

As explained by Saldaña, once in vivo themes have been established this way, a second pass at the data termed, “Elaborative Coding,” (2016:255) can ensue. Saldaña suggests that data from a minimum of two phases of research be used the ultimate theoretical constructs proposed should emerge from rich data. I am suggesting that at this point, it can be assumed that the researcher has gained a clear understanding of the context and is no danger of introducing new bias into the process if he applies Walter & Andersen’s re-interpretation method. That is, first apply in vivo and qualitative elaborative coding, and then, to the same dataset, apply quantitative data analysis to compare the themes. For example, perhaps, in the tradition of qualitative research, we did not count the number of community members who gave a certain response the first time, but at the third pass, even basic quantitative analysis can provide richly informed development of theory.

I am proposing that Saldaña’s elaborative coding process can provide a basis on which to resolve the tension between context and quantitative method that many indigenists are wary of. Instead of rejecting quantitative methods altogether, perform quantitative data analysis two steps removed from context. Indigenist research then, when it dichotomizes and rejects quantitative methods, fails to see that computational methods can develop the indigenist paradigm for, and thereby integrate indigenous worldviews with, mainstream research and practice.

2.4 Other Pertinent Literature

This section establishes a research direction by tying the theoretical roots just discussed in the first two sections of this chapter with pertinent existing literature. This part of the literature search is organized according to the three phases of research, accessive, adaptive, and applicative phases, with good reason. While idea themes in iWorlds, rika, and indigenist paradigm (termed indigenist maths here)s are foundational to the entire work, some sources to be examined in this section of the literature search may have primarily informed one or two phases of the research.

By placing works within the phases in which they found most saliency, we can better learn how each informed research design and direction. Three subsections in the remainder of this chapter reflect research phases as follows. In the first phase of research, the research question examines the structures of Place that undergird environmental stewardship. For this research phase, literature that facilitates an investigation of the structures of Place in this context will be interpreted considering the theoretical and methodological roots that we have just established in sections one and two of this chapter.

The adaptive phase looks at the question of motivations. To inform the adaptive phase, interpretation of motivational literature will consider research and findings of the accessive phase. In the applicative phase the research question focusses on project strategies in consideration of the findings of earlier phases. This phase considers the participatory aspects of project literature that are relevant to this regional context, with an emphasis on citizen science. The objective will be to highlight utility of citizen science in this context as a tool of stewardship-centered indigenous development.

In so doing, we contribute to development of indigenist theory at the intersection of Science and Information Technology for Sustainable Development, through phased participatory processes integrating indigenist and elaborative data analysis. Thus, the literature search establishes a research direction that reflects how the three phases, each addressing one research question, build on each other. I start by discussing the literature that influences the accessive phase.

2.4.1 Knowledge Gaps in Research Informing the Accessive Phase

In the accessive phase, we want to learn what structures underlie environmental stewardship in an indigenous community with place based and social media practices. We proceed based on the assumption that Mbeere shares in the indigenous norm of identification with Place (Tuck & McKenzie, 2014). However, we expect differential access to be a factor in the ability of members to act on the shared norm i.e., identification with Place does not denote similar access to information and technology. Warrick et al. (2016a) have clustered the community according to differential access factors, resulting in two main clusters, one cluster in Place is made up of elders. Warrick et al are partially right to conclude that the cluster on social media is made up of millennials, however they miss the complexity of interactions and are as yet not attuned to the indigenous title(s) to rightfully confer to Millennials. The integrative rika framework is yet to fully manifest in the data and in interactions with community members.

Two key differential access factors are posited in Warrick et al (2016) as acting upon the indigenous iWorld: social media, and indigenous knowledge, differential access factors that are unique to an indigenous iWorld. Warrick et al. find that community members below

35 years of age are more likely to steward through social media, while those classified as "elders" are steeped in indigenous environmental knowledge, more likely to use place-based approaches and less likely to use social media. Additionally, the authors find that interactions with elders result in transference of knowledge and indigenization of the social media space, i.e., use of shared recall and retention on social media, and linguistic development of Kīmbeere as a shared community experience. Lack of keyboard features to support non-ASCII vowel integration makes conversational threads in Kĩmbeere, written using an ASCII keyboard, difficult to translate into meaningful Kīmbeere whilst retaining intended meaning. This may demotivate posting in Kīmbeere. A predominance of English and Swahili appears correlated. (International Standards Organization assigns codes based on language unintelligibility). Difficulty of bridging interactions between Media and Place due to separation of capacitating diaspora from Place. The authors recommend government, donors, and private industry align with born-on-social media FB groups to capacitate community development projects identified, termed Harambee stewardship in Warrick et al. It is suggested with examples given, that FB develop a toolkit of Language Learning and AI to support non-ASCII language and cultural expression on social media.

The authors find that more research is needed to understand the interactional aspects of social media, indigenous knowledge, and Place. In this work, we springboard from Warrick et al. to first investigate the structures of Place. We assume that elders will play a key role in this process, based on prior findings. However, little is known about rika in resilience thinking in present-day day Mbeere. In resilience terms, these domains present a spectrum of diversities, including but not limited to, cognitive, linguist and information,

function (responsibility capacity for perception, and agency for normative action and/or experimentation).

2.4.2 Mbeere Sovereignty at First Contact with Returning Systems

To my knowledge, the data synthesis and analysis that I have undertaken in this work presents the first empirical study with the diametric scale and symmetric depth to put to rest questions of Mbeere and Embu relations pre-contact. Not least, Marginalization of Mbeere's role in the EC was effected rather late in the game for political purpose as we shall see in the next subsection. Here, I foreshadow the argument with some thoughts shared regarding Mbeere Sovereignty, by Riley & Brokensha (1989) the foremost scholars on Mbeere biocultural diversity and indigenous knowledge. The authors delineate biocultural differences and note that early British settlers recognized the unique identities and autonomy of the two communities,

> "We camped by a river which formed the boundary of the Embu and Embere (sic) territories. Here we were met by chief Rūmbia who had come to escort us to his country ...there was a most glorious view of Mount Kenia (sic)....and the snowy peak was glistening in the sunshine ...the river was...very beautiful....lofty palms… a most picturesque-looking bridge over the little waterfall, and the whole effect was very charming ..." (Crawford, 1913: 156-160 in Riley & Brokensha, 1989)

This account of an early tour into Mbeere 6 years after British occupation, shows a time when Mbeere largely still in a state of Rika. It is obvious that the two communities of Mbeere and Embu at that time were not considered as one. Note that chief Rūmbia was a returning system appointee, precolonial Mbeere was a non-hierarchical society (Glazier, 1985), without chiefs or kings.

Further to this, Embu community was in the process of dynamic reorganization at the point where returning system occupation came to bear, with colonialism halting processes already in progress for both communities. This statement is based in evidence based

historical research, beginning with Saberwal (1968, 1970), who analytically compares his own data with textual analysis of Lambert's ethnographic accounts (2018/1956). Saberwal does not concern himself with Embu origination, concluding that the Embu community itself lacks vigorous interest in origination and moreover has several discordant myths of origin, a factor he attributes to the diversity of its makeup.

Later work by Ambler, (1989) all published accounts on origination of communities of the EC, particularly Embu and Mbeere, are based in folklore and unbacked by empirical anthropological data or archeological evidence. He concludes that, whilst the two communities are unique in that many of their members claim origination in their present day territory, more data is needed to back the folklore; and further, any claims of historical dominance of any one community over another in the EC are unfounded. Ambler documents that due to proximity with a massively land-dispossessed Gīkūyū community on the North Western border, beginning in the 1920s Embu became increasingly apprehensive about imminent land grabs by the returning system machinery. Realizing the power of shaping the narrative to preempt a similar fate, Embu unites around the idea of primary occupancy in the region:

> During the early 1900s, a British administrator collected Embu traditions that described the gradual migration of families into the mountain highlands and their displacement of previous occupants. By the late 1920s, these traditions had apparently been displaced or superseded by others - clearly resembling those of neighboring Kikuyu-speaking communities - that claimed a common origin for all Embu-Mbeere people and asserted Embu occupation of the mountain in perpetuity: 'When the Europeans tried to ask the question of origin, we knew they wanted to take our land. So, we told them that "we are not newcomers or slaves, we belong here since the land was created and we expelled nobody from here... "' Other evidence suggests that the new traditions gained a deeper acceptance than this recollection would indicate. Indeed, the monolithic tradition of origin persisted into the I960s when the idiosyncratic traditions of individual lineages again gained prominence. (Ambler, 1989:154)

Further to the reshaping of history through narratives as just cited in Ambler, actual hands on-measures have been used to obfuscate Mbeere rika. Elders shared with us that the

nduīko of 1932, as they called it, was a joint nduīko involving communities of EC, Ndia, Gīchūgū, Chuka, Mbeere and Embu, but that this had never happened before, nor since, because to have a joint nduīko meant forming one government and the two were separate nations. The event was so strange that it is still remembered; especially as it proved to be the death knell for Mbeere self-governance until a short period starting in 1996 and ending in 2010.

In Rika taxonomy, Nduīko is the investiture ceremony in which a polity 'becomes' a unified governing body, entering into a state of noncompetitive governance by all. Research by Ambler (1989), Glazier (1970, 1976, 1985), and Saberwal (1968, 1969, 1970) Further, elucidates Lambert's role in staging of a joint rika investiture between Mbeere and Embu societies in 1932. Saberwal has provided the most detailed data analysis of Lambert's 1933 report, informed by his own fresh data collecting in 1963-4, from 50 participants who had first-hand experience of events going as far back as 1912, in their then youth.

This historical research provides a rich context on which to arrive at new understandings of EC community dynamics where Rika in historical context was the system of governance. Nationally, districts and present day counties are largely based in understandings of pre-contact sovereignty and status of a unique culturally distinct people in a nation of linguistically related communities. Therefore, drawing out the data on Mbeere as a player in different dimensions in the EC is of great importance. The case to be made by historical data on Mbeere Rika as a capacitor in Embu only further strengthens the case for its economic and ecological importance in the EC, as seen in Chapter 1, under research setting.

2.4.3 Rika in historical EC Context

Historical data suggests that Mbeere Rika played a key role in facilitating a resilience mechanism for Embu, known as guided reorganization in SES research (Walker 2019). As a young Embu community in precolonial experience underwent a normal process of becoming a society with a unique identity, Rika provided the capacitating resources. Dynamic reorganization is a mechanism of resilience, one that, according to data, is built into the Rika System. As illustrated at in Chapter 4 under dynamic reorganization, Saberwal documents his impressions of community identity based in an immersive two year data collecting experience starting in 1963, that, as with any new nation, when he arrived on the scene in 1964, Embu felt itself to be, "the best," at anything they did, a characteristic that he likened to emerging nationhood. Exceedingly proud of their way of life, he found that the community culturally expressed national identity in material terms comparative to neighboring communities; depicted themselves as winners in all historical battles, confrontations, traced their origins to a male progenitor by the name of Mwenendega, and associated genesis of the Mwenendega family with a sacred grove of the same name in the community.

Saberwal notes, however, that a thriving based Returning belief system orientation and universal agrarian practice in a densely populated area, including widespread cultivation of coffee from as early as 1934, precluded many industries. As such, Embu was dependent on Mbeere for mining, iron smithing, medicine and hunting. He also notes that it by the time he arrived in 1963, Embu was densely populated and heavily cultivated, with coffee farming having started in 1934, hence, it was not possible for the Embu community to leave large areas of land fallow to allow for soil regeneration; a factor that explained use of banana groves for ceremony in Embu, termed marigūrī. Conversely, Chapter 4 on Irī in Mbeere details widescale preservation of wild plant species at various natural preserves termed Irī or

Ithama. In Mbeere, some preservations of historical import, such as the natural underground spring around which Rika civilization thrived in Ūvarirī, at Kīang'ombe and locales, are also documented in Riley & Brokensha, 1(989a, 1989b). Mwenendega grove, today a gazetted preserve in Embu, appears to have gained in importance during the land wars when it became important to demonstrate origination. As Saberwal additionally reports from his own participant accounts, also verified through Lambert's eye witness accounts of 1932, (1933; 1956) participants reported travelling from Embu to Mbeere to attend ceremonies at Mbonjūkī, to Chuka at Īgambang'ombe, and then on to the Mbeere side at Ūvarirī, for conferment of a new name under which to govern as a self-governing polity.

These are all aspects of the Nduīko ceremony, the ceremony by which the polity became a self-governing body in "governance by all." This process allowed the inducted to elect members into representative governance. Saberwal reports that this conferred macro level name was then confirmed by a delegate Elder from Mbeere, upon return to "marigūrī" banana groves in Embu and conjugated by the term, "Ndiriri" to indicate that the rika name was a derivative of the macro level Rika name. Lambert also documents that on the Rika taxonomy, when a second name is added to the primary rika term, it acts as a qualifier, denoting nestedness. Lastly, Saberwal documents that on the electoral level, Embu clan coalitions used only 6 of the 7 mītī, ballots, to cast votes for 6 Embu representatives into legislative governance; whilst the last ballot was not cast. Saberwal's participants did not take part in the closed functions of legislative governance; they reported only those activities they witnessed. The eyewitness data goes back to 1912, but as there knowledge of witnesses does not extend into the chambers of office, we must assume that 6 elected Embu representatives on each side of the coalition would presumably then elect amongst themselves one delegate

from Mbeere in their peerage, who was qualified to serve in the Nyangi/Ivate role. (mītī are ballots. Special sticks to cast votes). The term gūīkia mītī, to cast sticks, in literal translation, comes from the precolonial electoral practice of casting actual sticks in the ballot)

A telling finding is a chronic anxiety over rain characterizing Saberwal's data. This cultural perspective seems contradictory, given the verdant and lush nature of Embu highlands and the unlikeliness of drought, a remarked upon incongruity (Ambler, 1989; Njeru, 1979; Saberwal, 1967, 1970).

However, when Mbeere's significant influence in Embu becomes known, the mystery is solved. The importance of Mbeere to Embu territory or Rike includes provision of aforementioned economic and health resources; induction of new governing Rika; and officiating over ceremonial activities. We see in chapter 4 that ceremonial activities such as such as rainmaking were viewed differently by members of the public, relative to the point of view of those officiating, who saw them as long term conservation programs incorporating symbolic expression to motivate public engagement. Saberwal's participants in Embu expressed their experience in religious terms, as does Kenyatta in Facing Mt. Kenya (2015/1938); Mwaniki's participants expressed their roles in terms of revelry, reflecting participation in general public celebrations (Mwaniki, 1973, 1973); Whereas, the gravitas observed by Lambert (1956) reflect legislative processes of governance (1956), also described by Akũrũ A Kīrīra in Mbeere during my own research. In Mbeere participants who expressed understandings of aforementioned functions in religious terms were also identified with Returning belief systems such as Christianity or schooling.

On a spectrum of dynamic reorganization, if Mbeere rika were placed on one end of the spectrum and Gīkūyū at the other end, Embu presents an interesting case with its rika

organization at a midpoint, evidencing aspects of Mbeere rika as well as aspects of Gīkūyū rika. The table below consists of data extracted in verbatim from Mwaniki (1973), to illustrate this idea, which will be further examined in Chapter 4, where I have demonstrated the concept of dynamic reorganization, this time using gendered and nongendered rika taxonomies to show the same idea; that is, the broad-based nature of Embu community as a system in dynamic reorganization, interrupted by the arrival of colonializing agents with far reaching consequences.

The table below shows Mwaniki's data from 20 participants in Embu. Out of these, 15 participants were able to offer their genealogy. Of these, 10 show a mixed genealogy of immigration into Embu; 3 do not report immigration data, whilst 2 report that their families originated in Embu from time immemorial. Genealogical data is spread between Mbeere, Gīkūyū, Meru and peripherally, Kamba. The intermixing does not surprise, as Elders told us that prior to the present day political system, the Rika system facilitated robust movement between communities within reciprocated protocols.

Name, Locality, Clan	**Circumcision age group**	**Generational age set**	**Genealogy**
WILLIAM MURIRIA Kigumo, Kyeni Location Igamuturi	Kaburu	Nyangi	14. Muriria born at Kigumo 13. Ruciria born at Kigumo 12. Kathunga born at kigumo 11. Icaria born in Embu but captured when a boy by Meru enemy called Muiku. He grew up there but returned to Embu to join his family later. 10. Njue — 5. Mikui 9. Icaria — 4. Njeru 8. Nvuria — 3. Nthugi 7. Kirumba — 2. Muvingo 6. Ngari 1 Kathiiri; in Embuland from time immemorial.
MUYATHITHA NJAU Riakiriti, Ituri, Gaturi Location Iruma	Gatego	Nyangi	4. Mbogo born at ? — 7.Muyathitha born at Mugwanderi 3. Kiriti born at Kigumo — 6.Njau born at Gaturumbari 2. Murira born at Mbeere — 5. Mugo born at Riakiriti 1.Njau ?
KAMAU MUTHANU	Mugokoro	Nyangi	

Kibogi, Gaturi Location, Embu Kina			3. Kariru 2.Kauru 1.Njeru 5.Kamau 4. Muthanu
GETANGUTHI WA MUTUNDU Kirurumwe, near Kivuti, Gaturi Location Igandu	Ngungi	Nyangi	3. Nguruma 2. Nyaga 1.Mugo 6.Getanguthi 5. Mutundu 4. Mugo
SIMEON GITANGARURI Nvuvoori, Ngandori Location Igamuturi	Murigi	Nyangi	9. Gitangaruri- Born at Kiruiro, a short distance above Nvuvoori. All ancestors born around here also. The first ancestor to come to this area came from Igambang'ombe but he is not named. 8. Kivunga (Of Munangotho age-group and of Merambu generational age-set). 7. Ngai 6. Murimi 5. Nguma 4. Gikorwe 3. Mugwarunjiri 2. Muturi 1.Njagi
PETERO NJURANIO Kigumo, Kyeni Loacation Ngai	Gatego	Nyangi	11. Njuranio 10. Muturi 9. Nyaga, his brother left Kigumo to seek better fortune in Upper Embu; his descendants live at Kibogi 8. Ithiga 7. Mutua 6. Gakuu 5. Karumi 4. Mukiria 3. Ngomi-all born and lived around Kigumo 2. Ndumara born at Weru 1.Ngae who came from Ikamba
KABOGO GACIGUA Kiorerori, kagaari Location Igamatau	Mande	Nyangi	7. Kabogo 6. Gacigua 5. Karico 4. Kanyaari 3. Mbogo 2. Mbui 1. Nguru
HERBERT NDWIGA GATAARA Gakwegori, Kyeni Location Gicuku	Kiviu Mwiri (Kikuyu not Embu)	Ndiiriri	13. Ndwiga born at Karaga, Kathunguri 12. Gataara born at Karaga 11. Murenji born at KaNdwiga, near the cave of Kabwe Thuci 10. Gutaria born at Karaga 9. Ireri born at Karaga 8. Ndaru born Karaga 7. Mbii born at Ikuura by the Kabwe cave 5. Migui born at Ikuura 4. Ndwiga born at Ikuura 3. Nthiga born at Ngandi, above Karaga 2. Kagatu born at Ngandi 1.Kaviu born in Meru but migrated to Embu
NGINYANE WA MAKURURU Ena (Kivumbuuri), Kagaari Location Igamatau	Kithambara	Ndiiriri	4. Nginyane born at Kariari, near Kivumburi 3. Makururu born at Kivumbuuri (of Irungu Nthuke) 2. Murinda born at Kivumbuuri (of Irungu Nthuke) 1.Kirai (brother to Kithami) born at Uru in Meru.
MUTAMBUKI KARIUNGI	Gacuthe	Ndiiriri	Mutambuki born in Ukambani during the famine of Muugu, after the Murekethu famine. During the Ndaca famine came to Embu

Kigumo, Kyeni Location			and was adopted by a son of Kariungi. This son failed to be a responsible man and Mutambuki deserted him to be adopted by Kariungi: 6. Kariungi 5. Gacaria 4. Ngure 3. Mbogo 2. Njeru 1.Kivuti	
MBOGO KAMWEA Gatunduri village, Mbeti Location Gicuku	Gatego	Ndiiriri	10. Mbogo born at Ndiuri 8. Kamwea born at Kianjogu 7. Njue born at Kianthinwa 6. Muruanguu born at Gacagoori 5. Mutuamigui born at Kathangaari in Cuka 4. Namu born at Kiganja below Igoji 3. Ireri born in Igembe 2. Kiura born in Igembe 1.Nvungu born in Igembe My forefathers left Meru for Embu due to famine.	
NGINYIRUA KABUGUA Kithimu, Gaturi Location Andu-a-Njuki	Kithambara	Muranja	6. Nginyirua 5. Kabugua 4. Ireri 3	3. Ndethia 2. Gakuru 1.Njuki
JOSEPH KIBARIKI Ngandori location Kithami	Kiamate	Muranja	11. Kibariki 10. Kamwea (Ndarathi) 9. Munyiri 8. Njeru 7. Njagi	6. Migui 5. Nyaga 4. Ireri 3. Marema 2. Kithami 1. Nyaga
KAMWOCERE WA NTHIGA Njukiri, Mbeti Location Kithami	Kiamate	Riyiu	9. Kamwocere born at Ngurukiri of Nthuke ya Riyiu 8. Nthiga born at Ngurukiiri of nthuke ya Thumi 7. Kuyina born at Ngurukiiri of nthuke ya muranja 6. Mirori born at Ngurukiiri of Nthuke ya Karara 5. Nthiga born at Ngurukiiri of nthuke Merambu 4.Mirori or Nguu born at Gitwa of nthuke ya nyangi (those who smeared cattle with mud to avoid detection) 3. Kithani born in Igembe and settled at Gitwa on coming to Embu 2. Nyaga born in Igembe? Of Ndamata nthuke 1. Njagi born Igembe? Of Ndoroma nthuke ?.Embu born of Kubai nthuke	
JESEE MURUAFUNDI Runyenje's, kagaari Location Gicuku	Mande	Irungu	12. Muruafundi born at Kagaari, very near Runyenje's 11. Kanyange born at Gaciari 10. Maa born at Weru, by Kamaa stream near Ithatha pond 9. Ngondi born at Weru by Kamaa stream near Ithatha pond 8. Manyaki same 7. Nthiga same 6. Maa born at Njeruri 5. Nvungu born at Weru near Mbeere 4. Muringi born at weru near Mbeere 3. Ngotho born at Weru near Mbeere 2. Ngondi same 1.Maa from Ithanga with H. Muruamiu of (rumemo) Mugokoro circumcision age-group	
NYERI OR CIURUGURU, WIFE OF GAKINYA Kathaari, Kyeni Location	Kithambara			
MRS. MAITHA KITHAE				
GRACE MURUAFUNDI				

HEZEKIEL MURWAMBIRO (BROTHER TO MURUAFUNDI)			
HEZEKIAH MURUAMIU			

Table 2-A: Mwaniki (1974) Embu Genealogical Dataset in Verbatim

As an explanation of data in the table above, Elders shared the kīrīra, knowledge (Also confirmed in Saberwal, 1967, 1970; Lambert, 1956) that Nyangi Ndiriri in Embu is a njaū of Nyangi in Mbeere, that is, a "calf" of Nyangi. Preceding the table, functional reasons for the nested nomenclature are discussed. More details are discussed in Chapter 4 under dynamic reorganization.

It will be remembered that in precolonial terms, the above data on the various immigrations into Embu, eventually leading to an Embu identity, did not in actuality represent movement between "tribes," but rather, rika to rika. Groups moving into occupied Rika territories were assimilated by their corresponding Rika, or, in the case of Embu where they moved into unoccupied territory in then less preferred areas near Mt. Kenya, they founded their own Rika territory and representative government.

The concept of tribe was introduced by colonial machinery (Daniels, 1982). The idea of a dynamically reorganized Rika system after contact with a colonizing force is not unique to Embu and no doubt similar dynamics were taking place at the same time all over Africa. Much further back in history, a similar dynamic is observed by Bremmer (2009), who documents that the Frisian Rika of 800AD was much different to the Rika of the middle ages. He traces significant changes starting in the 4th century AD, when the rise of Christianity into territorial dominance sees an increase in ethnocentric, hierarchical, patriarchal, and deified characteristics in Frisian Rika.

Subsequent to this, the term rika as well as Frisian language and culture fade from prominence circle 4th century, only to reappear in the middle ages as European societies of present day Netherlands and Germany, restructured to align with ideas of monarchy and coalescing around hierarchical governing jurisdictions as we know them today.

In the immediate research context, empirical research on underlying dynamics of Rika is rare. Most published works were satisfied to report comparative data, hence they failed to see the aspects of these generational relationships that were guided by concepts beyond those of kinship at ground level. Moreover, they failed to appreciate the modulating aspects, whereby the micro level phenomenon they were looking at was reflected in structures of governance at macro level. This is a key mechanism of structural resilience fostered by the Rika system's capacity to embed in familial relationships at micro level and modulate at macro level using the same terms and interactional structure.

Macro aspects of rika were treated as defunct after the 1930s, and are now thought to only have existed in precolonial life as magico-religious belief systems because they have been poorly articulated in the research, which tended to focus on symbolic expression based in anthropological traditions of Europe dating back in the middle ages. These include successive, corresponding, or linear generations of elders, rika, acting as governing bodies within complex binary systems (Ambler, 1989; Fiedler, 1996; Finke, 2003[2015]; Glazier, 1976; 1985; Kenyatta, 2015[1938]).

Not surprisingly then, anthropologists have long shared the belief that the institution has little relevance for present-day life (Ambler, 1989; Brokensha, 2007; Fiedler, 1996; Finke, 2003[2015]; Glazier, 1976, 1985; Kenyatta, (2015[1938]); Lambert, UP, 1956/2018; Riley & Brokensha, 1988; Saberwal, 1967). Research on Mbeere rika has predominantly

ensued from an assumption of the institutional extinction of rika, based on Lambert's documentation of the "last" rika investiture ceremony in 1932.

Yet, paradoxically to the rika extinction narrative, the we find that the Mbeere rika concept is one of the most fully integrated amongst Kenyan peoples. Saberwal (1970) observes in his study on Embu that the neighboring Mbeere traditional government continued undisturbed long after Embu had ceased its practices, and that his participants in Embu reported dependence on Mbeere rika to complete some of their own nduīko, investitures of new governments. Saberwal is also one of the few authors to give data driven evidence on the role of Ūvarirī for communities other than Mbeere. Ūvarirī is perhaps the most important stronghold of health and environmental stewardship in Mbeere to this day. These aspects of regional importance of Mbeere rika are further discussed in chapter 4.

I can confirm from my own experience as a Mūmbeere (a Mbeere indigene), as well as through empirical presented in this work, that many practices embedded in the traditional rika institution are still alive: circumcision, arbitration of disputes through blood oaths, muuma, and the stewardship of medicinal plants. Land is a researched topic in Mbeere, where clans were given jurisdiction over property holdings in the returning system era as the British Government subjugated rika. Chapter 4 on accessive phase goes more in-depth about rika demographics using data mined from our interactions with community members from 2015-2020. In this sample, it is not possible to measure or predict an elder's clan identity based on his rika. The clan data is spread out across Īrumbī and Mūrurī, showing evidence of patterns of coalition, which will be discussed in chapters 4 and 5, for their role in electoral processes by which the polity elected noncompetitive representatives into executive governance and legislature. Researchers who focus on clans believe Rika to have lost its

power decades ago (Glazier, 1985; Riley & Brokensha, 1988). Moreover, despite challenges of land tenure raised by colonial-era ascendance of the clan into dominance, in my experience and that of many female research participants, families in Mbeere meet the land needs of males and females according to their capacity, and in many cases rika relationships guide questions of access to common property.

2.5 Coeval Gender Diversity in Rika

The society, as we shall see in more detail later, has retained aspects of gender plurality or diversity, although coeval design is much eroded by returning belief systems. For example, among the male offspring of one man, the younger, rather than the older, inherits the land on which the family home stands, while the older male inherits land further afield. This younger male offspring shares a rika with elders in his maternal line. Moreover, it is customary to consider the land on which the family home stands common property; so that it may be apportioned for females who are heads of households for any number of given reasons, whether by choice or by circumstance. As we see in the findings, the tradition is much erroded by conferment of male clan elders in the leading role with regards to land adjudication, among other previously inclusive practices. Further to this, when minors find themselves land-destitute due to divorce or paternal calamity, their rika ties with maternal relatives afford them access to common property on the matrilineal side. Rika thus adds dimensionality to social and economic safeguards.

Yet, contrary to such egalitarian practice, since the early 1900s, the Western practice of classifying African societies in matriarchal or patriarchal terms has overshadowed the nuances of gender balancing features embedded within the rika structure with few exceptions. Forde (2017/1965), one of few mid 20th century studies on African culture

(including rika systems that are named in local nomenclature), documents multiple examples of reciprocal levels of patriarchy and matriarchy that characterized communities of East and Central Africa. A few other authors (Njeru, 1979; Saberwal, 1970) have documented a lost legacy of inclusivity that today could serve as an indigenous model in this age of rising global egalitarianism. Based on my reading, over time the written word has taken precedence over oral records and daily practice. Misinterpretations and overgeneralizations have gradually become indigenized and hardened into patriarchy and female marginalization. I suggest here that both matriarchy and patriarchy are evidence of structural problems, and that rika is designed to be plural gendered, showing gender diversity.

More research is needed to test the hypothesis I have laid out in this work, that a pattern of patriarchization is observable, whereby early exposure to returning belief system corelated with patriarchal structures, lessening of gender plurality, marginalization of women, gender violence, and a diminishing dimensional complexity or absence of rika structures. In communities with the longest exposure by the advent of concerted documentation of African systems in the early 1900s, the nuclear family becomes the central structure of male authority, with rulers centralizing power in hierarchical scales that also make way for coalescing of land based resources around clans and powerful families. Many coastal and long-distance trading communities such as the Nyakyusa of Nyasaland in Tanzania appeared to fall into this category (Tew, 2017/1951).

Kenyatta (2015/1938) also details such as process in his book, Facing Mt. Kenya, whereby he claims that the Gīkūyū community in Kenya started out matriarchal and gradually became patriarchal. Indeed, it would appear that much of the function of social anthropology and development literature has been to prove patriarchy and female

marginalization in African systems. Yet, research suggests that domination of one gender over the other can be traced back to sustained contact over time with Greco-Roman systems (Forde, 2017/1965; Walker, 2006). One of our research participants a female 87 years old, shared her personal lived experiences of marriage to two female spouses. Kenyatta (1938) reports in Facing Mt. Kenya that polyandry existed in Gīkūyū, where a woman could marry more than one man. As is well known, polygamy is written into the 2010 Kenyan Constitution (GOK, 2010) but not polyandry, due to changed societal attitudes eroding women's rights after contact with the beliefs of returning systems about gender roles. This situation whereby erosion of equalizing mechanisms of Rika continued to expect men to participate fully in the same practices that were accorded across genders in precolonial experience is directly responsible for much of the inequalities and gender violence that characterizes Africa experience today, and which has not been attributed to its rightful source in the rise of othering of women by patriarchal returning belief systems and governing structures. The expectation that women take their father's or husband's name, identify primarily with their father's or husband's clan (in baptismal records, national identity card, and all official records), is a Rika anomaly, and one with far reaching consequences, especially because male clan elders were also given carte blanche authority to confer property ownership.

With the assumption that early, consistent exposure to externally originated religious systems is likely to lead to acculturation toward patriarchy and a loss of rika, it is worth noting that as of this writing, Returning belief system practice is widespread, but as explained to the research team by elders, not everyone in Mbeere has converted to Returning belief system practices, contrary to popular myth (Ambler, 1989; Fiedler, 1996; Finke, 2003/2015;

Glazier, 1976, 1985; Riley & Brokensha, 1988; Brokensha, 2007). By returning belief systems here I mean Christianity or Islam. Findings of this research in chapter 4 challenge the long held views of female marginalization in precolonial indigenous Africa.

As Pritchard is accused of among the Nuer of Sudan (McKinnon, 2000), evidence points to Lambert's key role in patriarchization of rika in his long tenure in Kenya. For example, not only do his reports give little credit to women beyond a passing mention that he had observed, their 'equal participation' during rika investiture, he also uses rika investiture and other processes to implement of some of the earliest policy reports targeted at control of female rights. During his tenure, his reports are preoccupied with drawn out processes by which he hands over jurisdiction of the female body to clan councils made up entirely of males and headed by male chiefs, an anomaly in rika terms; as women's rika were in charge of women's affairs, by our elder accounts. For example, he oversees standardization of something he calls a bride prize in his 1933 report, framing bridal status in transactional monetary terms with long term impacts that continue to reverberate to present day, where the term "*kūgūra*" "to buy" over time crept into popular usage, taking precedence over the traditional "kūvika" roughly translated to, "to arrive" or "to cross over"

Fortunately, as has been observed (Finke, 2003/2015; Brokensha, 2007), Mbeere have kept much of their social culture, having only been forced into privatization of land in the 1980s, and having been directly occupied only since 2010 after the constitutional changes that extended gubernatorial jurisdiction of Embu County into the then Mbeere District. Glazier documents that his “informants” were in their 40s when he first encountered them some 40 years ago. They would be in their 80s and 90s today. In this work, it was centenarians and near-centenarians who undertook the longest, iterative data correcting

exercises with us. Put in the form of questions, we may ask what are the internal structures that have allowed rika to survive in the face of dominant competing interests? What mechanisms does the community have to foster resilience of its indigenous structures in altered circumstances? Why and how?

2.5.1 Knowledge Gaps in Research Informing the Adaptive phase

The second phase of research undertakes to understand indigenous motivations with a focus on the motivational role of social media. Little research has been done on indigenous motivations that is of indigenist origination, i.e., as a community self-study for self-understanding. The small corpus of existing research on indigenous motivations takes place with students in formal learning situations, mainly in Australia (2016), Ames (2013), and Mooney et al. (2016). I did not attempt to distinguish these works as either indigenous or indigenist research. These works concur that indigenous students were motivated to learn when teaching styles were holistic, communal, and integrated content about their communities, thereby increasing orientation toward indigenous identities. Mooney et al. (2016) additionally found that desire for community success increased motivation to learn. In this work we also consider the motivational role of different technologies in the small worlds of indigenous social media. As we engage in the exercise of delineating the rika model, we are interested in how social technology design features may impact on rika information behavior.

It follows then that to define a theoretical framework within which to investigate motivation as part of resilience thinking, we must remember that indigenist worldviews are oriented toward Place, i.e., the land and everything in it, and then additionally consider that

indigenous access to social information technology may additionally extend understandings about Place (Jaeger & Burnett, 2010; Warrick et al., 2016; Tuck & McKenzie, 2014). Therefore, hypothetically, the motivations of rika may be identifiable on social media.

To get at social media data, which by the nature of its storage outside human brains, requires a rethinking of indigenist methodological paradigm. Hence, we leverage Walter & Andersen's (2013) idea that origination may be used to justify the use of a quantitative method. Hence, we leverage the Rotman survey (2013) and other quantitative tools in order to understand motivational impacts of technology. In her study on motivation toward participation in citizen science across the globe, Rotman (2013) considers the motivational role of location, with based on data collected in Costa Rica, United States, and India.

Rotman identifies but does not closely examine, a gap between indigenous and outsider perceptions toward technologies and their application in biodiversity projects. Rotman notes a gap in the literature on motivations within indigenous places. We endeavor to close this gap but acknowledge that this work looks at the motivational aspects of social media, a factor not considered by Rotman. Due to these disparities of scope, differences can be expected between Rotuman's conclusions and those of this work. Rotman's work on motivations towards contributing to biodiversity projects in diverse cultures is based on the principles behind Hofstede's cultural dimensions theory (Hofstede, 2001). Hofstede studied how national cultures around the world influence workplace motivations and relationships. He used five measures on his index, listed below.

- *Power Distance:* How much tolerance a national culture showed toward inequality (the degree of normalization of inequality within a country's culture).

- *Uncertainty Avoidance*: To what extent the national culture could tolerate lack of structure and ambiguity.
- *Individualism versus Collectivism:* If the national culture favored communal world views or preferred individual-based motivations, decisions, and actions.
- *Masculinity versus Femininity*: Whether national culture valued assertive behaviors and competitive work environments as opposed to giving more weight to nurturing community or family-oriented activities to boost reciprocal relationships.
- *Long-term Orientation:* Whether the national culture was more oriented toward preserving conventionality and conformity, or they were more motivated toward fulfilment of future personal goals.

Hofstede scored the countries on a scale up to 100, where 50 is neutral. A brief examination of Hofstede's cultural dimensions index indicates that Kenya as a nation state scores 50 on uncertainty avoidance. This is a neutral score on the index. He interprets this halfway score as a national culture with attitudes of uncertainty avoidance and tolerance of ambiguity in equal measure. Kenya is a nation state consisting of indigenous communities; therefore, it is possible that Hofstede's participants embody the cultural differences of the two worlds in which they navigate, but this was not a variable measured on the index.

Hofstede correlated uncertainty avoidance to high scores in power distance and masculinity. Kenya as a nation state scored somewhat highly in Hofstede's index: that is, 70 on power distance and 60 on masculinity, meaning that national culture was more likely to tolerate inequality and that assertive, competitive behaviors were valued to a slightly higher degree than reciprocal relationship-fostering behaviors. With Hofstede's in mind, we

examine two dimensions: uncertainty avoidance and power distance in the indigenous iWorld. In keeping with Rotman's survey parameters, our own research design did not use Hofstede's index. We use those of Rotman (2013) and Rotman et al. (2014), which are based on the same principles.

Further to this, in consideration of contextual factors, we proceed with the hypothesis that Hofstede's analysis of uncertainty avoidance, power distance, and masculinity, all of which are correlated, manifest differently between the indigenous culture and the culture of the nation state within which indigenes are extant. Hence, his regarding motivational and strategic impacts of cultural differences on interpersonal communication and organizational culture will be compared with Turner's ideas about the power of communitas to capacitate members of the indigenous community with tolerance for uncertainty and ambiguity as a function of the liminal transformative experience.

An assumption is made that tension may arise from cultural differences between the indigenous community and the nation state. Our motivation for taking this direction is that Rotman noted, as have others (Rinne et al., 2012; Rotman et al., 2014; Zanini & Migueles, 2018), that Hofstede's cultural dimensions theory failed to capture the complexity of a people's entire social reality.

In our case, for example, Turner's (1969) views on indigenous inculcation of tolerance for uncertainty and ambiguity through ritual process ought to be examined in relation to Hofstede's cultural dimensions theory. An examination of liminality research shows that there could be a reason a connection has never been made: when the concept of avoidance vs tolerance is applied in non-transformative contexts, ambiguity and uncertainty are often interpreted as negative constructs unsuited to the support of present-day egalitarian goals

(Stenner et al., 2017). In such cases, the focus is on ways to minimize ambiguity and uncertainty (Eden, 2016; Crawford et al., 2015; Latta & Wittman, eds, 2012). But there is another view of indigenous motivations that has little been considered as such, much less linked to the concept of rika.

I refer to Victor Turner's (1969) views on the role of uncertainty and ambiguity as social transformation tools in the indigenous Ndembu context. However, more and more research understands Turner's ideas about ritual as a tool of social transformation, based on his work on rites of passage among the Ndembu peoples of Zambia (1969). Turner built on the ideas of Van Gennep in his book rites of passage (1960[1909]). Best known for his ideas about liminal space and communitas, Turner proposed that rites of passage such as circumcision, in which a child is transformed into adulthood, are indigenous tools, leveraged to launch a transformative process. During the protracted ritual process, initiates enter a transitory period in which they are neither child nor adult. Often, they are physically separated from the community, not subject to social convention and unsure of themselves in the unfamiliar process. This is a period of ambiguity and uncertainty.

Borrowing from Van Gennep's 1909 term, Turner describes this transformative space as liminal space, in reference to its transitory nature. Turner argues that the whole community joins together to facilitate the initiates' transformative liminal experience by participating in communitas. He describes communitas as a liminal space in which social hierarchies and conventions are temporarily dropped, and the community exists together in a place of equality outside of social structures. In this way, communitas acts as a positive driver of transformation by lending the initiates a sense of tolerance for the ambiguity and uncertainty that they must suffer.

Turner extensively examined social rites of passage, but he did not examine seasonal regenerative rites of passage centered in nature. In this work, I look at Mbeere seasonal rites of regeneration that incorporate stewardship, with biodiversity implications. I do not do this by making a tenuous connection with Turner's conclusions but rather by reverting to Van Gennep's original delineation of rites of passage in his 1909 writing. Van Gennep defined liminal state as one aspect of a wider frame, preliminal or unwanted state, liminal or transitional state, and postliminal or transformed state. Within this frame he included cyclical seasonal regeneration whereby, for him, the natural world in winter is in a preliminal state, experiences the liminal rites of regeneration in the spring, and thereafter in the summer enters the postliminal state in which plants and animals are in full abundance. Van Gennep evaluates these cyclical rites in much the same vein as much of social anthropology has done over time, that is, without considering environmental stewardship protocols that may be incorporated in seasonal rites of regeneration, which he terms rites of passage just the same as any other rite of passage.

> *"The seasons are of no concern to man except for their economic repercussion son the more or less industrial life of spring and summer. It follows that an exact parallel to purely seasonal rites of passage may be found in rites intended to assure the rebirth of vegetation after the transitional period of winter dormancy. These rites also insure the resumption of animal sex life and resultant increase in herds." (1909 [1960:179]).*

This pragmatic view carries an essential truth of the interdependency between healthy human livelihood activity and healthy natural ecologies. If Van Gennep does not tally to interpret deeper processes of stewardship that may be encapsulated within rites, it is not only that he

wrote well before environmental stewardship became a critical issue but also that his short book is illustrated from examples covering a broad swath of the entire human experience. He does not go into depth but rather creates an outline. The author proposes that, in his considered assessment of the subject around the globe, much of Eastern thought is based in African systems. In the tradition of his time, he frames Eastern thought as a refinement of crude African conceptual thinking. However, research has since debunked this Darwinian approach to African thought systems, showing for example that celebrated Ancient Egypt was an entirely African civilization in robust trade with the rest of Africa, (Walker, 2006). In other words, much Egyptology begins after the conquest of Egypt by Greco-Roman agents, however, the entry of Europeans into the scene found a great civilization intact, ran by the called Nilotic peoples, much as the Nuer of Sudan. Ironically, the entry of foreign agents eventually led to the fall of a civilization that had existed thousands of years before they arrived on the scene, decimated by unsustainable expectations, avarice and ecologically dissonant practices. The pattern is repeated elsewhere, in places like the Americas and can be observed in progress, through the activities of global development, a handful of which are outlined in the work at hand.

It is for individual researchers to interpret Van Gennep's generalist classifications by undertaking in-depth inquiry within specific cultural contexts and based on their own disciplinary focus. Where the potential has not been fully realized is in an almost exclusive focus on liminality. As well, within liminality research, natural rites of regeneration are a much less considered aspect of Van Gennep's ideas, possibly because Van Gennep's original writing is not as well read and cited in current research as are Turner's ideas. Turner extracted from Van Gennep's broad conclusions the aspect of liminality, which he centered

on social, religious, and later, technological aspects of liminality. Thus, current research has tended to focus on these aspects.

Another key idea on liminality that I examine in this work, is my understanding of rika as the structural underpinning of the phenomenon he describes as communitas in his work on the Ndembu of Zambia, who are an Ubuntu society, and therefore socially governed by the rika model. Turner does not examine rika specifically, and nothing in my reading implies his awareness of the concept. But he is fully and contentiously aware of structure. In his stance as an interpretivist his purpose is, even if not exactly to undermine structure, to at the very least elevate transformative process in relationship to structure.

If Turner's chapter on communitas is considered to the exclusion of the rest of the chapters in his book on structure and antistructure (1969), then his larger meaning is missed. Often, it is then thought that anti-structure means anti-establishment. But Turner here is defining his work within the broad symbolic interpretivist tenet that spoke to a view that the mundane was non-transformative. They focused on 1. the transformational aspect of the non-mundane i.e., ritual, religion, suffering, etc. and 2. disregard of social convention (structure) over "elevating" processes (ritual).

To transcend these early anthropological trappings in which much of indigenous research finds itself to this day, this work leverages the iWorlds approach, an approach that incorporates the structural (norms, values, social types) and the transformative (access, boundaries, bridges). The iWorlds stance also facilitates a macro level view of social structures as well as a micro level view of processes that facilitate transformative change in diverse small worlds that make up part of the whole. Turner focused on micro level meaning

making. Our community is engaged in macro level meaning making; thus, leveraging the Theory of iWorlds, we follow.

2.5.2 The marginal versus the liminal

Turner's most examined theme in the sciences is the concept of liminality. In environmental science, liminality has been described as a state in which citizens experience uncertainty between macro level environmental theory, and their own ability to apply this knowledge in daily life, i.e., community members feel that they have a personal grasp of environmental concepts but are uncertain about how to apply these concepts in their daily lives.

To transition citizens out of the liminal experience between macro level knowledge and uncertain daily practices, bridging environmental civic curricula are suggested (Eden, 2016; Crawford et al., 2015; Latta & Wittman, eds, 2012). While I concur with the basic tenets of these findings, that there is a need to transition citizens out of uncertainty and into informed daily environmental practice, the experiences described in these prior works are marginal rather than liminal.

The marginal can be used to describe situational generalities of disconnectedness and uncertainty, such as presented in the cited environmental research, but liminality is specific (Turner, 1969; Stenner, 2014, 2018) and implies intention, possibility, as well as the anticipation of transition. Therefore, any state in which a community has languished for an indeterminate period, and from which it may not emerge, can scarcely be defined as liminal just because of the associated feelings of uncertainty. Additionally, transition arises out of liminal experience if the subject, aided or not, has embraced ambiguity and uncertainty in

liminal space and thus increased their own sense of capacity for transformation (Turner, 1969, 1987; Stenner, 2018). Propulsion from one state to another by an external agent does not by itself denote liminality since agency and transformative outcomes are not necessarily denoted.

Lastly, for liminality to occur, it is necessary for the subject to leverage liminal transitional objects such as social media, which further embolden the adoption of unfamiliar stances and render the possibility of transition. Without all these elements, situational uncertainty such as examined in the cited environmental literature is more correctly defined as a negative construct, which would explain author perspectives of uncertainty and even liminality itself, as something to avoid or to limit. This is the antithesis of ritual process in African culture. In this work, therefore, we hope to contribute to liminality research in environmental science by distinguishing between the liminal and the marginal, and we hope to provide a context within which to draw for specific examples depicting the journey into and out of liminality.

In the field of ICT, social media has been examined as a liminal space that is characterized by ambiguity between personal and public information (Bruns & Highfield, 2015; LaPoe et al., 2017), especially on open forums like Twitter where there are "personal publics" with whom users share "publicly private information" (Bruns & Highfield, 2015). Once again, the cited works define the term broadly and are useful as a springboard from which to launch specific contextual research into transformative liminal experience on social media. In the wider sense of the lifeworld introduced in the cited literature, social media is now an established everyday reality and can be said to present a *preliminal* state to the user, who then may or may not experience transformative liminality.

Thus, the contextual spaces that are emerging within social media are in various stages of development and worth understanding. Similarly, in the indigenous social media we are engaged with will feature spaces are in liminal state, many will not be. Some may also replicate the *marginalized* states of their physical worlds, such as cyberbullying or political foment hotspots described in Stenner et al., (2017). Others have achieved *postliminal* state, such as individuals who have successfully leveraged their personal publics and have acquired new identities and are making unique new types of contributions to which we in the lifeworld have assigned new names. Indeed, as Stenner (2018) points out, liminality is subjective. An experience is liminal only in the sense that it produces experiences of liminality for the subject. According to Stenner, liminal technologies are subjective in nature, in the sense that it is the experiencer who assigns liminality to the technology by using it as a device to facilitate transition and transformation.

If we were to apply Stenner's concept to indigenous liminal use of social media, we might say that a technology may be facilitative of change and therefore transformative for one community but not for another. The example Stenner gives is that one baby may use a pacifier as a liminal transition object, facilitating passage from thumb sucking via a brief period of using a pacifier, while another baby may need a different device altogether to facilitate a similar passage.

Liminality is therefore deeply contextual, a third world that is difficult to define in terms of other people's prior experiences. Liminality is, "transition as it is happening, and as such, is quite literally neither the world of departure, nor that of arrival…. Liminality is about the process of *becoming* and not about explaining what already exists." (Stenner, 2018, p. 178. Italics are the author's). Even in cases where an external event such as a natural

disaster propels transition (Stenner et al, 2017), not all subjects facing the disaster will embrace ambiguity and uncertainty requisite to entering the emboldening liminal space. Therefore, not all subjects will experience the disaster as a liminal transformative event.

If we relate Turner's ideas to our framework, we begin to see that liminality is the same concept as boundary space-transitional space, as posited in Jaeger & Burnett's body of work. Similarly, liminal technologies that, according to Stenner, facilitate transformative experience in liminal space are in essence the same concept as bridges in the iWorlds' framework. The liminal transformative experience here is the experience of using social media.

Hence, we want to find out what aspects of social media can be seen to have the same effect on bolstering tolerance for ambiguity and uncertainty in the same way that the liminal experience does. In this way, we circle back to Hofstede's ideas and determine how the indigenous world fares in comparison to the culture of the nation state in which it is extant. The idea is to arrive at conclusions that are based in indigenous, rather than nation state, motivations.

2.5.3 Knowledge Gaps in Research Informing The Applicative Phase

The applicative phase applies findings from the first two phases to community strategies. As such, literature to consider in this phase of research is with regards to the climate in which community strategies are ideated and implemented. It is of necessity kept short and focused on citizen science and sustainable development, of which the context is externally misinformed by sustainable development thinking and internally informed by Rika Resilience thinking, as I propose in this work. As such, research is considered in terms of its

potential to influence strategic thinking in the community. As well, determination of the principles inherent in application of rika structures, motivations, process, and practice into actual goal-oriented projects outside of research context.

Once again there is little research on strategies of environmental stewardship and/or social media use that is indigenist by origination and intent. To arrive at clarity regarding everyday projects, we springboard from conclusions of Warrick et al. in 2016, regarding community projects as observed on indigenous social media. The authors found that projects on indigenous social media were directed toward restoration of Place using a development approach with an environmental and social justice stance. Water was a key theme in project goals. But the role of elders in the project ideation needs to be built upon, especially to cement or challenge the indigenist maths stance that indigenous relationship to Place is imbued with rights and responsibilities of Place.

As with a nation state, it cannot be assumed that indigenes are universally compliant with environmental stewardship of Place. Vulnerability factors that help or limit stewardship of Place will be examined. Warrick et al. placed a great significance on the capacitating role of governments, yet our early assumption that solutions could arise from the direction in which marginalization is reinforced was contradictory.

The structures, motivations, and strategies of the indigenous community must be viewed within the larger context of the Nation state, decentralized its national level government, devolving power to county level governorships, following the mandates of millennium development goals (MDG). In 2015 the government added sustainable development goals (SDG) to the MDG framework (Beisheim et al., 2018, Wu et al., 2018). Hence, counties have greater oversight regarding governance, including local decision

making. Hence, it is very unlikely that, after we have already seen the County stance on Mbeere reflecting in its fiduciary behaviors, that County government will be a genuine capacitating partner in Mbeere after 10 years of unchecked abuse.

Context-based decisions such as affirmative action, development projects, and indigenous protections for property rights would fall under local oversight. Under the SDGs, the many donor institutions such as the World Bank, now mandate that as prerequisite to project funding there should be a sound understanding of the social, environmental, and political frameworks of indigenous peoples (Garnett et al., 2018) so as to address their needs in ways that are relevant to indigenous ways of knowing and being. However, there is little reason to believe that these are taken with any degree of seriousness by the gubernatorial office in Embu County.

Such donor responsibility covers technical and other capacity building to indigenous communities, such as sustainable resettlement when displacement occurs as a result of a project. In Mbeere's case, the hydroelectric project, which is yet still unfinished with five dams built and two more in the long-term strategic plan, all the mandates are relevant. County strategic planning does not effectively address indigenous community resilience, and although the documents diligently report environmental degradation and overexploitation, where Mbeere is considered, sustainability planning and fiduciary follow-through is solely lacking at county level. Yet donor projects have been reluctant to get involved in politics, separating it from governance and confining themselves to top-down mandates on structural adjustment from a national policy perspective (Haan, 2014). However, indigenous initiatives such as we explore here provide a rich context within which to explore other options outside of mainstream nation state governance and policy structures.

Another work that has influenced my ideas about Place is the 3-prong definition of indigenous knowledge as Person, Place, Practice, by Awori et al. (2015). The authors give Place a central role as a knowledge container or knowledge steward. They present intergenerational use of technology by indigenous, transnational Kenyan emigrants who stay connected with elders in Place in order to learn indigenous knowledge.

The youngsters who desired to learn their indigenous knowledge were in Australia. The elders who taught them were geolocated in Place, in Kenya. At the end of their study, the authors posit that indigenous knowledge can be defined as Person, Place, or Practice, and that social media technologies such as YouTube could provide the multidimensionality necessary to indigenous knowledge acquisition through geographically dispersed intergenerational interactions.

More research applying the concept to different variables in computer supported, geographically dispersed interaction would be of value. This is especially so in the area of environmental stewardship, where indigenous communities have been recognized as holding valuable knowledge and integrated practices that can add to the conversation on resilience and sustainability.

Another view of Place that I found inspiring leverages the "Power of Place" to delineate five dimensions in which citizen science projects can strive towards more connectedness with their participants in Place (Newman et al., 2017:55-64). The authors posit that Place can be considered along five dimensions: social-ecological, narrative and name-based, knowledge-based, emotional, and affective, and performative. For Newman et al., these systems aspects are central to the ability of citizen science to leverage the power of Place. The authors provide evidence of projects that, by leveraging these five systems

dimensions, have improved conservation decision-making, increased participation, and improved community resilience.

Thus, by asking research to consider the human and systems aspects of the geographic locations in which they conduct research, Newman et al. widen the scope of the still emerging definitions of citizen science. This work is not thematically conceptualized as leveraging the five dimensions of the power of Place in Newman et al. Nonetheless, the authors' ideas are influential, especially regarding resilience as an outcome of Place-centric citizen science projects. They inspire us to define indigenous citizen science projects within a place-centric, indigenist theoretical lens.

With entry of Facebook as a private capacitator in the global SDG space in 2020, (Levin, 2020) it is hoped that the influence of liminal transformative thinking engendered in social media enterprise will have a bolstering effect on the capacity of global donor institutions to endeavor toward genuine accountability and ameliorative strategic planning to preserve vulnerable socioecologies in the places where misinformed attitudes and resultant SDG projects have caused the most damage.

3 Chapter 3: Methods

3.1 Chapter Overview

Research took place in three phases, beginning with an Accessive Study in 2015 and followed by the Adaptive Study which was based upon the findings of the Accessive Study and began in 2016. The applicative phase began in 2018 and is ongoing. The field aspects were undertaken by four researchers in a team that included me and three community researchers. They are the bridges without whom this boundary space (Jaeger & Burnett, 2010) undertaking would not have been possible. I approached the research with a set of methods that were progressively adapted, based on findings and interactions between researcher and community. This chapter will delineate the tools, processes, and procedures that were undertaken throughout, and is laid in three sections. In the first section, we will discuss data sampling. The second section will emphasize data collecting and interview design, while the third section covers data analysis. Under each of these three sections we will get a sense of how methods changed over time as new knowledge was acquired in the field.

3.2 Data Sampling

Research was undertaken in rural Kenya with the target community being the Mbeere people, a community indigenous to the EC region in Africa. In African south of the Sahara, numerous participatory projects incorporate aspects of environmental stewardship goals. Some focus on sustainable livelihood development, and others on biodiversity and citizen

science. They are run by research institutions, government, donor agencies, and the ecotourism providers.

The original intent of this study was to discover indigenous perceptions of and engagement with such environmental projects and impacts of information on the mobile device. This focus shifted progressively as I oriented toward the community's own perceptions. Sampling was intended to represent a cross section of adult members of the community, hence we adjusted sampling methods iteratively in the course of the research.

Randomized data sampling began in the summer of 2015 in an accessive approach. This involved circulating fliers at village markets. This randomized approach was met with skepticism, especially in Mbeere South where mĩraa, a plant indigenous to the hills of Mbeere and now being cultivated as a cash crop, faces unwanted attention from researchers due to its narcotic effect. The community is increasingly dependent on this cash crop (Njiru et al., 2013), and is naturally taciturn around inquiring strangers. Due to lack of response to written consent forms due to community members being suspicious of the fliers that served as an invitation toward participation, it became obvious that we needed a non-randomized sampling method that community members could trust.

Subsequently, based on the advice of one of the researchers with deep experience in Africanist critical theory and indigenist methodology, the team switched to networked call to participation in order to minimize questions of trust. The earlier skepticism experienced during a randomized call to participation was minimized by a networked call to participation, which seemed to reduce anxiety and increase trust, even though the outcomes of our research remained as ambiguous to community members as they had been, until the following year, when I undertook the first reporting exercise in talking circles, in December of 2016.

In the meantime, my return to the United States in the Fall of 2015 was followed by a period of writing and reporting as well as adapting the methodological approach to respond to the initial findings of the accessive phase. When we went back to the field in the fall of 2016, we were now at an advanced stage in the accessive phase of research, and I had a better grasp of the context. It followed that we undertook a targeted approach to sampling, with the goal of getting a more representative cross section than we had thus far. Sampling addressed variables that we had not targeted before, i.e., age, gender, location.

This targeted sampling approach was based on initial findings of the year before, which showed a marked gender disparity, suggested that age was a factor in stewardship strategies, that Mbeere North and South showed a difference of approach, that access to social media was of interest, and that the diaspora was a key player. A concerted effort was made to engage community members who would help us investigate those emergent variables over a longer period.

Community members who took part in the 2016-2017 field study did not entirely break up when our field work on the ground in Kenya was completed in December of 2016. Some of the community members from the larger pool organized themselves into a working group based on research. These community members became a smaller, self-selecting, project-driven sample with whom the research team continued to work to establish mutual goals. At this point, the research team started collecting data from the process of community project ideation and design. We have termed this process project driven sampling.

3.2.1 Breakdown of Participating Communities and Individuals

Community members 18 years and older contributed their knowledge, time, and resources toward this research. A total of 226 community members were successfully recruited into the study and provided the data presented in this work.

The data presented in this work represents several wider scales of passive participation of networks in the Rikamedia whose content was extracted, analyzed and visualized in the aggregate. These are population studies looking at trends on the micro, meso, and macro levels of the information world, to characterize the Rikamedia. Personal data was not presented, and every effort was made to anonymize any potentially identifying information. The communities measured were: Two FB groups UVA and Mbeere Politics, with approximately 10,000 total membership count; Five FB community groups of five communities sharing the EC with Mbeere, approximately 750,000 membership total membership count across the EC Rikamedia. This number means that approximately 5% of an estimated 15,000,000 from the EC is on Rikamedia (KNBS, 2019).

An online survey was taken by 116 community members who participate in indigenous social media, termed the Rikamedia in this work, in reference to the originating Facebook (FB) community group, UVA (the seminal group on the Mbeere FB ecosystem). During data analysis, one community member who took the survey turned out not to have been a member of FB Group at the time that she took it, hence their data was removed from the dataset. Thus, the survey data reported here is based on 115 members (n=115). Community members responding to the survey ranged in age from 18 to 74 years. The gender gap was 3:2, whereby 69 were male while 46 were female. Community members hailed from both North and South, with two thirds being from Mbeere North and one third of the community members being from Mbeere South. Approximately 28% of respondents had

participated on Rikamedia from its inception in 2011. Approximately 33% of respondents had joined in the previous year alone.

I have taken care not to over-count, counting each individual only at the first encounter. Many members took part in multiple activities. An individual might take part in many talking circles, respond to the online survey, and participate in community projects. Additionally, I was in constant contact with at least a dozen members of the community on WhatsApp and iterative member checking exercises through talking circles. The interactions became too numerous to count over the five-year lifetime of the research from 2015 to 2020.

3.2.2 Consenting

In the accessive phase of the research, community members were asked to sign their consent on a consent form, and there was a requirement that community members be able to read the form as well as sign it. We found that consent was understood differently in this indigenous community; requests for signed consent were felt to be coercive. In indigenous communities, signatures on paper are historically associated with events where local leaders and citizens signed off on documents that were later used to coercive effect (Chilisa, 2010). In community members' own words, "hidden demands," often hid in small print of the written word, thus unwittingly giving oneself and one's community over to government reprisal, land grabs, and limitation of social and economic and liberties in Mbeere.

The consenting process was lengthy and guided. Firstly, it involved relaying the contents of the form in their entirety to translate into local context. Secondly, with potential interviewees following along on their own copies the researcher would read aloud question to question, with pauses to for questions and written responses.

Despite these safeguards to bolster recruitment of fully informed and consenting participants, many consenting forms were returned with incomplete responses, e.g., a checkmark to indicate awareness that the participation was voluntary, optional and not required in full; that they had agreed to participate, that they knew they could leave the process at any time for any reason, without explanation and with full compensation where relevant, per agreement on the consent form; etc. When assessing written responses on consent forms (per protocol in the initial written consenting process) we took impartial responses and/or irrelevant answers to be a passive form of non-consenting, possibly resulting from perceived pressure to participate for various psychosocial reasons such as the presence of paper-based consent forms, presence of a person who had invited them to the event, and other expectations not immediately evident.

Fifteen (15) community members approached during the paper-consenting period fell into this group, either due to lack of response to written consent forms or due to community members being suspicious of the fliers that served as an invitation toward participation, or because they had given irrelevant answers to interview questions prompting for demographic data and did not meet the parameters, for example some market town participants did not identify with Mbeere in any way, simply visiting on a market day to buy and sell.

Not surprisingly, transients were readily willing to be interviewed, in contrast to resident community members. Indigenes in particular placed greater priority on trust over remuneration and were reluctant to sign consent forms or offer information. This contextual challenge was brought to the attention of the Internal Review Board (IRB) at the University in Maryland, and permission was granted for oral consenting in the adaptive phase of the

research. These members are not counted in the 226, because they were not successfully recruited.

Once we stopped issuing consenting paper forms, questions of consent became moot, with the result that we thereafter encountered little challenge in successful participant recruitment. The oral consenting process was no less lengthy. It followed the same script in the written consent form, but it was delivered orally, with responses also sought orally. The conversational tone of this process allowed for discussion, alignment with local privacy and communication protocols, and tacit weeding out of non-consenting members, bolstering trust building. One such example took place at the start of a predominantly female talking circle in Kĩambeere. It became clear that two community members who were guests of our hostess either did not fully understand the consenting process or they were unsure about their decision to participate in the talking circle. As it was not possible to exclude them from the talking circle due to social dynamics (talking circles took place organically around the rhythm of life in the village, such as mealtimes), the researchers conferred to the side and diplomatically agreed that, while we could not ethically recruit these community members into the study, out of respect for our hostess and her guests, it was best not to disclose the decision to the rest of the talking circle.

Tact required that any potential contributions of the guests be acknowledged during the session, and that they be compensated along with other participants. However, in our field study notes we were careful to note that any potential data from them could not be used, according to which they were not counted in the total. Notified of their right to choose to participate and unwilling to either give consent or leave the circle, the guests were tactfully informed of the researchers' responsibility and decision. The task was performed by the

Senior Research Assistant, to avoid loss of face or compromise to the circle, in which the guests remained throughout the proceedings.

Due to the tact exercised by the research team, the two community members reciprocated with equal tact, refraining from offering opinions in direct response to interview prompts. The result was that neither party was unduly compromised. In my view, this example points to the strength of the talking circle method. Conversational patterns of taking circles are similar, whereby members who are knowledgeable in the topic at hand organically take center stage. The rest of the circle accords respect to the experts, and forms an interactive audience, corroborating or challenging the primary data being shared by the experts.

It is therefore entirely natural for non-consenting members such as the guests, to passively participate in the social aspect of the circle, whilst not participating in the researcher's data collecting, which is also a latent aspect of the talking circle. The researcher, if well practiced in the method, is but one participant. This requires using nonintrusive methods to record the data, such as a digital audio tape or a phone that can be unobtrusively set amongst teacups, glasses, and snack bowls.

Another incident was regarding data offered by one community member in Ishiara who claimed to have found a way to extract and reduce the active ingredient in mīraa in a home-made laboratory. The research team could not corroborate his claims. I have neither used his data nor added his name to the participant count. Upon further investigation, it turned out that this community member had given consent in the hope of attracting a sponsor for his mīraa project, a result of misunderstanding our research goals.

As is evident, challenges of recruitment were greatly reduced by use of the oral consenting, and by switching from individual interviews to talking circle method, which also supported corroboration and interrogation of data, thus increasing research rigor and validity of collected data. Oral consenting was guided by the following protocol:

As much as possible every attempt is made not to appear as the outsider who is an expert and who is interrogating community members, to avoid two loci in the circle (one being outsider based, thus creating an in vitro rather than in vivo experience). This is especially true when Elders are part of the encounter. The researcher takes the stance of learner. As well, the researcher is prepared to give and to receive gifts (after passing this through the institutional IRB for approval before undertaking the research). Researchers will spend some time establishing their credentials through reciting family trees or learning how to do it properly in an impromptu, unsolicited lesson from Elders. (The context of credentialing differs if the researcher is an outsider, when the need to establish that no harm will arise, and that the community will benefit from the encounter is of more moment. In all cases a 'gateway' researcher is essential for relationship building, ideally this researcher resides full time in the community.) In our case three research assistants are the gateways into the community and provide enough of the credentialing ahead of time to get us an audience but not so much that it will not be required on the day of the encounter. The steps roughly followed this protocol:

- Wait to be introduced by a gateway researcher.
- Participate in establishing connections by reciting family tree, remembrances, and teachings, as the context dictates.
- On signal from a gateway researcher and from community members, begin asking questions orally (try not to read anything off a paper or screen, but commit questions to memory as much as possible. Be flexible enough to let the conversation meander into unexpected directions, especially accommodating Elder stories and personal histories. Make every effort to go through all outlined questions but give room for asking less of the outlined questions and listening more than speaking.
- Exchange gifts as appropriate, taking cues from hosts and knowing-others.

Figure 3-A: Oral Consenting

3.2.3 Compensation

Along with the indigenous centered oral-based consenting plan was permission from the IRB for the study to proceed with indigenously acceptable forms of negotiation and collaboration. I detail this aspect of indigenist research here because it is a much contested area, especially by non-indigenist researchers. Indigenist researchers compensate community members out of respect for their time and knowledge (Bang, 2012; Bidwell & Winschiers-Theophilus, 2015; Chilisa, 2011; Smith, 1999, 2005; Warrick et al., 2016b). From 2015-2017 we compensated community members at the rate of Ksh1,000-3,000 Kenya shillings ($10.00-$30.00) depending on duration, type of contribution, and availability of funds. Elders fell on the highest end of the compensatory scale. Depending on duration and complexity of task, a fee was agreed upon by mutual consent between myself and Research Assistants. Over the 5 year lifetime of the research, as team members they were compensated between 5,000 and 30,000 Kenya shillings ($300) for varied duties, and additionally compensated on the same scale as other participants, each time they were in the role of active participant either during a talking circle or during field observations.

Further, the survey tool included an incentive of Ksh2,500 ($25.00) to participate in the form of a random raffle drawing. The raffle was conducted periodically throughout the period that the survey was posted on the Rikamedia. Members were given an option to share their Mpesa (mobile money) number. This Mpesa mobile number was only used to send money in the form of Mpesa transactions to the 15 members who won in the raffle drawing. M-Pesa numbers were given anonymously whereby only digits could be entered in the response, and thus winners remained anonymous.

Beginning 2018, monthly project meetings and collaborative efforts were underway, according to which we mutually addressed and adjusted expectations: the projects were

community originated initiatives to which the research had been invited to participate and document, hence at this time I considered my contribution to be primarily geared toward our mutual goals. These efforts propelled me toward a non-profit initiative, Integrated Stewards Systems (ISS), from which to capacitate the group's initiative and further articulate a research and practice framework for my own continued interest in the community group's projects. Despite uncertainty surrounding project ideation and implementation, the group's ecological and business ambitions functioned as a beacon toward which we defined mutual long term goals.

Group members participated in many community initiatives that I was sometimes aware of, but which ISS was not a part of. There were two projects where our mutual goals intersected: a micro-pilot reforestation project with bamboo, and a self-fundraising effort designed to run the length of the micro-pilot, with the goal of supporting expansion at the conclusion of the pilot phase. The group envisioned that such capital may be used toward the purchase of seedlings, farming equipment, or perhaps to make a down payment on a farm at a future date.

Toward the group's micro-pilot, ISS contributed the monthly data collecting effort on citsci.org requiring a $20 monthly tab from the group, to compensate the member who had been designated the data collector by dint of his professional interest in information technology. Although citsci.org is a free data management service, the data collector used public transportation to travel from site to site, three of which were isolated. Additionally, funds were needed for airtime (prepaid internet) for data uploads. The data collector was also given a small stipend for lunch hydration during the all-day excursion. All expenses considered, $20 per month to support data collecting appeared to be good value for money.

Toward the group's self-finance investment project, ISS did not participate in the investment activities. In its capacitating role, ISS contributed a share of the seed funds, and committed to a further monthly contribution of Ksh300 ($3.00) to pay the subscription fees for the group investment account. This was to be a safeguard for savings accrual and any interests that may compound on the account.

In 2017, group members had conducted an eight month market research before deciding on bamboo. In 2018, ISS needed a third-party assessment, presenting a neutral report on the feasibility of the project that could form decisions for ISS and iCitSci as well. I therefore commissioned, on behalf of ISS, a business proposal from a business consultation firm located in Nairobi, where one of the directors was on the Rikamedia leadership team. I also solicited his firm's support in transitioning iCitSci to an online investment platform for its self-financing project. The latter was used as a two-day workshop which also doubled as a means by which the group could participate in offering data, insights, and local context, to inform the proposal writing that was underway. Due to relationships, I had established with the director during the time I worked with Rikamedia leadership team, the firm worked pro bono, accepting only the offer to cover meals, transportation, and administrative costs of materials.

Lastly, beginning in 2018, ISS reduced compensation to elders from $30 to $20 per member checking session each. There were several reasons for this change. Firstly, the $30 amount predated ISS, had been grant-funded, time bounded, and as such had expired at the end of 2017. ISS could not sustain the higher amount in compensation. Secondly, we had switched from initial data collecting in talking circles and elder consultations to targeted member checking sessions. These were shorter, and besides, they were focused on fact-

checking the findings of existing research, rather than soliciting the elders own accounts and interpretations, as in the accessive phase. Adjusting compensation in consideration of ISS's current capacity appears to be fair.

I deliberately outline these costs to illustrate that although compensation should be accounted for at the start of the research process, there is room for negotiation. The realities on the ground shift constantly as new insights are gained by the community and the researcher, giving rise to new goals and objectives. Within reason, flexibility is called for. However, once expectations have been established over time, care should be taken to sustain the expected compensatory framework, as it then acquires a motivational role and besides, factors into trust building.

3.3 Data Collecting and Interview Design

Data collecting started with individual interviews and progressed to talking circles, data extraction on social media, survey tool and project documents. Next, I give a detailed account of data collecting methods.

3.3.1 Conversational methods

Individual interviews and talking circles took place in five locations that were chosen to provide a cross section of the community in Mbeere. The following list involves only those sessions in which original data collecting took place from June 2015 to December 2016. Subsequent to the listed sessions, we conducted numerous other talking circles, WhatsApp calls, group chats, and monthly meetings from January 2017 to December 2018, when I started to integrate with the community's lived experiences. Additionally, from July-October 2019, we conducted a battery of intensive talking circles with elders to increase data validity.

Additional talking circles were held in February and April 2020, to update the data due to an unexpectedly prolonged period it took to revise this work for submission.

- Ishiara, with eight individual interviews and eight talking circles
- Gacoka\ and Don Bosco, with twelve individual interviews and two talking circles
- Kĩambeere, with five talking circles
- Kĩamũringa, with one talking circle
- Nairobi, with one talking circle

The objective of talking circles after 2016 was three-fold, to corroborate prior collected data on rika, check the validity of my interpretations of the information they had given me prior, and to collect new data as the team learned to ask better questions. We used a mix of WhatsApp and talking circles to implement these exercises, which in at least 4 talking circles involved textual analysis of about rika published in prior research.

An important part of the indigenist research protocol is talking with elders. We focused on asking questions about their perceptions of the environmental concerns we had identified with other community members. We additionally asked questions to elicit their thoughts about stewardship principles and practices, and any indigenous information they may have to share that could help inform their activities, which might not be obvious to us. Figure 3-B depicts our first two talking circles in 2015. On the left is a mixed age talking circle and on the right is a group of elders in their mid-70s.As it turned out, they were some of the youngest elders we were to interview in the course of the research.

Figure 3-B: Demonstrative talking circles. Mbeere South, 2015.

In Figure 3-B, we have already moved away from individual interviews and into talking circles. However, even in the talking circles, at this early stage initial interview protocol was semi structured and we asked about community members' concerns around the environment, what they did to alleviate those concerns, how they used their phones, possible contribution of data or information using the phone, possible organizations they worked with, possible roles they played, and any perceived barriers to using their mobile phones every day or for environmental reasons. Research protocols for conversational methods in the early phase of research are available in Appendix C-E.

Data collecting took place within five areas and were spread out at multiple locations. The five areas roughly covered the residential areas of Mbeere from North the South, excluding the Game Preserve. They were from North to South: Ishiara, starting at the border of Chuka and Mbeere on Thūchi River, Ishiara proper, canal scheme, Kīambindu and Kanyuambora; Gachoka, starting from Rwīka towards Don Bosco, Ngenge, and Kĩrĩtirĩ; Kĩambeere including Mūtuovare, mariūko on Thiba River (watering stations); and the

hydroelectric dam properties located on Mbeere ancestral lands; Kĩamũringa, including Mbita area; and lastly, Nairobi. Circles were composed of five to eight members on average.

The setting was predominantly rural, with sessions taking place at the farms and homes of community members, except for Ishiara and Nairobi. In Ishiara, a vast and uniquely local outdoor local restaurant on the outskirts of Ishiara village market served as a regular meeting place. In Nairobi, the talking circle took place in an office at the city center, on Tom Mboya Avenue. All talking circles took place outdoors except in Nairobi. Customarily, the people tend to spend most of their socializing hours outdoors when they are not at their present-day jobs.

Many talking circles took place during periods when I had returned to the US, especially member checking exercises. During these sessions, I participated remotely using WhatsApp video chat. Research Assistants were physically present at each of the sessions. Once community members were settled in a single location, conversations were recorded on smartphones and photos taken where appropriate after seeking consent from community members.

By the end of the initial data collecting period, talking circles emphasized consultation with elders, However, the attendance included a mix of elders and younger community members who were not elders. There were times younger family members or interested neighbors sat in on the conversation, besides which the research team was composed of younger and middle aged members, Traditionally, elders are defined as those who have passed childbearing age and whose children's children are initiated (loosely, grandparents with circumcised grandkids i.e., older teens, are elders). However, after an initial attempt to quantify participant numbers based on these parameters, I decided it would

be more effective to let the community members define themselves to us as elders. In tallying the ages, we found that those who had defined themselves to us as elders also reported that they were over 75 years old in 2015. This would make them 80 years old in 2020. A majority of those we consulted repeatedly were aged 85 years and older. Several were more than 100 years old.

A talking circle with Rikamedia site administrators was necessary to seek permission to post an online survey on the site, extract data from the UVA Facebook group, get questions answered and perhaps even negotiate mutually beneficial probes of UVA members that could be incorporated into the survey.

I did not intend to collect data at this meeting but rather to conduct a relationship-building exercise to facilitate data collecting and engage community members as stakeholders in the research. FB Group is a closed environment, understandably administrators of different sites on the ecosystem are cautious about granting permission for data use without a clear understanding of how the data will be used and members protected.

Per IRB requirements at the University of Maryland, I drafted a letter, the contents of which guided the meeting protocol in December 2016 (See Appendix K). I did not intend to present the letter in writing but use it as a guide for our conversation. The intention, which was conducted as such, was to ask for permission orally and have the consent granted orally. As mentioned earlier, one of the lessons to come out of our accessive study was that paper-based calls to participation and requests for signed consent paper are met with reasonable skepticism in Mbeere.

A Protocol for Member Checking, 2015.

Determining environmental values and strategic action towards the environment.

1) So now that we have talked about things we value in our lives, let's have a chat about some environmental challenges that come up around us. Are we talking about them on social media? What do we do about these challenges?

2). What are we doing and talking about with regards to water? What are others doing?

Determining relationship between livelihood priorities, environmental values, and social media use.

3) How do we make our livelihoods? One imagines cell phones play a big role.

4) Could you describe some of the things you do on social media and if they support your livelihood?

5) Looking at how we use social media, are there connections between our business and professional activities and how we tend the environment in Mbeere?

3.3.2 Data extraction

During one of the talking circles with millennials in Ishiara, community members guided us to their social media spaces, where I called up data using APIs on Facebook, on UVA: Universal Voice for All, the seminal group of roughly 4,500 members, MBEERE-POLITICS Mbeere with approximately 5,000 members.

The API used to call up data were Netvizz (now defunct), Sociograph (later severely limited by Facebook's data policies) and Graphml, which appears to be operational as of this writing in 2020. WhatsApp became increasingly more important over time, and we found our observations increasingly shifting between Facebook and WhatsApp chats. Hence, the team manually coded WhatsApp group chats dated 2017-2019 and representing project communications. Lastly, transcripts with conversational data from talking circles and individual interviews were coded into adjacency lists for visualization. The idea was to

determine overlaps between Place and social media, and to establish key actors within emergent clusters.

3.3.3 Survey tool

With a goal of finding out what motivated the community toward participation on UVA, a survey tool was co-designed with the community in several stages, over the course of four months. The questionnaire built on a survey tool designed by Dana Rotman in her 2013 work on motivations towards participation, in her study of biodiversity citizen science projects across the three countries, USA, Costa Rica, and India. (Rotman, 2013; Rotman et al. 2014).

In this research, we used a modified version of the Rotman Survey to inform the second research question, 'what motivates engagement in environmental stewardship?" We expected the survey to also broaden our participant base. We also expected the survey to answer questions on motivation that talking circles may not have addressed. The following processes were used to inform modification of the Rotman Survey on motivation towards participation tool that will be used in this study, in a process that I have termed indigenization, that is, modification for contextual relevance. The following informed the indigenization process.

- from the accessive study in this research, which suggested that there was need to learn more about indigenously motivated participation and indigenous use of social media platforms.
- Guidance from Chilisa's Indigenous Research Methods framework on how to indigenize survey tools (Chilisa, 2011: 28-31, 55)
- Member-checking with the community researchers, who provided guidance about suitability of language, perceived intent, and other matters regarding ways of knowing and being, such as gender references.

- Two pilot studies, one carried out for one month in October 2016 with five community members in Place who were also members of the Rikamedia. A second pilot was undertaken in January 2017 with the same team.
- Co-design activities with Pathfinders, which included an in-person meeting in Nairobi in December 2016, followed by several iterative testing and design sessions facilitated by calls and chats over WhatsApp.
- These pilots were guided by all three community researchers, under the supervision of a highly experienced community researchers.
- After my 2015 and 2016 one-month stays in Mbeere, I returned to the U.S. Thereafter, communication between us was facilitated by WhatsApp, email, and phone calls.
- These steps were necessary to indigenize the tool, increasing its utility to the community. Chilisa (2011) suggests that survey tools be used sparingly if at all, and then always indigenized, that is, adapted with consideration for local protocols from various dimensions. Quantitative indigenists Walter & Andersen (2013) relax this earlier guideline, stating that the problems indigenous communities and indigenous researchers have historically associated with quantitative tools like survey have been problems of association, not one of efficacy.

Quantitative tools have been misappropriated to present negative and marginalizing narratives. Rather than reject surveys, the indigenist researcher approaches the tool with the intention of service to the community. According to Walter & Andersen (2013), the intent to serve is more important than the actual tools chosen. Based on this guideline and through the above steps, the survey tool was indigenized (contextualized) to ensure that the questionnaire was in line with local needs as well as respectful of indigenous information sharing protocols. The indigenization process tested for usefulness, tone, and perceived possible usefulness for the community.

Simultaneously with the indigenization process just described, the survey was optimized for social media using Survey Monkey optimization tools. This is the ability of an interface to scale its features up or down based on the capabilities of the participant's device. Optimizations were necessary because we had found during the Accessive Study that those who reported being members of the Rikamedia overwhelmingly owned smartphones;

however, they used a wide range of devices, from the most basic smartphones made for the local market, to sophisticated global standard Androids and iPhones.

We had also found that access to cellular data varied greatly, with many community members purchasing data in "bundles," that is bandwidth capacity that is bounded in time. For example, one common bundle that was on offer yielded 30 minutes of use. Time and bandwidth were considerations for some of our community members and, therefore, key reasons that we needed to ensure the survey could be taken, on average, in 10 minutes or less.

With considerations for indigenization and technology optimization in mind, the survey was piloted multiple times with different groups, on different kinds of devices, networks, and varying "bundles" or bandwidth capacities. After the survey had passed the tests on cultural literacy, relevance to the goals of the Rikamedia and the community in Place that UVA was a part of, readability, and scalability of technology features (hence no crashes, no loss of prompts or data inputs regardless of device used) with the above considerations in mind. Most respondents took eight minutes or less to respond to the survey. We dubbed it The UVA Survey, to reflect its target sample population.

The survey was administered online only, as a user post on UVA, in March 2017 after a two-month piloting period in January-February. Based on background literature (Chilisa, 2011) and drawing from experiences with the consenting process during the Accessive Study (Warrick et al., 2016a), a paper based survey would have been inappropriate to the context. A link was posted on the Facebook Group UVA, with periodic reminders over the course of two weeks, for members to respond to the survey. In the Rotman Survey, Rotman spoke to individual volunteers of citizen science projects in three countries across the globe, intending to find their personal motivations towards participation. In the research at hand, the Rotman

Survey has been adapted and is referred to throughout this work as either the UVA Survey, social media survey, or as the survey. In this work, when the term "the Rotman Survey" is used, it is used in direct reference to concepts or content that is originally contained in the original survey as delineated in Rotman's 2013 work, the findings of which are additionally reported in Rotman et al. (2014).

***Method*: Online survey**
(Note: Within this box, A) contains protocol; B) contains the final posted survey.**)**

A) Protocol used to adapt and develop questions for UVA Survey

Purpose:

- Expand participant base.
- Make links between use of various social media technologies and motivation toward participation.
- Make links between UVA strategies and motivation toward participation.
- Make links between perceptions of Place and motivation toward participation.
- Expect to increase female participation.

Introduction, instructions, and disclaimers

Determining the demographics of the Rikamedia.

- What is your age?
- What is your gender?

Determining motivation over time.

- How long have you participated on UVA?

Determining geographic situatedness of members of the Rikamedia in relationship to Place (location).

- Please tell us where you lived when you joined UVA.

Identifying clusters or small worlds in the Rikamedia (use of various technologies by different groups).

- How did you first hear about UVA?
- Are you a member of other Mbeere Facebook groups?
- If yes, which other Mbeere groups do you belong to?
- What other modes of communication do you use for community activities (WhatsApp, Twitter, face to face, etc.)

Determining motivational impact of ability to control access and privacy on social media.

- Should UVA remain a closed group?
- Why do you think it should remain closed or why do you think it should not?

Determining intrinsic and extrinsic motivations.

- On UVA, what conversations on UVA are of greatest interest to you?
- On UVA, what kinds of activities do you currently participate in?
- What motivates you to participate on UVA?
- What is the most important motivation for you to participate on UVA?
- Are there other activities you would like to contribute to or see others contribute to on UVA?

Determining prioritization of sector level integration with government, donor, and private macro institutions.

- The following nine sectors have been identified [...]as a blueprint for community development in Mbeere. Please tell us which items are [of] priority to you by checking Low, Medium, or High Priority. (Sectors listed: Water, Agriculture, Education, Infrastructure, Health, Economy, Governance, Social Services, and Environment)

B) Final version of UVA Survey as posted on social media

Q1. What is your age?
Q2. What is your gender?
Q3. How long have you participated on UVA?
Q4. Please tell us where you lived when you joined UVA
Q5. Which part of Mbeere do you predominantly identify with (either by having been born there, living there, working there, or going to school there)?
Q6. How did you first hear about UVA?
Q7. Are you a member of other Mbeere Facebook groups?
Q8. (Optional) If your answer to the previous question was yes, which other Mbeere groups do you participate in? Please be very specific with group names or hashtags.
Q9. The following questions will ask you about your direct participation in activities that have been previously initiated on UVA or by UVA members. Please select responses that most closely describe your level of participation in each type of activity.
Q10. When I am on UVA, I feel connected with...
Q11. My involvement on UVA promotes...
Q12. The most important motivation for my participation on UVA is: (You may have more than one strong motivation for participating on UVA, please choose the one that most closely represents the strongest reason you participate, rather than one that you feel should be the reason you participate). Answers are anonymous.
Q13. The following items have been identified by UVA Admin as a blueprint for community development in Mbeere. Please tell us which items are priority to you.
Q14. These are activities I would like to see/contribute to on UVA.
Q15. What other modes of communication do you use for community activities?
Q16. Should UVA remain a closed group?
Q17. Thank you for participating in the survey. We will keep your responses anonymous. If you would like to be entered in the draw for one of 10 random prizes of Ksh2,500 (two thousand, five hundred shillings), please provide us with a cell phone number that is Mpesa enabled. Your choice to participate in the draw is entirely optional and will not influence our handling of your survey responses in any way. Please be aware that once sent, mobile money cannot be recouped from Mpesa, therefore, we are not liable for any mistakes that occur during sending. It is your responsibility to ensure that the number you provide is correct and that you have access to it and to the money. We will not send additional funds if you discover that you gave us the wrong number or that you no longer have access to the number you originally provided. Your entry will remain anonymous. Please be assured that we will not share your number with others. Winners will be notified immediately after the close of the survey is announced on UVA. (Answered by 89 members; skipped by 26. The answers to this question were decoupled from the rest of the survey responses as a first step after the survey closed. Mpesa numbers could not be linked to survey responses during analysis. This preserved anonymity of participants.)

Protocol 1 UVA Survey after adaptation with community

3.3.4 Field Observations

The following questions guided notetaking when field observations were made at village level. Additionally, they guided observations of community projects when these started to emerge. These questions secondarily answer provide for identification synthesis and analysis of social structure, motivations, and strategies; hence notes taken during field studies did not go to answer a separate research question. They were also used to as means of breaking down the overarching research questions for purposes of coding the data generated from talking circles and other collected data.

Field observation guide

1) What is the activity?
2) How many community members are involved?
3) What are the genders of those involved and what roles do they appear to be playing?
4) Is this a volunteer type effort or one that supports a livelihood, or is there a profit-motive (Livelihood activities such as farming do not always have a profit-motive, can you tell the difference?)
5) Does the activity primarily help others or the one who is engaged in it?
6) Is there use of tools? Describe.
7) Are any of the tools technological?
8) Which technology devices are being used?
9) How is communication happening?
10) Is social media being used?
11) How long/often does this activity occur?
12) At what stage did you find it?
13) What is the process—describe the process.
14) What is the expected outcome?
15) Who benefits from this expected outcome?

Protocol 2 Field observation 2016-2020

The table below depicts how data collection addresses research questions. Methods used for a research question are marked with X. Those used primarily are marked three XXX. Those used contiguously are marked with a single X. Methods with blank cells were not used for that question mark, e.g., semi structured interviews were only used for RQ1, and only contiguously.

Collection Method / **Research Question**	Semi structured Individual Interviews	Talking Circles	Data Extracted From Social Media (user posts, comments, likes, searches of topics).	Passive Field Observations	Active Observations (collaborative work in community originated projects)	Social Media Survey (UVA Survey)
RQ1) What are the underlying structures that support environmental stewardship in an indigenous community with place-based and social media approaches?	**X**	**XXX**	**XXX**	**X**	**XXX**	**X**
RQ2) What motivates environmental stewardship in an indigenous community with place-based and social media approaches?		**XXX**	**XXX**		**XXX**	**XXX**
RQ3) What strategies drive environmental stewardship in an indigenous community with place-based and social media approaches?		**XXX**	**XXX**	**X**	**XXX**	**X**

XXX *Principal data collecting method*
X *Ancillary data collecting method*
☐ *Blank cell: method not used or not enough data to answer this question.*

Table 3-A: Research Question To Data Collecting Method

3.4 Data Analysis

Data analysis used a mixed approach. Data collected 2015-2016 used deductive coding to characterize the indigenous community as an iWorld engaged in environmental stewardship, based on seven codes from the Theory of iWorlds that adhered to the seven concepts of iWorlds as stipulated in Jaeger et al. (2014). These are norms, values, social types, information behaviors, boundaries, bridges, and access. The concepts are discussed in depth in Chapter 2 on the literature search. From this process, three overarching themes, structures, motivations, and strategies emerged. These themes became foundational to forming the three research questions from which the accessive study ensued in the fall of 2016.

Starting in the fall of 2016, all data was first coded in an in vivo coding process using indigenous terms, i.e., the actual words of participants. Emergent in vivo codes were then categorized, and the categories were added into the thematic codebook. The three

overarching themes were on the three research questions with which we re-entered the research space in 2016.

In a third pass at the data in 2019, an elaborative process was used to compare codes across all three studies for development of theory (Saldaña, 2016). It was at this point that rika emerged as an overriding idea that connected the three different types of studies. This finding suggested that rika was a resilient norm of Place; hence, I incorporated the code Resilience into the thematic codebook. There was already an existing age code. I continued to use the age code to parse for evidence of rika in the data and determined that there were more dimensions to the intergenerational aspect of stewardship than my original research design had assumed, based on an initial finding from Warrick et al. (2016a) that there were two loci in environmental stewardship based on differential access, elders in Place, and millennials on social media.

3.4.1 Thematic Analysis

During the accessive phase, the primary goal was to uncover the information world, with the clustering effect that Jaeger & Burnett refer to as small worlds, or social groupings that are identifiable by their shared concerns, norms, values, and information access, and within which the use of technology on the device may possibly differ. We hoped that these groupings, once uncovered, would offer us a pathway through which to examine ways in which the community was using mobile technology to participate in environmental projects in the area.

Deductive (thematic) coding was applied on various data at the first pass (Miles et al., 2013). This included interview data from individuals and talking circles, and content from

the Facebook Group UVA, some of whose members had taken part in two of the talking circles. We began the coding exercise in 2015 with a deductive process that used themes extracted from the Information Worlds Theory as our framework. From this framework, a codebook with 21 codes emerged, including norms, values, types, behaviors and boundaries, bridges, social types, access levels, value, behaviors, boundaries, and bridges. These were the codes used to carry out thematic analysis in 2015.

The following datasets were coded using this process:

- Individual Interviews
- Talking circles,
- User posts on UVA

After categorizing the themes that were emerging from using the 21 codes taken from the Information Worlds framework, broad themes emerged. The first theme was that this community had a unique approach of engagement separate from the citizen science, environmental, or conservation projects in the area, an approach akin to environmental stewardship that was tied to their information sharing values and practices. It was also clear that in this community, those with mobile devices seemed to practice environmental stewardship differently than those without devices. However, there was a need to find out more under these broad themes that were emerging.

3.4.2 Indigenous coding

In 2016, I adapted data analysis so that new datasets were first subjected to indigenous coding. In this grounded theory approach (Saldana, 2016) I would first generate a list of indigenous codes from the data, classify these meaningfully, and then use them in an

elaborative coding process, described in the next subsection. Indigenous coding is the application of indigenous words of participants to analysis of their responses to interview questions. I first came across the idea while in the process of adapting research design based on initial findings of the field study in the previous year, I came across the 2014 reprinting of Saldaña's book on coding for qualitative methods. (I subsequently switched to the updated 2016 edition in the same year; hence citations in this work are based on the 2016 edition). The author used the term in vivo coding. He explained his use of the term in vivo as deriving from the Latin term in vivo which means, "in that which is alive" (2016, p. 105). He posited that local context had its own taxonomies, categories, and themes, and that these were best uncovered by using the actual words of participants. In so doing, the researcher could capture contextual ways of knowing and being.

Saldana suggested that coders who used the actual words of participants as codes were able to identify commonly occurring keywords that could then be further refined into categories and themes. Through this inductive process, which Saldaña synonymously termed indigenous, literal, or natural coding, the researcher could generate a set of "indigenous codes." These codes could then be applied to data analysis in conjunction with thematic codes. Saldaña credited this method from earlier work by Levi Strauss (1968) on Grounded Theory (Saldaña, 2016, p. 105-110).

I began by testing the idea on a single transcript, with data collected in 2015. After I had coded the data using the words of participants, I shared my process, codes, and findings, with two colleagues, who made two separate passes at the same data, confirming my initial findings. Both were PhD students in the department of Education. They were not part of this research and had never seen the transcripts before, nor did they discuss any aspect of the

process with each other. Their purpose was one of verification. Their independent validation of my findings bolstered my confidence in the process, and I subsequently adapted my data analysis plan to incorporate indigenous coding.

For illustration, the table at the bottom of this subsection shows how the indigenous coding process facilitated discovery of contextualized patterns of motivations and strategies used to address environmental and stewardship needs. Attitudes towards self and others as stewards also emerged at this early stage of the coding. For example, as seen on the coding of the excerpt in left column of the table below, we learn from that government neglect has motivated the community to look after an irrigation scheme that was initially a government project. Moving to the middle column, we encounter indigenous codes derived from his actual words, such as, "government has ignored." This excerpt is part of a long transcript from a two-hour conversation, and these codes form part of a larger pattern of government neglect, which first reveals itself in the words of Njeru when used as codes. Therefore, I place them under larger codes deriving from patterns. One of these pattern codes is, "inadequate government support." We can see that the government's inadequate support of local irrigation schemes resulted in the need for self-reliance, and the locals have thus taken over the running of the schemes. It appears significant that a pattern of government neglect resulted in a needs-based strategy. We therefore categorize any codes suggesting patterns of government neglect under overlapping categories including, "strategy" and "motivations."

Excerpt from talking circle: "Okay irrigation schemes there's like the Ishiara-Kathĩgĩ irrigation scheme. Okay before it was a government project, but now it's like the government has ignored everything about it so, it is being done by individual members."			
Excerpt example	**Indigenous Coding (Inductive)**	**Pattern Coding (Deductive)**	**Categories (Themes)**
"Okay irrigation schemes there's like the Ishiara-Kathĩgĩ irrigation scheme. Okay before it was a government project, but now it's like the government has ignored everything about it so, it is being done by individual members."	- "Ishiara-Kathĩgĩ Scheme" -"Government has ignored" -"done by individual members"	-NAMES OF LOCAL IRRIGATION SCHEMES -INADEQUATE GOVERNMENT SUPPORT -SELF RELIANCE	-Place based projects -Arising need -Motivations -Strategies

Table 3-B: Generating Indigenous Codes

Though limited, data from this excerpt is nonetheless adequate to demonstrate how a conclusion may be reached that villager needs for water to irrigate are closely tied to their motivation to run the local irrigation scheme called Ishiara-Kathĩgĩ. Furthermore, we deduce that they ran the scheme as a strategy to meet the need to mitigate against the government's failure to maintain Ishiara-Kathĩgĩ. Talking circle transcripts are long and rich in information such as seen on this short excerpt. As it turned out, the themes suggesting themselves in this single statement by one member turned out to be shared by a majority of those interviewed. Thus, this method of coding allowed us to arrive at new themes such as Place, projects, motivations, needs, and strategies of practicing environmental stewardship in this community.

As I became more familiar with the research context, I learned that of itself, indigenous coding was not enough to give breadth to my deepening understanding of context, without which the relevance of emergent findings remained elusive. For this, I had to turn to elaborative coding, discussed in the next subsection. I viewed Njeru's account differently subsequent to the finding that social ecological principles of rika had a motivational impact on stewardship.

In later interpretations of data on projects, I took a much less dichotomous view of Place and social media, regarding approaches not so much as need based versus altruistic, but rather as scales of participation within structurally defined roles. In the next subsection I present elaborative coding. Following on that, I present an example of coding toward the development of theory, whereby I used indigenous codes in an elaborative process to arrive at findings presented in chapter 4 on typology and functions of rika. This was one of the processes of data analyses that centered this work in resilience thinking.

3.4.3 Elaborative coding

Saldaña (2016) suggests that using elaborative coding at the tail end of data analysis is especially useful to researchers who intend to expand on theory. To paraphrase Saldaña, elaborative coding is a phased process involving comparative analysis of studies undertaken in the same context and intended to facilitate refinement of theory. A minimum of two studies are needed, with three or more being ideal. With at least two studies undertaken in the same context though not necessarily using the same participants and methods, the researcher subjects the first study to textual analysis, using findings as a source of thematic codes. This set of codes, generated from findings of the first study, is then applied in analysis to data of the study in progress. New realizations are expected to emerge from this method. The idea behind elaborative coding is that the researcher is expected to leverage insights gained from the second study, in order to understand existing findings in a new light. New insights will be reflected in the data. Participants and/or the research context could also have changed in subtle or significant ways, which will also be reflected in the data.

These developments in the data will inform the codes derived from findings of the first study, resulting in new insights, deeper understandings, perhaps even articulation of a new focus in research design. The researcher will adjust the existing theory to reflect new insights. Whilst it is not necessary that completed studies be published, the researcher must have generated a set of findings from these studies, as the value of the process lies in comparing existing findings with new data to gain insight.

In my own analysis, I followed Saldaña's process very closely, with the exception that I started the process by developing a codebook from the findings of Warrick et al (2016a), which I used to adjust research design. The findings and conclusions of Warrick et al were largely heuristic, albeit the key recommendations of the paper proved apt and even prophetic. The paper described the influence of access on archetypal environmental stewardship behavior in Mbeere at the intersection of Place and social media, and it additionally opened the context to unanswered questions regarding indigenous structures, motivations, and strategies that supported the observed environmental behaviors. To close these gaps, indigenous and elaborative coding were potentially actionable methods that I could adapt interactively with each other to align research design more closely to indigenous context.

For my first study, I coded findings of Warrick et al (2016) at the time a paper in submission, accepted for publication by the Association of Computing and Machinery (ACM) subsequent to presentation at the 2016 Human Computer Interaction Conference (Atrichia) in Nairobi. Data analysis of this paper was based largely in the theory of iWorlds and informed by findings of Rotman et al about motivation toward participation in citizen science across the globe, which had included projects using indigenous volunteers. Warrick et al had largely brought insight into how research may, after thematic application of codes derived from 5 concepts that define an iWorld, conceptualize the indigenous community as an information world.

The paper has proved prophetic in some ways that belie its exploratory role: Following a short-lived field work experience in June 2015, I undertook data analysis, followed by an intensive period of member checking in in the Fall of 2015 (Member

checking involves secondary data collection with new or existing participants, to validate or challenge emerging findings, thus increasing likelihood of local relevance). The latter was a remote process, made possible by constant contact with research team members in Mbeere via video conferencing on WhatsApp, a widely used social media group chat application that was just beginning to gain popularity at the time.

Distance meant that by the time I wrote the paper, I was yet to add the WhatsApp dimension to relationships forged during my initial encounter with community members. In addition, much of the data had been collected using the English language medium. By corollary conclusion, it was appropriate to develop a thematic codebook, application of which would result in universal understandings of present day indigeneity at the intersection of Place and social media. As explicated in Jaeger at al., (2010) concepts defining an iWorld are universally pertinent, i.e., norms, social types (key actors), values, information behavior, boundaries, bridges, small world concerns, and access to information on the mobile device; yet application of these concepts in local context can lead to structurally transformative insights, amplifying marginalized voices and boosting adaptive capacity by attracting partners with new ideas.

In terms of research design, iWorlds themes provided a flexible codebook that could be adapted for specificity over time as I gained in understanding. My approach to adapting for specificity was to apply textual analysis to findings of Warrick et al (2016a) in an elaborative coding process, arriving at a set of contextual iWorld concepts in the English language, initially used to determine the three themes, structure, motivation, and strategy, used to formulate research questions in 2016 and to adapt and research design so that it was centered in Indigenous language. At the conclusion of data collecting in 2019, I undertook

elaborative coding, whereby findings based in iWorld codes were analyzed alongside findings based in indigenous codes. Indigenous codes were identified during analysis of data that is presented in chapters 4, 5, and 6. An elaborative coding table can be seen below.

ELABORATIVE CODING-TYPOLOGY AND FUNCTIONS OF RIKA

<table>
<tr><th>RIKA
(participant identified and example)</th><th>SOCIETAL LEVEL, STRUCTURAL FUNCTION
(participant and researcher identified)</th></tr>
<tr><td>RIKA RĪA GŪCIARA ANDŪ
<table><tr><td>RIKA RĪRĪA ĪKŪRŪ (Constant/Coeval with human origin)</td><td>RIKA RĪRĪA ĪNINI (Metachronous/Adaptive)</td></tr><tr><td>Nyangi</td><td>Ivate</td></tr></table></td><td>MACRO LEVEL
-Overarching rika.
-Traces origins of homo sapiens to Nyangi.
-Modulates diverse stewardship duties of citizens into two ecological sectors, botanical and zoological.
-Aligns goals of industry with priorities of ecological stewardship.
-Regulates resource allocation, monitors population needs.
-May dynamically reorganize sections of population to form new national identity whilst maintaining core identity and function of Rika Rīa Gūciara Andū.
-Regionally mirrored at community level (i.e., at national level in precolonial experience)
-Fosters allied relationships between neighboring nations.
-For dynamically reorganizing Embu, Mbeere sets and models standards of practice</td></tr>
<tr><td>RIKA RĪA KĪRĪRA
Nyangi | Ivate</td><td>MACRO LEVEL
-Codify, curate, and disseminate knowledge.
-Provides continuity, links history with present day.
-Provides theoretical instruction.
-Advises incumbent leadership.
- At micro level, consists of grandparents in Mau/Cūcū learning relationship with grandchildren, considered equal peers. See Mau/Cūcū at bottom of table.</td></tr>
<tr><td>NTHUKE
<table><tr><th>LEVEL</th><th>RIKA RĪRĪA ĪKŪRŪ</th><th>RIKA RĪRĪA ĪNINI</th></tr><tr><td>Mūciarī (Parent)</td><td>Nyangi</td><td>Ivate</td></tr><tr><td>Ciana (Children)</td><td>Itherū</td><td>Nangamīguī</td></tr></table></td><td>MACRO LEVEL
-Modulates succession into governance through parent/child hierarchy.
-Parent generation hands over when Child generation "breaks away" and "becomes," i.e., assumes governance and leadership. See Nduīko below.
-Nthuke cycles are never ending.
-Only 4 named Nthuke exist in Mbeere.
-Nthuke structures not based in chronological age per se but leverage chronological age-grading for implementation at national level.</td></tr>
</table>

NDUĪKO Nyangi | Ivate Examples: Mūranja (Nyangi. Inaugurated in 1932) Kanya Ka Mbūri (Ivate, Inaugurated in 1932)	MACRO LEVEL -Occurs at a given moment in time. Historical. - Qualified for nduīko through programs ran by coalitions of clans, Īrumbī or Mūrurī. At induction members form a polity of noncompetitive government by all, as Nyangi/Ivate (*Nduīk*o has dual meaning, breaking/becoming) -All members of qualifying generation undergo induction, nduīko together and elect governing representatives among them. Governing rika assume unique name during tenure in office.
RWĪMBO Nyangi | Ivate Example: Kīvata - A dance invented by Mūranja and Kanya Ka Mbūri at commencement of its incumbency.	MACRO LEVEL -After Nduīko (above), a generation formalizes its social organization, given a unique name by the outgoing generation. The structure is informally termed, "the dance" or "the song," because its name derives from a unique music-accompanied dance that the generation invents to represent its time in history. -Individuals take on new names (titles) based on achievements or valued personal traits.
RIKA RĪA MUMO Īrumbī | Mūrurī Example: Njavani (Came of age and commenced active service during WWII years)	MACRO LEVEL -Coming of Age (mumo means, "coming out") following period of isolation & separation from Place. -A Peerage consisting of Multiple Marua (circumcision cohorts) 0-15-year age range. -Assumes unique name during period of service - Active Service in security & military. - Learn affairs of state as "government-in-waiting" -Individuals take on new names (titles) based on achievements or valued personal traits.
RIKA RĪA KŪTHURA ANDŪ Īrumbī | Mūrurī Coalitions of clans. Many njaū names of Matriarchal clans (Njaū means derivative), symbolize rika roles, e.g., Ndegi (Meaning the opposition), a clan charged with responding to status quo.	MESO LEVEL -clan coalitions in charge of administration of local learning programs in politics and governance. in charge of inductions, i.e., circumcision, Rika Rīa Mumo - Political organization - High degree of local interests -Is the Electoral Body (allied matriarchal clans elect representatives to officiate in nduīko functions as noncompetitive Nyangi and Ivate)
CIAMA (Not rika. Local implementing channels. Councils, associations, special interest groups) Example: Kīama Kiirū, The Black Council, highest level of office in civil service, attained by Akŭrŭ A Kīrīra.	MESO TO MICRO LEVEL -Councils interpret local interests within rika Principles. -Decentralized judicial and administrative leadership. - Some are gender defined
NDUNDU YA RIKA Nyangi | Ivate Īrumbī | Mūrurī	MICRO TO MESO LEVEL -formed between rika equals. -facilitates business, trade, information sharing, etc., enforces parameters of confidentiality, defines contractual obligations,

No Example: Non-disclosure precludes identifying or sharing of information on Ndundu	clarifies terms of service for legislative function, transactional purpose, etc.
ĪRUA Īrumbī | Mūrurī Example: A small set of Īrumbī males would be circumcised at Lake Mbūgirū in Siakago, Mbeere North	MICRO LEVEL -Circumcision age-sets. Members are within a 3-5-year range. -Under jurisdiction of clan coalitions

RIKA RĪA MŪNDŪ NA MAU KANA CŪCŪ WAKE

Corresponding Generations	**Nyangi**	**Ivate**	**Direct Title**	**English Equivalent**	**Rika Rīa Mumo** Induction into active service	**Nduīko** induction into governance/stewardship
Parent	Itherū	Nangamīguī	cūkūrūrū	Lost	1900 Mūranja | Ngiciri	1932 Mūranja | Kanya Ka Mbūri
Parent	Nyangi	Ivate	cūkū	Greatest	1930 Rasima | Njavani	1960 Nyangi (un-named, incomplete) Ivate (none)
Child	Itherū	Nangamīguī	mau/cūcū	Boomer and Silent	1960 unnamed	1990 None
Parent	Nyangi	Ivate	Mūciari (parent)	GenX	1990 Founded Rikamedia	2020 Rikamedia (UVAma, UVAfe)
Child	Itherū	Nangamīguī	Kamau/Gacūcū	Millennial and Z	2020	2050

my child is my parent
- Grandparent/Grandchild Non-Hierarchical Succession.
(considered equals).
-resolves generational power binaries, maximizes elder/youth resource binary; both Mau/Cūcū are equals, unlike Parent/child.
-Must share Nyangi/Ivate identity but does not necessarily share Īrumbī/Mūrurī identity.
-Imparts broad-based theoretical knowledge from an early age.
-Imparts special skills and provides opportunities for practice; prepares for professional occupation.
-Through instruction Mau/Cūcū rika integrates industry with ecological stewardship and possibly but not necessarily noncompetitive governance at Nyangi/Ivate level.

-micro level safeguards cognitive diversity. Diversity increases as structures become smaller.

Table 3-C: Coding for Typology and Functions of Mbeere Rika

In the table just seen, the elaborative coding is intended to partially answer the first research question, on structures that support stewardship. At this juncture, I already suspect that rika is structurally important, due to its frequent occurrence across all elder talking circles. However, rika appears nowhere in the findings of Warrick et al (2016a) To begin my adapted elaborative process, I first undertake elaborative coding of existing transcripts, which I set aside.

For new transcripts that have not been analyzed before, I Undertake indigenous coding, identifying indigenous codes in the data based on words of participants that appear to

represent concepts with societal function. The resulting indigenous codes are then categorized under elaborative codes for each research question. In this case, the elaborative codes are structure, societal level, structural function, and actors, derived from comparing the findings of Warrick et al with data in existing transcripts. The application of indigenous codes to elaborative codes helps us close gaps in the findings of Warrick et al.

The findings on typology and functions of Mbeere Rika in chapter 4 are directly obtained from the process of indigenous and elaborative coding tabulated here. Given that this coding method has utility for developing theory (Saldaña, 2016), researchers wishing to build on the work at hand may wish to begin their own investigative process by applying codes from findings presented in chapters 4, 5, and 6 to their own newly created list of indigenous codes.

3.4.4 Member checking

To increase rigor and ensure validity, member checking was undertaken throughout the research. Member checking is a process by which the researcher first analyzes the data, and then shares the initial results of the coding, presenting these as first impressions to members of the researched community. Member checking is also a data collecting tool, in that it involves soliciting more data through follow up questions and prompts.

Member checking can be as simple as making a phone call to one member to verify a piece of data, as elaborate as calling a talking circle, or as professional as reporting on a publication that resulted from the early phase of research before embarking on the next phase of research. Ideally, this is done often and is iterative, in order to allow for all voices to be heard. The researcher is open to correction, informs community members that the purpose of the forum(s) is to verify that the researcher's interpretations are correct or to challenge

assumptions if the interpretations are wrong. The researcher informs participants that the process requires iterative corroboration.

At any point, the consenting process may be revisited to ensure that the data being used can continue to be used with the community members' permission.

Member checking took place periodically beginning in the fall of 2016 to 2020. Emerging questions were posed at various times either to talking circles or to WhatsApp group, modified to suite the forum, for example shortened to be more suitable for WhatsApp texting. Data from member checking was coded alongside other collected data, thus member checking is a form of analytical data collecting. An example of data generated during a member checking exercise is presented in the findings, on figure 4-A, titled excerpt of youth talking circle at village level, in Chapter 4.

3.4.5 Data Viz

To visualize the data, I used the open source visualization software, Gephi (Gephi.org). on two of the resulting visualizations are reported in Chapter 4 and 5. They underscore the different roles of Place and social media in the community's participatory framework. I also periodically visualized sample data using Facebook group dynamics utility over time. The utility is inbuilt into group admin functions on FB, to give a long-range picture of group demographics for decision making. Data included group retention, migration between groups, gender, and location. This data helped determine stability of Mbeere FB groups over time, so that I remained assured of the relevance of findings on population data in the 5 years of research.

In the box below, I share an excerpt with notes that I wrote during a data viz exercise. This is a stream-of-consciousness narrative process that not only provides

breadcrumbs during data analysis later on, but note-taking in this narrative format may lead to insights in the moment. The narrative provides a window into indigenous coding, quantitative statistical analysis of the social network, and contextualization of findings to bolster relevance for community.

The Datasets: Facebook groups, UVA extracted with Sociograph plugin on Facebook, 2012 to 2018. MBEEREPOLITICS extracted data using Graphml API on Facebook, 2019 (Sociograph defunct). Preexisting datasets were cumulatively imported into Gephi and graphed in 4 phases. To facilitative this process, I used multimodal graphing plugin on Gephi (gephi.com). Multimodal graphing allows Gephi to import and synthesize datasets from diverse types of networks. The datasets may be in similar or different file formats. The purpose of using this modality is to compare and contrast elements of dissimilar networks. Datasets and file formats were as follows:

- UVA (.xlsx)
- MBEEREPOLITICS (.graphml)
- WhatsApp Group Chats (.csv)
- Talking Circle Transcripts (.txt)

First I turned on the multimodal graph plugin, in the backend of gephi. Next, I imported UVA, and after a visualization of the initial network, I only used the table tab to import the rest of the networks into the multimodal graph. The next one was MBEEREPOLITICS, imported into the existing network graph to converge it with UVA. I repeated the same process, filtering the data as I had with UVA and then importing the WhatsApp network data.

The process of parsing conversational data for import into Gephi was a deeply involved process that required the research team to check back with each other iteratively.

I invented a system of accounting for researcher bias, using an "information and knowledge approach" to parse the content for meaning and intent before creating an edge between two nodes. The goal of this approach was to account for the relationship between researchers and community members from an indigenist perspective: community members were the experts and therefore source nodes relative to researchers, who were the actual recipients or beneficiaries of interactions in which they solicited for information or knowledge from community members. In those cases, nodes representing researchers were the targets and nodes representing community members were sources.

This invented system of accounting for researcher bias using an "information and knowledge approach" to parse the content conversational WhatsApp chats and talking circles for meaning and intent had a second function: It paralleled to some extent interactions of users on sampled Facebook groups. Creators of Facebook content such as images, videos, and tweets were treated as source nodes relative to target nodes, that is, users who were in a "recipient" role, and who had responded with liking or commenting relationships.

I had arrived at this strategy during a testing process in which we used a small dataset with 3 talking circles and partial dataset of one WhatsApp group chat. During visual analysis on Gephi, I noticed that the research team members were heavily weighted in network, giving these nodes an appearance of great importance in the network, termed as network authorities. This appearance of "expertise" was resulted from research design in the early talking circles when the team had predominantly used a semi structured interview protocol. Researchers had asked a great deal of questions. In parsing the data to create adjacency lists, for each question or confirmatory prompt posed, the node representing the researcher had been treated as a source node and community members who responded had been treated as target nodes. When the adjacency list was visualized, the researcher appeared to provide rather than seek the answers, and community members, whose nodes were initially target nodes if they had responded to the researcher prompt, appeared to be recipients or beneficiaries of researcher contributions. To resolve the marginalizing and misrepresentative impressions we reversed the coding to be more representative of the knowledge flow

Indigenous coding and network visualization

This involved looking for relationships between commonly occurring words of elders, and that were emerging in the social network regarding highly connected nodes or key actors, social ties, functions, and cooccurring communications. My objective was to settle unanswered structural questions about rika and social media. *Who were the actors and what was their function in rika, in Place, and on social media? Could I establish beyond doubt that a typology of rika existed between key actors? What attributes of rika could be identified in the interactions of identified actors?* I had a hunch that if equitably synthesized, the diverse communications of key actors would offer substantive answers to these questions.
Sampled Facebook Community Groups: UVA with approximately 4500 members an MBEEREPOLITICS with approximately 5000 members.

Sampled WhatsApp Group Chats: In-facing project communications on communications of Facebook community leaders, iCitSci project communications, temporary breakaway group chats, e.g., remote consultation with diaspora. Conversations in Place: Individual interviews, talking circles with community members, consultations with elders, , project meetings between iCitSci in Mbeere North and diaspora technical advisors, mentors, and consultants)

To graph by communities, data was imported into Gephi. Other types of posts are possible in Multimodal Plugin depending on the network type and parameters defined during extraction, but these were the types of posts in the networks under analysis. I filtered by modularity class, clustering the network by type of communication, a parameter on the Multimodal plugin This appeared to be the best way to avoid network bias toward communities with more members. Two last filters to control the largest networks so that I would still be able to see the 9000 conversations of elders in Place against 45,000 on social media. (nodes between 0-6 degrees and 1500+ degrees were excluded to remove outliers)

Adjacency lists of WhatsApp Group Chats and Talking Circles.
The Multimodal graph now had multiple communities with diverse edge types, that is, nodes connected by different types of communications. On FB, these types of communications connecting user nodes were commenting, liking, relationships. Users had posted status updates, photos, videos, and tweets. WhatsApp chats and conversations were manually coded, resulting in adjacency lists with a source and a target, that is, conversational threads were coded to reflect the node initiating the conversation (source) and the node in the listening role (target). Edges connecting nodes in the chats and conversations were coded to account for replies and reactions. For example, to indicate liking, emoji that conveyed positive emotions were interpreted as reflecting both a commenting and a liking relationship between the nodes involved in the conversational thread. Other types of WhatsApp conversational user behaviors included self-looping (multiple posts from one user without response from other group members). A similar treatment was given to transcripts of conversational data. These were treated as conversational threads and coded into adjacency lists using the same parameters as posts on WhatsApp group chat.

Self-loops were removed during imports of all data using a feature on Gephi's import wizard, that allows for limited filtering before the import is initiated.

In conversational transcripts, affirmations such as, "mm", "er.", etc., were interpreted for liking or commenting relationships. This degree of detail in creating adjacency lists was useful in establishing degree of connectivity. However, all relationships in WhatsApp and conversational data were partitioned under a default type of post termed, *miscellaneous.* This should not necessarily be viewed as a software bias toward Facebook parameters. Multimodal plugin on Gephi allows for partitioning by multiple self-defined vertices. I made the choice not to apply my own self-defined vertices as the task at hand could be just as easily achieved by the most expedient means: WhatsApp and talking circle data organically fitted under the default category of miscellaneous. When unsure, I used the content table on the back end of the graphing interface to determine if I may there were any indexing anomalies to resolve with a user defined type. However, I believe the smart decisions I made during import (remove self-loops, and filtering so as to have a manageable number of variables under consideration and to avoid network bias toward Graph's matrix network, which was rich in descriptive categories relative to a csv, txt, or gephi files.

Future indigenist maths may develop technologies to automate the process of identifying, extracting, and graphing data from conversational methods used in Place for graphing. Given that indigenous peoples are increasingly living between Place and social media and given that classic indigenous research methods (IRM) is still preferential to conversational methods such as talking circles, such an analytic tool would add to the indigenist toolkit in a digital age by bridging conversational networks to digital ones.

Figure 3-C: Sample Of Raw Data Viz Notes

3.5 Research Timeline

In Table 3-D, I illustrate how various methods fit into the research timeline from 2015 to 2020. I have decided to leave the content as originally filled in to give an idea of elaboration. The explorative phase is also termed the accessive phase, for reasons explained in under research design in chapter 1.

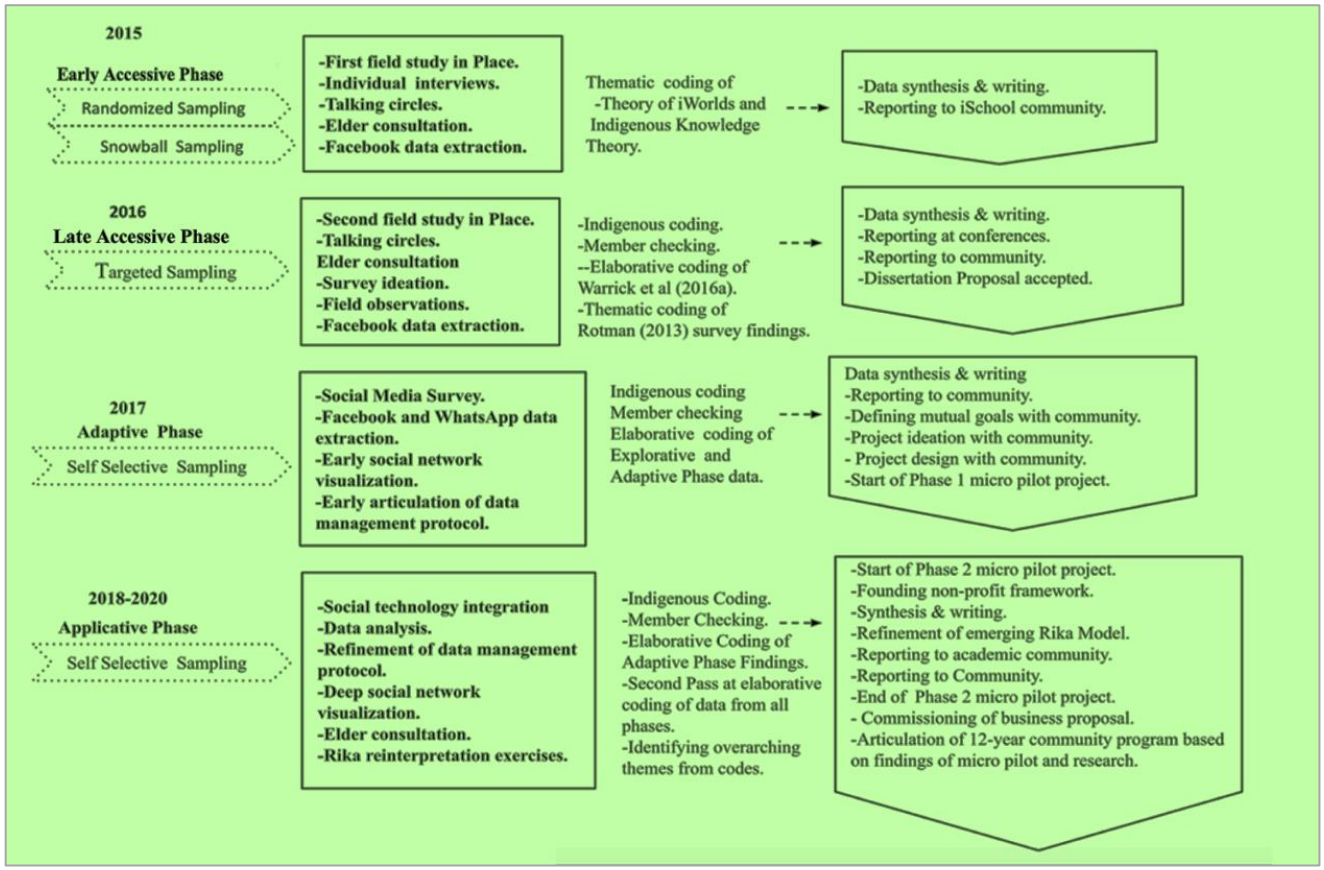

Table 3-D: Timeline of Research Method

4 Chapter 4: Structural Resilience

4.1 Chapter Overview

This chapter presents evidence on structural factors that support environmental stewardship in Mbeere. The research question that guides data analysis in this chapter focuses on structural resilience and asks, “What are the underlying structures that support environmental stewardship in an indigenous community with place-based and social media approaches?

Data analysis shows that at least 87% of Mbeere residents continue to undertake ecological preservation, maintenance, and restoration on private and public land, and furthermore that, at the intersection of Place and social media, practices are guided by the principles of rika. Of those, 11% are elders with place based methods and 76% are in the Rikamedia, with practices straddling Place and social media. The remaining 13% of our participants are engaged in practices that do not meet the threshold for stewardship. They include representatives of institutions with projects that are harmful of ecologies, such as subpar donor projects with low quality piped irrigation schemes that harm riparian ecologies, waste water resources, and result in environmental degradation in the long term. In keeping with the internal systems perspective of this work, I have arrived at the findings presented here using a methodological approach intended to uncover internal aspects of Rika. The data presented in this chapter took shape over a 5-year period between 2015 and 2020, crossing a number of disciplines, technologies, and geographic boundaries.

Accordingly, the examples that I present to evidence my claims are taken from a variety of data collecting formats, including conversational talking circles and content from social media. It follows that data analysis uses an indigenist maths approach as well, with

data presented in the form of tables, graphs, and network visualizations intended to demonstrate aspects of digital indigeneity best suited to quantitative tools.

The goal of this chapter is to delineate structural factors associated with environmental stewardship in Mbeere. This goal will guide the organization of the chapter. In this chapter, we focus on structure and function. I will attempt to link outcome to structure and function by showing how outcomes can be used as criteria to determine structures whose function is one of stewardship and outcomes that point to unaccountable ecological practice.

We begin by identifying key players in Mbeere, based on access to indigenous knowledge in Place and to information on the mobile device with a focus on social media. I additionally outline key structural differences between projects of stewards and s. In addition to the accessive role of information and knowledge, I endeavor to demonstrate the adaptogenic role of the rika system, my central claim being that rika is the modulating framework bridging stewardship practices in Place with practices on social media. I posit that although rika leverages lineage systems, it is itself not a lineage system. Rather, it is a purposefully designed, abstract conceptual framework whose function is to simplify and modulate complex societal and ecological systems for stewardship by humans.

Further, I strive to illustrate that the ingenuity of rika as a modularizing system arises out of its ability to delineate systemic inclusivity, as well as activate accountability measures with great specificity. To demonstrate that rika evidences principles of resilience thinking, we will consider established attributes of resilience from social ecology and social network theory such as simplicity, modularity, diversity, networked learning, distributed leadership, and feedback mechanisms among others. Moreover, as a theoretical contribution, I will

consider the accessive role of rika, especially as it impacts inclusivity along boundaries of information, age, gender, religion, ethnic and national identity, among others.

In this, my objective is to introduce access as an attribute of resilience thinking, thereby expanding the theoretical application of resilience thinking to include an information science perspective beyond established social network concepts. It is my considered opinion that this attribute is a missing link especially in sustainable development theory where theorists and practitioners continue to grapple with significant gaps between application and practice due to ignorance of leaders of projects in indigenous places, about structural factors that underlie access to information and indigenous knowledge that, once contextually understood, may be leveraged in the design of ecologically sound project practices.

As a guiding statement in summary of key findings, I paraphrase the perspective of Mbeere elders thus: The rika stewardship ideal is integrative, driven by the principle of accessive inclusivity across all levels and sectors of society and universally activated at the micro level by fundamental, formative human relationships.

4.1.1 Criteria Used to Determine Access Level

To determine the level at which members interacted with information on their mobile devices and/or with indigenous knowledge, we asked community members to share kinds of environmental activities that, in their own perspective, they undertook within their own everyday lives. We additionally asked if and how they used their mobile devices in any of these activities, and if so, share with us what kinds of devices these were.

For a social level of access to both information on mobile devices and indigenous knowledge in Place, two criteria had to be met: Firstly, self-reported practices had to be

corroborated by other community members as directly or indirectly leading to or likely to lead to desirable environmental outcomes. This was based on a consensus of what constituted desirable environmental outcomes. Secondly, the participant practices had to go beyond access and use to encompass sharing and creating. These are the attributes of social access based on The Theory of information Worlds (iWorlds) (Jaeger & Burnett, 2010; Warrick et al, 2016). The participant evidenced that they:

1. Applied accessed information and/or knowledge in their own everyday practice,
2. Shared learned information/knowledge with others, and
3. Created new artifacts that had utility, possibly even beyond their immediate small world.

From the perspective of this work, without community consensus regarding co-occurrence of environmental and interactional criterion, a group of people, small world, cluster, or social network could not be said to have a social level of access to an information or knowledge resource.

The original data evidencing community consensus on practices with desirable environmental outcomes was limited, due to my limited understanding of the wider social and political structures within which community members defined self-reported practices. This included practices based in Harambee (all pull together), mainly projects geared toward tree planting, reforestation, and water stewardship. The list grew over time, as we continued to corroborate new findings, giving new meaning to accounts of community members in previously collected datasets.

Moreover, due to the private nature of much of the land under stewardship, I initially made the conclusion that practices of Place were need based, whilst social media projects

were altruistic. With continued analysis, I gradually uncovered causal factors associated with rika principles on socioecological justice that explicated the nature of stewardship far beyond my early simplistic understandings, based in reductionist views of environmental stewardship in existing literature.

For the criteria on information and knowledge, I defined information on the mobile device as any visual, audio, or textual data accessed via a mobile device such as a phone, or tablet. I defined indigenous knowledge as any information or embodied practice whether accessed in Place or on social media, that was so integrated into the practices of Place as to be regarded as indigenous by common consensus of community members. In other words, the origination of the practice was not paramount.

Given that knowledge is dynamic, I assumed that indigenization would be a natural outcome of intersecting worldviews in present day Africa South of the Sahara. Once there was corroboration of indigeneity, I would check with elders for historic data to establish origination. For indigenized knowledge, I would check for factors that contributed to indigenization. These are discussed in more depth in chapter 6 on project strategies.

Basic access to mobile devices means that participants used their phones to call, text, or for mobile banking with Mpesa. It is common knowledge that Kenya has been a cashless society for more than a decade, therefore mobile banking is considered a basic everyday function in this work. Basic access to indigenous knowledge means that participants live in Place and therefore have physical access to practices defined as indigenous to Place. They can assumedly hear, see, or experience indigenous knowledge through the practices of others, but they do not demonstrate integrating accessed knowledge in their own practices.

The research team used two approaches to collect the data reported in this section. Firstly, we asked participants to share their personal accounts. Secondly, we observed self-reported practices in context. This helped to validate the data as well led to a new understanding of environmental stewardship from an indigenous perspective.

4.2 Demographics at the Intersection of Access and Stewardship

Based on criteria set forth in the previous subsection, data shows that 76% of the sampled population (n=226) had a social level of access to their mobile devices, whereby they were found to access, share, and create new information using mainstream social media. The main self-reported platforms were Facebook and WhatsApp. This group includes representatives of organizational practices found to be integrated with indigenous stewardship practice.

They are included in the social media group based on communication practices of interviewed staff, with community members, specifically on WhatsApp. Another 10.62% of the sampled population was found to have a basic level of access to their mobile devices. This cluster did not use social media but texted, called and conducted mobile banking on Mpesa. Conversely, this same cluster were found to have a social level of access to indigenous knowledge and to use Place based stewardship approaches.

Approximately 13% of the sampled population were found **not** to have a social level of access when environmental stewardship was considered. The clusters in this group consisted of 8.41% who were community members and 4.85% who were representatives of organizational projects. Both reported using mobile devices and social media for their own business practices, but these practices were not found to meet the criteria for social access as defined by community consensus.

No elders 75+ years (80+ years in 2020) were found in any of the clusters with practices that failed to meet the threshold for environmentally desirable outcomes. As said, Elders were in a cluster based entirely in Place, consisting of 11% of interviewed 226 community members.

4.2.1 Uncovering Mbeere Social Media

The 76% who engaged in stewardship on social media consisted of self-identified as indigenous Mbeere members, self-identified as new residents, as well as self reported representatives of government or donor-initiated projects. New residents were community members from neighboring communities of Embu and Gīkūyū, who had bought land in Mbeere and settled there in the previous 5-15 years. Both indigenous and new residents who reported that they engaged in stewardship on the mobile device had common interest in tree planting, reforestation, and riparian water stewardship on their own private land.

Indigenous Mbeere members additionally engaged in activism such as public marches against taxation without representation, demonstrations to protest dumping of toxic waste and large scale community development projects that integrated livelihood goals with environmental stewardship, such as restoration of indigenous social watering stations, called mariūko. Furthermore, after a comparative analysis of the project clusters, data suggested that the 76% who reported that they were stewards on social media in many cases developed their projects as a mitigative strategy, intended to address ecological crises resulting from policies and activities of the 13% whose projects caused harm to ecologies of Place.

This was true whether projects took place on private or public land. For example, water monitoring on Ishiara canal irrigation scheme had to a large extent become vigilant in an uphill battle caused by donor projects, i.e., members of Ishiara Kathĩgĩ limited the canal

water flow in the struggle to make up for the wasteful practices of water consumption characterized donor-initiated piped irrigation schemes. Donor and government initiated piped irrigation schemes were poorly maintained, with water often running for weeks from broken pipes that sat unrepaired. Conversely, the Ishiara Kathĩgĩ scheme, which itself was a returning system era government scheme, had been designed for zero wastage, so that it used gravity and water was channeled back into the river downstream. Project cases are presented in detail in chapter 6 on strategic resilience.

Structurally, social media stewardship in Mbeere is centered in a handful of Facebook community groups and WhatsApp, with some reach into Twitter, mainly of a political nature. Their practices bridged social media with place through consultation with elders, technical support from diaspora using a mix of in-person meetings, and WhatsApp chats.

Further, diaspora had a capacitive role in expanding social media access beyond mainstream platforms such as Facebook and WhatsApp. The goal was to bolster data management for strategic resilience. I discuss this project strategy in greater detail in chapter 6, as an example of the impacts of diaspora on increasing resilience of rika strategy. Dedicated social technologies involve applications the support social interaction, collaborative sharing, and creation of new information and knowledge artifacts that may find utility with beyond the needs of creators.

Of particular note, conversational talking circles were our doorway to social media. The research context beyond Place and into social media was facilitated by youth talking circles in Ishiara, Mbeere North. The excerpt below illustrates a transcendent moment in June 2016 when community members oriented me to social media stewardship.

> Prompt: When we talked last time, this idea kept coming up, of using social media, to connect to people who have similar ideas to yourselves, you know. And we never really

went to the specific social media that you are using, you just said social media. So, today I would like to go in-depth into the social media, maybe even get a few examples.
Steward: Okay what I use is Facebook, and I like it because we for (sic) various different groups with different perspectives. okay, I'm also on Twitter and Google for my email
Prompt: Yes, so now, was it you who told me that you've met a group of people who plant trees, and you meet on social media?
Steward: Yes, yes, on Facebook.
Prompt: Could you just send me a link? I was wondering, who are the sponsors, do you have donors?
Steward: No, we just do it by ourselves.
Prompt: Do you use Twitter?
Steward: Personally, I do.
Prompt: do you use it [Twitter] for this work, the tree planting group?[5]
Steward: no

Figure 4-A: Excerpt of talking circle at village level

My prompts in this excerpt are representative of the semi structured interview protocol used by the research team in 2015, which we had transcended by the start of 2016. Notice that, when I ask for more details on social media engagement, which members of the talking circle had alluded to in a previous session, I describe their stewardship activities narrowly as "tree planting." This line of questioning reflects my own erroneous assumption at this early phase, that I would encounter a basic level of engagement, as prior research appeared to suggest. The concept of tree planting was to loom large in the data. Ultimately it was but one scale of a whole strategy interwoven with other grassroots initiatives on Mbeere social media.

At the tail end of the conversation, I asked Njeru if he and his friends typically used Twitter to support their tree planting projects. He replied in the negative. His response addressed only my prompt, which was specific to the use of Twitter by Njeru and his friends to support their replanting exercises. His reply in the negative can be interpreted as meaning that his personal network did not leverage Twitter to engage in replanting projects, however as I was to discover, Twitter featured in a different way the FB ecosystem. This talking circle

[5] *At this early stage I had not yet grasped the systemic approach of rika stewardship and was still focused reforestation and water stewardship as Harambee centered, which I took then to mean crowd sourced indigenous practices.*

played an accessive role to my growth from an explorative observer to an active participant and community member.

As a first step in this process, the talking circle shared some content from their FB group sites such as the below, from which we can begin to observe that social media serves Place.

Figure 4-B: Sample of shared content from FB groups

Secondly members of the invited me to join the FB groups in which they themselves were members; and thereafter we focused much of the discussion on the work that took place in these groups. As confirmed the following year by Facebook community leaders, Mbeere North youth informed me that the seminal group in the ecosystem was UVA, an acronym to the phrase, Universal Voice for All, otherwise known as UVA in the community /*ouvuh*/. The first syllable is a diphthong, pronounced the same way as the word boat. In Kīmbeere, Ũva is a pithy interrogative phrase, asking, "Where are you?" As youth told me, they regarded UVA as, "A seek call to action." The concept was later confirmed by UVA FB

group leaders, during a December 2016 meeting in Nairobi. My first attempt at understanding the Facebook community was confined to UVA.

Mbeere North youth introduced me to a second FB group, called MBEERE-POLITICS. At first glance, the content on MBEERE-POLITICS appeared to feature more activist content relative to local business promotion on UVA. Aside from these key differences, the two FB groups appeared to be closely matched, with Membership numbers ranging from 4500-5500. Both UVA and MBEERE-POLITICS group goals and descriptions were geared toward a mix of politics, activism, and community development centered on similar issues surrounding ecological restoration, access to water, and reclamation of land Mbeere right to land resources. When I converged extracted data from UVA and MBEERE-POLITICS[6] by visualizing the network of both groups using multimodal graph plugin on Gephi, I found that tweeters had a unique and unexpected role in the network.

To understand this function, we need to think of underlying social networking processes at the boundaries of social media and Place. At one end of this communication divide, data extracted from Facebook groups UVA and POLITICS showed a highly dispersed network confined to the social media dimension and characterized by parallel communication in the form of status updates. The exception was a highly connected cluster of Tweeters making up 0.7% of the sampled Facebook community groups. This cluster appears in blue in the social network in Figure 4-E.

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[6] *Several Facebook groups go by names that incorporate the words Mbeere and Politics. Some groups change their names over time. They all share in a universal set of values and goals localized by geographic identity in Mbeere.*

Regarding Place, 49% responded that they used face-to-face communication and 25% indicated that they used Chief's Baraza.

Content analysis of tweets showed a difference between tweets that were categorized as a type of post and other types of "tweets" which were not actual posts on Twitter but rather hashtags used by community members to highlight topics of interest. While UVA hashtags were internal communications, on MBEERE-POLITICS, tweets were mixed, including both internal Hashtags not posted on Twitter, and actual tweets posted on Twitter. While tweets on MBEERE-POLITICS were an identifiable and highly connected cluster (in blue), on UVA hashtags and handles were only identifiable through content analysis of user posts, because they were entirely topical in character. The Process of content analysis that unearthed UVA hashtags was carried out at a different time than the process of network visualization: Gephi's layout algorithms do not visualize non-tweets without manual manipulation that was not useful for purpose of this research.

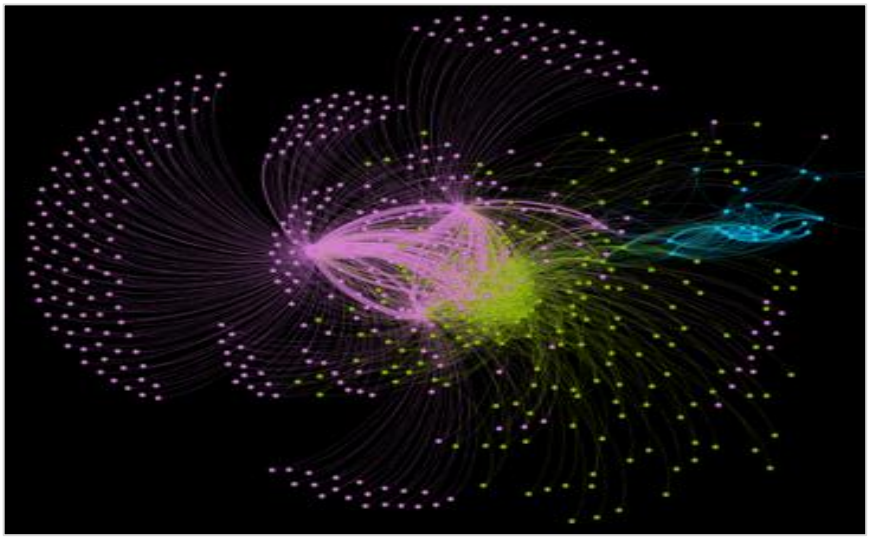

Figure 4-C: Tweeters increase network density of multimodal FB network

In the graph above, tweets are in blue to the right. A difference found between hashtags and handles on UVA and MBEERE-POLITICS was that MBEERE-POLITICS had

a user protocol to differentiate between actual tweets and topical internal hashtags, but not handles. These were characterized by spacing between symbol # and word component. For example, #majimaji would be an actual tweet, whereas # majimaji would be a topical hashtag. Handles were used when MBEERE-POLITICS members directly addressed fellow users by their actual Twitter handles. Real time tweeting was restricted to MBEERE-POLITICS with the impact of expanding indigenous Mbeere FB ecosystem into Twitter.

As a brief contextual interpretation, *Majimaji* is a Swahili term coined by historians in reference to a local rebellion of 1905-1907 against returning system rule. Some scholars now see Majimaji as an environmental conflict caused by the government's efforts to manage wildlife (Matheka, 2016). During the seminal battle, indigenous armies fighting for land rights against what was then German occupied East Africa, believed that a special kind of water *(maji), when poured on the body of a warrior,* could stop a German bullet. Although indigenous armies lost this battle, it marked the beginning of organized resistance that led to the war of independence.

Moreover, Majimaji was the first of many tensions caused by new systems of environmental management that disrupted traditional indigenous co-existence of communities with local wildlife. Hashtags such those used on UVA are thus indicative of an activist approach to the fight for universal access to water in Mbeere. After this discovery, I re-coded existing datasets from talking circles to establish motivational impacts of Place on indigenous social media user behavior.

The community member in this excerpt speaks in reference to wildlife caused deaths, one of the environmental causes championed by UVA but with poor visibility. She suggests that a dedicated hashtag might make a difference,

> "I think if you put anything on social media especially in Kenya it catches on fast, lakini mau tīmo maūndū marīa maragīrīria. ūkegua īni, alikuliwa? Pole. People will even laugh about it vandū va gūīka atīa? So, I think it's important people on social media [notice] such important things. Akorūa nī kīndū ta mang'ang'i mau, put a hashtag."
>
> Tr. "I think if you put anything on social media especially in Kenya it catches on very fast, yet those are not the things people here talk about. [on wildlife caused deaths] you get responses such as, 'oh no, he was eaten? Sorry!' People will even laugh about it, instead of taking action! So, I think it's important that people in social media [notice] such important things. This kind of news, such as those crocodiles, use a hashtag." (Moni, Ishiara Mixed)

Others cited the relative obscurity of Twitter in the community at village level as one reason why it was not a feasible choice for organizing around topics of interest, *"[M]paka wa leo, they don't know what a hashtag is. If you put a hashtag, naūka amirorie ūguo. Auge mi sielewi Tr.* " ….to date [some do not] know what a hashtag is. If you use a hashtag, they will look at it and declare that they do not understand." Still others told us that Twitter lacked a sense of community,

> " Wananii kambuge nina Twitter account no ndimitumagira tondu, haina ile personal touch. Kama wale watu ninajua, hawako in Twitter. So, if I go there it's just about news, or famous people, talking about things which are outside there, sometimes I reach a place that maybe if I want things which are outside there, I'll just use other avenues, so, Twitter kwangu ni kama imekosa function, because if I want to get in touch I'll go to Facebook or Whatsapp, if I want news I'll go to the news websites, then now Twitter inakuwa haifanyi kazi."
>
> Tr: "I have a Twitter account but I do not use it because it has no personal touch. The people I know are not on Twitter. So if I go there, it's just about news, or famous people, talking about things which are outside there, sometimes I get to a place that if I want things which are outside there, I'll just use other avenues, so, to me Twitter is as one which has no function, because if I want to get in touch I'll go to Facebook, or WhatsApp, if I want news, I'll go to the news websites…" (Joro, Ishiara Talking Circle).

Others furthermore indicated that they cross-posted news Twitter and Facebook so as to keep their Facebook groups aware of important topics that might affect them,

> "Na posti Twitter, ngoragūa nī Linkidin na Facibuku. So, nī posti ya Twitter, īkīthiī kwī Facibuku. Nīnthingataga news. Koguo nathii Twitter riria narikia kuthoma ngiambiriria gu posti inyamu, ngi posti."Tr. "When I post in Twitter, I have linked it with Facebook, so when I post something on Twitter it goes to Facebook….I like to be in it for investigative purposes. I keep track of the news and...I post [them]"
>
> (Njerū, Ishiara Talking Circle)

Taken together, survey responses, member checking, and talking circle data provided conclusive evidence that the use of hashtags on UVA was chiefly for decoupled, totemic information sharing, and that Twitter was not supportive of community and privacy needs of the Rikamedia.

4.2.2 Beyond Facebook: Tweeting and Chatting

When I first posted a survey to ask community members how they had first heard about UVA, the responses seemed to confirm my impression that Facebook was the favored platform of choice, but the answers caused me to examine WhatsApp more closely, largely because 62% (n=115) replied they had first heard about UVA on Facebook and 16% on WhatsApp and 82% that they used WhatsApp for stewardship activities. While 19% had first heard about UVA from in person communication, this was not a surprise, based on findings of Warrick et al, from which we had made an assumption that the community was extant in Place and on social media.

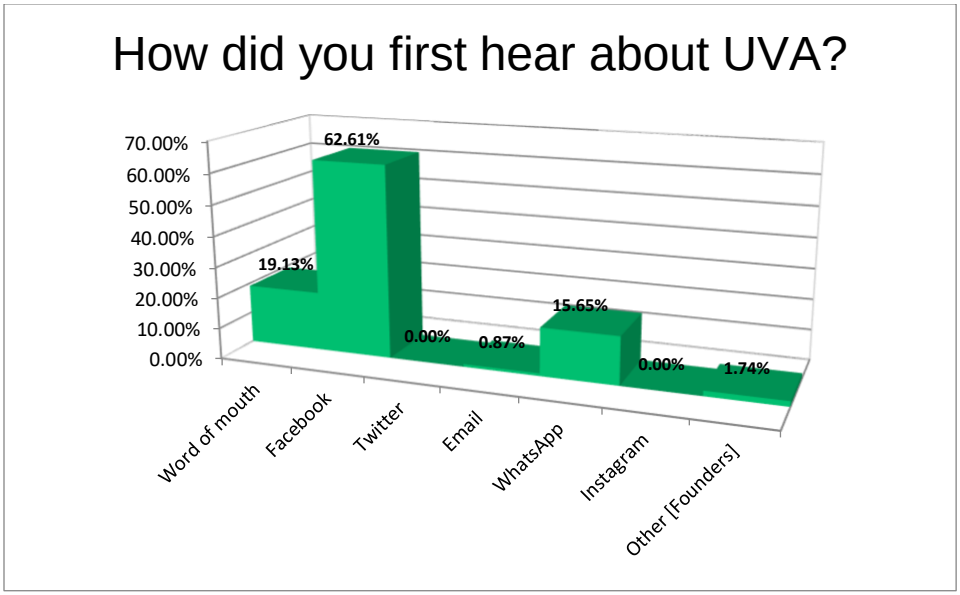

Figure 4-D: How members first heard about UVA

To map the extent of the Mbeere social media networks beyond the open mainstream platforms such as Facebook, Twitter, Instagram, etc., we needed to learn the extent to which members used in-facing networks on email, group chat forums and messaging (texting).

We additionally wanted to learn where these in-facing networks intersected with place-based networks. Toward this end, the survey asked community members to share other platforms or modes of communication they used for community stewardship activities outside of their use of Facebook. Users could choose all, some, or none of five choices: WhatsApp, Texts (SMS), email, Face-to-Face, and Chief's Baraza). This prompt did not have a write-in response, as the previous question had addressed unexpected social media platforms; and the pilot had indicated that the five modalities were the most likely to be used for stewardship in varying degrees.

Note that this was not a radio button prompt, i.e., responses were not aggregated to total 100%. Rather, based on data from talking circles, we expected members may use multiple platforms. Each prompt therefore measures for 100% of the responses (n=115). From survey data, the most frequently chosen was WhatsApp, with 84% of community members indicating that they used WhatsApp for stewardship activities, 34% that they used texts, and 21% that they used email. Those who used texts and email also used WhatsApp.

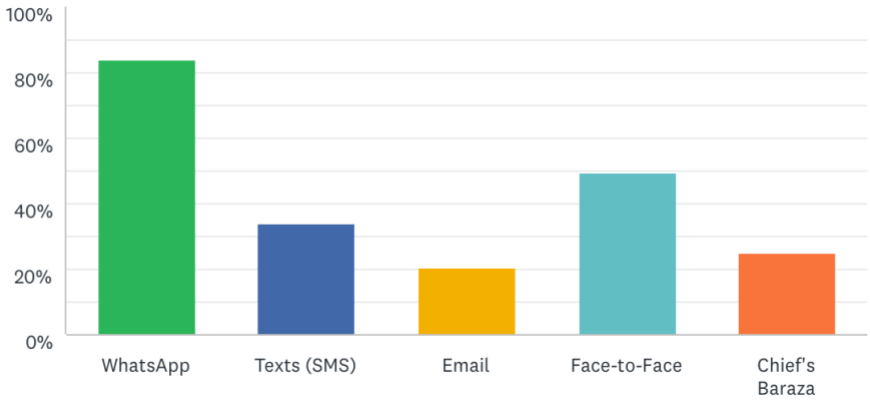

Figure 4-E: Types of Communications

4.2.3 WhatsApp Group Chats-Project Communications

Next, given the finding that stewards used WhatsApp for in facing communications, and Facebook for outfacing communications, I wanted to find out if I could establish structural interaction between the two platforms, based in convergence of user data extracted from Facebook groups and user data extracted from WhatsApp group chats of projects. To this end, in a process detailed in Chapter 3 on Methods under subsection 3.4.5 Data Viz, I used a multimodal graph plugin on Gephi to import WhatsApp data to into a network graph already populated with Facebook networks, i.e., UVA and MBEERE-POLITICS.

Immediately, there was an obvious problem of scales was between Facebook and WhatsApp. Being smaller networks, the latter were subsumed by the large FB communities. To resolve the problem, I applied a scaling filter on Gephi, Yifan hu proportional. The resulting graph was scaled in proportion to the size of each imported network type, allowing for comparative analysis between Place and social media.

Finally, I applied a statistical formular located in the Preview feature on Gephi, whereby the difference between the smallest and the largest node in the network was visualized at a 3:5 ratio by degree of connectedness. This reduced network bias toward UVA

and MBEERE-POLITICS, which were extremely large networks relative to the WhatsApp network, which proved to have the highest degree of connectivity relative to the Twitter and FB clusters.

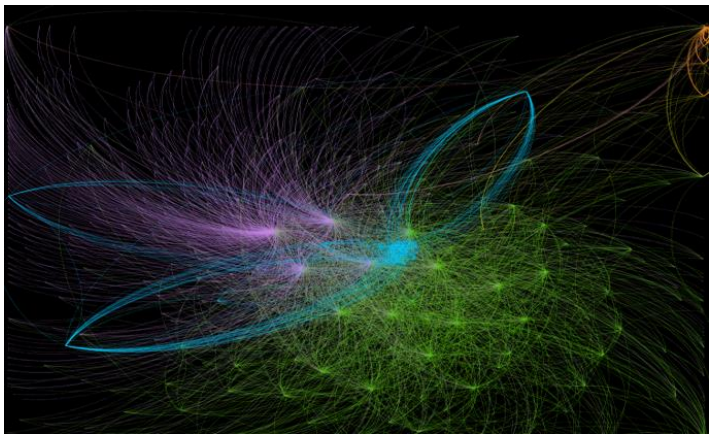

Figure 4-F: WhatsApp Project Group Chat is Added to Multimodal Graph

In the network structure ensuing above, tweeters are no longer the most densely connected network. Thus, they are now seen as an orange cluster, top right. WhatsApp chats take precedence, with reach across both FB groups.

Influential triangles in this multimodal network (blue butterfly) represent ties between communications of Rikamedia members (UVAma and UVAfe) and project owner of Site CW. All are weakly connected within the social media networks; however, due to cooccurring ties with Pathfinders on Rikamedia and iCitSci members, they make strong links between the networks.

4.2.4 Uncovering the Bridge Between Place and Social Media

Next, knowing that elders formed 11% of stewards whose practices were bounded in Place while 76% straddled Place and social media, we added conversational data from Place to the growing social media network, to establish bridging elements between the two domains of

practice. Toward this, I imported conversational data from talking circles, meetings, and individual interviews, using the same parameters outlined above for WhatsApp and also detailed in the methods, which can be found in chapter 3 under Data Viz. This analytical process showed that project group chats were the bridging structures between communications of members bounded in Facebook Groups and conversations bounded in Place,

As seen in Figure 4-G, WhatsApp chats and conversational transcripts have a high degree of connectedness. The introduction of those networks into the network containing Facebook Group networks has a visual impact on the multimodal graph, by causing the network to reorganize dynamically once added. In the resulting network on 4-G, WhatsApp and conversational data weights the network toward the right corner in blue (the most connected community was always in blue, per the default color scheme that I picked on Gephi to use in partitioning and ranking. Edges share source node color). As seen in Figure 4-F, the biggest impact of WhatsApp group chats was a decrease in the relative weighted degree of connectivity between tweeters, who were the most densely connected in Figure 4-C, when only the dispersed FB group communications were under analysis. After addition of Chat data, although more densely connected than the dispersed FB networks, tweets were less so than group chats. Ultimately, with addition of conversational data, WhatsApp chats and Place conversations formed one modular cluster (in blue) with the Chats in the bridging role at the intersection of Place and social media, in the area circled red, in figure 4-G.

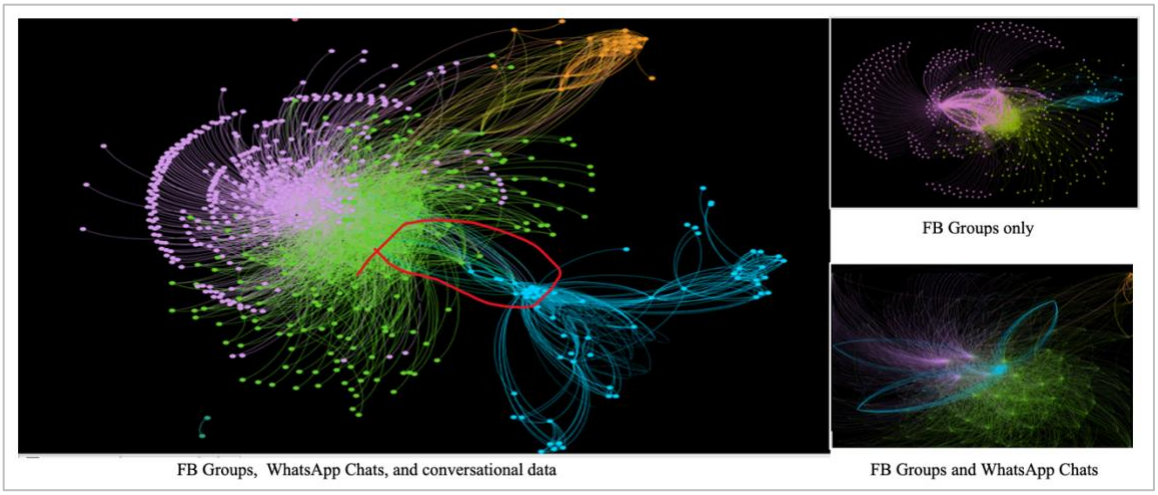

Figure 4-G: Structural impacts of conversational data on distributed FB groups

WhatsApp group chats (circled in red, in the blue to greenish bridge between conversations in Place (blue fishtail) and FB networks (Pink, green) and tweets (orange). These ties are the bridging structures between Facebook and Place, and moreover that this was an outcome of interactions between Facebook leaders (also termed Pathfinders) in the diaspora and youth leaders in Place. Pathfinders played a capacitating role to projects of youth in Place to support integration of stewardship priorities with livelihood goals. They provided mentorship and technical leadership as a community service. For communication they used a combination of WhatsApp and in person meetings in Mbeere North.

In this framework, key actors were strongly connected in one dimension whilst being weakly connected in the juxtaposed dimension. Thus, their interactions resulted in a network that was both convergent and divergent, attributes that safeguard network resilience when they are co-occurring. It follows that this graph validates the value of stewardship projects to bolster community resilience. For links between the structure we have visualized here and concepts of the role of Rika in the information dissemination and project development,

concepts about the role of Rika in information dissemination, research design and project development, see Figures 4-L under a discussion on Rika Networks and 6-A under a discussion on Project Strategies.

4.3 Neoteric Rika

Turning our attention toward factors associated with neoteric stewardship, we consider the makeup of neoteric stewardship characterized by 4% who are mīraa growers. I term this cluster Esoteric Rika in the sense that according to Akūrū, mīraa farming on a large scale was traditionally discouraged. While the crop has grown wild in Mbeere and is endemic to the hillsides and mountain areas, Akuru told us that community members were by Rika codes only free to consume miraa under the precondition of stewardship before consumption. In the context of miraa, this meant a community member, before they could either grow a few plants for personal consumption or optionally forage, they had to have been inducted into elderhood. This was a formal process. An elder was conferred into rika ria ngome, the order of the ring, and wore a ring, ngome, to denote elderhood in that particular status. The precondition of stewardship that this elder had met was one of having finished with the business of childrearing. He could then consume miraa to his contentment. Hence, large scale farming of miraa is undoubtedly led to outcomes that are antithetical to the precondition of stewardship in that young persons who are yet to become parents are now consuming the product as an everyday practice, with attendant social outcomes.

For these reasons, the practice is seen as an neoteric rika practice in that it is part of an innovative transformative process toward economic empowerment on the part of the community. Miraa farming in Mbeere denotes remarkable self-determination despite decades

of marginalization and government neglect. A recent development in the industry is formation of a miraa cooperative. It is hoped that partnerships can result in innovative applications.

For example, it is possible that the precondition of stewardship before consumption associated with miraa in the rika code may point to an underlying medical factor associated with aging. What I mean here is that other narcotics are shown to have active ingredients that relieve medical symptoms associated with aging and autoimmunity, such as chronic pain. By inference, further research on miraa may establish this and other types of applications.

We had the opportunity to tour the farms of 2 mīraa farmers in Mbeere South who were evidenced the indigenous practice of intercropping, planting mīraa in small batches fringed by shrubs or tall indigenous trees that provided shade to the crop. As they told us, this mirrored the natural shaded environment where mīraa grew wild in the hills of Mbeere, and reduced evaporation to a degree. This was a mitigative factor geared toward water conservation between rains. One farm was by Thiba river and used furrows to deliver riparian water without need of a generator. The other was land-locked and used a combination of rainwater tank and bore hole for irrigation. Due to the mitigating stewardship measures that we observed; due to the status of the crop as an innovative transformative adaptation; due to presence of an active FB group on the Rikamedia; due to the group's advocacy for inclusive national policies leading to legislative action to recognize miraa as an indigenous property, ergo a national asset and a cash crop; and lastly, due to the group's action in forming a cooperative that reported paying dividends to members this year, a noted

"first" in the industry (Mwiti, 2020) mīraa farmers are not included among those residents whose self-reported practices failed to meet the criteria for social access.

By all of the foregoing, the cluster is in active liminal transformative space. Hence, I have classified mīraa farmers in a special category as an neoteric Rika. However, there is need to acknowledge emergent concerning needs in the industry, such as the need for water irrigation to levels that require steady supply but without the requisite infrastructure that the government ought to provide for productivity. This is definitely an area where the word growth and development can be applied robustly, aligning with the will of the community to support mīraa growers.

I tentatively estimated that mīraa farmers consisted of approximately 4% of the total indigenous population in Mbeere. This estimate was based on comparative data between our population sample and periodic analysis of Mbeere Facebook Group communities from 2015 to June 2020. The largest FB community of mīraa farmers, of which I am a member in the role of participant-observer, has consistently numbered 365 members. This amounted to roughly 3% of the largest FB group, Mbeere South, consisting of 14,000 in June 2020. Additionally, the newly formed miraa cooperative reports similar membership numbers.

Overall, community perspectives about mīraa farming are positive, with the crop seen as contributive of increased quality of life by most community members, due to its income generating capacity. More research is needed in this area. In interviews with Rikamedia Pathfinders, it has emerged again and again that the community is reticent to share information about mīraa due to a hostile climate created by external interests. The industry has potential for the good if resilience thinking is applied to address the industry as part of the whole ecosystem.

4.4 Returning System Practitioners

Returning systems (RETS) are those in the global lifeworld, consisting of societies dispersed across the globe with expansion of Rika networks out of Africa in a time before documented history. For more on this see Chapter 1, on introduction to Rika Resilience. Practices that do not meet the threshold of stewardship based on criteria already established in section 4.1 fall into RETS practices, as demonstrated in the data to follow. RETS Practitioners are not necessarily foreign. Indigenes may fall into a RETS cluster based on their practices. In this work, the number of participants under RETS practices breaks down to 8.85% who responded to queries on the practices of institutions where they worked and 4.41% who reported that they were new residents in Mbeere and are therefore regarded as citizens and community members. The practices of these two clusters cannot be likened in terms of scales of impact. Community members act on a micro level, with limited scope and impact. These are small world clusters. Conversely, institutions act on a macro and meso level, with wide scale impact. Institutions are lifeworlds, rather than small worlds.

In terms of long-standing damage, practices of new residents in comparison with many of the institutional practices in question that began more than 90 years ago, besides which each staff member working for an institution does not speak for themselves but for the practices of hundreds, or in the case of government and global institutions, thousands of other actors in the machinery of macro level governance.

Moreover, whereas community members are subject to laws and regulations, institutional practices have remained unaccountable for their role in widescale and biocultural destruction. Indeed, even with rampant failure to meet environmental obligations, there have been no documented cases of institutionally mandated consequences that could

lead to meaningful change. What we can infer from all of this is that institutional practices have causal role in much of the environmental crisis reported in Mbeere. This means that meaningful turnaround that could lead to environmental regeneration to begin will take transformative change in institutional practice. The small gains that could result from shifts in practices of new residents are not significant to change the environmental map in Mbeere, but those of institutions can.

4.4.1 Institutional Returning Systems Practices

Institutional practitioners were defined based in their institutional practice of deriving data from 20 participants who responded to queries about agencies and organizations they worked for, institutional practices included any combination of the following: direct initiative, funding, management, promotion, training, or other indirect support of agricultural and low quality, unsustainable irrigation programs and projects that led to mono cultivation, overirrigation, and out of season farming of crops that are not geographically suited to Mbeere soils and climate by use of mechanized irrigation that pollutes riparian zones, destroys natural riparian communities and compromises others' livelihood by lowering riparian water level. Other areas of concern included dumping of hospital and industrial waste from outside Mbeere, mining in indigenous preservations, confiscation of indigenous social water access points and grazing lands, etc.

We were not able to reach representatives of many departments of Embu County Government, yet gubernatorial practices in Mbeere rank among some of the most destructive and marginalizing we encountered in the course of research. This and my own textual analysis of Embu county planning documents gave me no reason to suppose t interviews with County employees would have evidenced stewardship practices in Mbeere. In order to fully

represent ascription from the community perspective, the team tabulated data from two separate datasets.

One type of dataset is presented in Appendix J due to its large size. It reflects data gathered from semi structured individual interviews conducted in 2015 with employees of donor initiated and government managed projects, sometimes known as people led or community driven projects. The second type of dataset is presented here, in the form of key actors, environmental concerns that were ascribed to them, and number of mentions by participants in the first four talking circles that we held in Mbeere, in June of 2015.

Actors (Institutions or Industry Served)	**Ascribed Concern Expressed in 4 Conversational Circles**	**# Mentions (June 2015)**
-Embu Subcounties, National -Building industry-quarry and sand mining - Illegal timber harvesting -Illegal charcoal production -Tea factories (wood burning to process tea) -Chinese Mining Companies. -Embu County Government	LOSS OF FOREST & TREE COVER -Deforestation -Loss of indigenous species -Loss of forest cover -Loss of water catchment -Soil erosion -Loss of medicinal species -Compromised rain patterns -Backlash effect on glaciers of Mt. Kenya, regional impact.	536
-Donors institutions Piped irrigation projects Building industry-widescale sand harvesting -County Government -Various Sectors	DEGRADED WATER ECOYSTEMS -Loss of riparian ecology -Riparian over-irrigation -Unsustainably low river and canal water levels -Loss of watershed -Water pollution, loss of access to potable water -Sewage and sanitation crisis -Overcrowding -Downstream over-siltation -Low biannual bounce-back of seasonal streams and rivers -Backlash effect on interconnected riparian systems.	439
-KenGen (Kenya Power): National Government (70% shares) Open market Investors 30% shares) -Chinese Mining Companies	STRIPPING OF LAND BASED RESOURCES Widescale dispossession of land-based resources: -Loss of access to potable water -Loss of access to grazing land	75

-County Government (Multiple, e.g., extensive mining, denial of access to development funds, marginalizing policies, etc.)	-Loss of indigenous social watering stations (mariūko) -Loss of water catchment preservations -Mining in sacred forests -Human-wildlife conflict at dams. -Denial of electrical service grid. -Denial of water service grid.	

Table 4-A: Actors and Ascribed Environmental Concerns

The actors on the left were ascribed by community members, with the exception of percentages of shared in KenGen, and a bullet point ascribing destructive mining to Chinese companies (Business Daily, 2019). I found this information in 2020. The column with number of mentions to the right is intended to give the reader a sense of the robustness of the discussion around environmental concerns. Actors were not enumerated therefore, addition of KenGen shareholder percentages and Chinese Mining Companies (Business Daily, 2019) did not affect the number of mentions, but only served to add dimensionality to the scales of power involved in environmental destruction in Mbeere.

Three limitations of presentation suggest themselves in the data. Firstly, the list of concerning institutional practices is much larger than is presented in this table, which only includes data from the first four of numerous talking circles.

Secondly, community members were reticent to bring up issues of oppression and dispossession surrounding KenGen, hydroelectricity, water, dislocation, and stripping of land resources facilitated by the Embu County gubernatorial government. Hence, with few exceptions, they waited until we had turned off audio recordings before sharing their perspectives, for fear of discovery. This gives these sensitive topics an appearance of low concern, relative to the others, an outcome that belies ground reality. This topic, along with sand harvesting, were vigorously discussed and considered two of the worst abuses of national and gubernatorial governments. This factor raises issues of social ecological,

political, and economic justice. In a data driven world, the question of how to render the invisible visible for presentation perhaps gives new importance to triangulation of textual, audio, visual, and embodied mediums of documentation and sharing.

A last issue of note is that speakers used several languages in conversation as is common practice, English, Swahili and Kīmbeere. Hence, even though all effort was made to search for language variants of terms, some may have been missed, especially if they were offered in indirect reference.

Despite these limitations, the table reflects environmental topics frequently brought up by community members over the course of research and is important because many community projects we encountered stemmed out of a desire to mitigate the degrading impacts of the powerful entities tabulated here, an almost insurmountable goal from given the scale of exclusion at micro level.

4.4.2 Returning Citizen Practices

The cluster responding that they did not use their mobile devices in stewardship consisted of 10 community members self-identified as new residents. I have termed them returning citizens, as explained in Chapter 1. Members of this cluster shared that they used their mobile devices primarily to support their businesses, for example by posting advertisements offering goods and services, searching for new markets outside Mbeere, and connecting with their business community. Others shopped online, used traffic advisories, socialized with private networks, attended online returning belief system services, etc. In other words, many lived fully online, but did not necessarily share in the motivation that drove other community members toward participation in community or private stewardship projects.

We prompted participants in this small world to share their perceptions of the environment in Mbeere and give examples of their own or others' land-based practices in which they had participated, the responses of s had three commonalities. Their view of Mbeere was that it was a dry place whereby intensive irrigation was needed to sustain farming. Secondly, some in this cluster had the means to implement mechanized irrigation with riparian water, including using makeshift generators, and water tankers, both of which were expensive but regarded as cost effective to support large scale year-long farming of horticulture, artificial fish farms, and other export products such as watermelons. Thirdly, this group did not practice intercropping but rather large scale monocultivation to maximize yield.

In perspective and practice, this small world stood in sharp contrast to those who reported that they were stewards. Firstly, some lived in newly crowded market towns that were responsible for a growing environmental crisis from lack of a sanitation infrastructure to cope with the influx of immigrants from Embu Subcounties to Mbeere Subcounties afforded by policies devolving Mbeere District into Embu County in 2010. Others had the means to be landholding farmers, however, their practices of monocultivation were largely regarded by stewards as antithetical to ecological balance, as it did not allow for indigenous methods of maintaining soil quality through intercropping and agroforestry. Secondly, practices of RETS practitioners fall in the area of those identified by stewards, such as poorly mechanized and subpar piped irrigation with riparian water, as ecologically unsound. It resulted in depletion of water levels and destruction of watersheds supported by Mbeere rivers.

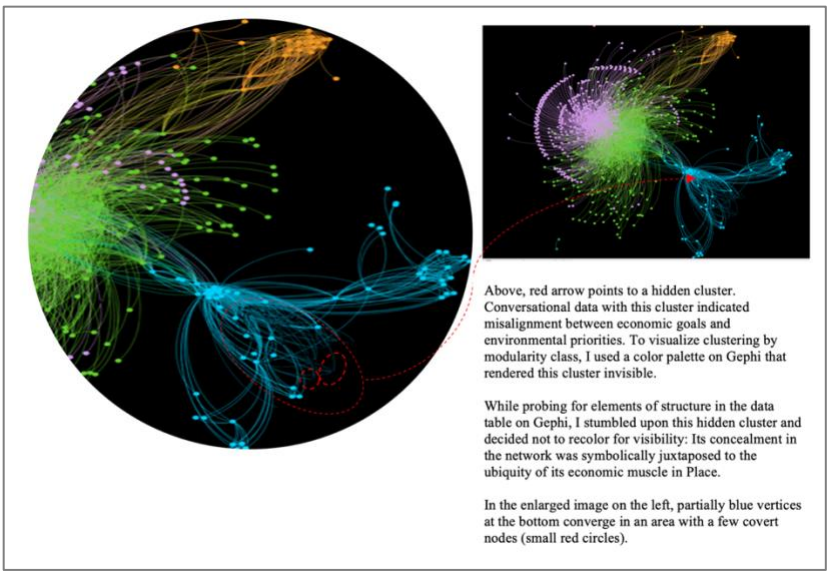

Figure 4-H: Returning Systems Cluster in the Multimodal Network

In summary, approximately 13% of participating community members (n=226) reported personal or institutional use of social media to support business goals but associated practices, processes and outcomes did not meet community defined criteria for stewardship. Institutional policies and practices were neither discernably preemptive nor demonstrably accountable for regeneration of harmed communities and ecologies.

Institutional policy, projects, and outcomes were sectorial and temporally pervasive, relative to localized activities of citizens, i.e., new residents. Approximately 87% of the sampled population (n=226) reported ideation toward and/or participation in stewardship projects to alleviate environmental concerns stemming from disruptive institutional policy, practices, and project outcomes, with 11% consisting of elders bounded in Place and 76% between Place and social media, termed Rikamedia.

4.5 Confronting Unanswered Questions, or Toward Inquiry on Rika

We have delineated the accessive role of mobile technology in stewardship of Place. Community members who reported that they were stewards, were engaged in development of community projects on multiple scales of practice necessitating a social level of access to mobile devices to support dimensions of interactions between information on social media and knowledge held by elders in Place. We also saw that citizens who reported using social media to support business goals but not stewardship, engaged in practices that were likely to result in ecologically disruptive outcomes such as unsustainably low water levels, and compromised biodiversity in riparian zones.

In this second section of the chapter, I examine the rika system as it defines structural functions of community members who reported that they engaged in stewardship. Toward this goal, I identify rika design principles, demonstrate their application toward environmental accounting concepts designed to modulate potentially disruptive systemic bias. Findings are based in data collected from conversational talking circles, online survey, and social network analysis.

Toward this end, elders shared concepts about rika and the functions of its various component parts,. This section presents findings interconnecting indigenous structures of rika with those observed on indigenous Mbeere social media. Component parts are examined relative to functions that support ecological stewardship. The following outline of findings serves to map the organization of this section of the chapter. Based on its role as progenitor of all humans, Nyangi has legislative and executive authority over the rika system. The rika system originates with Nyangi at Ūvarirī in Mbeere North. Rika consists of two interwoven

rika systems that modularize diverse economic, political, and social activities articulated in stewardship terms to undergird regeneration of interdependent ecologies.

One level is a system of modular intergenerational power sharing legislative governance structures defined by the concepts of *Nthuke*, *Njaū, and Cūkū. This dimension of rika operationalizes integration of economic goals with environmental stewardship duties.* The other dimension is Īrumbī and Mūrurī, constituting judicial and sociopolitical rika, a coalition of clans representing interests of matriarchal clans at macro level, and responsible for implementing an ecologically centered social justice system at micro level.

4.5.1 Rika Stewardship in Historical Context

Elders shared that environmental stewardship has historically been in the jurisdiction of different types of rika, “Ūcio warī wīra wa marika[7],” translated as, "That was a function of [multiple] rika," Moreover, according to elders, the basic function of rika has always been to bring the public together in united effort, thus, in their perspective, different types of rika are responsible for, “wīra wa kūmenyerera vūrūri,” meaning, "Stewardship of the nation."

According to elders, environmental stewardship in Mbeere has not historically occurred in isolation, but rather is integrated into a comprehensive organizing system defined at all levels of society and known as rika. The overarching rika framework consists of a coalition of two bodies, Nyangi and Ivate. Formed in a historical time and documented via oral history that has been passed on from generation to generation.

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[7] *Marika is rika in the plural [where the prefix* ma *denotes plurality]. That is, more than one rika or more than one type of rika.*

Further, elders shared that, as humans are descended from Nyangi, therefore all communities in the region could trace their roots to Nyangi. “Nyangi nīyo ngūrū. Īni na nīyo īciere andū monthe,” Nyangi is the elder. It is Nyangi that gave birth to human beings the world over. Elders in Mbeere South and Mbeere North confirmed this perspective, including Elders in their 70s who are Christians and have received a Western education in their youth.

Elders told us that Nyangi is the rika, tracing its origins from Kīang'ombe Mountain, humans are descended from Nyangi; and itself Nyangi traces its origins in Mbeere, at a place called *Ūvarirī,* which they also called *Kīrīmarī gīa Kīang’omb*e, meaning *The Mountain of Cattle*. Kīang'ombe Mountain is in present day Mbeere North. Elders told us that a perennial underground spring in Kīang’ombe was responsible for the development of a thriving community known as Ūvarirī, which in historic time was the capital of Mbeere and a renowned seat of knowledge, Kīrīra. “Kīrīmarī, gīa Kīang’ombe. Kūūrīa Ūvarirī. Nīkuo Mūciī mūkūrū.” Elders told us that most present-day myths about Ūvarirī as a place of magic and sorcery are based in legendary national public health strategies, based in the practice of natural medicine for which Mbeere is still renowned.

The section of the community strongly identified with Ūvarirī, in Mbeere North, traces its origins right there in Ūvarirī, “*Ūcio nīwe Mūmbeere. Mūmbeere ūrīa Mūmbeere aumīte Ūvarirī*.” Mūmbeere has his origins in Ūvarirī. “*Nīyo yarī Kavito.”* It was our capital. "*Nīkuo Marika magendaga gūtuīrūa marīītūa*.” This is where all rika were conferred with their rika name.

Elders explained that of the two rika, Nyangi has responsibility for setting the stewardship agenda, by virtue of its “age,” which is greater than that of Ivate

Elders also shared that, historically, each rika was responsible for the management of numerous preservations, set aside for ecological purposes. These were public goods of national importance, called Irī. These locations still exist today. [8] We shall discuss Irī in more detail in the next chapter, under the motivational role of social ecological justice principles

According to elders, within the traditional framework, rika governed and managed all sectors of society in an integrated manner that accounted both economic and environmental priorities. In this integrated manner, Nyangi signaled the start of the calendar year in the month of September, with wide ranging duties spanning present day sectors of meteorology, agriculture, forestry, conversation, and water management. These duties, which included the release of seed stores to the public, ‘mbegū (seeds and seedlings), would culminate in a community-wide planting season.

Shortly after, Ivate’s responsibilities would commence, focusing on the prosperity of humans and their wellbeing, as well as that of animals. Apart from prevention of environmental diseases that come with “mbura ya mare” (the short rains), Ivate’s sectors included iron production and black smithing as well as hunting and raiding, both of which are related to the production of iron.

Data from elders shows that the formation of a second rika, Ivate was to account for the need for change. Specifically, assimilation of migratory waves into Mbeere is associated

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[8] The nation state does not recognize any of Mbeere's historical nature preserves and has begun a program of widescale mining in places such as Kīang'ombe in partnership with Chinese mining companies. Mbeere citizens are forbidden to enter these ancestral areas under penalty of death. They are now considered properties of Embu County Government.

with the development of the Ivate rika. Historical migrations are traceable at points North and South, which remain sacred sites for Mbeere to this day. Immigrants into Mbeere were assimilated into indigenous practices of Ūvarirī and enrolled with either Nyangi or Ivate so as to participate in the affairs of the nation. At the Northern entry, other in from Īgambang'ombe, at the border of present day Tharaka Nithi (Chuka, Meru) and Mbeere North in Ishiara, where much of this research took place.

The area is recognized as sacred to Mbeere to this day. At the Southern entry, the largest immigration is believed to have entered Mbeere via Mbonjūkī, at the border of present day Mwea and Mbeere South. At an unspecified period in history, immigrants crossing Mbonjūkī into the southern areas of Mbeere proved to be change agents by dint of their overwhelming numbers, leading to formation of a second rika, today known as Ivate in Mbeere.

Evidence points to rika as the system on which geographic identity is delineated. In other words, rika can also be defined as a society of many allied communities. supported by demographic data sampling from our participant pool, which confirms that rika identity is transcendent over gender, clan, and geographic divides. The demographic data is extracted from mixed age talking circles that included elder consultation, in both Mbeere North and South. It is worth evaluating for evidence of resilience principles.

In Present day, community members who identify with Mbeere North are more likely to have retained their rika identity than community members who identify with Mbeere South. Conversely, Mbeere South members are more likely to be strongly identified with the electoral Mūrurī and Īrumbī dimension of Rika, rather than the executive/legislative dimension of Nyangi or Ivate. When Mbeere South members offer rika identities at the level

of executive governance and legislation, they are likely to identify as Nyangi. Overall, Nyangi is the most often self-reported rika identity. Gender does not appear to influence the likelihood that a community member would offer their rika identity. Within the span of birth years reported in the data, geographic identity, rather than age, appeared to influence the likelihood that a community member would report their rika identity.

4.5.2 A Modulated System

System modulation is achieved through intergenerational power sharing structures defined by the concepts of Nthuke, Njaū, and Cūkū. This dimension of rika operationalizes integration of economic goals with environmental stewardship duties.

The dimension of rika that I endeavor to understand in this work is that in which rika achieved integration of ecological stewardship with economic interests, narrower context is required to give meaning to the stewardship functions of rika. I begin by outlining rika from indigenous perspective of Mbeere as Nyangi, the predecessor of all humans. Nyangi Rika has its origins at Ūvarirī in Mbeere North.

As conceptualized by Elders with Ūvarirī in progenitive function, Mbeere people are descended from Nyangi Rika, a modular family template consisting of two horizontally placed rika who are in reciprocal parent-child relationships with two horizontally placed rika. Nyangi is the parent of Itherū and Ivate is the parent of Nangamīgwī.

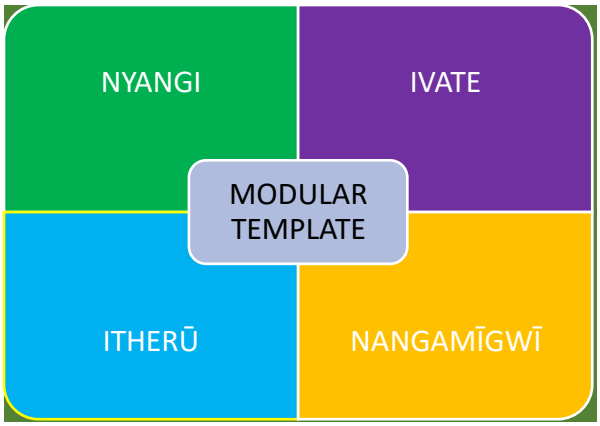

Figure 4-I: Basic Units of a Modular Rika Template.

These four entities are autonomous and yet interdependent. Although conceptualized as family relationships to leverage natural social structures, rika identities are neither male nor female. In the basic rika algorithm, parent partnerships can only be formed horizontally, with three parent partnerships possible between Nyangi and Ivate. Three parent partnerships are possible between Itherū and Nangamīgwī. Vertically, Nyangi and Itherū take turns giving birth to each other in an infinite repeating pattern. Likewise, Ivate and Itherū take turns giving birth to each other in an infinite repeating pattern.

This is the algorithm that articulates the generational concept in Mbeere. Unlike natural parent child power dynamics, rika embeds inclusivity mechanisms by which to neutralize implicit parent-child hierarchies. Each community member born will join one of these rika at birth. In some cases, membership into a different rika may be purchased when there is a demonstrated need to make the change. The rika basic identity template is infinitely replicable across time, gender, age, geographic, economic, or religious boundaries.

Interactional inclusivity principles are articulated in concepts of *Nthuke* and Njaū, which define familial structures for reciprocation. We consider each concept in systems terms at different levels of society. At its basic meaning, Nthuke denotes a generation. for

example, millennials are one generation, whilst the arising generation under 20 years old has been called the Z generation. However, in rika, Nthuke does not as a rule denote chronological age but rather is a means of modulating and simplifying systems power structures, activated at familial level, and mirrored. indeed, its very purpose is to break socio economic and political divides imposed by time. As such, Nthuke denotes cyclical, rather than chronological generations. Additionally, the structure is multidimensional. In one dimension, Nthuke refers to parent/child relationships. Mūciarī, a parent, is a member of one nthuke, while their child is a member of the Nthuke below, at the child level, called a njaū, calf. This dimension of Nthuke can never form coalitions with each other: At familial level the parent has authority over the child. At national level Mūciari or aciari (parents) refers to an incumbent government with legislative jurisdiction over the Nthuke in a Njaū level.

For example, elders told us that, Embu rika are njaū of Mbeere rika, in rika, anything that happens at micro level must repeat itself at meso and micro level in a modular structure.

In a different dimension, members of society from babies to elderly may identify as members of the same Nthuke that repeats cyclically in alternate generations. These nthuke are diametrically placed from each other on the repeating cycle. This On a different level, those born within 0-30 years of each other may consider themselves members of one nthuke or generation, by forming a coalition, a rika, to declare autonomy "gūtwīka" break, from the authority of an incumbent government. Once broken, the Nthuke will then "gūtwīka" become, i.e., form a self-governing body, now termed a rika (coalition) of this specific Nthuke. given a unique name,

Njaū defines a hierarchical power dynamic between two adjacent generations, symbolized by a parent level (Mūciarī, meaning parent) and child level (njaū, meaning calf)

1) Njaū interactions are marked by difference rather than sameness, with the parent level having unreciprocated responsibility over the child level, whose function is to leverage parental resources whilst progressing toward self-governance.
2) In anticipation of periodic need for dynamic reorganization in response to unexpected circumstances, the njaū level of a rika is designed to either integrate with Nyangi structures or to decouple when separation from mainframe rika is beneficial to the njaū level.
3) Njaū principle has wide significance in the EC region, whereby different types of njaū could and did move away in response to hardship, forming new identities while maintaining the same functions and purpose.

4.5.3 Foundations of Inclusivity

In Mbeere as in other indigenous worldviews, stewardship of ecosystems is defined holistically as a resilience mechanism, therefore, my analysis has endeavored to factor in interactive systems for ma variety of angles. In Figure 4-J, I hand-drew a family tree in a bid to understand how rika modularizes diversity for Mbeere's numerus clans, and how the concepts of age and/or gender may be represented .

This process was transcendent in helping me understand rika as an abstract conceptual framework that leverages family structures and uses familial nomenclature to perpetuate inclusivity principles on which stewardship of the community is based. We can see, based on evaluation of our hypothetical family ties alone, that in the shifting and diverse canvas of kinships and genders, the enduring and integrative ties are those of Nyangi, Ivate and their Njaū, Itherū and NangaMīguī, who not only simplify a diverse structure of clans but also modularize it. A modular system is one that is founded on a few basic units that, at minimal cost to the system in time and material, can be replicated and fitted together in an infinite number of ways, conserving resources, and increasing productivity. Lego set toys are founded on this principle. A rika community of millions is similarly founded on four "modular units," consisting of Nyangi, Ivate and their njaū, Itherū and NangaMīguī. This simplification of structure makes the administration of programs easy, as opposed to two

dozen clans and countless Mbarī, the patriarchal house headed by a male head of household.

I present the data below, illustrated by a hypothetical family tree. The family is founded when a Nyangi male (C1) is paired with an Ivate female (C2). The family could just as easily consist of two or more females, female and several males, or any other combination of gendered or non-gendered, married, or unmarried partnerships. Rika affords gender equity in marriage, although the practice is now closeted due to changing attitudes about what constitutes a co-habituating and/or parenting partnership. Nonetheless, we were fortunate that UVAfe's network afforded among our elder participants an elder, (CUPlu, 87) who gave us primary data based on her own experience as head of a family consisting of multiple female partners[9]. An excerpt from the conversation illustrates the concept:

> Nīnamagūraga. Gwekagwa atīrī...kangwīre. Na nīwe ūkwīrete arīīwe. Anga ndikūva īthe wa mwīrītu ng'ombe? ....mamwiīre thiiī ūvike nīguo mwarwanyūkwe agūrane. Nagūrite aka aīrī, ūmwe ngīmūgūra arī mwīrītu. Ngīreterwa wīngī wīna ciana ithatū.. arī Mūembu, ūcio wīngī arī Mūmbeere.
>
> I did marry them [females]. Let me tell you how it was done....yes, she will come to me herself. Will I then not send [dowry] cows to the bride's father? …[the parents] they will tell her, "you may go and be wed, that your sister may marry." I had married two women. One was a virgin when I wed her. The other had three children when she was brought to me. She was from Embu. The first was from Mbeere.

Note that by the 9th generation, 16 clans have entered the family structure from marriages, some of which are multi-partnered. While clans are widely varied, they are often short lived, dying out with the entry of a male from a different clan. For example, the

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[9] *Kenyatta (1938) documents that polyandry, the term he uses to mean marriage between many men and one woman, existed among the Gīkūyū. The practice was widespread in the EC.*

patriarch's clan, C1, dies out after only 3 generations, with the entry of a male into the family line who identifies as with C4.

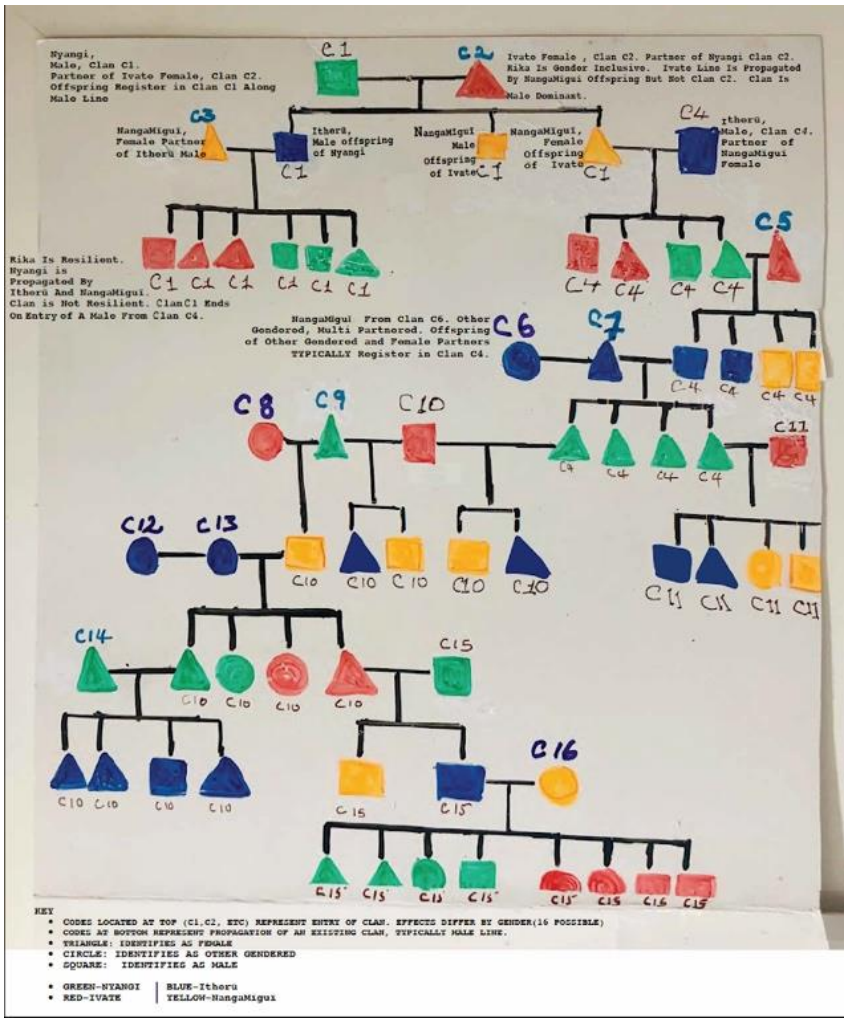

Figure 4-J: Nyangi and Ivate Modularize Diverse Matriarchal Clans

Note in the hypothetical family tree, that since mīvīrīga (matriarchal clans) at some point in history oriented toward the male line, mīvīrīga are not inherently inclusive of females and other-gendered community members. This was not always so. Historically the community was gender diverse, with patriarchy providing the basic the family unit, mbarī, and matriarchy providing sociopolitical units of 25-200 patriarchal family units, mīvīrīga.

One of the conversations to underscore the role of clan in eroding equality, and doing so. through experiences that took place outside of the Rika experience in the early years when functions of Rika for establishing diversity, equity, and inclusion has not been as compromised as in present day. As told by CUPlu, as a "mission kid" she did not participate in Rika procedures. As such, even though as a young women she was enterprising, it was with great difficulty that she was able to rise above the challenges of gender violence, property theft and mechanisms of exclusion that were erected by the now male-centric clan machinery, as she endeavored to establish herself as a contributing member of society.

> Niī nī Mūmbeere karīng'a, ūrīa wītagwa karīng'a. Twī twarī a mīceni.. naciarīrītwe mīceni, nīwona nīmūtonye gūtū? Nethīre marika marī mathiru.. Nī twatūcaga mutī, tūrī a mīceni, mīceni tīkwa yagendaga ivatarī… No rika nīrīagendaga rīkathiī kwanga kībata….*I am a Mūmbeere through and through (does not explain further). We belonged with the missionaries. I was born on a mission. Do you see any piercings on my ears? In my time, rika had stopped…We [youngsters, mission kids] would climb to the top of the tree [to watch the Rika dance], we were not allowed to attend traditional dances…but Rika, yes, [members of a rika] it used to attend the dance….*
>
> Ava Kīthembe varī kīthaka kīa kwa andū a Nyaga navoete ngīrīīrwa nthenge nī andū acio, marī aganu makīrega kūnūmia.. mūvīrīga wa Mbūya….Naguo muvīrīga ūyū wetu naguo ūkīgaa ngītūma mami na mūthuri wīngī wa Ikandi… Maicokirie rūyū makiuga matina mūgūnda wa kūva mwīrītu. *Not far from here, at Kithembe, I gave a goat to some people of the clan of Mbuya for them to give me a piece of land but since they were amoral people, they did not give it to me. And in our own clan, when the clan started privatizing land, I sent my mother and another man of Ikandi.. The money was returned by the clan the next day with an argument that they didn't have any land to give to a girl.*
>
> Toyū ndici kana nīwakinyirie ngiri ithano, nagūrīte na eka eka, īgana īgana, warī wa eka īkūmi na ithatū… Naguo wīngī nagūrīte eka mīrongo īna.. naūgūrīte na mori īmwe na ndegwa, mori yarī ya Magana maīrī na ndegwa yaī ya īgana… Nīrī Kīrītirī nīnarutītwe ūfundi wa Sarani ngīrīva īgana rīa mīrongo ītano.*This one [the land on which the conversation is taking place] did not even cost five thousand, I bought each acre at a hundred shillings and they were thirteen acres… I bought another one which measured forty acres. I bought it with one heifer which was valued at two hundred shillings and a bull whose value was one hundred shillings…. When I was staying in Kiritiri I paid one hundred and fifty shillings to be trained in tailoring.*
>
> īndī īmwe ngīcucwa mbia nī mūndū etagwa Ngarī wa Kiriūngi…. Twarī Kīrītirī… Ekaraga Ishiara andīkītwe nī mūthūngū wa ngirigaca wetagwa Kainoko… Aūka kūngova nanīī narega… Wa agītua ithandūkū rīa nduka.. Na nūrangūna, ngīmucuca mbia.. ngīoca ithiga rīa ratiri.. Wangīmugia vau tiring'i...Yarī Alamisi Tukīthiī Siakago Jumaa.. Ngītuīrwa faini ya ciringi mīrongo ītano kana mīeri īrī nake ucio afungirwe mieri īthatū īte faini. *Once, a man named - decided to rob me of my money. We were at Kiritiri.. He resided at Ishiara, employed by an Agricultural Officer who went by the name of Kainoko. The man asked to borrow money, and I refused. He reacted by assaulting me. He was in the shop [jumped over the*

> *counter]. He broke the lock and entered the cash box. All the while, he was hitting me. I defended myself and tried to prevent him from taking cash out of the box. I picked one of the weights from the weighing scale, and hit him with it...It was Thursday and we were in court in Siakago on Friday. I was sentenced for two months or a fine of fifty shillings. He was jailed for three months without an option of fine.*

The accounts by CUPlu are of events taking place in precolonial experience and affecting an enterprising young woman who striving to find her footing in the new regime. She herself is born in a missionary station of a family that has converted to Christianity and given up the practices of rika, including ear piercings, dances, etc. As such, each and every one of the reported incidents takes place outside the jurisdiction of Rika, in a parallel space of lack and deficiency despite best individual effort. The rules are defined by return system dynamics, out of the reach of Rika authority, but the structures are broken so that, as has continued to be the case since then, the structures of governance do not reflect everyday experiences of citizens.

As a result, in the structurally disordered state that ensues, the stripping of gender diversity, denial of participatory equality and inclusivity are facilitated by appropriation of both systems as it helps those who are now in places of dominance maintain their dominance.

Once hierarchies are recognized but without the resolution of correspondence and reciprocity previously afforded by Rika, we are no longer in a state of Rika. How this comes about is complex, and is by both colonial and indigenous processes. We see that in the elders' eyes, CUPlu is regarded a "girl" rather than a by virtue of her non-participatory status in Rika processes. This is but an excuse, a basis for exclusion and a foundation for abuse. None of the processes are accounted for within Rika. Hence, there are no protections except for those inadequately afforded by the colonial government, in which all are equally deficient, ergo, guilty by reason of actin based in agency, regardless of intent, whether in aggression or self defense. Furthermore, in this broken tableau, the male clan elder becomes

a law unto himself. Gender diversity, female participatory role, previously aspects valued as resilience mechanisms, are nullified. Clan ascendancy therefore does not signify resilience but rather rising vulnerability.

4.5.4 The Rikamedia Generation

One of the most interesting findings of this study was the special rika relationship, termed Cūkū in rika terms. This is another mechanism by which Rika establishes correspondence between members of two groups who would otherwise be in a hierarchical relationship. At the same time, cūkū is mechanism by which the time dimension is harnessed infinitely, and brought to bear in present terms, so that history and all of its knowledge resources are given relevance in decisions and actions of the present.

Over time, the mau/cūcū relationship is also defined in cūkū terms so that it loses its gender boundedness of present day interactions. In other words, cūkū is a mechanism by which generational achievements and challenges, can be captured and described in the aggregate over decades, centuries, and millennia, so as to draw lessons from the past into the present. This is, therefore, a resilience mechanism necessary to effect continuity within the dynamics of change.

Cyclically, the cūkū relationship is one in which the parent/child hierarchy gets resolved in 2 generations when the great grandchild takes the parental role by ascending into governance. Currently, the parent generation is GenX, the founders of Mbeere Rikamedia, (Born 1965-1980), parenting The Silent Generation, (theoretically took reins of government in 1932) This is the Rika that, on the side of Ivate (Mbeere South) surrendered government to

Lambert's machinations in 1932.[10] On the side of Nyangi, this rika governed symbolically as "Mūranja," until the 1960s when Mūranja were challenged by Njavani, also called Rasima at micro level in Mbeere North, per 14 corroborations (Corresponds with the Greatest Generation) in English. Based on elder accounts, it is in order to refer to a governing rika by its Mumo name, service name. So we may call our eldest elders Njavani or Rasima. This is evidence of an ability to decouple, conserve resources and simplify structure when under sustained threat.

Decoupling some parts of the system to avoid total collapse and simplifying structure to conserve resources are resilience mechanisms. Now we see the expansion of structure is emergent on social media, however, it remains to be seen how Ivate will negotiate the space with significantly less institutional knowledge than Nyangi, regarding the reciprocal and inclusive aspects of the coalition as it was intended.

Today, although GenX are small in number (Figure 4-K), they are significantly impactful in regeneration of the stewardship agenda, and their key strategy in Mbeere is to translate knowledge and practice between boundaries of Place where the elders are, and social media, where the under 39 year olds abound. The image below gives the gist of cūkū generational bridging, comparing demographic data from our talking circles in Place with

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[10] This is a matter of public record. The Lambert District Reports are heavily referenced, especially the 1933 report, where he reported on the events of 1932 orchestrating a new Rika order, which he aptly conferred the name of Thathi, showing his understanding of the system (And by implication, intent). The name is historically symbolic as a watershed moment in dynamic reorganization. Theoretically this is the point at which sectors emerged between primary orientation to plant based and animal based industries, with stewardship aligned by resource consumption. Kenyatta touches on this (1938) briefly. The name Thathi is no longer used in the Mbeere community. Ivate is was the correct name to have used. The Nduiko name (conferred to government at induction) was Kenya Ka Mburi, as Lambert notes & Elders corroborate. The Lambert Library is held in print form at the Africana Collection, of the University of Nairobi. An internet search will produced a PDF with serial catalogue numbers.

data collected on using a social media survey. below, I present a more detailed social network visualization to illustrate the same concept by tracking one member of cūkū generation by degree of connectivity across several kinds of networks in Place and social media.

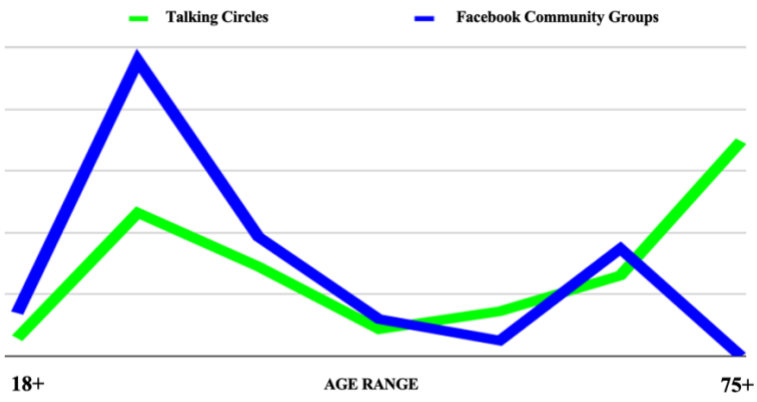

Figure 4-K: Rika Trends Between Place and Social Media

We were surprised to learn from elders that indeed, their fathers had been the last autonomous government in Mbeere. 1930-1932 in essence marked the loss of independence in Mbeere, after the subjugation of their father's Nduīko, autonomous government at district level. By elders' accounting of the Mbeere calendar and in accordance with rika protocol, their grandchildren were the cūkū in the line of succession from their fathers and slated to take over the reins of government in the present time. It is therefore of moment that the becoming of the cūkū generation coincided with the social media revolution, with great impact on the revitalization of rika as a whole.

It also is of significance that the Rikamedia incumbency coincides with the 2010 loss of Mbeere autonomy to national and county level interests, triggering a similar response of resistance in Nyangi of this Cūkū generation as had happened in Mbeere North during the

time of their Cūkū, the Rikamedia generation. The relationship between these two generations is one of parent to child, defined by power and tension. However, the opposite is true between the Rikamedia founders and our Akũrũ A Kīrīra. As grandparent-grandchild, they are considered one rika. agemates in a relationship of equals.

It is therefore of great significance that, in Rika terms, our Akũrũ A Kīrīra (corresponding with the Greatest Generation) are regarded as one and the same Rika with Rikamedia founders. As rika-mates, they are in a relationship of equals. This is a relationship of learning, in which the older cūcū or ūmau emboldens their young counterpart with knowledge and skill. According to rika protocol, the Cūcū and ūmau, our Akũrũ A Kīrīra, are the instructors, thinkers, and scholars driving the knowledge economy, "the knowledge rika." Mau/Cūcū defines a relationship of equity between corresponding generations.

1) The rika is specific to a pair of individuals who are in a grandchild-grandparent relationship, whereby the grandchild is the successor of the grandparent,
2) Mau/Cūcū is an interactional principle designed to bolster continuity of the rika structure.
3) Mau/Cūcū rika function of flattening age related hierarchies, removing gender binary, and simplifying diversified rika structures has been represented in analysis of a hypothetical family.

Familial Roles	**Nthuke Cia Nyangi**	**Nthuke Cia Ivate**	**English Generation**	**Rika Title** (color matched) **(cyclical)**	**Rika Rīa Mumo** Induction into active service	**Nduīko** induction into governance/stewardship
child	Itherū	Nangamīguī	*Lost*	***cūkūrū*** ***cūkū*** **mau/cūcū**	1900 Mūranja | Ngiciri	1932 Mūranja | Kanya Ka Mbūri
parent *(UMMbi)*	Nyangi	Ivate	Greatest	**mau/cūcū** **cūkū**	1930 Rasima | Njavani	1960 Nyangi (un-named) Ivate (none)
child	Itherū	Nangamīguī	Boomer And Silent	**mau/cūcū** **Kamau/Gacūcū**	1960	1990
parent (UVAma UVAfe)	Nyangi	Ivate	GenX	**Kamau/Gacūcū** ***cūkū***	1990	2020 Founded Rikamedia

child	Itherū	Nangamīguī	Millennial and Gen Z	**gacūkūrū** **cūkū** **Kamau/Gacūcū**	2020	2050 Digital Life on Rikamedia

Table 4-B: Corresponding Rika

Before discussing the rika relationship captured in Mau/Cūcū in detail, I reiterate once again that In Mbeere rika, the macro mirrors the micro level. Any structure that does not follow this principle is not a rika structure, but it may be leveraged by rika. Examples of structures that do not obey the micro/macro mirroring principle are family units, clans, and councils.

How does the rika relationship come about? We may hypothetically have a corresponding rika, Nyangi and Ivate form a parenting relationship. In this parenting relationship, the child level or "Njaū, meaning calf, consists of Itherū, the Njaū of Nyangi; and NangaMīgwī the Njaū of Ivate. To flatten the inherent hierarchical binary between parents and children, a rika concept, Mau/Cūcū, is introduced into the family structure to activate the accessive inclusivity principle. As an explanation, in familial terms, Mau/Cūcū is the formal title used two members of corresponding generations, i.e., grandparent and grandchild are formally referred to Mau/Cūcū (third person singular, his/her/their Mau/Cūcū or Mau/Cūcū waku (second person singular or plural), your mau/cūcū.

A grandparent can be in several Mau/Cūcū relationships, but a grandchild can only be in one Mau/Cūcū relationship, symbolized by the name carried, which is a njaū, a derivative, of the Mau/Cūcū's name, peerage titles, stewardship duties, or other type of personal attribute. For example, if a grandfather is named Mbogo, meaning buffalo, the

grandchild, Kamau, may derive a njaū name, Njiru, "the black one," capturing a celebrated quality of the buffalo. Another grandchild may bypass the name altogether and take the name, Mwarīmū, "teacher," if Mbogo is/was a respected teacher. In sharing a rika relationship with his grandparent, the child becomes the equal of his parent's parent, minimizing the hierarchical advantage of the parental position relative to the child.

The term is collated with a general address between grandparent and grandchildren. By this I mean that Grandfathers address and are addressed by grandchildren of any gender as Ūmau. The grandchild is referred to as the Kamau, in relation to their grandfather, meaning "little grandfather," regardless of gender /ka/ indicating the diminutive, i.e., /Ka-mau/. Grandmothers address and are addressed by grandchildren of any gender as Cūcū. The grandchild is referred to as the Gacūcū, in relation to their grandmother, meaning "little grandmother," regardless of gender /ga/ indicating the diminutive, i.e., /ga-cūcū/. Grandparents and grandchildren are generally considered to be of the same rika: they are agemates and equals. By addressing each other using the same title, regardless of gender, they manifest an underlying principle of equity, between a single binary pair consisting of one specific grandchild and grandparent. In the next chapter, we shall consider the motivational role of this structure, especially with regards to ability of elder Mau/Cūcū to facilitate learning for diasporic rika

During our encounters with community members at village level, the most significant demographic determinants of the likelihood that a community member would know his rika identity were Nyangi Rika and geographic identification with Mbeere North. These two factors also increased the likelihood that members would give a personal account of present day livelihood occupation that was integrated with stewardship duties from lived accounts in

present day experience rather than from remembered family histories. However, all elders regardless of if they remembered their rika identities or not, appeared to agree on the criteria that constituted stewardship, as delineated under section 1 above under the concept of access.

Meaningful interactions appear to increase useful knowledge and information about rika by bolstering curiosity about the system's application in everyday experience. This suggests that even for the section of the community in Mbeere South who are currently alienated from their rika identity may, with time and learning, join our ongoing effort to build knowledge on Rika Resilience. As is seen in the Rika Demographic data table, UVAfe's network includes at least 4 elders who are in possession of their entire rika identities, a promising circumstance for the remainder of UVAfe's network in Mbeere South. The response of UVAma to research prompts on rika identity indicates both the latency of the Rika framework and accessibility of networks necessary for its uncovering.

> *"Nīngūririkana nīmūnini, Cūcū akīmbīra maita meengī atī nīrī wa Nyangi. Nīngūīgua akiuaga atī Ūmau, mūndū ūrīa njierūe, nī wa Nyangi, kūoguo naniī nīrī wa Nyangi. Na Ūmau arī wavo. Nūkūa arī mūkūrū mūno rīu. Ena mīaka mīngī! Nūkīrītie ūguo mīaka īgana na kīndū. No tūticī mīaka yake. Ethūa maūndū macio nīmo ūkūenda, nūanthiī gūake. Mau maūndū Ūmau nūmecī mūno. Wana nūwe ūratūīre agendaga kūnyuithia muuma. Aratigire warīīu, kīndū ūguo 2015, erūa nī Cūcū atige maūndū mau, atonye kanitharī. Nūanthiī ngamūrie ūvoro ūcio wa Nyangi...."*
>
> Translated,
>
> "I remember my grandmother informing me time and again in my youth that I am a member of Nyangi. I hear her stating that grandfather, the person I am named after [my ūmau], is a member of Nyangi, which makes me a member of Nyangi. Grandfather is still alive, although he is very old now. He is very advanced in age! He is more than 100 years old. But we don't know his exact calendar years. If these are the types of things you want, I can go to his home. Grandfather is very knowledgeable on such things. In fact, until recently he oversaw administration of muuma [the oath]. He stopped around 2015, when Grandmother asked him to stop and join the returning belief system. I can go ask him about Nyangi...."

Such interests has implications for further growth of the developing rika demographic table presented here in Table 4-A. This is another instance in which use of the terms growth

and development may be applied in transcendence of deficit driven usages of the terms leading to the externally derived counterproductive poverty narrative of the SDG.

Below is a process oriented visualization of the UVAma's reach into the network once he had started to integrate his Mau/Cūcū network with our research processes. During data extraction, I was able to map his node (red circled) indicating his central role in the cumulatively expanded and deepened multimodal network, consisting of several networks synthesized for comparative analysis. As is seen, his Mau/Cūcū's network, which interacts with other community members in Place is influential in the amount of information and knowledge that has gone into knowledge building on rika.

Future thoughts include intersection of our emerging genealogy model with the group's agroforestry project targets . To arrive at the insights garnered here Next, I imported into the developing multimodal graph datasets based in conversational talking circles in Place. This was the last step in converging divergent social networks we had all collectively encountered between Place and social media in the course of research. I undertook this process in 2020, having already developed a theoretical perspective on rika resilience. In section 2 of this chapter, I elaborate further on how social network analysis informed my emerging theoretical perspective on rika resilience.

There was a period of accounting for researcher bias in data visualization, in which the parsing of conversational data for visualization was a deeply involved process that required the research team to check back with each other iteratively. Based on shared observations about our "researcher" role in the data, I invented a system of accounting for researcher bias, using an "information and knowledge approach" to parse the content for meaning and intent before creating an edge between two nodes. We evaluated this approach

over weeks using smaller conversational datasets until we had reached a consensus that that it was not possible to account for the relationship between researchers and community members from an indigenist perspective: That is, the view that community members were the experts and therefore source nodes relative to researchers, who were the actual recipients or beneficiaries of interactions in which they solicited for information or knowledge from community members. In those cases, nodes representing researchers were the targets and nodes representing community members were sources.

The invented system of accounting for researcher bias using an "information and knowledge approach" to parse the content conversational WhatsApp chats and talking circles for meaning and intent had a second function: It paralleled to some extent interactions of users on sampled Facebook groups. Creators of Facebook content such as images, videos, and tweets were treated as source nodes relative to target nodes, that is, users who were in a "recipient" role, and who had responded with liking or commenting relationships. In the methods in chapter 3, I have shared raw notes that partially went into data analysis.

By this process of bias minimalization process, together with the statistical analysis algorithm embedded in the multimodal graphing plugin on Gephi, also shared in the methods, the central role of UVAma/UVAfe (red and yellow circles in the networks below, on Figure 4-L) became clear in the network, we confirmed that their importance was due to valuable Mau/Cūcū learning relationships that they each enjoyed in Place, underscoring the centrality of the learning principle as a resilience mechanism, a confirmation of findings in much of resilience research that has influenced this work. Moreover, the gender inclusivity of the outcomes is not lost on us. The next chapter goes more in-depth about the content of learning that bolsters motivational resilience, including ecological principles of stewardship.

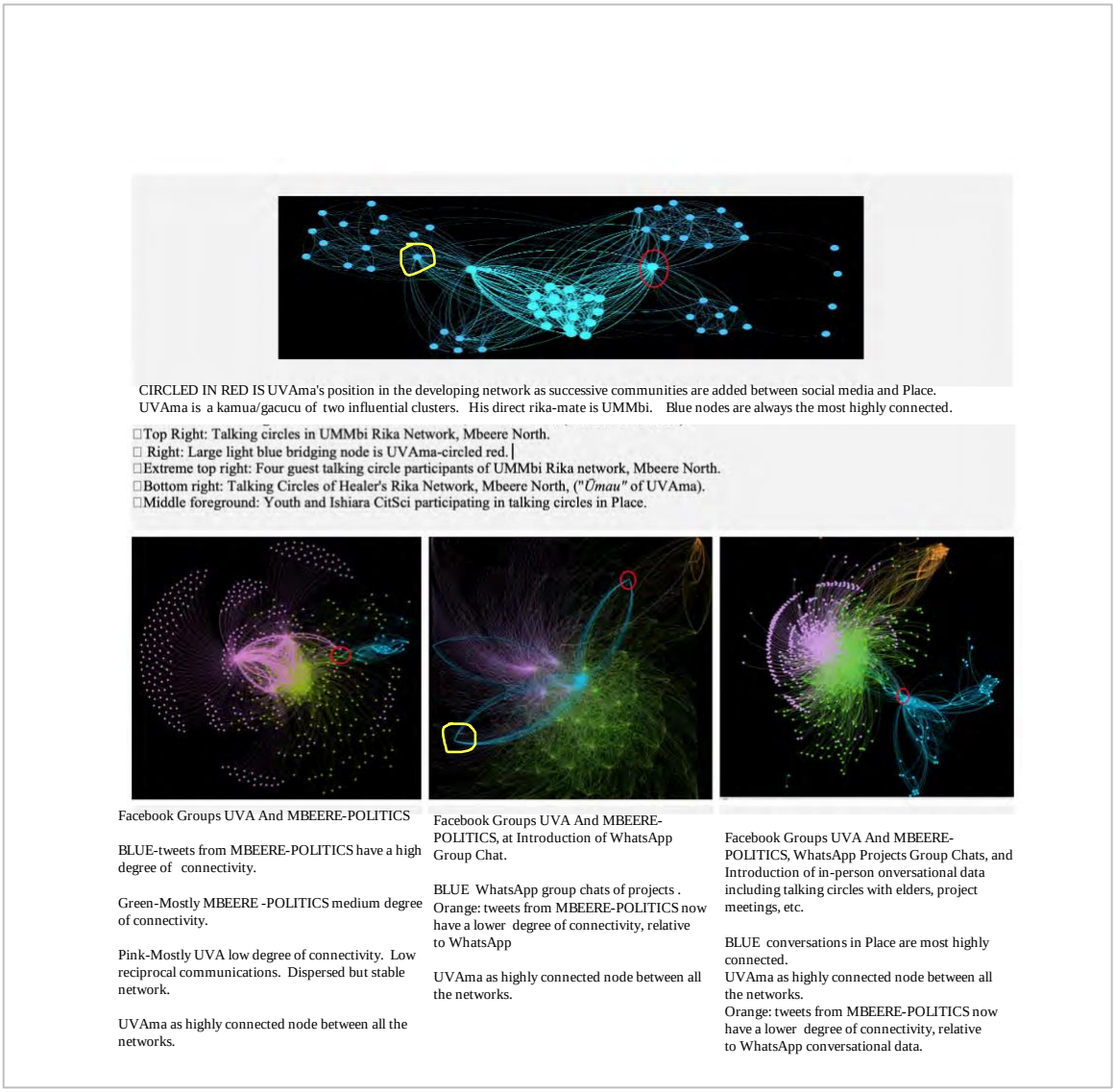

Figure 4-L: Rika Bridging Between Place and Social Media

The networks of UVA and UVAfe, which are shown on Figure 4-L in the network visualization, are then presented in tabulated format on Table 4-C to follow. The rika data sample on the table is a portion of a developing dataset, still emerging from continued data analysis and member checking exercises of the research team as of this writing in 2020. The main function of Table 4-C is to show dimensionality of the dataset from which we have triangulated analyses throughout this work, for example, the larger datasets extracted from

social media, presented in figures 4-K and 4-L, are directly informed by data on Table 4-C.

Secondarily, my hope in presenting Table 4-C in the Kīmbeere nomenclature of Rika is that other members of the community who may encounter the tabulated rika demographic data sample in Table 4-C, may possibly find meaningful connections. Ultimately, we hope to that more people will be inspired to undertake research on a personal or collective level, toward reclamation of rika in its authentic sense. Given capacity of the system to visualize and bolster inclusivity at various levels, our effort has been concentrated on illustrating applicability at intersections normally prone to hierarchical structures. The table below has been pared down for presentation so that it only incorporates elements of rika discussed in this chapter. The table incorporates the elements of rika that evidence bias minimalization. For example, UVAma and his UMMbi, in the table are members of different clans and different electoral coalitions. This is common in the dataset, whereby it is the rika relationships that, because they are modular rather than diverse, result in convergence, a necessary safeguard for the extreme divergence achieved at meso and micro level by clans. For resilience to be mitigative, a balance is needed along these multiple binaries. Yet, natural familial relationships do not always articulate inclusivity mechanisms until a correction needs to occur, in which case the system is already compromised.

Rika Demographic Sample Table

NAME ID *Anonymized*	**GENDER**	**BIRTH YEAR** *Birthyear (majority are approximated)*	**MŪVĪRĪGA** *Matriarchal* Clan (not a rika)	**NTHUKE** *Cyclical Rika*	**RIKA Macro** *Rika (legislative/ executive)*	**MŪVĪRĪGA** *Clan Coalition (Electoral Rika. Also effects meso sociopolitical and judicial functions)*	**MWENA** *Geolocation*
UVAma's network							

CUTha	F	1932	Nyonga (c1)	Itherū	Nyangi	Īrumbī	North
UMMwi	M	1930	Mūkera (c2)	Itherū	Nyangi	Īrumbī	North
UMKka	M	1916	Nyonga (c1)	Itherū	Nyangi	Īrumbī	North
CUThi	F	1925 Married to MZThi	Not Reported	Ivate	Ivate	Īrumbī	North
CUNge	F	1938	Mūkera (c2)	Nyangi	Nyangi	Īrumbī	North
MZKab	M	1948	Nyonga (c1)	Nyangi	Nyangi	Īrumbī	North
MMZnj	F	1952	Īgoki (c3)	Itherū	Nyangi	Īrumbī	North
UVAma	M	1975 Kamau of UMMbi	Nyonga (c1)	Nyangi	Nyangi	Īrumbī	North
UMMbi	M	1920 Mau UVAma	Ngithi (c4)	Nyangi	Nyangi	Mūrurī	North
CUWan	F	1935	Ngithi (c4)	Nyangi	Nyangi	Mūrurī	North
UMThi	M	1925 Married to CUThi	Reluctant *(minimizes clan identity)*	Nyangi	Nyangi	Mūrurī *(expresses preference for Mūrurī over clan identity)*	North
MZNnj	M	1948	Ngai (c5)	Itherū	Nyangi	Mūrurī	North
UMNth	M	1925	Ngithi (c4)	Nyangi	Nyangi	Mūrurī	North
UVAfe's Network.							
CUMbu	F	1942 (married to UMKim)	Kere (c16)	Nyangi	Nyangi	Mūrurī	South
UMKim	M	1928 (Married to CUMbu)	Mūkera (c2)	Nyangi	Nyangi	Īrumbī	South
UMNga	M	1922 (married to CUNga)	Magwī (c6)	Ivate	Ivate	Īrumbī	South
CUNga	F	1937 (Married to UMNga)	Mbūya (c17)	Ivate	Ivate	Īrumbī	South
UMJng	M	1930	Kamūvīa (c7)	Nyangi	Nyangi	Īrumbī	South
MZKag	M	1942	Mūthīga (c8)	-	-	Īrumbī	South
UMDan	M	1932	Īgamūmū (c9	-	-	Īrumbī	South
UMMin	M	1928	Thara (c10)	-	-	Mūrurī	South
CUNgu	F	1922	Ngūī (c11)	-	-	Mūrurī	South
UVAfe	F	1972	Īkambī (c12)	-	-	Mūrurī	South
CURut	F	1937	Nditi (c13)	-	-	Mūrurī	South
MZNya	M	1940	Ndegi (c14)	-	-	Mūrurī	South

CUPlu	F	1933	Īkandi (c15)	-	-	Mūrurī	South
MZEmu	M	1943	Īkambī (c12)	-	-	Mūrurī	South
Note that the estimate of 17 clans is based solely on self-reported clan identities of community members (c1-c17). The research team has not attempted to analyze the clan nomenclature but presented the data as reported. The number may therefore possibly be boiled down or even increased, depending on the parameters used to define a clan. Glazier (1985) presents detailed lists of Mbeere clans. The research team did not compare between Glazier's and our dataset. Rather, I have left it as a subject for future research.							

Table 4-C: Rika Demographics Population Sample

In the table, the relative readiness of data on rika demographics in Mbeere North as well as the likelihood that Nyangi is the most often reported identity, appears to suggest that the missing data on Ivate has been lost as a result of structural changes in Mbeere South due to colonial agents discussed elsewhere. However, I find no reason to doubt that, as elders told us, rika lived side by side. Without more data on Ivate, I infer firstly from elder accounts of immigration into Mbeere and the purpose of Ivate as the facilitative change agent. Secondly, Mbeere South holds land resources that historically supported zoological industries and supporting sectors, including pastured livestock management, hunting, beekeeping, mining of iron ore, blacksmithing. Elders in Mbeere South, but not in Mbeere North, on several occasions discussed historical events linked to the waning importance of Ivate relative to Nyangi, specifically a 1932 mandate to form a rika coalition homogenizing small EC communities under the banner of "tribe" led by Gīkūyū. This event is traceable in historical research, as the documented vanquishing of Ivate in 1932, by Lambert's administration. This event corresponds with increasing confiscation of the land resources in Mbeere South, on which these industries were dependent. It is inevitable that increased alienation from everyday practices would result in the waning importance of zoological stewardship and the industries that Ivate supported. In Chapter 5, under Rika Protocols for Resilience, I present an excerpt with the single direct reference to Mbeere South, in which "Thagana" leads in a

symbolic aspect of a larger disease control exercise. Table 4-D below illustrates the relative scarcity of Ivate data compared to Nyangi data.

4.5.5 Mbeere Rikamedia

Drilling down to social media, we were able to link the concentration of Nyangi in present day Mbeere North with the formation of the seminal Facebook group by citizens in Mbeere North. The group, UVA, consisted of 4,513 members at the time of the survey in 2017, data showed that two out of three UVA members were predominantly from Mbeere North. Membership numbers have held steady over the last 3 years of observation with fluctuations of less than 100 annually marking both increases and decreases as members move between the Facebook groups in the ecosystem.

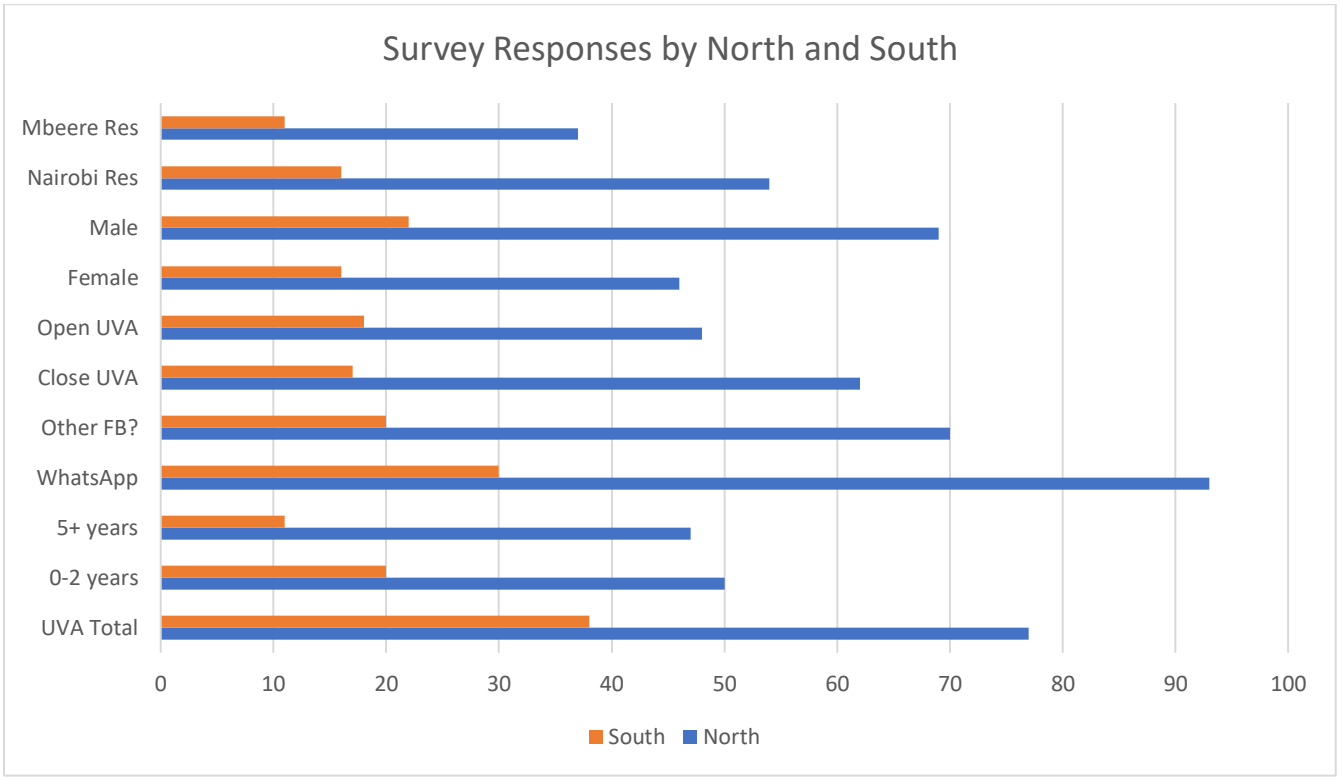

Figure 4-M: UVA Membership by North-South geographic identity

The survey asked participants to indicate which part of Mbeere they predominantly identified with either by living there, having been born there, working there, or going to school there. The prompt included a third choice, to decline to answer this question. All participants picked a geographic identity. Out of 115 community members, two thirds responded that they were from Mbeere North. This question was prompted by three factors: (1) the Pathfinders wanted to apply outcomes to their decision-making strategy; (2) talking circle data from our accessive study had suggested that North and South had divergent environmental perceptions, and may be motivated to participate in different ways; and (3) the predominant nomenclature of the Rikamedia was characterized by Facebook group identification along North and South geolocations.

Īrumbī and Mūrurī: Modulated Electoral Bodies

Electoral COALITION	**RIKA**	**MBEERE NORTH**			**RIKA**	**MBEERE SOUTH**	
Īrumbī	NYANGI	Nyangi	1		NYANGI	Nyangi	3
		Itherū	6			Itherū	0
	IVATE	Ivate	1		IVATE	Ivate	2
		Nangamīguī	0			Nangamīguī	0
		Īrumbī North Total	**8**			**Īrumbī South Total**	**5**
Mūrurī	NYANGI	Nyangi	4		NYANGI	Nyangi	0
		Itherū	1			Itherū	0
	IVATE	Ivate	0		IVATE	Ivate	0
		Nangamīguī	0			Nangamīguī	0
		Mūrurī North Total	**5**			**Mūrurī South Total**	**0**
Totals	**North**		**13**		**South**		**5**

Table 4-D: Sample Breakdown by Rika, Electoral Body, and Location

Data on Īrumbī and Mūrurī, aggregated from our rika demographic sample with 25 elders and 2 Rikamedia members, helps to confirm the finding that rika has a modularizing impact on diverse clans. In the table, participants reported a total of 17 clans in a sample comprised of 27 members. Conversely, there are only two rika each, at the electoral level and at the executive level of governance.

According to elders in Mbeere South, the structural functions of Īrumbī and Mūrurī were historically to (a) coalesce clans for electoral purpose "gūīkia mītī." and (b) prepare citizens for active participation in governance, service, security, and military affairs. Each was a coalition of diversified clans, fostering citizen participation in an equitable sociopolitical processes under Īrumbī and Mūrurī. This rika is perhaps the most studied, but just as little understood as any other rika structures, because it has been examined using alien terminologies and in isolation with the rest of the Rika system.

In the cause of soliciting information about rika, elders in Mbeere North added complexity to the data by offering that, "Rika rīngī nī Īrumbī na Mūrūri. Wa narīo nī rika, kūringana na ūrīa andū ma tūīre," meaning that, "Another type of rika is Īrumbī and Mūrurī. That is also a type of rika, on account of how people were settled. Īrumbī is the elder, followed by Mūrurī."

As I had previously understood Īrumbī and Mūrurī to be the two overarching clans of Mbeere, until then to me synonymously termed Ndamata and Thagana respectively, I sought clarification regarding the definition of these bodies, their functions, and how they related to Nyangi and Ivate. I also wanted to know if membership into any of these bodies in any way influenced entry into Nyangi and Ivate.

By elder accounts, Ĩrumbī and Mūrurī are rika names, whereas the names Ndamata and Thagana represent the lineal organization more typical of a moiety in anthropological terms. This is important because in Mbeere, Ĩrumbī is often thought of synonymously with Ndamata whilst Mūrurī is thought of synonymously with Thagana, as had also been my understanding prior to learning from elders that the names Ndamata and Thagana define lineages, mīvīrīga. They are the overarching clans under which matriarchal clans define their diverse, and often binary interests, elemental, and unrepresented by rika. In terms of resilience, this is a level subject to Panarchy, universal laws of nature by which lineages, as natural systems, must be in obeisance. At the level of Ndamata and Thagana, hierarchies abound. Mūrurī and Ĩrumbī are conceptualized to neutralize these hierarchies. However, there is a difference in that, one's clan determines electoral orientation, hence, one remains in their electoral Rika, except by a lengthy process of fines and penalties. However a citizen may retroactively choose to belong in a different rika other than the one assigned them by accident of birth Nyangi or Ivate. On this level, elders told us, choice abounds, with attendant fees and process, one then undergoes the liminal transformative experience of gūtwīka, to break away/to become. (The word gūtwīka, nduīko, Itwīka, etc. has a double meaning of break and become). This expanded our understanding of nduīko. previously, we had imagined it to only apply to the process by which the polity of an incoming government was inducted into a system of governance by all through the nduīko ceremony. However the term had application in individual processes of induction into membership from one rika to another. Historical research has been tentative about this findings in their own data, but the collective method we used for data collecting allowed not just for shared recall but also for wide corroboration or challenge to an idea. Moreover, we understand by now that Rika is

not a bloodline system but rather a system leveraging bloodlines to transcend the natural hierarchies that are often created by social groupings based in bloodlines. Hence, we can confidently assert the finding that Rika allowed individual choice. Below are three representative quotes from three different conversations:

> CUTha (Nyangi, Itherū, Mbeere North) Negucaga ngirwa ati twari a Ivate. Ati nikwa vava atwikire, tugitonya guku nyangiiri. "In my youth, I was told that we belonged in Ivate at one time, then my father broke away/became Nyangi, and we entered where we are now on the side of Nyangi."
>
> UMthi (Nyangi, Nyangi; Mbeere North) Mwongia wakwa niwe wari wa ivate. Wingi uria naici ni muthuri ti...(names a neighbor and daughters). Acio engi... maundu ma mari nimathirire. Riu ndignimenya nundu ingi kwagendaga na uria mundu ekwigua. Mundu agendaga kuria ekwigua ingi. "My wife was the Ivate member. Another Ivate I knew around here was (names a neighbor and daughters). Others... well, the practice has ended, so I would not know who else was Ivate in these parts because [unlike Mūrurī or Īrumbī just offered], it depended on preference. One went to the preferred side."
>
> UNNga (Ivate, Ivate; Mbeere South) Marika mengi maria magite kuo riu, ni ama magwitwa aaKathoreki na aaAC. Ethwa aguo Atonyire gwa Kathoreki nawe ugitonya na gūkū kwa AC. Mau nimo marika maria magīte kuo riu. "The new types of rika that have arisen are Catholic and Anglican Churches. If your father is a member of the Catholic Church, then you may choose to Join the Anglican Church. That the new type of Rika we have now."

I concluded based in emerging realizations that a reason the names Ndamata and Thagana are interchangeably used with Īrumbī and Mūrurī, is that a large portion of the community has lost touch with an important aspect of structural resilience served by these structures as exemplified by elders. These names did not come up often in Mbeere North, but they wre a constant in Mbeere South and formed a large part of group dynamics on WhatsApp groups when the protocol allowed for this level of self identity. However, I did not encounter any community member referring to themselves as Ndamata or Thagana. The terms were used in descriptive detail, to inform, rather than self identify. Although this is a positive indicator in that there is an underlying recall of protocol. However, there is need to reframe the function of Mūrurī and Īrumbī so that it is less oriented toward meso level clan

interests of the matriarchal clan coalitions. It would bolster resilience at political level to be able to recapture the non-competitive electoral process exemplified at this level, since all community members are in full possession of their Mūrurī and Īrumbī identities. Even better, a full recapture of the legislative and executive level would be empowering to the County and national political process and governance. I will revisit the question of the function of electoral rika in the next chapter under motivations towards participation.

4.6 Rika fosters dynamic structural reorganization

So far we have predominantly talked about the role of rika in terms of maintaining structural constancy in changed circumstances, that is, ensuring a return to norm. However, resilience thinking incorporates positive feedback mechanism, triggered when there is need to transcend the bounds of normalcy and into new identities. Toward this end, I probed the data for evidence of patterns of change that may serve the purpose of bolstering not resistance to change this time, but perhaps even radical adaptation in response to external or internal pressures. I considered that for communities centered in land based resources and already demonstrating a propensity to environmental accountability, such mechanisms might make themselves evident with sustained contact. Toward this end, I asked elders to talk about any rika relationships that perhaps they had experienced in before, but which were not part of their lived experience.

According to their accounts in response, elders told us about rika in terms that applied in the wider EC context, although defined along varying planes of interaction based on historical development of the communities in question. For example, Mbeere Nyangi elders

told us that, Mwangi in Gīkūyū is Nyangi in Mbeere, and whenever they went to the neighboring community of Gīkūyū, they would be well received in the homes of Mwangi elders. Elders defined Mwangi, a Gīkūyū rika, as a variant of Nyangi, a Mbeere rika. As they told us, a Nyangi elder who visits with a Mwangi elder is at home, and vice versa.

This finding explained present day community relationships from a new perspective, in that it formed the basis on which to synthesize findings from historical research, generating a dataset to inform an Indigenist Maths investigation, seen in Table 4-E, below. The focus was one of the most important aspects of a resilience theory: that is, resilient systems provide mechanisms by which coupled units can decouple from each other in times of stress, either to conserve resources or to seek a new resource base. The decoupling process usually leads to dynamic and/or transformative reorganization, whereby some parts of the system may return to base whilst others transform into new shapes and identities.

Based on accounts of elders as well as textual analysis of prior research, the evidence strongly suggests that whenever necessary, Rika systemic design allows for decoupling so as to ensure maximum survival in the event of unforeseen disasters, population explosion, or other development where resources thresholds are exceeded within a geographic location, In the binary pair, Nyangi is the half that provides constancy in such an eventuality, whilst Ivate provides the flexible, more malleable half of the coupled rika, the goal being to facilitate the capacity to reassemble as a new community with newly named rika pairings, adhering to the basic rika pairings of Nyangi/Ivate, with Nyangi offering transitional capacitating support.

In this, Nyangi took a capacitating role in Embu, because Embu did not have rika at this level. This has already been established in the literature search. Our own elders filled in knowledge gaps raised in findings of Lambert, Saberwal, Glazier and others, with the often

repeated statement that, "Yembu ndīarī rika. Mau megwītwa aaa Nyangi, marī ma Mbeere." Embu did not have rika at the level of Nyangi. This was a Mbeere Rika function. below is a representative quote, from MZKab, Mbeere North.

> Kīama Kīrīa top mwenarī wa Kīmbeere gītagwa Kīama Kiirū na Embu gūtīrī, ciao nwangana mangīraretire.. mareterwe ndeto nī Njerū wa Mūrū wa.. No ūvoro wa nyangi ngwīre rīngī Embu matī rika… Njerū wa Mūrū wa... akīenda kūthondeka kīama gīake nīgenda ace akinyīre mbia.Ndonire ūrimū mwīngī mūno mūndū ūgwītwa (local politician), agīūka varīa va society mūcemaniorī wa farmers.. akīaria ūvoro wa Nyangi, aī arathurirwe atī gūtuīka wa Nyangi.., politically, nī mbia makūratia makinyīre president.
>
> *"The top council in Mbeere is called Kiama Kiiru (Black Council) and there is not one in Embu, not unless they have created one recently. That idea was introduced by a man called Njeru wa Muru wa.... But I tell you in Embu there are no rika, it was a Njeru's plan to make easy money. I saw foolishness when a man called (local politician) went to a farmers meeting and claimed to have been chosen to be in the Nyangi…Politically they are looking to fundraise."*

In operational terms, according to elders, dynamic reorganization of rika often occurred in times of yūra. The word yūra means scarcity, a commonly written about phenomenon in historical research in the EC. I want to examine a less well research aspect of Rika, gender dynamics as they may have been before interruption of resilience building by returning systems.[11]

Interpreting the situation in resilience terms, when resource thresholds are exceeded, rika decouples and dynamically reorganizes a portion of the population into a derivative but independent community. According to elders, when sections of the population are forced to move away, Rika maintains macro level structural integrity with Nyangi providing continuity whilst the Ivate equivalent is markedly adapted to the new environment. Nyangi actively

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[11] Contact with returning systems is traced as far back as the 18th century by consensus in historical research on systems of EC communities, cited throughout, incl Ambler, Glazier, Saberwal, etc.

builds capacities of the decoupled population through long term transition programs, fostering new coalitions.

This understanding of the Nyangi jurisdiction and its foundations of rika in Mbeere, shared by elders across the community, on one level explains the usage of the age principle that identifies Nyangi as the elder and Ivate as the younger rika. An examination of its value for community resilience yields additional insights regarding distributed governance, macro level feedback mechanisms, and decoupling processes necessary for dynamic reorganization in the face of disruptive changes that sometimes arise when a new agent is introduced into the mix by events outside the control of the community.

Giving the example of Embu as the most directly traceable structural relationship, Elders shared the kīrīra, knowledge, that Nyangi Ndiriri in Embu is a njaū of Nyangi in Mbeere. For Mbeere, inclusivity of rika is a counterbalancing mechanism to integrate matriarchal and patriarchal lineage levels. In Table 4-E, I present a gender spectrum showing dynamic reorganization or rika with increasing contact between communities and returning systems. This data is based in historical research on Rika as presented in Chapter 2 under Knowledge Gaps in Research Informing the Accessive Phase.

On a spectrum of dynamic reorganization, if gender is considered, Mbeere rika presents the most robust evidence of gender plurality, diversity or as some may call it, gender inclusivity, whilst Gīkūyū Rika evidences eclipse of gender inclusive mechanisms by Patriarchy. Embu presents an interesting case with its rika organization at a midpoint, evidencing aspects of Mbeere rika as well as aspects of Gīkūyū rika.

When combined with data from elder accounts, Embu does indeed appear to be in the process of defining its own socio political and environ-economic identity at the intersection

of Nyangi and a new rika that is reflective of its new geolocated realities. It can be inferred from the data that, if the process had not been interrupted by contact with Western culture, the communities would have developed along different trajectories following the same pattern whereby coalitions between decoupled rika were maintained through capacitating frameworks of Nyangi. To further inform elder accounts, let us examine dimensions of rika in three communities that neighbor each other in the EC region, as reported by local and foreign scholars.

The goal is to confirm elder accounts of the relationship between Embu and Mbeere through rika nomenclature. The dimensions examined reference the function of the particular rika or social structure in the stewardship system. I have used two Asterix to indicate where Embu rika derives from Mbeere taxonomy and two Asterix to indicate where Embu rika derives from Gīkūyū taxonomy. The data is also coded for gender inclusivity. M indicates matriarchy and P indicates patriarchy. R indicates Rika, E stands for Electoral. The data illustrates the concept of dynamic reorganization as a mechanism embedded in rika to manage change. As a matter of historic record, Mbeere has been the least exposed to returning systems and Gīkūyū has seen the most comprehensive exposure. Below the table, I discuss insights from the gendered aspects of Rika. It will be remembered that the OED defines Rika as a gender neuter noun.

SRUCTURE	**MBEERE**	**EMBU**	**GIKUYU**
RIKA Executive, legislative Economy, stewardship	Nyangi / Ivate R / R	**Nyangi Ndiriri / Kīmanthi Ndiriri R / P	Mwangi Irūngū/Maina P
NTHUKE (moderates successive generations) incorporates adjacent parent/child njaū and alternate grandparent/grandchild mau/cūcū)	Nyangi / Ivate Itherū / Nangamīgwī R / R	**Nyangi Ndiriri / Kīmanthi Ndiriri Merambu / *Irūngū R / P	Mwangi Irūngū/Maina P

RIKA (macro level clan coalitions modulate sociopolitical organization. Form electoral body. Inducts youth service rika, i.e., Īrua, Mumo)	Īrumbī / Mūrurī E / E	Gatavi / Ngua M / E	Mwangi Irūngū/Maina P
MĪVĪRĪGA (MIHIRIGA IN GIKUGYU) (Meso Level Matriarchy)	Mīvīrīga (Clans) M	Mīvīrīga (Clans) M	Mīhīrīga (Clans) M
MBARĪ (Micro Level Patriarchy) Diverse, short lived	Mbarī (Houses) P	Mbarī (Houses) P	Mbarī (Houses) P

Key

** Kīmbeere taxonomy.
* Gīkūyū taxonomy.
E Electoral Rika
R Rika
M Matriarchy.
P Patriarchy.

Table 4-E: Patriarchization of Rika As Dynamic Feedback Mechanism

After examination of the taxonomy in the table above, I theorized that based on the evidence, the data corroborated elders' accounts that rika originated with Nyangi, and that Nyangi had legislative duty over rika beyond its borders, to standardize Rika, and thus emerging communities were provisioned with macro level support in the process of dynamic reorganization. I additionally went beyond elder accounts to infer that, in its genitive role, Nyangi represented continuity, while the corresponding Rika in any community represented dynamism. I concluded that the system had been purposefully designed to dynamically simplify functions and limit systemic diversity. This would result in structural identity and function centered around Nyangi Rika, in the event of external threat. The tradeoff for survival was loss of gender neutrality of Rika, limited plurality of gendered and nongendered participation; erosion of significant aspects of inclusivity.

Seen from this perspective, the evidenced pattern of patriarchization over time takes on new meaning. When data is arranged from most recent and least colonially occupied (Embu)

to earliest exposure and most comprehensively occupied by returning system machinery, (whether or not the community had suffered direct or indirect occupation), Indubitably, Mbeere evidences the most marked gender inclusivity, Embu shows a mix of matriarchy and patriarchy, with taxonomic discordance, implying liminality or betweenness. Gīkūyū shows the most marked patriarchy. Given that the gender element appears to align with historical events, whereby Mbeere, least exposed, has been slow to patriarchized its rika systems relative to Embu and Gīkūyū, the rika observed today in Embu and Gīkūyū were highly likely more gender balanced prior to point of contact.

I now believe communities rapidly took on patriarchizing elements not just in response to the entering patriarchies of Europe, but just as importantly, that gender-based reorganization was an inbuilt feedback mechanism that was already embedded in the system emerged as an unanswered question at this point in analysis; and was carried over to deeper structural analysis that looked at internal structures in Mbeere with the understanding that the analysis just discussed might possibly be evidenced in various states of dynamic reorganization.

Although much research is needed in this area, the level of dynamic and comparative analysis between data in this work leads me to conclude that gender diversity and inclusivity is intentionally embedded in rika and the collapse of this element of structure has deep implications for systemic resilience. Not surprisingly, one of the stewardship goals of the Rikamedia Pathfinders and also articulated in governance structures of the Kenyan constitution is gender parity (GOK, 2010). Based in the gender equity observed among elders 90+ years old who followed many Rika protocol during our encounters relative to elders

from 60 to 80 year old, present gender discrimination may be understood as a product of coloniality. To triangulate my conclusions about gender as an aspect of Rika,

4.7 Gender participation on Rikamedia and in Place

We additionally considered impacts of gender on participation by age, and found that the survey and group analytics data (below) took roughly a similar pattern. The spike in participation for those 25-34 year old speaks to the millennial concentration in the group. However, the higher participation of males to females in the age group appears to be the reason for the 2:3 gender ratio. Moreover, the males 25-34 are from Mbeere North.

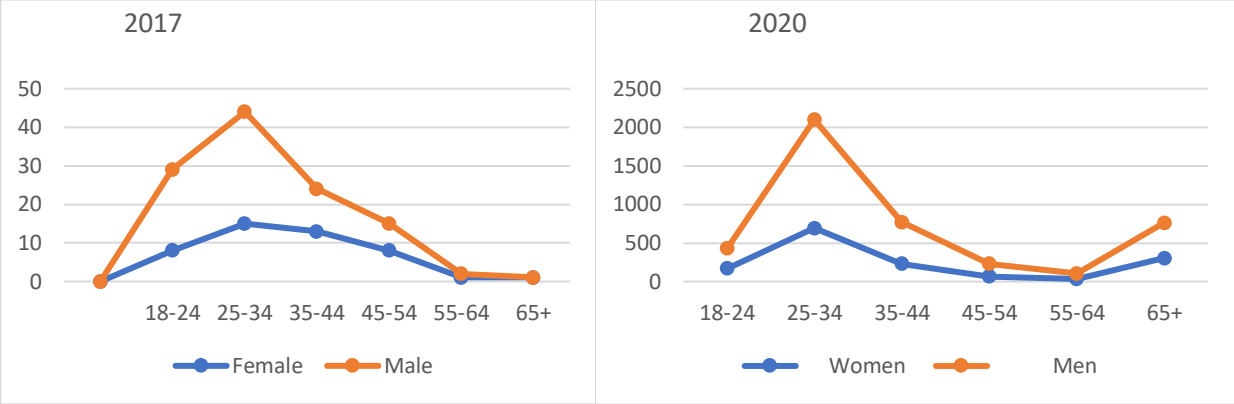

Figure 4-N: Age and gender curve on FB Group Data, 2017and 2020.

The conversation on gender is strong in Mbeere. Our eldest elder consultants, males, and females older than 90 years have shared that rika, regardless of the level, Nyangi/Ivate or Īrumbī/Mūrurī is gender inclusive. I call these elders rika affirmative. They are more likely to be versed in Mbeere indigenous education, kīrīra, and less likely to have acquired a western education. Additionally, rika affirmative elders are less likely to have been converted to

Returning belief system in their youth. The rika affirmative view of gender has been challenged by some elders and community members, mainly those falling in the right bottom corner of table from the ages of 85 years and below. I call these community members gender deniers.

They are more likely to have a western education and/or have been converted to Returning belief system in their childhood or early adulthood. These participants are also less likely to be well versed in Mbeere indigenous education. Some of those who hold this view posit that, "Nyomba nī cia athuri, nayo mīvīrīga nī ya aka. Wa mūvīrīga ūri nyomba ciaguo" Houses are male identified whilst clans are female identified, and each clan consists of a number of houses.

A few cited the example of Gīkūyū rika, Maina and Mwangi (sometimes called Irūngū), structurally patriarchal although also founded in matriarchal clans, Mīhīrīga. The highly diversified and volatile matriarchal clans of Mbeere are a source of political tension and viewed dichotomously by youth as to elders. The role of matriarchal clans is best discussed in the next chapter, which looks at the motivational role of structural elements that are outlined in this chapter, present-day politics

Gīkūyū clans have no role in the representative process. After comparative analysis of gender perspectives by participant age, I have concluded that exposure to Returning belief system worldviews greatly influences views on gender, with negative impact on inclusivity, so that women become marginalized in a relatively short span of time as the community orients towards patriarchal systems and loosens interpretations of rika as an inclusive system. Elders 89 years and below are more likely to take an apologetic stance toward Mbeere rika programs, interpreting them in present day religious language with a focus on

the ritualistic and the sacrificial. They iterate that, “Mbeere prayed to the same God we pray to today. Sacrifices were offered up as prayers, just as the children of Israel did.” It is not clear if, when we talked with younger elders, the lack of secular detail in their accounts was because they found little value for such details or because they did not actually know of the kinds of programs older elders talked about, to be discussed shortly. However, one can surmise the two factors to be at play. Elders told us that schools were introduced by missionaries with Returning belief system religious study forming a cornerstone of the education and African traditional culture greatly frowned upon as inferior to Victorian and Edwardian culture.

Indeed, prior to my own transcendent deep dive into the thick descriptions of our Akũrũ A Kīrīra elders, those at least 85 years old and ideally older than 90 years, I similarly misunderstood gender in the rika system, believing Rika to be antagonistic to gender equity, as presented in historical research on generational classes.

The male dominated opinion was held by both males and females 45 years to approximately 90 years old that, “aka mate rika.” women have no rika, and *“Rika nī rīa athuri, nayo mīvīrīga nī ya aka,*” “rika is a male concern and clans are a female concern.”

This view is invalidated in the data, although a superficial understanding of Kĩmbeere may seem to validate it. Elders will indeed say in the delivery of kīrīra, theoretical knowledge, that rika rītīcī mūndū mūkau kana rīmenya mūvīrīga” “rika knows no woman and nor does rika know clan.” *However, in the rika conceptual framework, the negative possessive pronoun denotes inclusion rather than exclusion.* The meaning is that rika is neutral in a positive manner relative to gender and clan, similarly to the expression that justice is blind, and therefore universally inclusive by omission of a defining knowledge on

which to base discrimination. That is, rika does not discriminate against community members by gender or clan. Indeed, in consultation circles with our Akũrũ A Kīrīra elders, those born in the WW1 years, in the women's voices were markedly stronger than in circles with elders 85 years old and below. When we asked in one elder circle, "you are giving us the names of your rika, and yet you are women. We have heard that women are not identified with rika. Is this not so?" The surprised response from both male and female elders was, "How would women not have rika? What would they be born into? Everyone must be born into a rika." Another pattern I noticed was that this perspective was shared by younger elders in them in their 70s and 80s, if they had not been "taken by the missionaries," or "become readers," in their youth. That is, they had neither converted to Returning belief system nor gone through a present day education system. As community members shared, "Girls who were readers were not allowed to have a rika. Only boys could have a rika. They would dance to the rika song, and we would hide so that we could watch the dance. Rika has always been for men, women have no rika. It was forbidden for our parents to circumcise us."

The semantics become clear, in that "rika has no woman." is very different in meaning from, "women have no rika." The first is inclusive, the second is discriminatory and marginalizing.

Another term that caused the team some confusion is application of the verb is, or to be, in statements indicating both a corresponding relationship between two rika and synonymity rather th*an correspondence. Elders would say that, "this is also that." When an elder stated that, "Nīrī wa Ivate, Njierūe nī Kanya Ka Mbūri. Nako Kanya ka mbūri, naūka Itherū. Nīko mūkwīgua gagītwa Itherū kūūrīa Ishiara. Na nūayo Nangamīguī we. Mainaga*

rūīmbo ūmūe. Nanii nainaga na Nyangi. I*vate rīainaga na Nyangi.* " "*My rika is Ivate. Born of Kanya Ka mbūri. And that rika named Kanya ka Mbūri, is also Itherū. It is the one that at Ishiara, they are calling Itherū. And Itherū are also Nangamīgwī.* [in their youth, before the "becoming" the Njaū, the "calf" or child-level rika, Itherū and Nangamīgwī would retain these respective birth names. Later, after their Ītwika, they would have their own song-name to dance to. He continues that, *"They used to dance to the same song. And me, I used to dance with Nyangi. Ivate used to dance to the same song as Nyangi."* This smorgasbord of nested relationships took me a while to deconstruct into synonyms, cyclical corresponding rika, and nested versus equating or corresponding rika pairs.

4.8 Rika in Theory

In this chapter, I have endeavored to present an empirical, evidence-based perspective on Mbeere rika, in answer to the question, what are the underlying structures that support environmental stewardship? Positing that rika is the overarching structure with functions that have thrived for more than 100 years to undergird environmental stewardship, our examination of rika has led to African understandings of inclusivity and environmental accounting by sector and industry, as articulated in Nyangi and Ivate stewardship mandates in alignment with economic practices.

Regarding the role of returning systems in Place, I conclude that the worst meso and macro level abuses of power in Mbeere are causally linked to pervasive loss of touch at

county and national level with almost the totality of historical and present day realities of the governed in Mbeere context.

Some reasons include but are not limited to,

1). Historical research focus on and taxonomical orientation toward, more accessible pseudo-rika, such as age-grades, affinity groups, etc.

2). vilification by missionary programs (Fiedler, 1996).

3). Extensive structural adjustments in 1920-1940s policies of subjugation by appropriation, (Ambler, 1989; Lambert,1933, 1956 Saberwal, 1967,1970)

4). Resultant to 1-3 above; politics of dominance in post-independence national policies, increasingly homogenizing structural mandates of the donor culture (de Haan, 2014).

5). Resettlement attendant to linear models of development and loss of place based linguistic and cultural repositories (Brokensha, 2007);

6). Centralized national governance codified in linguistic and legislative structures that are not aligned with those of the governed led to loss of linguistic and cultural diversity (Maffi, 2019); and not least,

7). self-interested economic greed leading to obstructive legislation and policy in contradiction to stated constitutional and legislative intent to protect indigenous rights.

It is for these reasons that founders of Mbeere Rikamedia coalesce into an Information World at the intersection of social media and Place. We have endeavored to show why this generation specifically, has the tools necessary to forge through with the mandate toward recovery of local self-governance, important for urgent ecological stewardship planning and implementation. Rikamedia pathfinders are Tūmau/Tūcūcū (grandchildren) of our Akũrũ A Kīrīra, the Nyangi/Ivate Rika, which automatically puts them in Rika together. Secondly, the incumbent Nyangi/Ivate are Tūcūkū of the 1932 Nduīko (great grandchildren are addressed in the collective as Tūcūkū in relation to their great grandparents, the Cūkū generation, where */tū/* indicates the diminutive plural, i.e., *tū-cūkū/.* The principle holds for grandchildren, Tūmau/Tūcūcū). Founders of Mbeere social media ecosystem and their grandparent networks in Place proved integral to continuity of the stewardship agenda, especially due to the connection between a rika's autonomy and its

agency to apply learned knowledge to economic endeavors and attendant stewardship of land based resources.

The loss of the former leading to the struggle to hold on to the latter is poignantly illustrated by the cūkū link between present day social media leaders and the Nduīko of 1932, in which the last cūkū (great grandparents in rika terms) lost rika self-governance with attendant loss of land based resources, economic agency, and autonomy of ecological stewardship. As there has only been a partial Nduīko in the intervening 80 years in the form of decoupled Nyangi inductions during the emergency period when the EC rural community was confined to concentration camp villages, the resurgence of the cūkū rika on social media to preempt a mirror event that saw Mbeere lose its autonomy once more in 2010 is of moment. It underscores the necessity of self-governance as a precursor to effective stewardship, bringing about questions of social and economic justice with regards to environmental stewardship. This concept is amplified by wide global application of the term rika, to mean autonomy, independence, or self-governance.

Jaeger & Burnett (2010) instruct that all research is a partisan experience, and that social information technology research ultimately is social justice research; hence we in the field cannot afford to equivocate out of a fear of appearing partisan. Connected to that principle is a view resilience centered in the idea that safeguarding biocultural diversity is a human rights issue (Mafi, 2019). Biocultural diversity means diversity of living ecologies, human cultures, and languages. Maffi additionally notes that the three types of diversities have been scientifically proven to either co-occur or to be co-threatened; and that indigenous strategies centered in intergenerational stewardship of ecologies are proven to bolster resilience. Maffi (2019) highlights the need for multidimensionality of diversity to undergird

resilience. We have endeavored to show the structural aspect of diversity in Rika, illustrating diversity of gender and age in particular, as among key reasons we may give as reasons why indigenous peoples make up a majority of the world's biocultural diversity. As a reminder from Chapter 1, Mafi declares that,

> Losing one's linguistic and cultural identity means losing essential elements in people's connections with one another and with the natural world. The consequences are profound for both the well-being of people and the health of the environment. Forcing cultural and linguistic shift on indigenous peoples and local communities not only violates their human rights, it also seriously undermines the goal of protecting the natural environment for the benefit of humans and all other species. "Monocultures of the Mind" have the same end result as monocultures in nature. They make our planet more fragile and vulnerable to both natural disasters and human-made crises. But the dominant ideology today ignores this reality and seeks easy-to- control uniformity instead of organic unity in diversity. (Maffi, 2019: 14)

Between these two viewpoints, one centered in access to social information technology, the other centered in indigenous right of Place, are ideas put forward in this work resting Rika as the inter-generational accessive-inclusive framework, fusing information and knowledge at the intersection of social media; a Rikacentric endeavor toward restoration of social justice and inalienable human right to self-determination. In particular, data underscores Illegitimacy of Embu County gubernatorial jurisdiction over Mbeere. Mbeere, whose name means "*First Peoples*" perceive their role as one of primary responsibility of setting the stewardship agenda in its role as the primary occupant in the region with Nyangi rika as progenitor of humanity. Elder' stance is triangulated in textual analysis of historical research by Lambert (1 showing interactions between different rika in the region, as posited in the data.

Of interest, then, is an ensuing conceptual understanding of the underlying motivation behind Lambert's 1932 investiture, in which he "conferred" what he saw as status to Embu, relegating women to a voiceless status, and thereby fundamentally restructuring a system of

which he had little understanding. Although on the surface the Embu community was greatly advantaged in this transaction, in terms of internal mechanisms, its dependence on Mbeere is ongoing and only outmarched by much remarked upon parallel narrative of ethnic superiority (Ambler, 1989; Brokensha, 2007; Riley & Brokensha, 1989a, 1989b; Njeru, 1979; Saberwal, 1970, 1989) whose genesis is traceable to macro level machinations. Certainly, the 1932 event was overseen by a few colonially appointed chiefs, for the sole benefit of Lambert collecting and reporting on data to the effect that Embu and Mbeere had exactly the same rika system: History would proof it to have been enough to push the monolith narrative. Lambert appears to have surmised that since Embu did not have the macro level Nyangi rika, as corroborated by Mbeere Elders and confirmed in evidence based research, for his newly constructed rika, he needed to work with the meso level of matriarchal clans, bypassing the macro level by elevating chiefs into his newly constructed rika legislature. In this way, Lambert used chiefs to make inroads into the legitimate governing structures that had been responsible for uniting communities thus far. Moreover, the clan level is one whereby Panarchy rules. This level is subject to natural laws of affinity to bloodlines, marital affiliations and identification with diverse, geolocated micro level economic and sociopolitical interests. The rika system had been conceptualized to modularize these hierarchical structures, i.e., resolve the natural laws of Panarchy.

Having thus effectively neutralized the macro level dimension of rika, that was then the local government, Lambert had reconceptualized the rika system as a one dimensional "clan system." Lambert and others like him who worked in other communities all over Africa have had lasting impacts on the politics of Africa south of the Sahara by systematically destroying the structures that were used to undergird unified stewardship. There is need to

reinterpret more historical data to inform understandings about systemic breaches and where these can possibly be repaired or transcended in present day experience.

Ambler, Glazier, and Saberwal have all found Lambert's account questionable, as do I. All have concluded, whether based in data from Embu or Mbeere participants, that the 1932 event was anomalous. Lambert's fudged report has been codified and has been historically used to justify homogenous administration of Mbeere from Embu, bolstered by an accompanying narrative about unfavorable weather in Mbeere, outmoded attitudes that do not withstand deeper examination in the face of an evidenced influx of immigrants from Embu Subcounties into Mbeere Subcounties in search of land and opportunities to unaccountably exploit land based resources, facilitated by lax protections toward Mbeere indigenous properties at County and national level.

I posit that it is from the subjugation of this resilience structure that marginalization of Mbeere has been pervasive, unlike in other EC communities who have retained their original rika identities, and today evidence robust local governance. Yet, in size and contributive value, Mbeere has as much merit, if not more than many other counties with local self-governance, including Embu County. Constitutional provisions for redress ought to be brought to bear and the case reexamined with urgency ahead of the 2022 general elections, reinstate the relationship between Mbeere and Embu in the years 1996-2010, when Mbeere community members enjoyed the right to and responsibility for traditional jurisdictional resources as is constitutionally guaranteed citizens of Kenya.

In a different vein that concerns researchers in EC context, manipulation of rika for colonial purpose has additionally led to practical problems for researchers, rendering it an

impalpable subject on which to base a hypothesis, so that only a few have attempted to undertake that long and tedious work required to arrive at cogency.

For example, Glazier's (1976) classification of Mbeere Rika is the most closely aligned with the actual system, presented in chapter 4. However, not even he escapes errors due to confoundment over his own findings and Lambert's, considered the gold standard. He therefore identifies Ivate, (as does Michuki in 1962) but is forced by the limitations of his own data to leave the matter unresolved. Moreover, thinking he has found a distinct weakness in the social structure based on what he terms generational classes, Glazier observes that generational classes do not easily fit within conventional age ranges normally associated with generations or age-sets, and that children and old alike appear to belong to a single generation. As we now know, he is looking at Nthuke, the cyclical structure by which modularity is achieved at micro level.

Moreover, the question of gender looms large in the data we have collected, yet appears marginal in historical research, whereby there is an appearance of male dominance throughout. We see that the historical gender bias is not based in Rika understandings of gender, which are centered in equity. Rather, historical gender bias stems from returning systems understandings of self and interpretation of African context based in those understandings.

For example, Lambert concedes that genders are equally represented in the processes he observes in 1932, (also confirmed in Saberwal, 1970), yet his acknowledgement of women goes no further in the data, instead focusing exclusively on achievements of males and marginalization of women. Firstly, by installing male leadership to the almost total exclusion of women, Lambert managed to patriarchalize the gender protections previously

afforded women by a multriarchal system, effectively silencing women in the process. Secondly, his district reports reflect that his use of the elders' councils[12] to pass legislation in Embu District was biased toward preoccupation with the control of girls and women through social and economic legislation, including in one place, monetization of a, "bride price," where tokens had been exchanged between families before, and possibly leading to present day language in which brides are said to have been, "bought," rather than married. Lambert was of course not a lone actor but an agent of the larger colonial machinery.

It is not unpredicted then, that in the male dominated social anthropology and ethnography of returning system Africa is saturated with patriarchal nomenclature, inherited through structures of society today. Yet, as I found out during this research, for Mbeere and many of the communities in which rika concepts find application, elements of matriarchal systems linger, but are not well understood, even inside the community of practice. Yet, such matriarchal elements themselves appear to be systemic over-corrections in pre-recorded history, when understood from the vantage point of rika understandings of gender equity,

Based on a comparative analysis of Mbeere, structurally the most intact rika, with Embu and Gīkūyū rika, I suggest that, at its most ideal, rika defines a system that is neither a matriarchy nor a patriarchy, but rather, gender plurality, underscored by the finding that Rika is not itself a lineal system but rather a system of systems, devised to leverage lineal and gendered systems for inclusivity.

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[12] Elders do not use the term Elders Councils in reference to the same or similar undertakings. The term appears in colonial reports (Colonial Report #1532; Lambert, 1933, 1956). Inferentially, we can assume a similar process was undertaken in other places under imperial rule.

This concept is illustrated in chapter 4 under the topic of gender inclusivity and is moreover triangulated by elder accounts. Included is the voice of 87 year old CUPlu, a respected elder in the community who by choice has married wives in the past. By the end of the chapter, I conclude that systemic leaning toward patriarchies and matriarchies are overcorrections, occurring in response to systemic stressors when resilient systems simplify for basic survival until a future time when recovery and reorganization is possible. Patterns of patriarchization of rika observed in our data and in prior work (Tew, 2017/1951) suggest this may be the case, especially because early direct occupation and/or classification of systems in research cooccurs with pronounced patriarchization.

Lastly and marginally, I will point out that that the term "generational classes" as used in the literature on Rika, while its utility in creating a social classification scheme is obvious, is not representative of the context. The traditional Rika based society has no classes in the sense conveyed through the English language. This is rapidly changing with urbanization, but for the majority of the community at village level, identification with material accumulation in the sense relayed by social class is still an alien concept.

4.9 Conclusions and Arising Questions.

While it is discernable that technology plays a transcendent role in reenergizing structure, i.e., rika, a question that arises is how to sustain motivation toward participation in a marginalized state, whereby gubernatorial constructs invalidate goals and priorities that are of value to Mbeere citizens under its control. In the next chapter we seek to examine motivational role of rika at the level of structural functions in a situation of enforced separation. That is, what principles, protocols, processes, contents, and dimensions of programs are of motivational value in decoupled state?

Key motivations toward participation that we will encounter in the next chapter link back to structural concepts we encountered in this chapter. A finding on motivations that links back to this chapter on structure is the desire to participate in something that benefits society at large, which is itself linked to values fostered through rika, to be discussed in the next chapter. We have seen in this chapter that structurally; learning is activated in the Mau/Cūcū relationship between specific grandchild/grandparent pairs at micro level and mirrored at macro level through Īrumbī and Mūrurī in sociopolitics and governance; and through Nyangi and Ivate in socioeconomics and governance. Another idea to be discussed is that, based in findings of this chapter, technology design that supports a sense of being in rika will have a motivational impact. In the next chapter, we discuss how these concepts are intertwined, providing evidence of motivation toward participation in rika stewardship.

5 Chapter 5: Motivational Resilience

5.1 Overview of Chapter

In this chapter I explore the second research question: what motivates environmental stewardship in an indigenous community with place-based and social media approaches? The answers are intended to demonstrate the value of rika for motivational resilience to support environmental stewardship. I regard this chapter representing the adaptive phase of research in that it is based in that it is based on the hypothesis that structures encountered in the previous chapter embed adaptive learning mechanisms whose function is to motivate community members toward participation in fulfilling the functions of rika in the face of risks and threat in order to maintain the purpose of system, which is to safeguard survival of the community in the face of change. I term this concept motivational resilience. From this understanding, we set out to uncover factors that support motivation towards participation in stewardship. Moreover, I term it rika stewardship, in acknowledgement of findings that traditionally the stewardship agenda is set in Rika by Nyangi and Ivate.

We already know that the community is extant in a gubernatorial structure that does not validate goals and priorities that are of value to Mbeere citizens under its control. This raises the question of how to motivate continued engagement and participation. Key motivations toward participation that we will encounter in this chapter link back to structural concepts we encountered in the previous chapter. A finding on motivations linking back to learning structures is the desire to participate in something that benefited society at large, which is itself linked to values fostered through learned rika stewardship principles, as yet to be discussed. We may remember from the last chapter that structurally; learning is activated

in the Mau/Cūcū relationship between specific grandchild/grandparent pairs at micro level and mirrored at macro level through Īrumbī and Mūrurī in sociopolitics; and through Nyangi and Ivate in socioeconomics and governance.

Further based in findings of the previous chapter, I posit that technology design that supports a sense of being in rika will have a motivational impact. In this chapter, we discuss how these concepts are intertwined, providing evidence of motivation toward participation in rika stewardship. In this chapter we explore the nature of indigenous motivations at the level of structural functions, principles, processes, content, dimensions of programs developed from this set of factors, and motivational role.

5.2 Identifying Key Motivations

When community members were asked to pick their key motivation toward participation, learning was the overriding answer on UVA with participants of all age groups. The second most picked motivation was the belief that everyone should take part in something that benefited society, whilst the third most picked motivation was the perception of the Facebook community as being of importance for Mbeere.

Two questions were designed to measure intrinsic versus extrinsic motivations and thus designed to determine whether community members participated on social media to steward, or if their participation was driven by personal interests. In the first question, community members were asked to agree or disagree, on a personal level, whether their involvement on UVA promoted a range of variables. The variables were: their status in Mbeere, their status outside Mbeere, their economic livelihood activity, their community interests in Mbeere, and their learning about Mbeere.

The question was not asked as an either/or but rather as a ranking along a continuum. They could pick one of four ranking choices: strongly agree, agree, disagree, or strongly disagree. Members could agree or disagree with all, none, or some of the answer choices, to any degree that they perceived to represent their motivations on a personal level.

Based on these parameters, approximately 98% of community members either agreed or strongly agreed that they were interested in learning about Mbeere, and 85% of community members responding thus also believed that involvement promoted their interests in Mbeere. At 75%, many community members additionally believed that involvement in UVA promoted their status inside Mbeere. By comparison, only 55% believed involvement in UVA promoted their status outside Mbeere. Also shared by only 55% of community members, that involvement promoted their economic, income-generating, or livelihood activities.

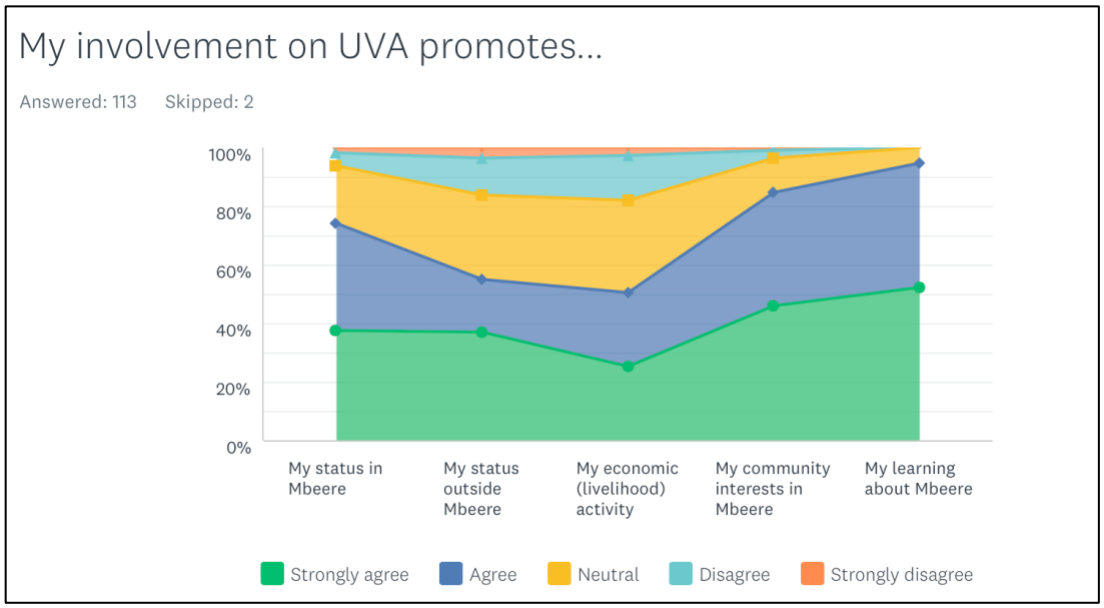

Figure 5-A: Motivations (intrinsic vs extrinsic)

The second question was close ended and designed to decrease acquiescence bias to the question above, and lessen the likelihood that the user would respond to positive tone (improve the likelihood that a community member's response aligned with their motivation toward participation). It measured member beliefs about the value of participation toward the greater good, outside of their personal interest. This question was restricted to one radio button choice, asking community members to pick their ***key motivation*** toward participation.

Users 45years + indicated that they were motivated to participate because they enjoyed sharing knowledge about the environment. They believed it was important for Mbeere that they participate, and their participation helped the greater good of society at large. They were less likely to indicate that they participated because they believed everyone should take part in something that benefited society. Hence the participation of older members 45+ appeared to be predominantly out of their interest in Mbeere itself rather than a propensity for philanthropic drive in a general sense.

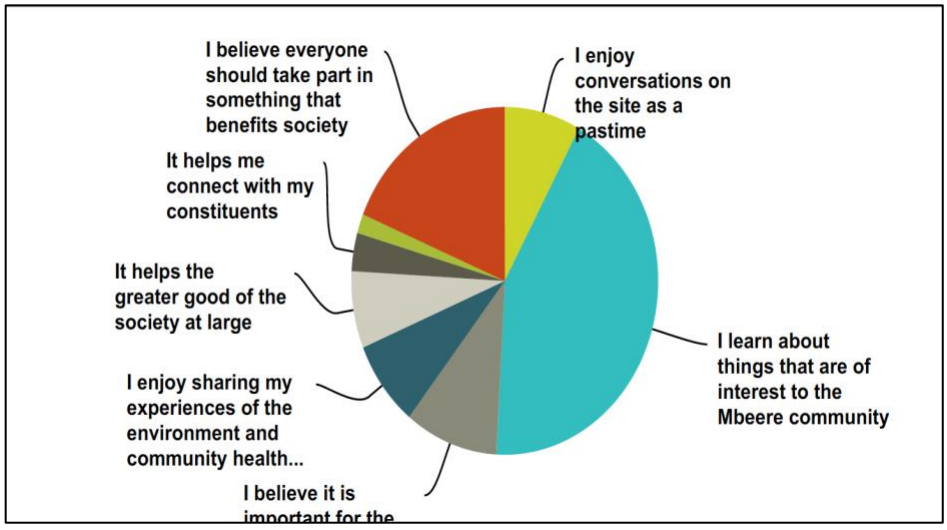

Figure 5-B: Key motivation to learn

In the next section we examine key motivations from an indigenous point of view, with an emphasis on learning. For the time being we will set aside questions about extrinsic motivation, focusing instead on key motivations.

5.3 Indigenous Learning Motivation.

Once we had gotten the big ideas from the survey, we needed to know why learning was the key motivation toward participation, as well as define it from the perspective of actors, process, and content. For this, we returned to conversational methods, triangulated with social network visualization, to inform emerging understandings on context. The value of a survey instrument is in getting an *overview of trends* in an area of study. To get at underlying mechanisms, different and overlapping methods need to be used, preferably through immersion in the context under study. This is especially useful in Indigenous societies, due to an abundance of tacitly transmitted knowledge which is shared orally or in practice. Kīrīra, the theoretical body of knowledge for basic education exists. However, it is best to get at the very least, intermittent physical contact with Place.

In attempting to understand why learning was the key motivation toward participation, as well as define it from the perspective of actors, process, and content, we start by reviewing the previous chapter on structures and functions of rika. In Mbeere, the Mau/Cūcū rika is instrumental to guiding the earliest and smallest of interpersonal interactions at family level and does so with great impact on social structure. A key underlying reason for this is that Mau/Cūcū interactions are learning relationships, serving the purpose of preparing the grandchild Mau/Cūcū for their stewardship duties in Nyangi or Ivate. Therefore, the Mau/Cūcū relationship also shares the Nyangi or Ivate economic-stewardship-governance identity. As we saw in the previous chapter, Mau/Cūcū rika relationships may, but they are not mandated to share in the same Mūrurī/Īrumbī identity. That is, a grandchild and grandparent can belong to either Īrumbī or Mūrurī, but they both must both belong either in Nyangi or in Ivate together.

The relationship has great impact on learning, retention, and retrieval of rika based principles. Our Naturopaths both identified as Nyangi and told us that they learned their foundational knowledge from their respective *mau*. It follows that a strong Mau/Cūcū relationship has motivational impact toward participation in any rika-based processes. First, we look at factors impacting the learner observed in real time, whereby one Mau/Cūcū facilitates a rich context for inquiry based learning, while the other Mau/Cūcū relationship suffers demotivating impacts of Returning belief system beliefs that render the relationship inaccessive.

To triangulate present day learning relations with long term motivational impacts of successful Mau/Cūcū rika, we will examine ecological stewardship practices of naturopaths, and their tolerance pushing back against macro level abuses, an outcome of Mau/Cūcū learning relationships from which they continue to draw knowledge. This section is intended to demonstrate the value of rika for motivational resilience to support environmental stewardship.

As reported earlier, Mau/Cūcū is the formal learning relationship between grandparent and grandchild, whereby they are considered agemates to facilitate reciprocal resource sharing. The loss of a Mau/Cūcū therefore engenders the loss of one end of a resource-sharing coupled resource sharing rika pair, and if that Mau/Cūcū is the elder, lost knowledge is difficult to recover.

As a result, a learning gap has emerged in Mbeere South. The situation is exacerbated by a mass alienation of the parent level generation in both Nyangi and Ivate rika, called the njaū (child level, theoretically consisting of Itherū and Nangamīguī born between 1940 and 1963, a time when their parents are engaged in the fight for independence). This generation

is aged 60 to 80 years old. They are the biological parents of UVAfe and UVAma; however, in rika terms, they are the children of UVAfe and UVAma. We know from UVAma's data that they belong in the Itherū Rika, a child Rika in Kīmbeere. If we correspond UVAfe with the mau/cūcū members of her network who are in possession of their Rika identities, they are either Nyangi or Ivate. This means that UVAfe is herself either Nyangi or Ivate, and her birth parent is either Itherū or Nangamīguī, as yet unknowns but traceable pending further genealogical research.

Within kīrīra, Returning belief system grandparents have historically navigated a space of tension in which many indigenous programs of interest, such as endeavoring to cultivate a rika name and identity, are eschewed by the returning belief system. By inference from absent demographic data on rika, Ivate rika appears to have converted on masse to present day ideals. But as *cūcūs, and ūmaus,*[2] that is, grandparents in the informal modern sense, for the sake of their shared cultural identity with their *cūcūs, and ūmaus*, their grandchildren, they have imparted a wealth of local knowledge to the younger generation, but without the requisite knowledge of how to navigate the formal rika structures to the same degree that their Nyangi counterparts do in Mbeere North.

Consequently, as the generation in its mid 80s to more than 100 years begins to pass on, much of the theoretical content behind anecdotal pieces of information picked up during conversational talking circles with elders who are experiencing tension between their Returning belief system and Rika identities, must be considered lost for the time being, pending further research. There is urgent need to apply the emerging findings of this and other works in a concerted effort at collect the living knowledge of our Akũrũ A Kīrīra.

5.3.1 Learning Motivates Ecologically Sound Medicine Practice

The role of healers or naturopaths' environmental duties has enjoyed remarkable resilience. Naturopaths are identifiable as a group of practitioners who treat patients using traditional, plant-based medicines. For contextual reasons, clarification is offered that this work cites only the work of Andū Ago (sing. Mūndū Mūgo), meaning healers or naturopaths. They stand in contrast to Arogi, who purportedly leverage powers from the spiritual world for curative magic-making. While Mbeere is reportedly renowned and even feared by neighboring communities for this science (Glazier, 1985; Saberwal, 1967, 1970), the practice of Merlinian wizardry and creative magic is outside the bounds of this research, because the level of penetration required to establish links with environmental stewardship is beyond the resources of the research team at this time.

For the inquiry at hand, the research team interacted at different times with a total of five naturopaths who shared aspects of stewardship that they deemed unclassified and shareable, based on their strict code of knowledge access. This is important because, of all the groups we talked to, naturopaths had the most comprehensive knowledge of the Mbeere environment and were consciously engaged in preserving the most valuable and endangered species of medicinal plants in Mbeere. Naturopaths stand to lose more than most when nature is impacted by manmade activities and species that they rely on disappear.

Of significance to the rika structure, naturopaths told us that they learned their medical practice from their grandfathers or grandmothers, as did our rainmaker elder. One of the naturopaths gave us a mandatory and very interactive lesson about Mbeere medicinal plants and their uses, declaring that the lesson was, "Tondū ndikwenda kīthomo gīkī gīakūa gīkaūrīra nthī." "lest my knowledge is lost in the ground" (meaning, he wanted to share his knowledge while he still lived).

This is a promising area of research that due to limitations in scope, I cannot report beyond the encounters in this section, though it is worth noting that in the two instances when we remembered to inquire, both the naturopaths we queried, MZKab and UMKim, responded that their Rika was Nyangi, further cementing the finding that community members identifying as Nyangi are likely to observe Rika ecological protocols, including the practice of naturopathic medicine and stewardship of medicinal plants. Notice from Table 4-C on the Rika demographic sample, that MZKab is part of UVAma's Rika network whilst UMKim is part of UVAfe's network.

Figure 5-C: Medicinal copses for sustainable harvesting

Upon request from the research team, Naturopaths showed us various copses (Figure 5-C) and small groves of medicinal plants, either preserved as they grew wild, or planted around their homes using wild samples. They included the following among their goals and practices:

- Use copses and groves as living 'pharmacies' to collect medicines for their practice.
- Conserve rare and almost extinct medicinal plants for future use.
- Conserve Mbeere natural heritage for the future.
- Teach others how to conserve plant integrity while harvesting parts of it for medicine.

MZKab, a Naturopath whom we talked to in Mbeere North, told us that he was directly involved in training local doctors and other medical facilities about uses of various medicines for some cases. A group of 4 young doctors visited with MZKab toward the end of our second session, underscoring the credence of his claim that he was often consulted for his knowledge of medicinal properties of plants, minerals, etc. He kept a record book with 140 patients, detailing their symptoms, various treatment plans, which remedies had worked, and which had not. He pointed out that there were new environmental diseases in the area, such as typhoid, for which he had no cures. Patients still came to him with new maladies and so he felt it his duty to use experimental methods and keep records with patient consent. He would send the patient for a diagnostic test or second opinion from a local doctor. MZKab did not show us the inside of his books and note papers, although during our visits with him, he kept them by his side and referenced them to illustrate a point about a plant whilst keeping patient anonymity.

When asked about the reasons behind their strict control of information, both MZKab and UVAfe's Ūmau, UMKim, a Naturopath and Mūkūrū wa Kīrīra residing at Kīambeere in Mbeere South, told us that they had shared their knowledge freely until events of the previous decade had made clear that their practice of open knowledge sharing had been increasingly abused and their tacitly held data methodically stolen and credited to other systems that would eventually rob them of their livelihoods. Each Naturopath emphasized his role as custodian of rare and almost extinct plant species who had a responsibility to keep this information away from potentially destructive interests.

Figure 5-D: Second visit to MZKab

According to Elders who were naturopaths, (UMKim, MZKab, and several other naturopaths we encountered in MZKab's network during a knowledge sharing session to which they invited a member of the research team), events in 2007 had led them to believe that knowledge was under threat of forcible extraction through research. As such, although they had gladly shared information with research in the decades many had returned to Mbeere many times to collect data, today they were less likely to offer systemically organized datasets to researchers, believing obfuscation to now be necessary. Over time, they told us, scientists had solicited information about biological, mineral and other sources of medicines, compounding formulations, preservation methods, conditions treated, symptoms, and diagnostic process, among other data of interest. As they told us, prior to 2007, researchers had questioned them orally and recorded their responses via audiovisual equipment. In 2007, concerted effort was made to standardize the types of data, widen the scale of collecting, and mandate the participation of all practitioners on pain of surrender of the right to practice.[13]

Recounting how they had been called together, Elders told us that the research body Kenya Medical Research Institute (KEMRI), had mandated in 2007 that naturopaths across Mbeere attend a "workshop" at Embu Town. During this "workshop," an announcement had been made that henceforth there would be an annual herbalist training workshop at the county headquarters. During that *first*, and as it turned out *only*, "*annual workshop*,"

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[13] *This was possibly a poorly communicated early effort to document indigenous knowledge for the dubious protections that are now offered by the PTKCE. As codified in the PTKCE Act of 2016, several self-contradictory articles of the Act outline knowledge extraction processes similar to those documented here, in the accounts of elders (GOK, 2016).*

workshop leaders identifying themselves as representatives of KEMRI had mandated that each herbalist list his various sources of medicines and their uses. They were also asked to brainstorm and share ideas about how they went about preserving trees, shrubs, and roots during the process of harvesting, extracting, and compounding. It became clear to them at the conclusion of the "workshop," that it had evidently been targeted at documenting the knowledge of the naturopaths as well as collecting their personal information to facilitate in exerting future control via imposition of punitive regulatory measures practitioners who may become non-compliant data generators: For our elders, the most telling aspects were that once documentation was taken away by KEMRI after the 2007 "workshop", naturopaths were not informed about the use to which their information was to be put, nor were they afforded access to representatives' contacts for any arising questions.[14]

As part of this exercise, Naturopaths were told by Embu County officials that they were to list certain data so that they would "receive certification to practice" and would henceforth need to keep their "certification" in good standing with the county health department in order to continue to practice. According to naturopaths, this "certification process" involved only giving out their personal information and systematic tabulation of sources of medicines and for each medicine, extraction methods, compounding formulations, preservation methods, conditions treated, symptoms, diagnostic process, dosage, etc. The "workshop" was not repeated in subsequent years as promised, but the "certification"

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[14] The protection of traditional knowledge act of 2016, (PTKCE, see GOK, 2016) mandates a detailed process by which communities must surrender their knowledge for dubious protections at County level. Dubious because the Act includes other legislative imperatives by which the cabinet minister's office may facilitate dispossession of indigenous properties for exploitation by unnamed third parties. The few indigenous protections offered are countered elsewhere in the Act and/or in the constitution.

exercise was partially repeated by representatives of institutions that were not clear, whereby they would be visited by people telling them to fill out data similarly to 2007 so as to "remain certified."

Elders informed us that after the KEMRI “workshop” and the County “certification” exercise, there had been neither follow-up for the promised capacity building, nor attempts to organize further for knowledge sharing as had been intimated. Based on this perplexing experience, naturopaths were reasonably skeptical of offering their knowledge to anyone who asked them to methodically recount it to them. UMKim informed us that by time the research body came back around asking him to fill out new “certification/registration” forms, he had decided that he would not present data systematically as was required in the proffered “certification/registration” forms. He and his colleagues had become skeptical (it turned out with good reason) about the intention of the process by then. It is not clear what the decision of other practitioners was regarding compliance with the mandate to give up data in exchange of "certification."

Although they wanted a degree of anonymity out of fear of reprisal, elders repeatedly stressed that they wished for us to document their feelings of having been tricked into giving up their knowledge through processes that ostensibly claimed to be aimed at capacity building, but based on the subsequent behavior of organizers, appeared to have been intended for the direct appropriation of their intellectual property and exploitation of their knowledge. From a research and practice standpoint, the conduct of the exercises reported by naturopaths to us was unethical and would today be in contravention of the indigenous knowledge protection act (Gilbert, 2016; GOK, 2015; 2016)

Our contact with naturopaths extended to an invitation to witness the introductory part of their first self-organized workshop in April 2017. Although a member of the research team attended a small part of the event, the proprietary nature of their practice does not allow for casual data collecting opportunities from researchers (hence the covert methods used by mainstream to mandate forcible dispossession). Health related or medicinal environmental stewardship remains an area of future research that will require rethinking approaches to data collecting whilst respecting concerns and property.

Our encounters with naturopaths leave us with the thought that perhaps it is not surprising that this is the only branch of kinship based environmental stewardship to survive the ravages of contemporary life. It is safe to conclude that a number of factors, including impalpability of domain knowledge, direct utility of plant based medicines to the local community, and adaptability on the part of practitioners in the sense of incorporating new tools into their practice, such as diagnostic testing at local laboratories, are responsible for resiliency of local medicinal plant stewardship, where other environment related caretakers retain knowledge with little opportunity for practice. Successful partnership in this area would require substantial investment in a responsive technology as well as in developing protocols and compensating elders. It remains one of the most promising areas of research in Mbeere.

5.3.2 Rika Protocols for Resilience

We asked elders if rika embedded within it values, laws, protocols, principles, or practices that were widely learned in the community with impact on environment; and if they had personally taken part in them, to provide us with accounts of lived experience. While

practices that emerged in the course of research were numerous, in this chapter we present findings that emerged during all phases of research, sometimes dichotomously to the indigenous intents delineated by elders.

Some principles were shared by elders regardless of whether or not they were Returning belief system converts or abstemious, while others were shared predominantly among elders who were centered in traditional practice. For example, medicinal conservation, Irī, muuma, were universal. However, rika protocols specific to Nyangi or Ivate were more restricted to elders who were either not converted or very liberal in outlook. These concepts will be deliberated on in the rest of the chapter. They are:

a) Muuma or the oath of honor, a blood oath in which the earth participates an incorruptible safeguard for land justice, is dichotomously opposed to court systems. As such, when the principle of ecological good for sapien bad ceases to apply, the honor system shall be initiated by arbitration through peers.
b) Humans are in a non-competitive relationship with each other, with ecologies of Place and with the processes of the earth, which they seek to mirror in alignment with universal law.
c) Separation from Place serves as an orienting tool, building geographic awareness of the interdependence between Place and entities that were extant outside Place, ideas of self as an ecological being, and value for interconnectedness.

5.3.3 Immutability of rika land justice.

In talking circles, elders were in unanimous accordance with the view that muuma law fosters integrity in the arbitration of land related and other inter-personal matters. From the 1980s when land was comprehensively privatized by donor and government mandates, the nation state legal system had become a way to challenge muuma law. As a result, elders argued, much of the environmental destruction in Mbeere was a result of the failed court system, which through legal loopholes had allowed new landowners without integrity to systematically “grab” land from its rightful stewards. Muuma was a safeguard.

Administration of muuma law is allowed in the country, in lieu of the written law that is embedded in legal court processes. As told to us, muuma in its indigenous Mbeere practice involves the humane slashing of a goat's throat, in which the goat's life is sacrificed in service of truth. This highly classified act is called Kūnyua ma, which literally translates to, "drinking truth" or "taking truth." As told to us, the truth residing in the mind of the knower was manifest through his own conscience. There was no magic involved and no magic understood, but that honor was tied into the act of sacrificing life in service of truth. Muuma law requires the consent of all parties involved, hence those who feel that they are at a disadvantage based on personal ethics or out fear for their lives will usually prefer to sue through the court system. The following example is representative of impacts of court processes on the environment in Mbeere:

> "Hear me now, that sacred grove—I will not fail to disclose this, even though I am now a Reader![one who has converted to Returning belief system and now 'reads' the Bible] When it came to be that the
>
> sacred grove had been violated by those who went to court and took it; even 'mītambī' trees
>
> were dug up. Sold for winemaking. All the fig trees were cut down to make charcoal to sell. Let
>
> me tell it without hiding any truth; the family responsible for this act is no more.
>
> When the land was sold to (name withheld), the 'miuracī' trees which were forbidden from
>
> cutting; all got burnt up for charcoal. (Name withheld) is the one who had been the chairman of
>
> the Tea Board of Kenya. (Name withheld) fell ill on and off until finally he died.
>
> He died a while back. Now his people, it is as though they have deserted the place. Even of the
>
> properties he had in his land in Werū, I hear that there is only now a workman guarding (Name
>
> withheld son's 'mīraa' farm who lives there. The land was sold to (Name withheld) by the
>
> people of my kinship, you know. As recent as after the privatization of land [1980s]. (Name
>
> withheld) came and died. And then what became of his people? Devastated. All due to which

trees? Those trees."

"Tegue we, Kīthama kīu, niī tīkwa nīngīrega kuga ūguo tondū atī wananiī nī Mūthomi! Kīthama kīu

rīrīa kīagire nī kīarīkwa, kīarīkwa andū aya maciirīra makīngīra kuo, wana mītambī,

yacimbagwa īkīgendaga kūnyuwa. Ingī īgītemangwa. Mīkūyū īyo yonthe īkīthiī kwendua

Makara. Knaggier wega ava ndagūkūthitha. Mūciī ūrīa warutire wīra ūcio ndūrī kuo.

Wenderua (Name withheld), miuracī īrīa ītatemagwa ya mbegū. Īria Ītatemagwa vau gatitūrī

kau, īgīūka īkīvīvua Makara. (Name withheld) nīwe ūratwīre e mūnene wa majani, Kenya.

(Name withheld) ararūarire mūrorongo, akīng'aūka. akuire wa tene. Riu andū make, wana vau

nītamaumire. Wana indo ararī nacio kīthaka kūu werū mbīgucaga anga nwa mūndū ūmwe

wīkaragia tūmīraa tūa mūvīcī vau. akīenderua nī andū a mūvīrīga wakūa we. Warīīu, ithaka inarī ngae. (Name withheld) aracire akua. Riu wana andū make mekarire atīa? Waūguo. Nūndū wa

mītī īrīkū? Wa īyo."

The problem with the court system then appears to be in the ability of the legal system to provide loopholes that are not available under muuma law. New landowners who win this way appear to contravene the principles of the preservation of public goods under which Irī were established. Two elders, who administered the oath, including a centenarian who told us that he retired in 2015, told us that indigenous muuma law and a discontinued process that they called gūcūna kaviū (glancing the dagger), were different from muuma events in which the kaurugo blood oath was administered to enforce allegiance (kaurugo is a mix of blood and other substances). They were referring to a process started during the fight for independence and currently favored by some Mbeere politicians as a means of coercing kinship allegiance during the national election season, when they campaign for elected seats. When asked for their opinion, elders unanimously voiced the opinion that the political muuma process is divisive of kinships and therefore an abuse of muuma law.

5.3.4 Humans are in a non-competitive relationship with each other

The following account provides another example of the structuring of gender equity design, this time in an aspect of environmental disease control that formed public symbolic expression. Rarely reported together, symbolic expression went hand in hand with public health measures of disease control that had basis in scientific thinking. As told by elders, at the news of a pandemic in a geolocation outside Mbeere, measures were taken to establish no-man zones. In this excerpt, we also have a hint regarding the role of Mbeere South in this particular process. As told, youth delegates were chosen from, "Thagana," (Mūrurī, Mbeere South, also indicated as consisting majority Ivate Rika on Table 4-C) A role for Ivate is indicated in this process, now lost in history.[15]

UMMGA: maundu ma kuthondeka vururi ri, twauka wa vau wa varia turari ri, wa toguo mwegua ngiuga kwari kathiri, maundu ma kuthondeka vururi ri, nimo gwatuikaga mari ma kugitira vururi. Wana mirimu ikuo ri, Mirimu iri---
UMMGA: Issues of stewardship, hhm, we have come back where we were. Just as you have heard me say, there was secrecy; things to develop the land involved protecting it. Even from communicable disease.
UMMGA: kwerikana tariu kwina kithuku; kithuku kiri wa nakuu kuraca, wa na guku Rungo
UMMGA: it used to be said if now there is measles; measles is some place far away, in a place called Rungo
R2: kithuku nuwici ni ndui? Ukambi
R2: do you know what 'kithuku' is? It is 'ukambi'
R6 iii nigici
R6 yes, I know what it is
UMMGA: mukambi, nikio kithuku Mumbeere, nuwegua riu, mukambi ni Gikamba. Kithuku, kithuku ethikwa nigiukirie nikieragwa nikivingirirwe. Ati gikwe atia?
UMMGA: 'mukambi' is what is called 'kithuku' by Mumbeere. You hear now? 'Mukambi' is Gikamba. Measles, if there is an outbreak, it used to be said that it should be shut out. That what should be done to it?
R6 nikivingirirwe
R6 it should be shut out.
UMMGA: nikivingirirwe. Kierwa ni kivingirirwe, tondu twaturaga kuria irimari iria guku gutangikinyika ni mbogo na mburia, nuwegua riu?
UMMGA: let it be shut out. When it was decided to shut it out, because we used to live up there in those mountains when no one could come here because of buffaloes and rhinos, you hear now?
R6 iii, iii na ni tukwaragia uguo
R6 yes, yes and we were talking about it
UMMGA: kwarutagua anake, mairi, ***thiini wa Thagana***. Mugatutuire ivuri.
UMMGA: some young men would be selected. Two of them, ***from within Thagana.*** To go and cut an 'ivuri' for us
R6 ivuri
R6 'ivuri'
UMMGA: ivuri inyamu riviana uguo ta mutanga
UMMGA: 'ivuri' is that thing which looks like a melon
R4: uguo ta mutanga
R4: like a melon
UMMGA: nuwegua riu? Ta riri twikagira magonori tugitema vururi. Mugatutuire ivuri. Ivuri riathii gutuuwa, rigiuka rigicarirua irerema.
UMMGA: you hear now? Like this one which we put in the 'magonori' as we subdivide the land. To go and cut us an 'īvurī'. When they had gone to cut the 'īvurī'

[15] *This excerpt is taken from one of few accounts whereby an Ivate process is documented.*

R5: irerema
R5: 'irerema'
UMMGA: namo mari wa Thagana. Mathii magiukwa namo. Riu ivuri riu riauka, nikuthure riri, twana tuu,
UMMGA: and they are found out there in Thagana. When they got cut they were brought. Now when the 'ivuri' came, two children were chosen.
UMMGA: kavici na keritu. Nyaga na Njeru.
UMMGA: a boy and a girl. Nyaga and Njeru
R4: njau igiri
R4: two calves
UMMGA: njau, ciitagwa njau icio. Nyaga na Njeru. Na ni vagauka mburi. Mbarika, yuke itwarwe kwa muthuri mukuru. Irare yovetwe marerema macio ngingo. Nario ivuri riri wa kwa muthuri wingi mukuru. Wa rika ina, mukuru. Rirare kuu. Rigituwa uguo ta kanya rikirutwa nyungu. Mburi iyo, igauka andu mekie rugiri itura igima. Kithiururu. Kuu ni kugiriririria ukambi ndugauke ku?
UMMGA: calves, those are called calves. Nyaga and Njeru. And a goat will be brought. A she-goat and. the gourd, īvurī, would be taken to a certain old man's home. It would be there for the night. Īvurī will later be cut in half, like a gourd, and the seeds removed. It would be hollowed out. That goat will later be thrown over the fence by the entire village. Standing in a circle. That is to keep measles from coming here.
UMMGA: mburi iyo, yuke igwatwe ni Njeru, auke amikire gati ka maguru, nake mwari wa nyaga agwate naguku mukia. Mathiururuke rugiri ruonthe, mathiururuke rugiri ruonthe, makomanie. Nake wa Njeru ringi, na mwari wa Nyaga wingi, namo moce ivuri, magwatane njara. Giuke kirindi kiu kionthe matwiririte īvurī rīu mata na mamira, gituiriritwe mata na mamira, gitwiririritwe mata na mamira. Marikia gukomania, vasi, wagugika atia, marerema maria magiuka marengangitwe tunuku, tunuku, tunuku, tunuku tunuku, mundu agīkagira njara. Riu marikia gwika uguo, ivuri riria, warikirutirwa anake mengi. Nyaga wingi na Njeru wingi. Magate Thagana. Riekagua vandu vetagua 'Ndia ya Kimani.'Kithuku kithi na na Thagana. Kiu ni Kīmbeere.
UMMGA: that goat would be held by Njeru, who would put it between his legs. And the daughter of Nyaga would hold the tail. And they would go round till they went full circle. And another son of Njeru and daughter of Nyaga be chosen. They would also come and take 'ivuri' and hold hands, once they went around, that was it. At that point, 'marerema' would be cut into tiny pieces, tiny pieces, small pieces, small pieces. Everyone would put one in their hand, now once they had done that, that 'īvurī' would now be given to a new set of youth, a new Nyaga and a new Njeru. They would take the īvurī, to throw it away. It used to be over at the place which was called 'Ndia ya Kimani'. So that the disease would be swept by River Thagana. Swept off by Thagana so that it may not come to us. That is Kīmbeere.
R4: na rikathii rigitucagirwa mata
R4: and it [īvurī] was spat on all the way
UMMGA: riagendaga rigitucagirwa mata nginya Thaga---?
UMMGA: it was spat on till Thaga...?
R6 Thagana. Rikuite murimu
R6 Thagana. Carrying the disease.
UMMGA: na mararama maria monthe, makirutwa njara makigwatanua na ivuri, andu magikia thagana
UMMGA: and all those 'mararama' would be cast from the hand onto the īvurī, so people could throw them into Thagana.
R6 Ooo, andu makimaruta njara, riu andu nimethamba murimu, nimathera
R6 Oh, people have taken them off their hands, that way they have washed off the disease. They are Clean.

Firstly, widescale fumigation was initiated at all border points and along the no-man jurisdictional boundaries between territories. Secondly, the boundaries of Place were closed

off, not just symbolically as in the account below, but in actuality, whereby roadways, no-mans land zones separating jurisdictional boundaries constituted areas closed off "kūvingūa." This was indicated visually with ongoing smoking fires from branches of specific trees that had disease fighting properties. Not only did this stave off entry, it kept away potentially disease carrying rodents and other vermin.[16]

Elder accounts of witnessing fumigating exercises were given in Mbeere North. However, as they did not include gender specific accounting, and because prior research has documented such processes, I have prioritized this particular account. Most especially due to scarcity of data on Ivate processes relative to those of Nyangi, an ivate process that also confirms participatory gender equity is key. Regarding the roles of Nyangi and Ivate in stewardship of environmental issues, I confirmed the accounts of elders, such as this one, by comparing conversational data in my own research with textual analysis of findings by Glazier (1985). Glazier reports Nyangi as the "people of rain" and Ivate as the "People of the Sun," with duties similarly to those in our elders' accounts. I found no corroboration of the sun designation, as reported by Glazier, possibly due to knowledge loss over time. As seen in Table 4-C, Mbura is a clan in the Nyangi Rika jurisdiction. CUTha, who is a member of the Mbura clan, (Mbura means rain), was the single elder to respond that she indeed was a member of Mbura Clan, and that this was the meaning of, "Andu a Mbura" "The people of rain." We build on Glazier's findings by placing women in a central role, as well as by

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[16] *Kenyatta (1938), documents a similar practice in Gīkūyū. Relevant for 2020 in the year of the Covid-19 Pandemic, quarantine measures have their basis in a time preceding documented history. It appears that each Rika was responsible for keeping its own jurisdiction safe. This gives meaning to findings of prior research regarding existence of zones that were treated as no-man's land. (Kenyatta, 1938; Turner, 1968; (Van Gennep, 1909).*

fleshing out findings with personal accounts of processes. As pointed out in the previous chapter, Lambert, (1956) Saberwal (1970) and Njeru (1979), all confirm equal gender participation in Rika processes. Moreover, UMNga gave us an account where he accompanied a Nyangi elder in a rainmaking ritual as a youth. He was not an official, but rather in an assisting role. As stated elsewhere, Rika did reciprocate duties of observation and monitoring to ensure compliance; but it seems that there was also opportunity to assist actively in some of the less official duties.

5.3.5 Motivational Role of Privacy versus Access

Privacy had been a key theme of elders in Place, underscoring many functions of rika. Hence, I wanted to understand perceptions and motivational impacts of privacy versus access on the Rikamedia. Access to technology was central to the founding of UVA. Additionally, elders in Place had shared concerns about some breach of information sharing protocols of Place. Moreover, it appeared by the private and secret status of almost all Facebook groups on indigenous social media, members preferred decoupled means of communication and information sharing.

Toward this end, community members were asked if UVA should remain a closed group. If they answered "yes," they were further asked to state in writing why they felt that UVA should remain a closed group. The margin of dissent was narrow, with 56% saying yes, the group should remain closed, and 44% feeling that UVA should change its policy and become an open group.

Those who favored the status quo used words such as, "maintain secret of group [or Mbeere]," "for confidentiality," "to safeguard privacy," "to evade intruders," and "to control

content." Those who felt that the group should not remain closed used words such as, "provide wider access," "to share information," "allow freedom of participation," "for others to get good news," and "to benefit everyone." Males who had participated three years or more, were more likely to want UVA to remain a closed group. They were also likely to respond that their involvement on UVA promoted their status inside and outside Mbeere. A number in this group also felt that their involvement on UVA promoted their economic wellbeing, a point on which a majority of participants in other demographic groups disagreed.

However, in addition to these personal interests, they equally strongly believed that their involvement in UVA also supported their learning about Mbeere. As this demographic is a majority on UVA and forms the Nyangi half of the rika duality, their work on Mbeere indigenous social media remains an area for further inquiry. When females were surveyed for the same question, they strongly disagreed that their involvement in UVA promoted their status outside or inside Mbeere, and nor did they believe that their involvement in UVA supported their economic wellbeing. This question was not ranked. Members could give higher, equal, or lower priority to any of the responses.

5.1.4. Reduces skepticism, increases tolerance for uncertainty

According to survey results, the second motivation was the desire to connect with other Ambeere. But why Facebook or WhatsApp and not on Instagram or Twitter? Data evidences low to no community usage of open platforms such as Twitter in group efforts. Members are personally active on open platforms as evidenced by hidden representative tweets such as #majimaji on indigenous Facebook forums but not on Twitter itself. Data suggests that inbuilt decoupled clustering mechanisms within Facebook and WhatsApp groups bolster

tolerance for uncertainty and ambiguity particularly in affordances for reduced skepticism, increased trust, and a decrease in decoupled sharing information sharing behaviors. According to community members, privacy afforded by closed Facebook and WhatsApp groups is a valued resource that supports open communication. For them, it reduces fear of macro level discovery.

5.1.5. Supports tacit non-disclosure

Facebook and WhatsApp group features further support indigenous tacit non-disclosure of information shared in a group setting. Asked if the group ought to become public in the survey 2 out of 3 answered that they wanted UVA to remain a closed group. Answers given were, "to keep the secret of the group." "It is Mbeere's business." "To avoid interference." These answers speak immediately to *gūtuma ndundu ya rika*, in the typology of rika, which can be translated as the non-disclosure framework within which business and legislation was traditionally undertaken. In present day, the concept is used informally to mean, confidentiality, but was historically, entry into *ndundu ya rika* implied consent to enter into formal processes, transactions, or negotiations guided by mutual non-disclosure.

Gūtuma ndundu is one of the indigenous protocols for ensuring that transactions could be carried out in total discretion by all concerned. The community indigenously values privacy and has protocols in place to protect these, such as illustrated by privacy mechanisms inbuilt within various rites and activities such as *muuma* (Oath of honor), naturopathic medicinal stewardship, etc. When these frameworks are missing, decoupled information sharing results and skepticism arises, as happens with present day challenges.

The importance of privacy is underscored by the finding that on UVA's Facebook ecosystem, there are a few open rather than closed groups, and these open groups report low membership counts.

5.4 Public Preservations: Irī Defined

Elders asked if we were interested in knowing about "wīra wa kūmenyerera vūrūri," meaning, "the work of caring for (stewardship)p the nation." Upon which I responded that, we wanted to know about caretaking of the environment, and gave examples such as trees and rivers. In keeping with the prompts that I had prepared for the research protocol to guide elder consultation, I iterated that I was interested in, "the stewardship of natural resources. The things that God has bestowed upon us." The literal translation of the prompt was," wīra wa kūmenyerera marigicīria, ta manjī, mītī, mīvuro, yīani, indo irīa

Elders referred to this process as '*kūvinga*," "to close off" and added that it was normally undertaken to preserve small areas of vegetation for short periods of time, such as a single season, when an area needed to remain fallow or a fruit tree was allowed to drop its fruit to the ground an entire season, for its natural rejuvenation.

Elders elaborated that there was a second level of conservation that was a public endeavor. This was undertaken when rika elders closed off large areas of public land, called Irī or Ithama. We then asked Elders to tell us more about Irī, give us some examples of Irī, and describe their locations in Mbeere. I have tabulated their responses about names and locations of those Irī that have been active in recent time. The literal meaning of the term Irī, is "the public," "the people," or, as termed in Jaeger & Burnett (2010), the lifeworld. Land referred to as Irī, is therefore "the public's" or that which belongs to the people. Simply put,

Irī is a functional term for lands that have purposefully been set aside for conservation and are, therefore, "public goods."

A less used synonym for the term Irī is "Kīthama," which in meaning approaches the term "sacred grove" in that it alludes to the sacred aspect of processes that take place inside Irī. Kīthama is a smaller, village level grove, for use by a handful of families. Every village had one such Kīthama. Irī is a macro level phenomenon, a community-wide resource.

As told to us, Irī and Kīthama's primary purposes were not ritualistic; rather a ritual served as demonstrative and instructive means by which to organize the continued maintenance of natural resources that are interconnected with livelihood activities. Their statements were supported by a finding that the areas chosen as Irī or Kīthama were habitats of long growing, rare, and ecologically important trees, shrubs, and grasses. This finding has been confirmed in Riley and Brokensha (1988). The environmental anthropologists have documented Mbeere indigenous botanical and cultural resources in a two volume encyclopedia. I used the encyclopedia to corroborate much of the data given me by elders on species of trees, their uses in medicine, timber, wine making, etc., specific conservation practice identified with the different species, and locations of Irī where they were conserved, such as at Mt. Kīang'ombe and Kīanjirū

Before they could give accounts with examples of indigenous projects that followed this protocol, elders emphasized that humans by law desisted from competing with the earth's gestational activity; hence, the stewardship programs that occurred during this time were meant to reinforce their non-competitive relationship with the earth and interdependent ecologies. In the period before new shoots had emerged from the ground, a ban was placed

on human sexual intercourse. The earth was regarded as undertaking this activity, and was respectfully accorded priority of Place.

Thus, one of the rika responsibilities was to foster a sense of respect for the earth during the planting season. Community members who broke this law were subject to fines, such as "kūrīwa mbūri nī rika," "to have a goat eaten of you by rika." The goat in question was sacrificed. Minor infractions did not lead to the founding of new Irī, but periodic maintenance activities occurred whenever there was a mandate to enter and conduct ritual sacrifice (e.g., reforestation and controlled resource harvesting). In this way, yet another public good resulted from a private bad.

Furthermore, by indigenous environmental law, humans did not transpose plants from their natural habitat, even when such plants were needed for livelihood. Reforestation involved only the propagation of already occurring plants, such as the fig tree at Gakamerī Irī as seen earlier, or the farming practice of companion planting with mūkau tree, a process facilitated by natural enzymic propagation of mūkau seeds by browsing goats. The disclosure of this process by Mbeere elders to environmental anthropologists has been documented (Brokensha, 2007) and the enzyme has since been isolated and is commercially available in the country. Prior to Brokensha and Riley's documented "discovery" in the 1970s, the mūkau tree was thought outside of Mbeere to be a slow growing indigenous tree and not suitable for forestation or reforestation. No compensation was made for this and other similarly appropriated indigenous knowledge. It remained for us to solicit examples of such programs, in the assumption that we could tease out principles that could be used to measure project alignment with stewardship even outside the immediate context. I also emphasized that I wanted to learn more about linkages of programs with rika structures.

5.4.1 Irī stewardship objectives

When asked to give examples of stewardship practices that they had witnessed from their own lived experiences inside Irī. The story that follows was given to us by one of the elders, who told us that he is of Ivate rika**,** describing his experience assisting in a rainmaking exercise as a young man. He states his duties specifically. He assisted in carrying the heavy goat and carrying out other handyman tasks. The officiating Rika in this exercise was Nyangi. The elder who was in charge was a Nyangi elder, and UMNga, our narrator, was simply there to help. This would have been a period when he was starting to learn his own stewardship duties, but in this case, he was on the opposite end of the aisle. During the telling, it became clear that the ritual process integrated the following stewardship practices:

a) Long term forestation.

b) Periodic maintenance.

c) Controlled consumption of natural resources.

The following excerpt conveys Irī conservation objectives in the voice of an elder from Kĩambeere. UMNga indicates he was possibly born in the year 1922 or thereabouts, making him 99 years old in 2020 (community members born before the 1960s have indicated that birthyears were approximated by others, such as ID issuing officers at government offices). The Kĩmbeere transcription contains his exact words and is followed by an English translation.

> Rīrī rīu, ka ngūve ūvoro. Ka mbūke riu. Nī naūka rīu. Tarīu naava ve vandū vetagūa Gakamerī. Vetagūa atīa? Gakamerī. Na nīvo andū maringagīra. Maarīte ndaraca ya mītī. Ĩgūrū rīa mathiga. Gakamerī mītī ndīatemagūa. Na varī mītī yetagūa yanyunyagwa, yetagūa atīa? Yetagūa mītambī. yarī vau Gakamerī. Mītambī ya Gakamerī, ndīatemagūa nī mūndū. Na kīthama kīu gīa Gakamerī, nī kīamundagūa mbūri. Mbura yatīra, niī taniī, tumīte varīa kīrīmarī kīīrīa, tumīte Gakamerī, ndūarīte mūmundi wa mbūri kūu thavarī ciīgana? (indicates 3 fingers)" ithatū. tūkuīte mbūri ya mwīrī ūmwe. ndūrūme. Tūthiīte Gakamerī, kenda mbura īke atīa?

Na twathiī Gakamerī, kwī varīa mbūri yagendagūa nayo. Kwī varīa mbūri yathīnjagīrūa. Mbūri yaitūa, nthakame īgīūka gūtavūa nīguo ītīke, Gakamerī kwī vandū vakariī ūguo. Ve tūthiga tūria tūathondeketwe nī Ngai tūagūkinya. Navo ava ve ndūī? Nayo mbūri, andū aria magwete mbūri me ava īgūrū. Mūndū wa gūtavia akinyīte tūthiga tūu, na akīamatūa njara īno nī mūndū ūmūe. Mbūri īgūetūe akīmīmunda atīrī ava "toh!" nthakame īkīgamba kaugarī gake atīrī "chrrrrrrrrrrrrrrrrrrrr" nthakame īkiuma. Wa mbūri akīamatūa. Namo manjī mekū? Me kūrīwa nthī. Ethīkūa vaū mbura angīkorūa nī īkura, nthakame īyo īkīrīkia kūthira mūndū ūyū kwa amatītūe, manjī maūkaga "vochooooooo!" wa makīruta nthakame rugarī.

Wa makīnathiī nakūrīa nthī. Na eka ūguo, mbūri nayo īkīthiī īkīthīnjūa nyama. Rūo, na mathagiro. Tūarīkia gūīka ūguo, nayo mbūri irī kanyamū getagūa kondo. Nako warutire waro. nako warutire waro. Wa gagīūka wa gagīkīrūa mathunya. Na tatha, ikīvīvīrua kuo. Nīgaūka gakuītūe waro. Mbūri tūkīvīvia waro tūkīria. Nyama irīa igūtigara wana mathunya, nītūtiga tūekīra vau mūakirī. Irūngūre. Rīu mītī īyo yetagūa mītambī, tondū nī yekagīrūa ūkī-īrī mbuvarī ikīruga. Kanyamū gaka nako karengetūa ava. Mītambī nī ītemūa mūthenya ūcio. Tūīnūke nayo, wana ya kūnyua. Wana ya kūnyua. Ūcamūrīte mūtambī, wanyua nūata wanyua ndaūa. Nūtemūa mūthenya ūcio. Na mūgumo ūrīa warī vo, tūgītiga tūatema rūvonge naruo rūkīvandūa. Rīu Gakamerī gūtia temagūa. Kīu kīarī kīthama.

Mbūri tūa munda Gakamerī, ava tūa kinya naava, vau cukuru īrī, naava…īno cukuru īrī, īno ya Mūtuovare. Tūkī thiī kūrīkia karīma varīa, nīvo varī mūracī. Nīvo tūa ūkaga gūcuuria kondo karīa. Karīa ga Gakamerī. Gagī tūrūa na mūīgua. Gagīta tatha na indo irīa ciīngī. Tūgī kinya cukuru īrīa ī gūītūa Kīnyaga īndī īyo, turīrītūe! Tūgī kinya mūciī nguo conjured conjure. Narīo tūgī kinya aūke, mīatū, ītūrirūe wana yatūrūa nginya gūkū ngito rī. Mwaka ucio mbura īka ura wana andū makīrīa irio makīvaa. Nūegua? Ndia kūrīkīria rūa Gakamerī rīu?

(UMNga, Mbeere South Ivate Elder-as a youth, assisted in a Nyangi program).

Translated thus,

I am here to tell you of a place, not far from here, called Gakamerī. What did I say it's called? Gakamerī. That is where people used to cross, high up, between the rocks, where they had built a wooden bridge into the rocks. At Gakamerī it was forbidden to cut down trees. And there were trees preserved there. We used them for making wine, and for medicine. They were called 'mītambī.' They thrived at Gakamerī. You could not cut down mītambī at Gakamerī. This was one of the Irī where goats were given in blood offering. Whenever rain was late. I have been up that hill and down on the other side (points in general direction at some distant hills), going to Gakamerī. I assisted *Mūmundi Mbūri* [The elder appointed in charge, the Nyangi representative]. On how many trips? [indicates three fingers] It was my job as a youth to carry, on behalf of the elder in charge, a male goat of one color. Going to Gakamerī, so that the rain may do what?"

There were natural steps in the rock, as if carved by Ngai [the divine]. The water ran deep down below. Those officials who held the down the goat would be on the higher steps. *Mūmundi Mbūri* would stand on a step slightly below them. He would hold a darting arrow in one hand, and a calabash in the other, which he filled with blood before allowing the rest of the blood to flow into the earth. At this point, *Mūmundi Mbūri would position himself so that his hands were outstretched sideways. O*ne person would secure his balance by holding firmly onto this hand [indicates left hand], and he would stretch the other hand out over the river, holding out the blood offering. Suddenly, a jet of water would shoot up from the river below, swoop up the blood clean out the calabash, and just like that, the river would settle down again. As soon as this happened, we knew it was going to rain!

We would then carefully remove the rumen from the now lifeless goat, cut up the choicest pieces from the leg, and roast them. These were then stuffed into the rumen with the cud still inside it. We sewed up the stuffed pouch and set it aside for later. After that, we prepared and

roasted the rest of the goat, including the skin, and ate what we could. Leftovers were carefully charred in the coals until they were ashes, including the skin.

Now, 'mītambī' were only harvested from Gakamerī on that special day. We would take plenty home with us. Enough to brew wine and to boil for medicine. When boiled, 'mītambī' is good medicine. There was a mūgumo[17] here. On that special day, we would also take a cutting from this mūgumo tree, and we would plant it there to propagate it.

From Gakamerī, we walked to the place where Mūtuovare school now stands. Before reaching the bottom of the hill, there was a 'mūracī[18] tree there. That is where we would make an offering of the rumen that we had brought back from Gakamerī. We would prick the stuffed rumen with a thorn [from the thorn bush tree]. And the cud would flow out of the rumen into the ground, together with the stuffing. Before we had walked to where the school called Kīnyaga is today, we would be drenched in rain! When we got home, we would be soaking wet. In a few days, the bees would start buzzing. Beehives would overflow from the trees; so numerous that they would hang from the beams of houses. There would be plenty of rain and a bumper harvest, and the people would eat to their fill. You hear? Have I not told you about Gakamerī?

(UMNga, Mbeere South Elder)

According to other Nyangi Elders, *Kūmunda Mbūri*, (blood sacrifice) such as the one described by Ūmau in this personal account, took place in various parts of Mbeere at the same time. According to Elders, every clan coalition had rika representatives, families with memberships in Nyangi. Table 4-C corroborates these accounts to an extent, with Nyangi and Ivate occurring in both Mūrurī and Īrumbī. It is hard to know how mixed Rika may have been geographically, as the land tenure processes interfered with geographic settlement to a great extent. That disruptive process is documented by Glazier, (1985). It was the responsibility of these representatives to lead the blood sacrifice process and attendant

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[17] Mūgumo, Miusops Kummel Sapotaceae. Noted in Riley & Brokensha (1988, p. 86) as possessing massive trunks. Not grasping the import of the location of specimens they observed inside Irī, the authors nonetheless concluded that the trees were historically clan property.

[18] Mūracī is a medium size plant indigenous bearing small edible fruit and used for medicine, construction, and general purpose. Riley & Brokensha (1988, p. 193) catalogue mūracī as anacardiceae, a deciduous tree in the cashew tree family.

practical activities such as obtaining seeds and seedlings from Ūvarirī, after the first downpour of rain. Considering the import given to indigenous seeds in the Kenyan constitution (GOK, 2010) and the PTKCE (GOK, 2016), more research is needed on this aspect of Rika stewardship.

As they told us, " seeds were obtained by *rika*." *"Īndī īyo, mbeū cia gīragūa nī ma rika."* The next part of the process was to galvanize the public in a special procession, with a single purpose of picking up stores of seeds from the families that stewarded this community resource during the dry season. Three of the elders in one talking circle in Mbeere North were members of one of the families with a leadership role in this part of the process in Mbeere North. They later participated in several member checking sessions that included other families.

According to elders, for this exercise (when representatives went by rika to collect seeds/seedlings from Ūvarirī), the procession commenced after elders duties' were completed at an Irī named Kathiga Gacerū, which for their side of Mbeere was the place where elders would sing their own rika song. "In that place, the elders would sing," "*Vau, vainagwa nī athuri*." [Meaning, it was male elders who carried out the ritual process].

Afterwards, the seeds were available to the other citizens to pick up from members of their family, "Icio ciaumaga Kūu, Mūciī Mūkūrū. Ūvarirī. Na Kūūrīa *Kīrīmarī. Īni. Ītavuarī. Nake Ītavuarī, agūrīte mūirītu wetū." "They [Seeds/seedlings] were annually sourced from the Great Old Home. Ūvarirī. Yes, at the hill. At the place of Ītavuarī, who had married our daughter."* As the Elders of one family in Mbeere North told it, in their area, representatives would not start out to fetch seeds/seedlings without the leadership of this family whose elders participated in two member-checking talking circles in Mbeere North.

"Ūke was mūciī ūyū wetū nīguo wa tūmaga tūvewa Mbeū, mweri wa Kenda. Wanarīu marī wa kuo. Tika maumire kuo! Wanarīu gūtīngī thiīwa nī mūgongo vatī mūndū wa gūkū."
"Our family's leadership was the reason seeds would be availed in the ninth month. Even today, they are still there, they have not left [members of another branch of the family who did not move away from Ūvarirī]. Even today, there is no way a procession would happen without someone from this family."

The elders pointed out that today, a big Catholic returning belief system stands at the sacred site of Kathiga Gacerū, where the ritual song of elders would eventually culminate in a procession to Ūvarirī.

Through these accounts, elders demonstrate the integrality of environmental stewardship and economic activity through laws or protocols that helped to support a healthy environment. Rika had a central role to play in the regulatory framework, which can be broken down into three aspects, protocols to establish common interests, establish good environmental habits, and maintain knowledge flow.

5.5 A Socioecological Justice Principle to Guide Establishment of Irī

We asked Akūrū, elders, to tell us more regarding processes of establishing Irī, and to clarify the role of rika in this process, as well as the purpose of Irī in caretaking of the land further. According to data, the principle behind Irī is the countervailing of public or private bads with public and private goods. Wherever Irī had been established, it had almost always been atonement for a tragic event or malfeasance because, "nūndū mūndū e' thīnarī." "humanity was in trouble." A council made up of one's rika, that is, a council of the offender's representatives chosen among one's peers, would deliberate and declare the area in need of cleansing, and they would fine the aberrant party. If it was a tragedy that happened there, the

area was, “kūvingūa” meaning, “closed off” or “forbidden.” A goat sacrifice would be made there and henceforth no activity that was deemed to sustain human life in any form could take place there, including taking a mouthful of water to quench thirst, grazing, cutting a tree, swimming, etc.

If some infraction had taken place, the council of elders would decree that a fine be paid by the person who was guilty of the infraction. ūkīrīwa nthenge nī rika.” Meaning, your peers would charge you the fine of Nthenge [a male goat] to be sacrificed by your rika peers at the Irī origination ceremony. Blood would flow to the earth, connecting life with death in demonstration of the gravity that had occasioned establishment of public preservation in that spot. The place would then grow into a forest over time. According to elders, Irī was inviolable because it was a public good created to atone for a private or public bad. We asked elders to illustrate this principle of origination with some examples, looking for embedded meanings within elder accounts. I termed this principle ecological good for sapien bad. Sapien here being Homo sapien in abbreviate form. Elders gave us examples:

1. Gakamerī, established after a family had neglected a disabled child;

2. An unnamed Irī which located by markers of a nearby Primary school, whereby a child had been drowned in a baobab tree with a closed off wild beehive. The culprits were Christian converts harvesting wild honey in a preserved area, counter to indigenous law.

3. Gwa Ciongee, where a member of the community who had immigrated to Mbeere from Tanzania had been buried, by his own wish, as a conservative measure to prevent cutting down of endangered species in that sign.

Each of these, and many others, involved detailed accounting by Elders. For the sake of space we have condensed the large amounts of information given to us on Irī into a Table format.

5.5.1 Historic and Present Day Locations of Irī Public Preservations

The list of Irī only includes those names that could be corroborated by at least 11 elders in two or more talking circles between 2019 and 2020. This is a growing list, intended to inform current preservation, for example of Kīanjirū and Kīang'ombe, which according to Google Earth, are designated nation state preservations. Contrariwise, according to county development plans, these preservations of rare plants and animal species are slated for mining and prospecting in precious stones. These nationally and locally significant preservations are under a full onslaught of active and prospective "integrated Embu County development planning" (ECIDP, 2019).

Status of Irī	**Macro Level Irī** *(Community Wide Significance)*	**Mbeere South Irī**	**Mbeere North Irī**
Historically Significant	-Kīrīnyaga *(Mt. Kenya)* -Īgambang'ombe -Mbonjūkī	-Gakamerī -Gūa Ciongee -Kaarange -Mītithiirī	-Kangai-rī -Kathiga Gacerū -Mīarangerī -Nthuera -Rūare Rūa Kamūthigo
Actively used or contains Irī artifacts	-Kīang'ombe -Ūvarirī	-Kīanjirū -Kīambeere	-Kīvūrū -Rīambiti

Table 5-A: Names of Irī

In the table on Names of Irī just seen, I have only indicated whether the tabulated names were offered by elders in Mbeere North or South. Further research can confirm whether these areas are currently located in Mbeere North or South political jurisdiction. My search for the names on Google Earth retrieved two results, Kīang'ombe and Kīanjirū, both indicating a

designation of “preservation.” This was the first of any such information indicating that the nation state may in fact recognize the importance of these important indigenous properties. Kīanjirū is commonly known to contain the nation’s planetarium, inaccessible to local people on whose land it is built. However, a review of county reports put any such hope to rest. Both preservations are earmarked for mining exploitation in county development strategic planning, which Mbeere is not party to except for purposes of taxation without representation and exploitation of its natural resources.

My review of county reports found no indication that the preparers of county development reports were aware of such preservation designations as indicted on Google Earth in 2020 and in prior years. Neither did I encounter any actionable plans targeted at preservation of Kīang’ombe and Kīanjirū. To the contrary, my review of county planning documents uncovered ample plans to encroach on this valuable Mbeere community property for mining of precious stones and other mineral resources (ECIDP, 2013, 2019). This led me to infer that the designation of “preservation” may simply be a means by which to render the lands around these mountains a national public resource, thus wresting it from its rightful owners, providing external interests a foothold under pretext of protective function.

As participants shared with us, community members are regarded as trespassers in their own land if they venture in those areas, and are forcibly kept out under threat of bodily injury. There is a shared sense of foreboding about activities that are largely thought to be illegitimate, more so because local people feel that their safety is under threat if they venture there, much the same as lands confiscated for hydroelectric power in the returning system era are still illegitimately held and exploited by KenGen.

The historic information divide that facilitated untenable returning system era policy on Mbeere is theoretically addressed by placing county and national development reports online. However, the county policy on Mbeere is largely theoretical. Information is not authentically accessible and usable in everyday Mbeere experience. As an example of the prejudicial gubernatorial policy framework between the two communities, community members told us that in Embu North, national law that forbids indigenous tree cutting is strictly observed under penalty of imprisonment and fines. Contrariwise, as told by numerous participants, Embu County condones cutting of indigenous trees in Mbeere to satisfied wood burning and timber needs outside the community, a criminal act under the law. Such acts are not condoned in Embu Subcounties.

Alarming but not unexpected ecological threats notwithstanding, locations of Irī are known in Mbeere to be of historical and ecological importance, and a manifold approach toward restoration of Irī to purpose is possible. For land illegitimately held by government and/or private industry at any level, policy-level activism on social media can at least have a postponing effect on the worst macro and meso level excesses.

Where private individual holdings are known to contain Irī, a program of repurchase can conceivably be articulated within a larger ecological and cultural (biocultural) restoration program. While activism will take time, purchase of land is a straight-forward process in Mbeere, at 800-3000 dollars an acre. It is hoped that future conservation projects can recreate the preservation of endangered indigenous species that were preserved here. Perhaps of help in a future reparation process is the commonly held belief, as elders concurred during talking circles, that misfortune has followed individuals who contravened conservation laws and cleared Irī during the contentious privatization program of the 1970s to 1980s.

Based on elder accounts, these holdings appear to fall into underutilization as title holders gradually capitulate to collective judgement. This being the case, it may be a matter of purchasing power to restore these important public properties, especially considering the documented and still untapped medicinal value of plant species known to thrive there (Riley & Brokensha, 1989a, 1989b). At the time of research, all but the two Irī designated as preservations were in private ownership and had not been used as Irī after the privatization of land in the 1980s.

5.5.2 Sustainable Stewardship Principle

Elders told us that unlike in the deleterious present day activities that were happening outside rika protocol, Rika embedded safeguards to ensure that the member who had the mandate to account for his conduct through stewardship had ample support in scale and over time. This sounded like a resilience mechanism and led me to infer that a main demotivating factor in present day stewardship was lack of a sustainability principle. Soliciting for more kīrīra, knowledge, elders told us that once Irī had been donated by the family of the culprit, or by some other means, it was set aside as a public good, for the benefit of all. Therefore, all community members had a vested interest in working together to safeguard the Irī as common property. The principle driving this expectation was the neutrality of rika to demographic categories of clan, gender, and deity, or theism. This perspective is expressed as, "Rika knows no…(i*nsert demographic category*)." However, family of the accused had primary responsibility of tending to Irī.

They were the stewards of the public property for all eternity. Hence, they passed down institutional memory as to the efficacy of the e*cological good for sapien bad*

stewardship. Indeed, one of the elders in regular attendance, who was from a clan called "Kamūvīa, would often remind the circle after an account such as the one given here, that it was his family were in stewardship of one Irī to mitigate the wrong-doing of dishonoring a disabled child in a time beyond recent memory.

Traditionally, clans were geographically intermixed. Hence, this kind of ameliorative stewardship was in the hands of families, rather than clans as has been assumed by younger community members who do not have a working knowledge of the rika system. At least 14 elders, all in possession of their entire Rika demographic data, are on record corroborating this finding. In addition, tabulated data on elders from Mbeere North validates this finding, that clans even today are intermixed to some level despite the privatization debacle overseen by the World Bank (Brokensha, 2007) and resulting in massive resettlements along divisive clan lines, which executive Rika was originally designed to modulate, including at the electoral level of Īrumbī/Mūrurī. The conducting of rainmaking and other activities of common interest inside Irī, at the rika level, guaranteed common ownership of protocols to establish good environmental habits

We see that the elders planted cuttings to propagate fig trees at Gakamerī. They also conducted controlled harvesting of fruit from vines for medicinal and vinicultural purposes. It was forbidden to remove resources from Irī at any other time. These are maintenance processes that are obviously tied to human livelihood needs.

5.5.3 Understanding Irī Principles for Present Day Application

With the information from Ūmau and MZKab regarding a naturopathic concept of stewardship in present day experience, I wanted to see if there were other kinds of widely

applicable projects that could be categorized as advancing principles of stewardship. asked community members to point me to projects in the community that they felt had good ecological impacts as well as to tell me why they felt this way. Community members pointed to the canal irrigation scheme in Ishiara.

Community members told us that they had taken ownership of the canal irrigation scheme when the government of Kenya at independence neglected the project. The community took over its management and indigenized the Ishiara Kathĩgĩ Scheme. When we checked with community members 35 years and below, we could not find consensus among them, as to whether this scheme was indigenous. Many believed it to be coeval with the community. Others said it was returning system but could not date it beyond that. Their appreciation for the scheme had to do with its "green" environmentally friendly features. They pointed out that

1. It used gravity.
2. its water flowed back into the river further downstream
3. members did not pay heavy dues to maintain it as with the piped schemes d.) it did not require external funding to maintain
4. it was ideal for collective village level maintenance, and therefore could be sustained without external funding.

Members monitored, and periodically drenched up silt that clogged up the canal. This silt was left on the sides of the canal to build up the banks and form natural rich top soils. In addition to youth, we consulted with 9 elders from the area, in a bid to date the canal and determine the nature of community participation historically.

According to our Akũrũ A Kīrīra two elders, the canals had been constructed in the 1930s-1940s by a returning system agricultural officer whom they called, *Kainoko*. More research is needed to identify Kainoko and to date canal development. He was repeatedly brought up across Mbeere by elders in their 80s and above, and they all agreed that he was an agricultural officer. His name also comes up in conversation with CUPlu, under gender equity, as

With regards to community participation, elders told us that, as young men, they had taken part in construction, working as day laborers. The consensus among elders was that Kainoko understood the nature of water and land.

Based on youth's list of the green aspects that gave community impetus take ownership of the canal, and bolstered by elder's perception of Kainoko as a man who understood the nature of water, it appeared to me that they had offered the research team indigenous ideas about sustainable strategies, and evidenced the canal as historical precedent.

The canal therefore gave us a baseline to determine project integration with Place, otherwise termed indigenization.

Concerns were raised by community members that neighbors who belonged to the new piped irrigation schemes posed a threat to the life of the canal scheme, as they often lobbied the Water Ministry to close the green irrigation scheme down, in favor of the fee-for service piped irrigation, which were controlled by newly formed associations with the help of donor projects funding the piped schemes.

Below are illustrations of the two types of irrigation schemes.

Figure 5-E: Irrigation Examples

In Figure5-E, on left is a new donor project with above ground piped irrigation. Poorly maintained, pipes are often broken as above, causing run off. Generators to run it pollute riparian ecologies. On the right is one small arm of the canal in the Ishiara Kathĩgĩ canal irrigation scheme, at the point where it back runs into the river further downstream. More information on donor projects is in Appendix J

Touring the different schemes in the area gave me a sense of what was a bioculturally sound project and the kind of project that imbalanced Place, such as the new counterintuitive irrigation schemes. The whole area served by the canals was charming, with palm fronds, lovely cottages, happy looking children, and well-tended farms. Villagers were welcoming and proud of their farms, and happy to demonstrate the various innovative ways they had devised over the years to make use of the canal water.

The green canal scheme appeared to speak to all aspects of the environmental principles shared by elders such as shared reciprocal responsibility, non-transplanting of living ecologies, conservation, non-competition with nature, etc. I now had a better understanding of environmental values that community members wanted to advance.

The scenes in the next two pages illustrate my impressions of life in the villages that are connected by the canal irrigation scheme in Ishiara, Mbeere North.

Figure 5-F: Restored īriūko, watering station upstream by the canal intake.

Figure 5-H: Village notice to participate in a canal cleanup Harambee

The notice reads, “Notice! There will be work at the canal on 26/11/2016. We will meet at Mariarī at 8 am. Arrive on time. Yours, Secretary.”

Figure 5-I: Young boys frolic in the canal waters on a sunny afternoon

Clay silt and algae gives the water its opaque color, but it is clean, potable water redirected from Thũci river, which flows from Mt. Kenya.

Figure 5-K: Steve demonstrates how the flow of canal water is regulated at the intake point.

This is upstream where the canal is redirected from Thũci river. Further down it forks into a rectangular grid to serve myriad farms before being redirected back into the river in a single stream.

Figure 5-J: Touring a traditional farm on the canal irrigation scheme.

The landowner and farmer, Moni is in the lead, followed by Steve and Jedy, members of the research team. In the rear is Meri with her infant daughter on board. Moni is a professional at an environmental non-profit agency in Embu Town. Meri was one of the founding members of iCitSci

Figure 5-L: Downstream, one small arm of the canal system.

Located behind the home of Tomi, one of the research participants and a founding member of iCitSci, a roof can be seen in the right mid distance.

As just seen, the community appeared to have played a marginal role in the inception of the canal irrigation scheme. Yet, we established that perceptions of the scheme were overwhelmingly positive, based in its integration with ecological principles of Place and its

ability to harness the power of rika through harambee for continued maintenance, so that there was little need to seek external support. These factors, rather than the role that community members played at the time of its inception, were the criteria for ecological soundness and fit with stewardship practice. We may remember these criteria were used in Chapter 4, to establish an indigenous definition of sound ecological practices.

By contrast, as seen in the previous chapter on structure, community perceptions of present donor and government projects, were mixed, and overwhelmingly negative. These projects use participatory, people-driven or community led models and are largely centered rural development. Their responses were mixed, with some positive and negative feedback. Community members felt that piped irrigation schemes, often using above ground piped system, were poorly maintained and mechanized systems. They offered that the systems were destroying riparian ecologies by lowering water levels to unsustainable volumes. The pipes also often broke, and repair was low to arrive, leading to wastage of water. On my trips to Ishiara, one particular above-ground pipe system appeared to be in perpetual disrepair, one or more pipes uselessly gushing water into the roadside.

Community members told us of positive changes brought about by a number of projects. For instance, they named a certain wood burning stove called Jiko Poa, that used less wood, allowing for conservation of indigenous trees, a key local environmental concern. They also thought that a tree planting program they called TIST had brought about good outcomes, paying farmers to reforest their own lands. TIST appeared worthy of closer scrutiny because it used reforestation, a local stewardship staple. This is the International Small Group Tree Planting Program (TIST), which provides trees for planting on private land and then also pays local farmers to reforest their own lands, as we were informed. While

local communities provide the manual labor that makes TIST work, the organization additionally asks small groups to collect data on growth and then turn the data over to the organization. Ostensibly, the goal of TIST is reforestation with local monetary benefits.

On closer inspection, this project has appropriated an already existing culture of tree planting to coalesce community members around collecting phenological data that TIST then uses to sell carbon credits on European and other world markets. Farmers receive a small portion of cash in compensation. While TIST's ostensible goal of reforestation is successful, the types of programs that it represents have been criticized for selling carbon credits to major polluters in industrialized nations, which in turn allows them to keep polluting on the backs of farmers in places like Mbeere, which themselves, like much of Africa have very low carbon footprints. It is felt that this practice helps to preserve the unequal and exploitative relationship that exists between industrialized and non-industrialized nations.

During conversation, community members appeared unaware of the larger global context in which the farmers in Mbeere were situated within the TIST framework. Be that as it may, TIST is notable for helping build a data collecting culture in the area and for making that data freely available on its website. Who this data is targeted at is another question altogether, as locals were not aware of it; and it is thus an ethical question that invites further inquiry?

However, in spite of identifying positive outcomes such as the above, community members felt that their participation in these projects was basic, confined to manual labor. Additionally, they felt that they were beneficiaries in these projects, rather than owners in a majority of the projects. There were exceptions to this view, and this was held by community members who were direct employees of named organizations. These members

responded that they felt they were direct contributors in donor project outcomes, a not surprising perspective that was in tension with their indigenous views of sound ecological practices.

5.5.4 Separation, the law of minimal requisites, and diaspora today.

Based on content analysis of user posts on UVA and other groups on Rikamedia, diaspora, whether inside Kenya or international, was more likely to respond to a call to fundraise than members living in Place. This was one of the findings that had led to an early conclusion, reported in Warrick et al. (2016a) that UVA altruistically motivated to participate in stewardship, using development and activist strategies in a holistic framework to meet the needs of Place, whereas those living in Place were more likely to participate in stewardship to meet their livelihood and/or economic needs, as reported in Warrick et al. (2016a).

This early finding was partially triangulated by UVA survey data in 2017, which confirmed that diaspora was more likely to indicate they were interested in fundraising than those who responded that they resided in Mbeere at the time they joined UVA. However, the idea that diasporic motivations are necessarily altruistic has not withstood the test when subjected to the phased approach to data collecting and subsequent stepped indigenous and elaborative coding. Diasporic participation is more closely associated with the learning motivation than with philanthropy.

The idea of temporal separation "kūthiī," (to leave, sojourn) as a means to appreciate the law of minimal requisites came up at almost every elder talking circle. Separation involved some type of long-distance walk, sojourn, or mission, sometimes hundreds of miles from home, followed by a beneficial return. Elders told us for example, that it was common to climb Mt. Kenya on a mission to fetch snow, "Īra," and to experience water in this

dimension. Other elders spoke of walking to the experience the tides of the Indian Ocean, yet another dimension of water. Still others encouraged the research team to sojourn, stating that, "We want you to go, but don't forget. Bring back your knowledge. That is our blessing." "Tūrenda mūthiī, nuatī mūtikariganīrūe. Na ningī, mūgacokia kīthomo. Kīu nīkīo kīrathimo." Additionally, elder accounts of their stewardship rites inside Irī involved a great deal of walking-to Irī and back, and then to fetch seeds for planting.

Perhaps one of the most striking separation-from-Place stories involved a rite of separation known as "gūtema ngurū" (a stealth military strategy). Although gūtema ngurū is a political rather than environmental exercise, it illustrates not just the idea of transformation through separation, but also Mbeere values about conservation of life and resources. As told to us, unlike other communities surrounding, i.e., Meru, Maasai, Kikuyu, Kamba, and Embu, Mbeere did not conduct aggressive war raids where large numbers of warrior enemies may die, and large herds of cattle driven home from the raid.

According to elders, patent acquisition of property was against the Mbeere value system. Mbeere did have to defend themselves against frequent raids "Maitha matūrivaga atīa!" (We often faced Maasai assault!) But Mbeere youth were mandated to carry out a decoupled mission of a different kind before they could be recognized as adults. This mission, gūtema ngurū was a means by which they show that they could stand up to the enemy and do the honorable thing to fend for those who were in their care. But they had to do so without unduly wasting lives.

The mandate was to carry out decoupled operations in small teams. Each "target" was carefully chosen from armies that had struck or were feared about to strike. Warriors brought home only one trophy from a struck warrior, as evidence that the stealth kills had been

successfully carried out. The “evidence” could be a hostage female member of the enemy warrior’s family, a treasured weapon, or a piece of armor. To bring any more, no matter how accessible the spoils, was considered excessive. A warrior stayed in separation until he had carried out a successful mission. On return, they were ready to start a family. Gūtema ngurū as a practice has been unlawful in Kenya for many decades. Rites of separation continue to evolve, for example, circumcision occurs just before entry into boarding school. As we will see in the coming chapters, separation from Place appears to have motivational and strategic impacts on environmental stewardship.

A variant of the elders' idea of separation as imbued with a motivational role had suggested itself in the form of diasporic identity when we had administered the survey, and now we turned to the data for further insights. When members were asked to indicate where they lived when they first joined UVA, 70% indicated that they had lived outside Mbeere when they joined the group. Most of the diaspora were living in the capital city of Nairobi.

The survey findings were confirmed by group analytics data which showed a majority 68% lived outside Mbeere. The figure below illustrates data extracted in July 2019 and checked again in February and May 2020, to ensure validity. The membership of the core group was 4,126 on the date of extraction. Measured against 4,513 in 2017, and 4,500 in 2020, there appeared to be an annual fluctuation of roughly 500 without significant change in the relationships between percentages locations of group members. Consequently, I decided to retain the 2019 chart, following.

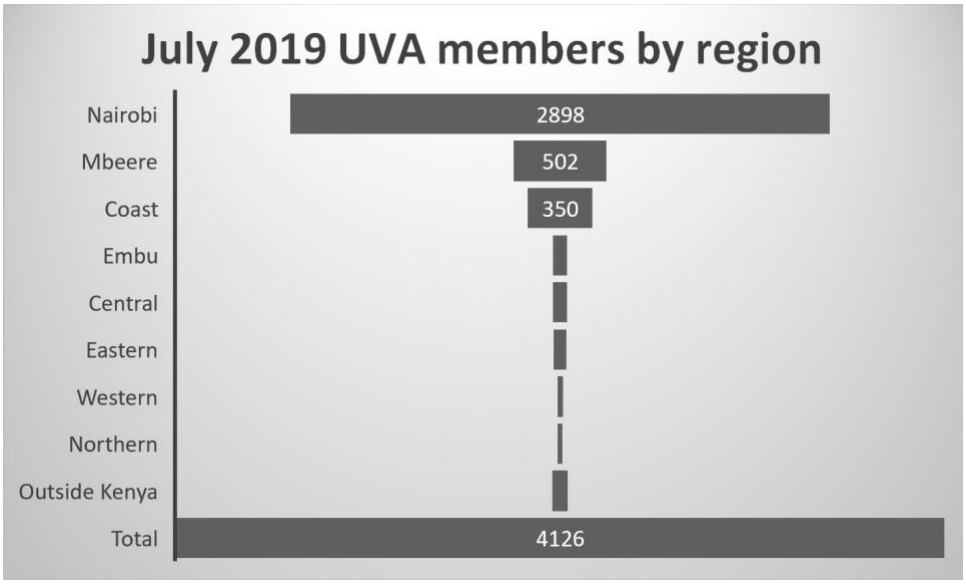

Figure 5-G: Rikamedia diaspora numbers in relation to Mbeere residents

Nairobi is about 60 miles from Mbeere. The drive takes about 1.5 hours, mainly due to traffic getting out of Nairobi. As we saw in the methods chapter under sampling, community members consider themselves farmers even when they work outside Mbeere, and a majority have second homes in Mbeere that they visit on the weekend. Hence this finding is not surprising.

On UVA, the largest diaspora outside the country was geolocated in the United States at roughly 20% while the remaining 10% were scattered across the globe. International diaspora per country range from one to three members and cover 53 countries around the world excepting Kenya. While these findings were unsurprising, taken in tandem with the learning motivations that were emerging in the data, they became interesting in that they pointed to values deeper than the simple desire to connect.

5.6 Motivational Role of Elected Representatives on Social Media

In this section, I will look at the motivational and demotivational role of politics; and by implications, representative governance, as perceived through interactions of elected representatives on social media. At the end of the section I will juxtapose elder accounts with findings on social media to arrive at a short list with conclusions, linking the demotivational role of present day politics with missing elements that may be traceable to Īrumbī and Mūrurī.

5.6.1 Elected Representatives on social media

While learning about Place was the most picked motivation, the least picked motivation towards participation was engagement in politics. Regardless of age, only 2% of all surveyed community members indicated that their key motivation was to connect with local politicians, and only 4% of all survey community members indicated that their key motivation toward participation was to connect with constituents.

As there were more users in this minority who were seeking to connect with constituents than were attempting to access politicians by joining social media, it appeared that politics per se was only marginally motivational. A core group of members who were active participants on a daily basis appeared to center their topics on politics. In interactions occurring 2014 and before, politicians were likely to respond to direct questions posed to them by members (using their name to address the question to them) if the exchange took place on FB. Tweets increased the likelihood of a sense of direct engagement, when either a retweet or hashtag was created in response to citizen tweets.

This is reflected in the networks visualized in Chapter 4, showing higher connectivity of a Twitter cluster relative to the rest of the network in the FB group Mbeere Politics. In

interactions dated after 2015 and thereafter as well as in community WhatsApp forums, politicians were less likely to respond directly to questions posed, even when they were addressed by name. This is likely because these forums developed after the FB groups had largely stopped engaging directly with politicians; had ceased the practice of asking questions and challenging their stand on issues such as water (often featuring full member number capacity allowed by the platform, these community. However in general, passive engagement was more common on FB than on WhatsApp forums. These are different from WhatsApp project group chats that have been visualized in Chapters 4, 5, and 6. Community WhatsApp forums carry the same goals as their FB group counterparts and can be regarded as providing a deeper level of privacy to and therefore greater specificity. These functions were carried out on FB prior to 2015 and migrated to WhatsApp due to an environment guaranteeing end to end encryption. Entry is by invitation of an existing members and indicates a high level of trust relative to the FB environment.

With time, it became clear that constituents did all the talking, with occasional interjections from moderators to be respectful. As a point of interest, instructions on etiquette were delivered in Kīmbeere or Swahili, and tended to be short, ranging between 3-5 words. The most active WhatsApp groups reported upwards of 50 posts per hour, while Facebook Groups may receive 50 posts per 24 hour period (active posting from 6am to 6pm Kenyan Time (10pm to 6am Daylight Savings Eastern Standard Time). There appeared to be more directly pointed criticisms on WhatsApp forums than on FB Groups, perhaps because the structure of Group Chat gives the appearance of participatory communication, relative to FB posts. My attempts to speak to two elected representatives at the start of research were well received and in many cases welcome, but proved unfruitful due to my own limited time.

Hence I tentatively offer that this finding can be understood within the larger context of Kenya's devolution mandate for increased transparency as community members told us in talking circles. In their role candidates into elected office as well as incumbents, are encouraged to be accessible to their constituents. Facebook groups provide a ready-made outlet for this function. In addition, as told by Pathfinders during member checking, politicians realize the influence of the Rikamedia and want to stay engaged outside the campaign years to leverage the group's support.

Contrariwise, we found that constituents who participated to connect with them had largely negative impacts on other members' motivation toward direct participation through active contribution of data, ideas, information and debate on arising topics. It was not the politicians per se engaged in conversation with this group, but other constituents. Representatives remained available in a global sense while constituents posted "at" them more than conversed with them. On average, observed forums, whether on FB or WhatsApp, featured a handful of members contributing to conversational threads. In both FB and WhatsApp that was roughly 5-8 members with occasional upsurges, for example when announcements were made with legislative news impacting on Mbeere.

While not optimally placed, the below excerpts from a talking circle in Kīambeere give a representative view of the general tenor of conversations in Place regarding politics and representative governance of Place in present day experience.

> R1: na nii na tikwa nthithaga. Wendani wa Mumbeere wana Muembu, uranangirwe ni uthamaki wa -uthamaki wa - niguo uranangire wendani. Tondu J niwe waretire miviriga. ndiari kuo Mbeere. Yarikuo—ya wendani. Wana riu tikwa wanathira, nundu mundu uyu wa Kagundu ta riu wana ki muviriga kirikaga ati kwagia kura. Na tukiuma kuria kurari, mwiritu wake akivika gwakwa. no indi iyo kurari kura, wana tutingiricanira. Na undu uciao waretirwe ni -. na wendani wa indi ya miti, waretirwe ni -. Ndwari guku gwetu. and I do not even hide these things when I speak. The unity between the tribes of Mumbeere and Muembu (Mbeere and Embu) got wiped out by the leadership of -. the leadership of - is what destroyed the unity

amongst the people. Because - is who introduced clan division. clannism was not there in Mbeere. Clans only served to unite the people. But even today, the neighborliness has not ended, (name) only influences clan division when we get to the voting season. but when the voting was on, we would not even have sat to eat together and that thing was brought about by -. and the favoritism which comes during the voting season was brought by -. We did not have it here in our land."

R2: ta riu niguo neraga mundu wingi ngiuga tariu gwi Technical yakirwe naava. Ta riu agiuka kuria campain nukorwa wi mwaka wa ikumi. Aukaga ati akivinguraga Technical iyo. Na nginya riu ndiri mwana yanagya, kana ndui, kana mwarimu Na agiuka ta riu nukuthii guka kuvingura. wana ngū ndungiuna kuo, nundu nukugwatwa. iini wana 'pipe' ndungikira. wana ti kwirigirire, wana ti kwirigirire. Watho. That building has been there going on ten years now. And if he came right now he would go for an official opening again. You cannot even get firewood from there. Because you will be in trouble with the law. no, even piped water, there is no access for piped water there. it is not even fenced off, it hasn't even been fenced off. It is the law that stands strong. nukuona ta riu varia Gitaru? Vau mwaukira varavara iri njuku muno nginya varia Matenderi, kuri andu methagwa kuu kithakari, ma watchmen. Makithurira. makithuthirira, kana watema muti. mandikitwe kuu ni! Matigukugwata niki? Mavecagwa musara wa wira ucio. wana ava Kindaruma mevo, wa ava ava Shauri.you see a place such as Gitaru? The road that you have used to get here is in very poor condition, stretching up to Matenderi. There are people in those bushes, watchmen, who keep a look out. who keep a look out to see if you might cut down a branch for firewood. yes, they are employed there yes! Why wouldn't they arrest you? They are paid to do that. even here at Kindaruma they are there. Right here in Shauri.

R1: riu turi wa ukombori. therefore, we are in slavery. niguo nimwirire ngimwira thui tutiauma ukoroniri. that is as I told you earlier, we have never been free of the colonial yoke. turi wa ukoroniri. we are still under colonialism.

R2: riu nacio menya ikinyangagirwa uguo. Tondu vatiri varia ukathii. Ingi ukathii ku? Akorwa nwa kamucemanio mwathii varia gakiarua, na tikaria uvoro wa manji na thitima. Wana ingarua ndeto icio cia thitima ikathirira va—vau. as you know, justice is just trumpled upon. Because there is no place you can go for help. Where would you go? If when you go for some small meeting to talk issues out, no one will discuss water and electicity use, and even if you discuss matters of electricity the story ends there

R4: akigweta kaundu vaci uvoro ukinathira. who mentions some insignificant thing, and. that's it. The meeting is over. guku andu nimarire thina. Gutiri ngurani na North Eastern guku. Ni thina ntheri guku na kuu. here people have lived in dire straits, there is no difference between this place and North Eastern. We are all in dire straits. Here and there. na riu na manji mari ava. and yet the water is found right here. ingi ti macio ndumene we. Nikwa ukwirwa ingi. Macio numene. Nii naukire guku ninty-four. (points) it is right here; do you not see it? Need we tell you about it? It is right here, as you can see. I personally came here in ninty-fourwana thitima nicio icio ivitukiririte. even electric cables pass right up here. ino, wana iyo ingi raini tiino. Niguo ndikaume ino tiino? (points) but they are right here. Even the other power line is right here. Isn't this the one that branches off from that one?

Not surprisingly, In talking circles and in WhatsApp chats, community member responses to research prompts about perceptions of political discourse indicated a demotivational role both in Place and social media.

However, social media interactions, when observed rather than reported on by members, showed a marked dichotomy that was altogether missing in the disenfranchised spaces of Place; relative to the liminality of social media interactions. In a dichotomy of function, political discourse was eschewed whilst posted political content was accorded a high information value. Discourse here refers to active ongoing conversations in the form of posts, replies, comments, likes, forwards, and any other type of direct, sustained engagement between members about political issues such as party popularity, personal electoral decisions, comments about factions loyalties, predictions of electoral outcomes, etc. Content here means, the actual data, information, or knowledge contained in the exchanged content. On the surface of it, discourse was perceived as contributing little to group intension toward community development yet disproportionately dominating the conversation. Additionally, some participants, including Pathfinders and community members, went so far as to indict politics for altogether distracting from group goals. An average of 75% of members strongly held this view over the course of research.

Nonetheless, it was equally evident that in 5 years of observation from 2015-2020, the data on group stability just as strongly suggested that most members were not dissatisfied enough to leave, even for short periods of time. Group member numbers remained stable across the platforms and in diverse groups. Fluctuations of less than 100 per year in either direction were noted and insignificant. The Covid-19 crisis of 2020 saw an upsurge in membership counts, with FB seeing the most benefit due to restriction on membership,

limiting to 250 members on WhatsApp chat. The largest group, Mbeere South, rose from 14,000 members to over 20,000 members in the space of a few months from March to June 2020. Active conversational threads (evidencing exchange of data, information or ideation) remained low on FB groups relative to WhatsApp.

The tension between form and content evidently stemmed from fatigue with large volumes of undesired content and a conflicting motivation to make sense of it and to learn from it. The few members who were active in sharing appeared to have a handle on the political process and representative governance. They posted about County budget allocations, expenditures, bills on the floor, constitutional amendment propositions and legislative acts. They also posted about performance of representatives in parliament, delivery on campaign promises, etc. Hence, it appeared that although political discourse demotivated direct user sharing behaviors, it did not appear to demotivate learning behaviors. Rather, political discourse supported the need to learn, but inadequately so for several reasons: By inference, it is difficult to engage in discussion on a topic of which one is unaware. This may explain the passivity of a majority of members. It will be remembered that although Pathfinders are GenX, majority members are Millennials and Generation Z, under 39 years old. It also raises the question of access. Due the linear nature of WhatsApp, much of the content is lost to the user if not archived on the Cloud. Since direct conversation has moved from FB to WhatsApp, there is need to grow the platform horizontally, to allow for filtering, a level of tagging or personal indexing that can reduce the cognitive load and support the learning motivation more efficiently. This is an area for future growth on FB, as there appears to be need for horizontal growth to accommodate topical specialization and development of personal publics in the larger WhatsApp forums, equivalent to channels or

rooms seen in a platform such as Slack (slack.com), where there is fluidity of horizontal and nested threads.

Another finding that helped explain the discrepancy between high numbers reporting discontentment and high numbers of member retention was specific to participant responses cited their own personal interactions on UVA as the cause of discontentment. was only arrived at after extensive mining of data to identify members who had responded to questions about social media participation by saying that they were "on UVA." As it turned out, the term UVA as used by participants in Mbeere North meant any forum or group in the entire Mbeere community Rikamedia. We found that many participants who reported membership on UVA were neither past nor current members of UVA, the FB group.

To arrive at this finding, the team combed through the data tables of UVA and Mbeere Politics, cross checking with each other iteratively over the course of some weeks, especially when members appeared to be registered under two identities. We were searching to verify membership of our talking circle participants, using data extracted in the lifetime of the group, 2012 to 2017.[19]

The outcome was surprising in that only 7 of those who took part in talking circles had been members of UVA at any point since its inception. Out of those, 2 had ended their membership by 2015 when we began research. The other members who had registered discontent were not registered members on UVA under any names or aliases that were

[19] *In 2017, FB put in tight controls on types of data that researchers could extract after widely publicized allegations of Russian meddling in the 2016 US elections.*

recognized by team members or other corroborators. The Pathfinders' team asks that members use legal names to build trust through transparency. The vetting process to enter UVA includes answering a set of interview questions to determine fit, followed by a social media search to verify identity and rule out any red flags such as a history of cyberbullying. It appeared that members FB groups centered in politics such as Mbeere Politics (visualized in Chapter 4) and social groups on WhatsApp Group Chats with a political bent were the members likely to register discontent with political content. Others were members of smaller groups that fell below the threshold of our data collection exercise of at least 1000 unless falling under a special topic, such as miraa, indigenous plants, or in one case, a women's group with less than 400 members that appeared in the search up to 2019 but not in 2020.

The more we intersected talking circles with data extraction on social media, the more we understood member identification with the name UVA, likely due to its seminal role as the founding FB group in the Mbeere Rikamedia, and the close association of the driving agenda to restore ecologies and livelihoods in Place.

Indeed, to some members in Mbeere North, the name was synonymous with the entirety of their lived experience at the intersection of Place and social media; thus political strife touching any part of the Rikamedia was likely to associated with their place of primary identity as a digital person, UVA. For example, reported cases of interpersonal conflict that had resulted in "a police case," following on politically instigated "fight in the market at Ishiara" (Mbeere North), a fight that had reported began on "UVA." In one instance, a member reported that Facebook had forced UVA to shut down altogether after repeated police intervention in group strife.

This member followed up with a plea to ideate toward how the group could be revived. After Pathfinders unanimously told us the reported accounts had not occurred on UVA and suggested with expand our search, we undertook data extraction of member data covering the lifetime of the FB group until then, (2017). As later corroborated in member checking exercises with Pathfinders and other community members. This community member had not joined UVA the FB group at any point, precluding by alias under the rudder of the vetting process and ou own verification process. This community member, approximately 30 years old; and 7others in our research who considered themselves discontented members of UVA, were not per se members of the FB group by that name. Rather they belonged to other, sometimes smaller and more volatile groups in the pre-WhatsApp period before 2015, when direct exchange had been robust on FB groups, leading to both transformative programming and conflicts over personal and local priorities.

Clearly this is an area in need of more research especially given undertones of possible links between political discourse and gender violence in the corners of the Rikamedia that may adapt back toward undesirable marginal states in which members existed before the liminal experience of social media. I will discuss this idea in more depth in the section on indigenous motivation in theory, at the bottom of the chapter, pulling in other clusters to illustrate my argument.

Suffice it to say that the foregoing findings were among key reasons that I expanded my definition of social media to include Place identity. I initially thought of it as a collection of FB groups and WhatsApp groups in a finite virtual ecosystem as afforded by private propriety of Facebook the company. However, it became clear that the Place based concerns of territorial jurisdiction, right of access to and responsibility for ecological stewardship of

land based resources were all aspects of Rika (Rike, Ric) that were integrally identified with the indigenous social media experience. Thus, was born the term Rikamedia.

5.7 Politics in Rika

My questions to elders were geared to understanding the role of politics in rika, and how this translated on social media, experienced by FB leaders as motivational whilst group members saw political conversations as demotivators.

The information that emerged from conversations with elders illustrated that differences lay in their understanding of how to scale the social structure on social media so as to reach constituents. Contrariwise, in the rika framework, the political machinery was latent, relative to everyday experience where political campaigns are patently obvious and self-promotional.

Elders told us that, in order to safeguard equitable representation within the rika system there exists a macro level rika which forms the electoral body. As we saw in the last chapter, in Mbeere, these rika are named Īrumbī and Mūrurī. According to elders, Mbeere has many mīvīrīga (sing. Mūvīrīga, today called clans). Membership in Ndamata or Thagana is entered purely by accident of birth, agency and choice do not enter the equation. All members of the society are automatically born into one or the other. But while all citizens are born into Ndamata or Thagana, adults citizens participate in the political process as Īrumbī and Mūrurī respectively. These are therefore terminologies differentiating functions within the same structures. Systemically, Īrumbī and Mūrurī form an electoral body, known as "Athuri a

Rika[20]," which literary translates to, "The Electorate of the Rike." The number 7 featured heavily in this process. Seven elders were elected by each clan coalition in the electoral body, making up 14 members the number 7 was presumably to break a tie. The role of Īrumbī and Mūrurī in the processes was one of electing representatives into government. From this electoral body, leaders were equitably chosen to form a non-partisan government of Nyangi and Ivate. Each representative government took a unique name identifiable with their time in history.

Elders shared with the research team that at the time of the last induction of their parents' rika into Mūranja (North) and Kanya Ka Mbūri (South), they were too young to take part in any but the most public aspects of rika inauguration into government, termed Nduīko, the ceremony of breaking and becoming.

Each side would observe legislative and governance processes of the other for 7 days, making up a total of 28 days, after which *Mweri wa Kenda*, the moon of the 9th month, was said to have ended, signaling the start of the short rains in October, and the beginning of the calendar year. These processes are reported elsewhere and feature for making of laws, and integrated with stewardship activities such as the issuing of seeds to the public.[21] Saberwal,

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[20] The word, mūthuri, meaning, voter or elector, is commonly used today to mean "man" that is, a masculine member of the community. However, it appears to have a gender inclusive taxonomy in a time before the patriarchization of power. The term Mūndū Mūrūme appears to be the EC regional standard indicative of a person of the male gender. Although rare due to predominance of males in precolonial and returning system research in the region, it has been reported that females participated in the same processes of government and were chosen in representative roles. Njeru (1979), Lambert (1933, 1956) and Saberwal (1968, 1970), marginally report female participation in government induction and other processes, corroborated by Akūrū A Kīrīra. Returning system research centered in evidencing patriarchy, simplistic animist symbolism, and "weak sociopolitical organization." Hence, evidence of gender inclusion was largely ignored, and when female participation was documented, there were no attempts to provide details.

[21] The Kenyan Constitution (GOK, 2010) and the PTKCE Act of 2016 (GOK, 2016) both recognize and protect indigenous seeds, as part of the indigenous knowledge inventory and ecological property in Place.

in addition to reporting that Mbeere Rika would send a representative to officiate in Embu government processes, found that each Embu coalition elected 6 elders, but there were 7 electoral 'sticks" mītī, presumably the 7th was cast for the Mbeere representative. Lambert also reports Embu Sojourn into Mbeere for inaugural purpose, corroborated with new data by Saberwal, and further confirmed by accounts by our own Akūrū, that Mbeere was heavily involved in the formation of Embu governments.

Once in government, the rika did not act in a partisan manner but rather governed under a non-partisan coalition under a unique name, historically identifiable. Mūranja and Kanya ka Mbūri are the last Nduīko rika and therefore, still in "power" even though the members are all deceased, being parents of our Akũrũ A Kīrīra elders, Commonly understood to have been stopped in the 1930s. However, Nyangi elders told us that they challenged the incumbent Mūranja rika in the 1960s when it was their turn to govern. An excerpt below catches a group of elders in mid conversation on this topic.

Prompt: Rīu mwainaga mūgīka atīa rūīmbo rūu?

When did you dance to that song?

CŪCŪ: Aya tīkwa mainaga, kwa megucaga

These people did not dance to it, they only heard of it (Itherū Elder, pointing to Nyangi Elders, her seniors in rika age accounting but agemates in chronological age, i.e., the Roman calendar)

ŪMAŪ THI and ŪMAU NT: Nītwarwinaga (Nyangi Elder responds)
We used to sing it
CŪCŪ: Wanarwina?
Have you ever sung it?
ŪMAU THI: Īī nī wa rika rīa Nyangi…rūu nī rwīmbo Rūa Nyangi
Yes, I belong to Nyangi Rika… That is a Nyangi song
ŪMAŪ NT: Twaūragia Mūranja atīrī, Ka mūkūrega na matīiri tūgangīra kū! wangūna matūmu wamenyire nakī na...
what we were asking Mūranja was, if you do not hand over the public arena, where shall we make our pathways?
CŪCŪ: Mwainaga mwī aruu?
Had you been initiated into adult hood when you were singing it?
ŪMAU THI: Īī, Īya
Yes, why

CŪCŪ: Ka mainaga!
They really did sing then!
ŪMAU NT: Nake ūyū nī mwamatīte ūū
And this one I was holding her like this (extending hand toward fellow Nyangi Female Elder)
Laughter
Prompt: Ok, rīu, kwīna gakīrīa karīa nīmūthakīre ava mbere karīa gakwaragia ava mbere ka ūvarirī, na negua wagweta ūvarirī ŪMAU THIRIKŪ
I heard you, Umau, mention Uvariri?
ŪMAU THI: Īī,.. rīu ūvarirī nīguo waī mūciī mūnene wathondekaga maūndū mau rīrīa macūka
Yes, .. Now Ūvarirī was the big home, where matters used to be solved when things went wrong
ŪMAU NT: Ūvarirī ūcio rīu nīguo watūīkire nīguo ūgatūrutagīra maūndū mau
Uvariri became the place that would solve those issues
UMAU MW: Ngīnyagia riu nwaguo
It is still that way even in the present
Aa UMAU NA Aa CŪCŪ ONTHE: Īī
ALL ELDERS: Yes

Elders went on to clarify that Nyangi had formed a government, a rika, and had gone through a nduīko, inaugural ceremony in the 1960s. However, they told us, that they did not undergo the formal process of naming their rika, which was required to be fully vested as a government. Several factors were implicated: Kenya would still have been in the struggle for independence. This was the Rika responsible for that fight against returning system occupation.

Having undergone circumcision around 1930s as their parents were forming Rika ria Nduīko an autonomous government, under the yoke of Lambert's returning system government, our Akũrũ A Kīrīra would have been members of Rika ria Mumo, up to approximately the late 1950s, forming the coalition of service warriors, in the national security sector until they were ready to break away/and become, in a Nduīko. As elders told us, they were not able to travel to Ūvarirī for their induction, and so they were not conferred a rika name, without which they could not form their song-rika.

The specific historical marker that explains this unfortunate development is that the returning system government had declared a state of emergency due to the MauMau unrest. The connection becomes immediately self-evident; As the incumbent Njama ya Mumo since

the 1930s, our elders would have been fiercely engaged in the fight for independence most of their adult life. However, the years immediately before independence was won were characterized by mass imprisonment, with entire villages in concentration camps under barbed wire.

Most of the male population in the EC region was under surveillance, the choice being either to join the surveilled in the forests or become a member of the home guard, local returning system police collaborating with the returning system government under a colonially appointed chief or subchief. Since our elders tell us they formed a nduīko in this hostile climate, we can assume they were not in the Homeguard. Homeguard movement would not have been restricted; they ran the concentration camp villages, besides which, the act of induction or Nduīko was essentially the start of a new autonomous government. It was tantamount to declaration of independence and had always been, even in precolonial life, hence by inference this elder account is one of decoupled resistance. It is therefore of significance that Nyangi elders who shared the information we report here have firsthand knowledge of the processes they share and in some cases they were taught in anticipation of adulthood, when they would take over stewardship duties for Ivate and Nyangi. With regards to participation of Īrumbī and Mūrurī as elected representatives, they would have learned but not participated directly, since their adulthood coincided with the loss of this aspect of Rika. They make up a distributed system of ciama (singular, Kīama), local councils, which send representatives into Īrumbī and Mūrurī, a leadership level whereby each rika addresses local affairs of clans that fall within its jurisdiction, and which also votes in representatives into Nyangi and Ivate, the rika responsible for macro level governance and cross-sectoral administration, i.e., the stewardship of Mbeere. An example of local affairs would be

organization of the education program that culminates in initiation of teenagers into youth rika, with programs such as circumcision and induction into service in the armed forces for both genders. Anthropology has diminished the complexity of rika programs by looking at them single dimensionally as circumcision rituals or religious practices.

Rika transition from youth service under Mūrurī and Īrumbī into macro level governance after undergoing a period of training and induction known as Nduīko. The word Nduīko has a double meaning of breaking away and becoming. When a rika is ready to form a government, the process is not a given. It must first decouple from mainstream structures by challenging the incumbent rika. Most of this process is lost to history, however, it involves negotiation, consensus, and preparatory processes, and is a lengthy process that culminates in month-long change-over and inaugural ceremonies. By elder accounts, the 3 year process corresponds with youth induction into various service rika.

Representatives from Mūrurī and Īrumbī form a government of Nyangi and Ivate, under its own historically situated rika name, conferred at appointment. Below are some representative statements taken from different talking circles with elders to provide examples of the functions at this level. One of the most challenging aspects of data analysis has been attempting to separate processes, needing clarity on legislative, electoral, and stewardship process as well as wanting to distinguish the actors of one from the other. However, I have come to the realization that this problem is entirely one of perspective. These processes are integrated and inalienable from each other in the instructors' minds. I have found it more productive as I have learned more about research with elders, to simply amass the data in the form of accounts and storytelling, planning to member-check the records later during analysis, than to try and determine the answers to these questions during talking circles.

"Mīvīrīga titumenya ūvoro wayo." We won't get clarity from a discussion on mīvīrīga, clans.

"Andu methagwa matukene. Mīvīrīga yatukeneoguo. tuaturaga tutukene." People were mixed. Miririga, clans were geographically mixed. We all lived together.

"Kindu kia vata ni Īrumbī na Muriri. Macio nīmo makaumondu wa gutethia" The concept that is of value has to do with Īrumbī and Mūrurī. Those these will give rise to useful knowledge.

"Wanario nwarika. Īrumbī na Mūrurī, Wanamo nimarika kuringana na uria andu matutukanite." Yes. This too is a type of rika. Īrumbī and Mūrurī. They are also coalitions aligned with how people intermingled.

"Rika riruaga na Īrumbī kana Mūrurī." Īrumbī and Mūrurī were in charge of circumcision.

"Na nwakuo gukauma ndui? Miti. Īrumbī rigikia miti, rikithura egana? Mugwanja. Naguo Mūrurī taguo. Rirute egana? " Nikuo ukwigua gukiuma mugwanja wa mburi. Nundu nigawa ikigairua ariku? Aya mugwanja mathiire wirari muthuritue ni rika rioo." And that is where we also get what? Votes. Īrumbī casts votes, choses how many representatives? Seven. Likewide, Mūrurī provides how many? [seven]. This is where the saying comes from, "a seventh measure of the goat." Who is the goat to be carved for? These seven.

"Athuri. Mundu uria uvingite uciari. Nimevinga mithenya igana? Mugwanja. Nimo marinawira wa magongona Mbonjuki ne'gamba ngombe. Nati ivarori Kwegendagwa ni mugongo guonthe." Elders. Those who no longer bear children. They will cleanse themselves for how many days? Seven. They will be in charge of the proceedings at Mbonjūkī and Īgambang'ombe. Mark you, open arena events were open to the public.

"Mugwanjoyu na uria wingi. Nimathii matandike nyaki mbonjuki marare mithenya igana? Mugwanja. Namo ama mengi mathii Igamba ngo'mbe mithenya igana? Mugwanja." Yathira mithenya mugwanja magikatia, magicenjania." Nundu wa kumagarania. Mwenoyu ukuumagaria uuria wingi. Magicenjania. Gwikira kirore." Seven from each side. They will sleep on straw for how many days? Seven. After that they will switch places with those at Igambango'mbe, one side certifying that the other's ceremonies are taking place successfully.

"Mauma Vau ni ya mucii. Makivinga mithenya mugwa? Mugwanja. Naguo wakanana ugikinyoguo mbura tekura ii."From there, they will return home, and cleanse themselves seven days. On the eigth day, it will surely rain.

Elders told us that the process of Nduīko was lengthy and culminated in the new government visiting Ūvarirī for the appointment of names under which to govern.

Once a polity was appointed a self-governing body, by induction into a Rika, they had "become." members of an incumbent rika in executive governance, and were no longer identified with their Īrumbī and Mūrurī identities, but rather, after inauguration at Ūvarirī, the members of the two Rika formed a coalition of government under a newly

appointed rika name. By inference then, politics on social media was experienced negatively relative to the indigenous political process for several key reasons listed below to summarize differences:

1) Social media politics occurred at the elemental, unmodulated pre-rika state, leveraging diversified interests of clans. Conversely, in traditional society, clans participated through a coalition of Īrumbī and Mūrurī, forming an electoral body to moderate participation of members at both the matriarchal and patriarchal levels of society,
2) Politics on social media lacked the bolstering effect of a comprehensive civic and political education with immediate application in the lives of citizens. Most especially, present day politics lacked the preparatory functions embedded in rika and geared toward creating indigenous statesmen. Therefore, social media politics created skepticism by their outcome, which was one of demotivation, ergo marginalization.
3) Politicians on social media appeared to be integrative but were systemic disruptors in service to self rather than community. To underscore this perception, the 4% who responded that politics was motivational were themselves politicians who accessed social media to connect with constituents. Contrariwise, politics within rika bolstered motivational resilience by reinforcing the value of structure to support full citizen participation:

By all indications, the listed factors point to a difference in the capacity of one system to foster participatory process and the failure of the other to do so. The rika structure fostered learning modality for civic engagement, political process, and representative governance.

Fostered by Īrumbī and Mūrurī at macro level, the model was implemented at micro level through rika relationships and mirrored at macro level through integrative milestones, i.e., Īrua (initiation into adulthood); Rika rīa mumo (coming of age and induction into service) and Nduīko (induction into noncompetitive governance). On the other hand, politics on social media although not directly linkable to representative governance structures, and as such they mirroring present day nation state political process from the perspective of the elected representatives; political discourse nonetheless was motivational in that it supported learning about political process relative to governance of often impalpable structures of governance.

5.8 Rika in Motivational Theory

The question of motivation toward participation invites examination of both Place and social media as a transformative boundary spaces. Jaeger & Burnett (2010) and Jaeger et al., (2014) have defined technologies as types of boundary spaces. Boundaries are places at which iWorlds come into contact. Communication and information exchange may be expanded or restricted here, hence boundaries present both possibilities and limitations. Thus, it appears that technology in itself can have a motivational role and can additionally present as a demotivator when access is restricted. The iWorlds stance also facilitates a macro level view of social structures as well as a micro level view of processes that facilitate transformative change in diverse small worlds that make up part of the whole. We take the wide theoretical and methodological stance permitted a versatile theoretical framework. Besides which, our community is engaged in macro and micro level meaning making, thus, leveraging the Theory of iWorlds, we follow.

If we blend today's structural transformative theoretical stance such as that taken by Jaeger & Burnett, with Victor Turner's interpretivist ideas about ritual process (1967, 1968, 1969, 1985) as a transformative tool in his work on rites of passage among the Ndembu, an Indigenous community in Zambia, we arrive at some understandings about Rikamedia as transformative space. But Turner focused on micro level meaning making through process and was only interested in structure in as much as he could situate process either within or

without it. We are interested in both structure and process, hence the theory of iWorlds helps us expand on Turner's understandings about the motivational role of ritual process.

Turner proposed that rites of passage such as circumcision, in which a child is transformed into adulthood, are liminal tools, leveraged to launch a transformative process. During the protracted ritual process, initiates enter a transitory period in which they are neither child nor adult. This is a period of ambiguity and uncertainty. Borrowing from Van Gennep's (1960 [1909]) term, Turner describes this transformative space as liminal space, in reference to its transitory nature. Turner argues that the whole community joins together to facilitate the initiates' transformative liminal experience by participating in communitas. He describes communitas as a liminal space in which social hierarchies and conventions are temporarily dropped, and the community exists together in a liminal space of equality, outside of everyday social conventions. In this way, communitas acts as a positive driver of transformation by bolstering initiates' sense of tolerance for the ambiguity and uncertainty that they must face as part of the transformative experience.

As equally advanced by Turner (1969), tolerance for ambiguity and uncertainty is inculcated in indigenous lived experience. I am suggesting that Rikamedia has leveraged this inculcated tolerance that Turner observed in communitas among the Ndembu. I am suggesting that the liminal transformative space that Turner refers to as communitas is established through rika. The initiate's support network is made up of people in different kinds of relationship with. The initiate develops an egalitarian, reciprocal atmosphere. Besides which, when the time comes, the initiate does not go through the experience alone. Fellow initiates, already in several other rika relationships, will transform into one rika, one name, identifiable through history. The experience is shared and therefore capacitated, a

powerful motivational tool. Rika structure integrates these adaptive mechanisms and it is not necessary to step out of structure to experience communitas.

However, Turner understands that ritual is in service of structure. His meaning of antistructure is not one of dissent, but rather of a loosening of conventions and norms. He also feels that the physical separations of initiates, and the highly symbolic behaviors associated with this time, denote an aspect of antistructure within structure. Research has sometimes misunderstood his meaning in the term antistructure. He delineates clearly that successful liminal experience and communitas is achieved within, not without, the established structures, whose role is to facilitate both stability and change.

It is easy to miss this point, which Turner embeds in his extensive detailing of various Ndembu rituals, rather than in his expose of communitas and antistructure. He chooses to focus his discussion about communitas and antistructure on applying his interpretations of the transformative elements of Ndembu culture in industrialized contexts.

Many people read the specific chapter on communitas to the exclusion of the others. Having missed his larger meaning, they imagine that 1. Crisis is unwelcome and the goal should be to get it over with as quickly as possible; 2. Antistructure means anti-establishment. Turner does miss a small but significant detail: the governing systems abstract itself. He acknowledges structure but does not examine it further. If he had, he would have seen that the liminal state and communitas, both extraordinarily elaborated upon, are two different things. As a systems model, rika is reducible to either two people at macro level, or four people at micro level. They are reciprocal, converging units, infinitely replicable and continuously in communitas.

This is true whether they are out of liminal state in everyday experience, or if they enter liminal space to physically gather in support of initiates who in effect are their own rika selves reflected back to them. Thus, the community is not always in liminal state, but it is always in communitas. The same is true of the liminal journey into rainmaking, to collect seeds from collective stores at Ūvarirī, to another city for work, to a different country for university, into social media to ideate on water projects, planning a Harambee crowdsourced tree planting exercise, climbing Mount Kenya, or following the water to the coast, etc.

From Place to social media, from child to grandparent, north kin to south kin; plant steward to animal steward, etc.

Our interactions have given us to understand that Place has always extended beyond the geographic boundaries of Mbeere. Hence, much as the Indigenous worldview protocols referred to by Turner as ritual process, may be an intensified expression of egalitarian convergence, communitas is wherever rika is to be found. It must also be remembered that Turner wrote at a time when symbolic interpretative anthropology still believed that routines could offer little manifest meanings, and therefore, process that appeared to have theistic or spiritual elements took on an elevated form in his era (Geertz, 2008 [1973]). But I am suggesting that the mundane, such as the social media experience, can be liminal by choice, as indeed social media is increasingly the mundane and yet supportive of transformative experience.

We may conclude that in endeavoring to carry out the protocols of stewardship much of the Mbeere social media ecosystem is in liminal state. However, there are many fringe spaces emerging in the wider EC social media ecosystem that are not in liminal state. They

are in fallow, sometimes oppressive, and sometimes oppressing boundary space experiences (Jaeger & Burnett, 2010) for diverse reasons.

For example, it is unlikely that would share in the collective liminal transformative experiences evidenced in Chapter 4, without considerable intentionality and effort toward aligning with the rest of the community on Rikamedia. One way to bolster this cluster's resilience is to define a rika protocol for norming with mīraa as an important adaptive economic resource that is accompanied by vulnerability due to its narcotic, and therefore, need for continued support. This could begin with inviting partnership with private research and development of applications of active ingredient(s) beyond popular narcotic use. Additionally development of a learning program integrated within established rika ecological principles would mitigate environmental. There is also need to mitigate the divisive and derogatory nature of didactic returning belief system doctrine, especially a dedicated policy-level taskforce to push against external lobbies by Returning belief system groups, donor agencies, diplomatic missions, and others who continue to push for criminalization of mīraa farming inside and outside the country. These efforts are intended to align with recent prohibitions of export to European countries. Lastly, a negative outcome of legalization of mīraa has been heavy taxation of the crop, of transportation services, and points of export or sale. Little support is given mīraa farming (Njiru et al, 2014; Warrick et al, 2016). Yet, taxation by Embu County is mirrored by all other counties, which also tax private ground transportation of mīraa as it passes through on its way to various points for export. This amounts to taxation without representation. There is need to bolster political will to end taxation without representation. More research is needed to if there are emerging frameworks geared towards these kinds of inclusive efforts.

On the other extreme, s who reported that they were new residents are even less likely than mīraa farmers to be in collective liminal state with the rest of the community. There are two contributive factors, the first is environmentally destructive practices, largely replicative of the larger exploitative county strategy, i.e., wide scale stripping of land-based resources for personal gain without the moderating remittances of rika ecological principles. At the very least, practices of this cluster lack the contributive impact on quality of life frequently associated with the small world of mīraa farmers. Providentially, these challenges may be addressed with structural adjustments at county level to increase ecological accountability. The second factor is more intractable, i.e., a self-reportedly negative perception of Mbeere. It goes without saying that these two factors are intertwined and causative, based in historical factors surrounding land ownership already discussed in the previous chapter.

These findings are in keeping with observations of Stenner et al. (2017), that some communities do replicate the *marginalized* states of their physical worlds. They give as examples cyberbullying or political foment hotspots. Indeed, as Stenner (2018) points out, liminality is subjective. An experience is liminal only in the sense that it produces experiences of liminality for the subject. From a Psychologist's perspective, the idea of subjective choice as a prerequisite to liminality is entirely reasonable. From an information systems viewpoint, my own conclusion is that access to a conducive context is an antecedent to the exercise of choice.

We might say that closed Facebook groups and WhatsApp, because of their closed nature, are conducive to facilitating liminal transformative experience by bolstering tolerance for ambiguity and uncertainty, as well as supporting a reduction in skepticism, and presumably thus increasing trust. On the other hand, Instagram and Twitter do not offer these

conditions and are therefore subjectively rejected as communal transformative objects. But possibly, based on survey responses, they may be chosen as personal liminal technologies. In other communities with different information sharing behaviors, open platforms may be facilitative of change, for example, in the case of eBird and other open Facebook fan sites of stewardship groups with different cultural orientations (Cardoso et al., 2016). The example Stenner gives is that one baby may use a pacifier as a liminal transition object, facilitating passage from thumb sucking via a brief period of using a pacifier, while another baby may need a different device altogether to facilitate a similar passage.

7.5.5 Situational marginality versus motivational liminality

I would like to distinguish Rikamedia experience on social media from marginal states that can be used to describe situational generalities of disconnectedness, ambiguity, and uncertainty, such as presented in the cited environmental research, (Eden, 2016; Crawford et al., 2015; Latta & Wittman, eds, 2012). Liminality is specific (Turner, 1969; Stenner, 2014, 2018) and implies intention, possibility, as well as the anticipation of transition, for example, in the cited stances that community members undertake, defining the terms on which they will address the issues in their community. This is different from any state in which a community has languished for an indeterminate period, and from which it may not emerge, can scarcely be defined as liminal just because of the associated feelings of uncertainty. For example, the elders in Place who offer detailed accounts of dispossession are very much in marginal state, while Rikamedia is in liminal state.

In iWorld terms, elders are in a boundary space, but it is one in which not much communication is taking place between elders and the lifeworld outside Mbeere. Conversely,

Rikamedia are in a boundary space as well, but theirs is an active boundary space, hence Rikamedia are valuable bridges between Place and the lifeworld. As we saw, Place is occupied by the youngest and the Akũrũ A Kīrīra members, hence this finding has some implications for knowledge transfer as well as brings up real questions about the stewardship of Place with the largest diaspora being in their most productive years, 25-45 years old .

Additionally, transition arises out of liminal experience if the subject, aided or not, has embraced ambiguity and uncertainty in liminal space and thus increased their own sense of capacity for transformation (Turner, 1969, 1987; Stenner, 2018). Propulsion from one state to another by an external agent does not by itself denote liminality since agency and transformative outcomes are not necessarily denoted. Lastly, for liminality to occur, it is necessary for the subject to leverage liminal transitional objects such as social media, which further embolden the adoption of unfamiliar stances and render the possibility of transition. Without all of these elements, situational uncertainty such as examined in the cited environmental literature is more correctly defined as a negative construct, which would explain author perspectives of uncertainty as something to avoid or limit, a context within which to draw for specific examples depicting the journey into and out of liminality.

In the field of ICT, social media has been examined as a liminal space that is characterized by ambiguity between personal and public information (Bruns & Highfield, 2015; LaPoe et al., 2017), especially on open forums like Twitter where there are “personal publics” with whom users share “publicly private information” (Bruns & Highfield, 2015). Once again, the cited works define the term broadly and are useful as a springboard from which to launch specific contextual research into transformative liminal experience on social media. In the wider sense of the lifeworld introduced in the cited literature, social media is

now an established everyday reality and can be said to present a *preliminal* state to the user, as we saw in the case of mīraa farmers who are on indigenous social media, liminality involves innovative, boundary breaking ideation with usages that mitigate potential harm to Place. So too are new residents who report stewardship practices. The same cannot be said of institutional returning systems and returning citizens whose practices cause harm to place. Therefore, contextual spaces that are emerging within social media are in various states between marginality and liminality and are worth understanding through further research.

A question about how the indigenous cultural context, Rikamedia, compares to the national culture within which it exists. Yet indigenous places have rarely been looked at with regards to motivations, except within formal school settings in which the motivation to learn about Place was similar to the finding in this research. Hofstede included Kenya in his study on cultural dimensions and workplace motivations. But he did not study indigenous communities for tolerance of uncertainty and ambiguity. That is, Hofstede did not look at indigenous cultural differences. Rarely has indigenous inculcation of tolerance for uncertainty and ambiguity been examined in relationship to Hofstede's cultural dimensions theory (1980, 2001). Yet, one of the most frequent criticisms of Hofstede's theory is that it makes sweeping generalizations that lack application in the diverse cultural contexts of the indexed nation states (Rinnes et al., 2014; Rotman, 2013; Zanini & Migueles, 2018)

As we have just seen through our examination of liminality research, when the concept is applied in non-transformative contexts, ambiguity and uncertainty are often interpreted as negative constructs unsuited to the support of present-day egalitarian goals (Stenner et al., 2017). In such cases, the focus is on ways to minimize the perceived crisis and resultant ambiguity and uncertainty (Eden, 2016; Crawford et al., 2015; Latta &

Wittman, eds, 2012). This might allude to some of the states in which Hofstede's measures were taken. However, as we did not use his test, there is no way to determine how the community would have scored on the index. Instead, we look at the issue from a review of literature stance understanding that the concepts of ambiguity and uncertainty manifest differently in different contexts.

According to Hofstede's cultural dimensions index, Kenya as a nation state scores 50 on uncertainty avoidance. He interprets this halfway score as a national culture with attitudes of uncertainty avoidance and tolerance of ambiguity in equal measure. Hofstede correlated uncertainty avoidance to high scores in power distance and masculinity. Kenya as a nation state scored highly in Hofstede's index (70 and 60 respectively). I believe the scores would have been different if they had been submitted in indigenous Mbeere context that is rich in rika reciprocity. Certainly, behaviors on Rikamedia evidence a low degree of uncertainty avoidance, as well as low degrees of power distance and masculinity. Gender representation on Rikamedia is a priority of Pathfinders. When under taking a specific project, every effort is made to have equal gender representation. The constitution of Kenya (GOK 2010 has the same mandate for gender equity. This is an area for further research. In the next chapter, we look at the applicative phase research question regarding strategies of projects that originate with community members.

6 Chapter 6: Strategic Resilience

In last two chapters, we encountered the accessive role of structure and its potential capacity to bolster inclusive participation in various dimensions. We also saw the motivational role of structure, when actors interacted with shared ecological principles, learning modalities, and technologies that bolsters ability to take risk and tolerate uncertainty. In this chapter, I offer an applicative perspective, looking at projects that evidence key findings encountered in the previous chapters.

Community members invited me to participate in project ideation and implementation, based on mutual goals. My approach to this phase of research was guided by the research question, "What strategies are leveraged for environmental stewardship in an indigenous community with place-based and social media approaches?" Activities and practices described are perceived as taking place within present-day consciousness of citizen participation in the Kenyan nation state.

In prompting community members about their perceptions, manner of participation and impact on Place, I wanted clarity on what Irī would look like in present day terms. Hence, it was important to have examples of nation state projects that were regarded, especially be Akūrū, as being in keeping with indigenous principles of stewardship. Conversely, this prompt was to elicit more information regarding what was considered an environmental bad as opposed to an environmental good. That is, supposing we were to build Irī today, how would we go about identifying "human poverty" in rika terms? What sorts of conditions would present as environmental concerns, i.e., public bads? What sorts of environmental

goods could be identified in present day to correct identified environmental bads and why? How would/could we mutually pursue a restorative agenda?

We saw in the prior chapter that for members of the Rikamedia, social media is a liminal transformative space, one that emboldens members and incubates diverse ideas by increasing tolerance for uncertainty in a similar manner to that observed in during transformative processes of rika, commonly known as rituals, that traditionally took place inside Irī conservation, now largely defunct with few exceptions. Both rika and Rikamedia spaces observe the same egalitarian outlook, maintaining neutrality of gender, clan, and theistic beliefs, and furthermore, both observe the same life preserving principles of maintaining ecological, legislative, judicial, social, economic, and political balance by seeking to redress private and public bads with public goods, using the principle of ecological good for sapien bad. Based on these prior findings, in this chapter we encounter community projects with a place-centric applicative framework, ideated on social media, researched, planned, and implemented both digitally on mainstream and subscription social media and in Place.

We set out with the expectation that participatory projects are the outcomes of interaction the actors we have encountered throughout the last two chapters, and therefore, they exemplify Rika Resilience.

What do I expect this resilience structure look like in the project strategies to follow? Firstly, iCitSci, the group that took on a risky citizen science project experiment, learning by doing despite high uncertainty, is made up of the 18-34 year old community members, that straddles both social media and Place. Concordantly, I expect to see their project strategies benefit from consultations with Akūrū on ecological decisions as they deliberate on

reintroduction of an endangered species. Simultaneously, I expect to see them access their social media networks for technical advice, skills, and training from the Rikamedia Rika, that is, the Pathfinders who are in the 40-55 year age range. They provide capacitating skills on a transparent platform for fundraising, investment technology, business proposal, etc.

Akūrū may not be on social media, but during the accessive study they demonstrated expertise in knowledge translation for the benefit of Place. Hence, information encountered by the young members on their social media can be translated into usable contextual knowledge, bolstering them with tolerance for continued uncertainty, and emboldening risky, experimental, and potentially transformative experiences. In resilience theory, this is termed regenerative learning, that is, the capacity to be highly productive in times of abundance but retain the capability to switch to a conservative mode where learning takes precedence in times of scarcity or threat. It may also be termed liminal transformative state or bridging behaviors at empowering information world boundaries. In Figure 6-A below, we have already encountered the impactful networks of UVAma (red circled) and UMMbi (in the blue fishtail at right, below), at the boundary of social media and Place, in Chapter 4 and 5. Below, communications of projects to be discussed take place from the greenish blue to the thin bridge in the fishtail on the right, in blue. UVAma, UVAfe, and Site Owner of Site CW, to be discussed under the micro pilot project in this chapter, are all central nodes in the network between Place and social media. As well, Pathfinders who are in diaspora and provide technical support, guidance and consultation services to capacitate projects are located within the bridging area of the network (blueish green). iCitSci member communications are clustered in a tight cluster in blue, where the network begins to fishtail. Elders are at the extreme ends of the fishtail with UVAma's network on the upper side and

UVAfe's network on the lower end of the fishtail. In the middle of the fishtail is a hidden network, a cluster colored in black nodes and black vertices, consisting of conversations had in Place, with non-stewards. These are employees of institutions with harmful practices, and new residents whose practices did not meet the threshold of stewardship criteria set out by community members, at the top of chapter 4, under criteria.

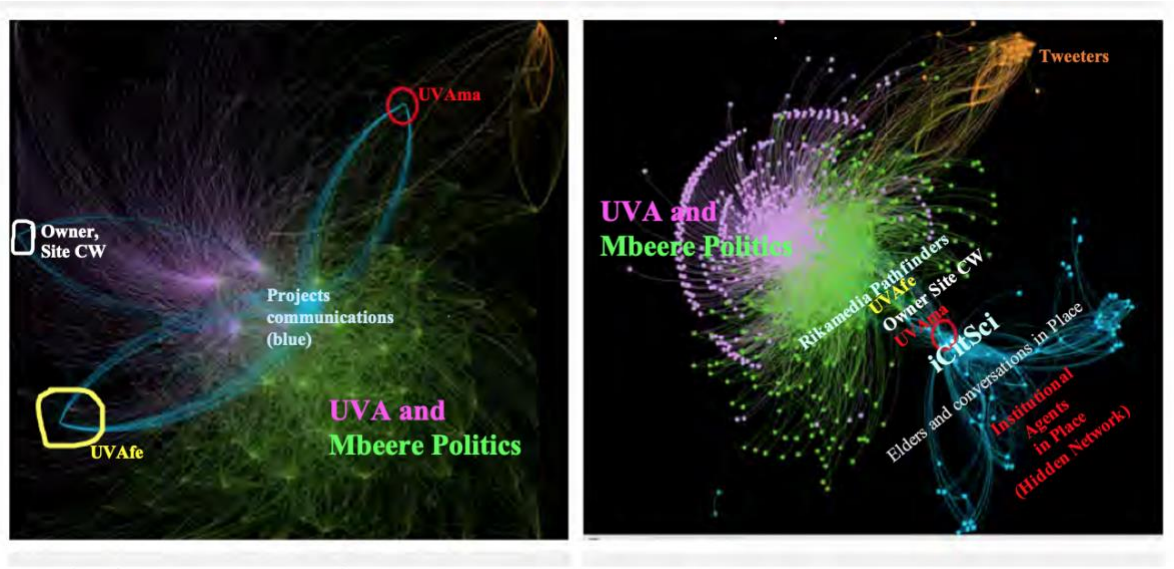


Figure 6-A: Project Bridges in the Network

More information on the network in Figure 6-A can be see under several subheadings. In chapter 3, methodological aspects are discussed under indigenous coding. In Chapter 4, section 4.2, structural aspects are discussed under the title demographics at the intersection of social media and Place. In Chapter 5, motivational aspects of the network are discussed under 5.3.1, Learning motivates ecologically sound medicine practice. In this chapter, we explore the strategic aspects with regards to interactions between projects at macro and micro level, between diaspora and iCitSci. In the state of Rika defining the relationships, iCitSci is both autonomously interdependent with diaspora. Both a capacitator of diaspora interactions in Place and a recipient of diasporic and place based resources, a rich context, and a vital bridge

in the integration of knowledge domains that occur through the experimental, high risk with possible transformative impact bridging activities at the intersections of overlapping worlds. Thus, diaspora lends macro level skills, whilst community in Place uses contextual knowledge to arrive at a contextually managed data protocol citizen science and investment model to raise capital, rather than depending entirely on the possibility of winning a bid for external aide.

6.1 Macro Level Endeavor

6.1.1 A Macro Level Vision

As reported to me in December 2016 when I met the Leadership team in Nairobi, UVA envisioned integration of its social media ecosystem goals with mainstream institutional targets. Thus, from its earliest days, the group had endeavored to leverage domain specific professional skills of members as well as to find interactional entry points with government, donor, and private institutions.

Shortly before I met with and articulated my research goals to the team, a development professional who was a member of the team had proposed an integrated approach to community development, with sectorial targets. The framework was suitable for rural development; and the leadership team had adopted it. According to members, the new focus was envisioned as a strategic guide that could be referenced by UVA members or groups who wanted to incorporate into small organizations, associations, or private businesses that could interface with macro level institutions. More so, the framework targeted members who may want to reach policy, funding, and capacity building partnerships. The team saw its role as leadership, mentoring youth to, "foster future generations." Warrick et al

(2016) delineates a similar project in which UVA outlines a proposal for a water project in an overarching framework that can be leveraged at macro and micro levels in the water sector.

To determine community priorities, the leadership team added a question to the Social Media survey, which is based on the Rotman survey (2013) which measures motivation toward participation in biodiversity projects across the globe. The Social Media survey measured motivation toward participation on The Mbeere Social Media Ecosystem as a Whole. The question measured community perceptions toward sectorial level priorities.

Further, when analyzed together with a different question that prompted for "activities of interest," the question on sector priorities gauged member interest to work at policy level. Responses are posted below.

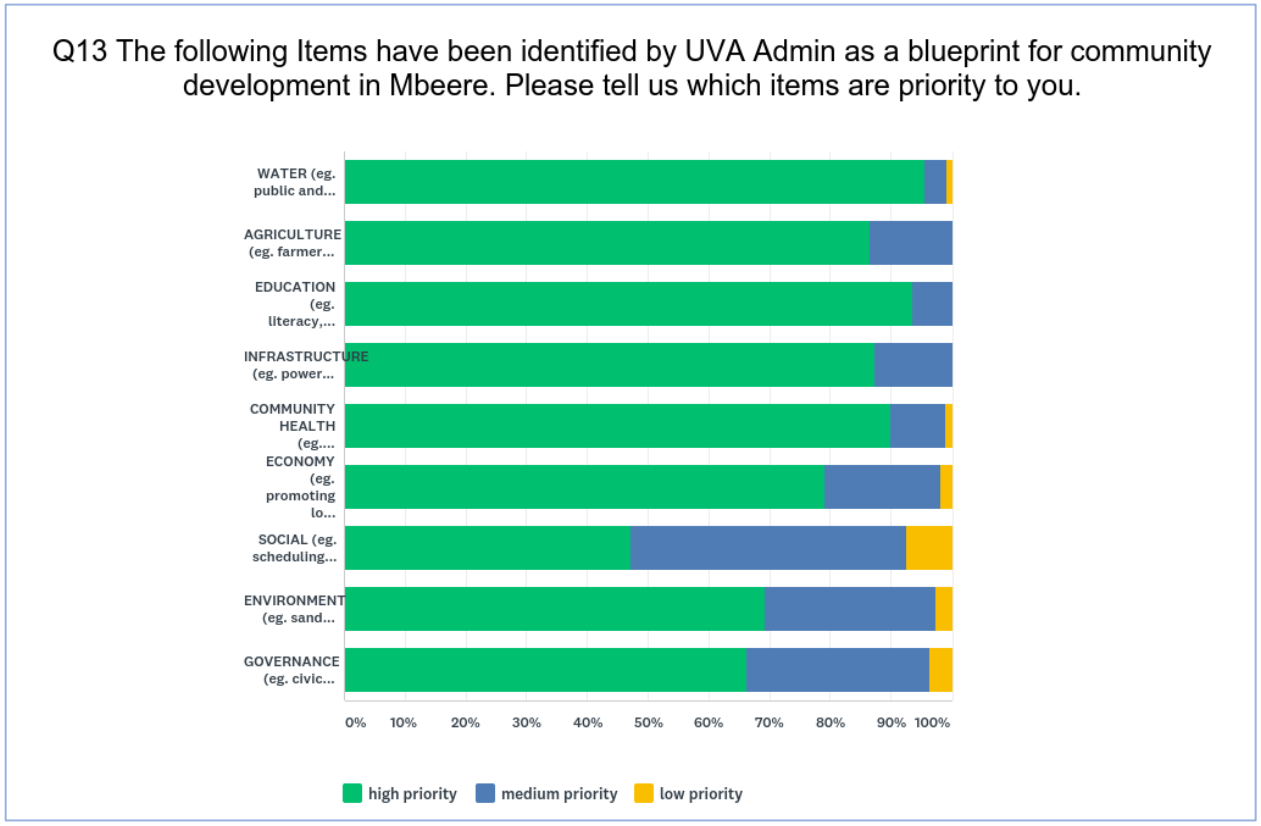


Figure 6-B: Sectorial Priorities

As seen in Figure 6-B, coding for priorities revealed that community members placed a high priority on water, education, agriculture, health, and infrastructure, while placing a low priority on environment, social events, and governance. It was surprising that the environment, as a sector, was a low priority suggesting that community members did not regard water, to which they placed a high priority, as a component integral to the environment.

Low priority was placed on governance, in light of the strong stance on political activism on the Rikamedia platform on Facebook, and especially as the group appeared to lean heavily towards candidates with an environmental rights agenda (especially water rights), and participated actively in the elections, influencing campaigns of national and local candidates who are seen as supporting The Mbeere Social Media Ecosystem as a Whole's stewardship agenda.

Community response suggests that members perhaps may not separate governance from politics and are perhaps distanced from the functions of county and national governance in their everyday lives, a reasonable assumption for a marginalized community. In the accessive and applicative phases, we were repeatedly told that for our participants in talking circles at village level, political discourse on Rikamedia was a demotivator toward participation in groups. This finding further underscores the group's accessive role, similar to those explored with rika structures as a vital bridge between micro level needs and macro level governance and policy frameworks.

Another suspicion I have regarding this question, is that if environment or governance were placed at the top of the list, the results may have been different. I presented the list on the survey exactly as it was given to me by the leadership team. As seen in community

response to the findings of the accessive phase, the Mbeere consider themselves a riparian community and as such, water is an overriding priority. Hence, the list appears to already have been ranked to a degree. Commenting on the survey outcomes, one member of the Pathfindership posted that, “The terms environment, infrastructure, and governance are too academic even for the millennials.” He further suggested using relatable phrases,

> “such as impacts of [environmental] degradation on low crop production, early drying of river therefore water crisis. Late and high cost of delivering market products hence losses could attract [discussion about] infrastructure through roads. On governance if we present "politics" we will be talking.”

This observation was confirmed by a fellow leadership team member, who commented that on other groups in the Rikamedia,

> “discuss [sic] revolves on water issues, environmental conservation (huge cry of wanton sand harvesting in Mbeere)….residents reclaiming the glory of being political led [sic] by one of their own...”

Ultimately, the team decided that community responses did not necessarily indicate that members placed a low priority on governance, social services, and environment. Rather, the prompting language in the question was development-centered, far removed from everyday experiences, and therefore unrelatable. My earlier charge in Chapter 5 about present day governance structures was that they are not integrated within themselves; hence they are unrepresentative. Governance in particular is not integrated with citizen self-identities and interactional frameworks but with those of returning systems. Citizens do not see themselves mirrored in governance. Knowing what we know about Rika now, the central role of socioecological foundational knowledge to understand the citizen rights and responsibility articulated as functions of rika; it is clear that governance, environment, and social services

(sic) are critical in Rika but not in returning systems. We can add them to the list of poorly integrated sectors. We may also surmise that it is not easy to leverage these sectors to economic gain, hence they are unsuited to the growth oriented SDG model as it stands today. This explains their low position on the SDG framework (World Bank, 2020; United Nations, 2015; 2019). However, in a Rika-Centric model of sustainability, these sectors would take precedence. Based on findings of chapters 4 and 5, indigenous governance modulates for prioritization of these areas.

Seen from this perspective, the low priority given to governance is a result of this divide whereby politics are seen as more immediately accessible, thus potentially empowering, where governance is not immediately so. Besides, political discourse motivates passive participation because many members do not know enough to contribute actively by posting content, yet they want to learn, to orient their activities toward Place. Hence, the groups see a high retention rate over a 5 year period, with minimal fluctuations, creditable to a 98% indigenous learning motivation.

Following on these understandings, a team decision was made to break down the framework into relatable constituent parts when communicating aspects of the integrated approach to the community. In any case, the survey served the purpose of advising the leadership team as to the need to parse linguistic connections with everyday life, and to establish interdependency between various component parts in different sectors and citizen orientation to these Ares of engagement, such as how deforestation and sand harvesting might affect the river and lead to a water crisis, which would then affect crop production and food security.

Also important from this exercise was the team's realization that Rikamedia needed to be able to convey on a practical actionable level, any context specific environmental concerns of Mbeere, to integrate micro level goals more effectively with national level policies within sectors that received a majority fiscal attention at macro level, namely, education, agriculture, and water.

6.1.2 Applying Findings to the Rikamedia Vision

Another opportunity that arose for me in the course of this research was to work with the leadership team to incorporate findings from various data collecting sources (talking circles, social media content, and survey) into The Mbeere Social Media Ecosystem as a Whole's vision, mission, and objectives. As I started to perceive a gap between how community members perceived themselves and the language that was used to describe them and their environment in macro level publications, I welcomed the proffered opportunity to revise the language in The Mbeere Social Media Ecosystem as a Whole's documents so that they spoke to community self-perceptions and definitions. The excerpt below illustrates a small part of this process, with just a few of the suggested changes.

> [9/14/17, 8:15:38 AM] TC: Moving on, using the Blueprint and with inclusion of the findings LW's research has unearthed, please share the draft vision, mission, and objectives.
>
> [9/14/17, 8:49:19 AM] LW: May I suggest that the words "development" and "progress" be replaced by "prosper", "prosperous" and "prosperity", "healthy community" and other terms that suggest self-determination as opposed to dependence on aid, which I believe is the spirit on which Rikamedia was founded.

[9/14/17, 10:56:36 AM] TC: [to MV]… since you know the older document and have been involved in the new, add it to the fact that you suggested we go ahead, I am sure you will do a great job.

[9/14/17, 6:30:04 PM] LW: suggest a fifth bullet point and the thing that sets Rikamedia apart from other development organizations. "Continue to serve as an exemplar for social media-born, self-development organizations."

[9/15/17, 4:04:38 AM] MV: I agree with this...what do the others say?

[9/15/17, 7:33:38 AM] LW: lastly from me this morning; on the fourth bullet point (about capacity building), I suggest we make it concrete and add something about mentoring youth. The survey shows that 63% are under 35. What do others think? Another thought is that this 4th objective will then also address the part of the vision that is about nurturing posterity or safeguarding the welfare of future generations.

Excerpt 1: WhatsApp chat addresses strategic language.

The changes that were made spoke directly to research findings,

1. Removed the focus on poverty that previously characterized the vision, mission and objectives and instead used positive self-descriptors to reflect community self-perceptions based on member responses to research prompts.
2. Reflected the sense of agency embedded in initiatives encountered in Place as well as those of Rikamedia by amplifying collaboration and partnership rather than aid.
3. Adding the mentoring of young peer groups by older peer groups in the Rikamedia rika to reflect the indigenous socio political rika system.
4. As the founding group, modeling best practice for other social media groups in the larger Rikamedia.

6.2 iCitSci: Micro Level Stewardship

As community members who took part in my research project continued to interact with each other, a micro level project organically developed from their continued interactions. In mid 2017, they invited my participation in the project. Findings from this project confirm the priority placed by the community on ecological balance and the belief that humans have a responsibility to take care of plant and animal communities who share space with them in Place.

6.2.1 Economic interest with precondition to steward.

Out of a call to participation on a WhatsApp group chat, iCitSci was born after community members took an interest in the research findings of this work. Three out of four research team members remained on the WhatsApp chat after talking circles were complete, to support budding interest in forming a long-term project and promote the interests of this research. On the WhatsApp chat, community members adopted a citizen science stance reflective of their intent to explore the concept of citizen science as they had begun to understand it during talking circles in the accessive phase of this research.

After learning about the concept from the research protocol with which the research team initially approached the community for data collection, members, of their own volition, researched and initiated application of this concept to their own lived experiences, which they termed "self-help," in monitoring, reporting, and responding to various environmental priorities and concerns in Place, which predated encounters with our research team. Activities named were monitoring of the green canal irrigation scheme in Ishiara, dump sites, and experimentation with varied species of crops in response to changing soil composition. Using a citizen science stance, iCitSci's goal is to reintroduce the endangered bamboo in an

agroforestry model that is centered on water sanitation and reforestation, integrating indigenous enviro-economic values with the group's entrepreneurial economic motivation. The group meets in person and on WhatsApp.

Bamboo, an endangered, undervalued plant for the very reason that previously thrived in riparian zones, could not be over harvested because of its privileged location along rivers, in keeping with indigenous socio-environmental values. With the breakdown of indigenous values regarding the protection of riparian zones, bamboo has been over-harvested without deliberative replanting. Locals have used the wood for crafts, firewood, fodder, and also simply cleared to make room for mīraa and other newly introduced plants such as tomatoes, which are not hardy enough to depend on seasonal rain as is traditional practice.

According to Akūrū in one consultation circle, bamboo, called *mūrangi (plural mīrangi)* is important in Mbeere rituals, and was historically used to make the horns that were sounded to call the community together. Akūrū told us that bamboo is easy to grow but the local varietal needs to be taken at the root, whereby a shoot is cut away together with its tap root before replanting. Only initial watering is necessary. Bamboo's destruction and that of other plants along rivers has had a negative impact on water sanitation and river ecology, as these plants help filter water as well as provide a home for diverse microorganisms. The group's agroforestry model will allow for controlled harvesting for the market while maintaining enough of the population to preserve the role of bamboo in water sanitation, soil and sand preservation, and ecological support.

After an eight-month period that involved market research and site identification, the group decided to experiment with reforestation of riparian zones in five sites on their own privately held lands. Each of the sites chosen manifested different conditions in terms of soil

drainage, access to water, vulnerability to pests, etc. Therefore, there was an element of phenological experimentation, as there was no accessible data on local riparian conditions under which the now almost extinct bamboo would thrive optimally if farmed rather than naturally occurring in the wild.

One of the sites is on the edge of a fast running stream that is prone to flooding in the rainy season. The second site is close by a stream but on elevated ground. Three sites are located within the canal irrigation system that we first encountered in the previous chapter. Of these, two sites are within a few feet of the running canal inside dried out fishponds. The fishponds are part of an unsuccessful donor-funded community project. The third site within the area served by the canal system is located on elevated ground, about ⅛ kilometer distance from actively running canal water.

6.3 Capacity building with the Rikamedia

At various points, members of Rikamedia leadership team and diaspora have played a role in building capacity of iCitSci.

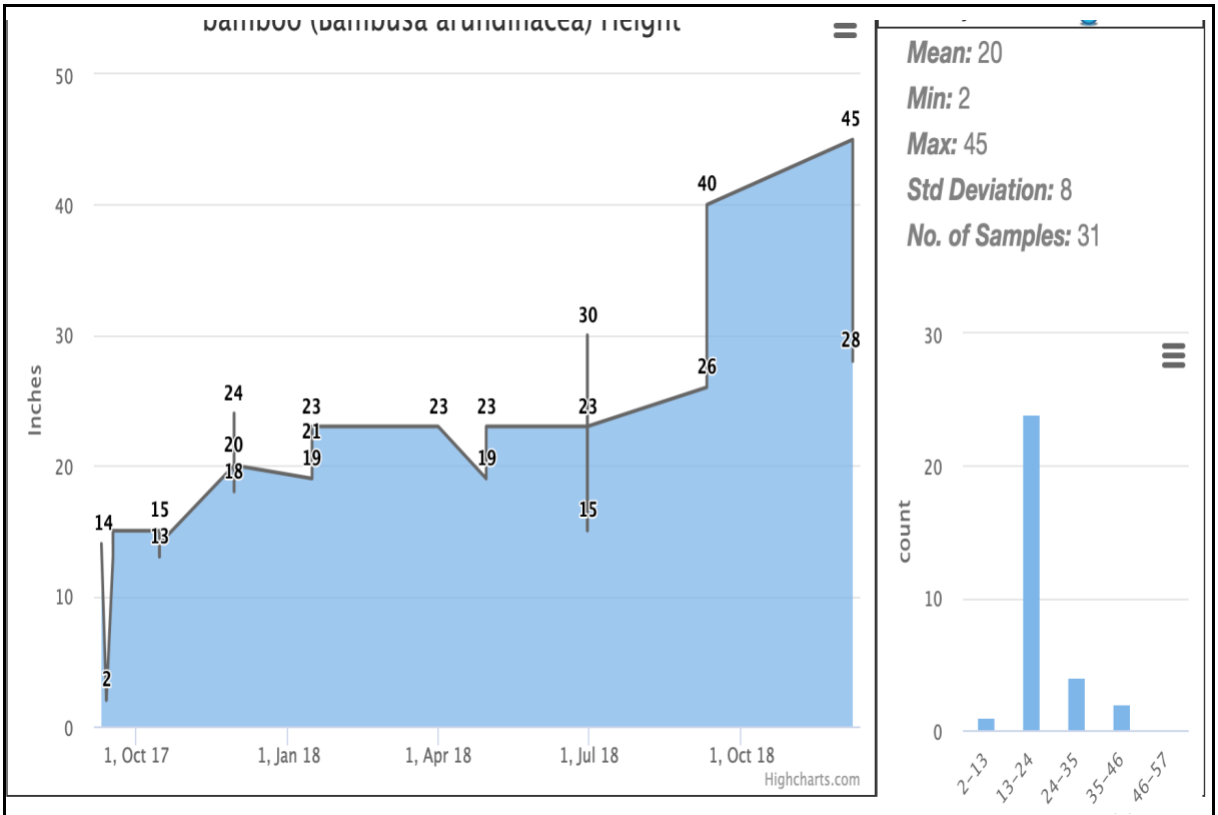
The first of these capacity building exercises was targeted at data collecting. In the first month of the bamboo's life, the group shared phenological data over WhatsApp, in the form of short narratives and photos about site characteristics, plant growth, condition, and steps taken. This proved unsuitable to support the experimental aspect of iCitSci. Hence, social computing applications were tested and Citsci.org was chosen to record phenological trends of bamboo, with a view to discovering relationships between various site characteristics and species over time.

From the accessive study, we may remember that community members had previously carried out monitoring before, such as monitoring water levels and reporting data to local scientists at the Ministry of Water, but in every instance they had used either mainstream social media or embodied methods of experientially sharing data with ministry representatives or with their own peers.

2 months-unidentified pest eats at leaves.

3 months-pest identified as cutworm, treated.

15 months - healthy



Average height of bamboo in inches at different sites in Phase 1 of data collecting, Oct 2017-Dec 2018.

Figure 6-C: Data Analytics on Citsci.org

6.3.1 An Indigenist Maths Data Protocol

In the chart above, Numbers occurring on a vertical line at the top of the chart indicate heights of sampled plants at different sites. The filter indicates that the search has retrieved data for height trends at <all locations>. The data collecting method is contextual in nature: first, the data collector tacitly assesses by visual estimation through a scan of the site, which of the five sites appear to have thriving plant samples. He then only takes measurements of a few specimen that are thriving in each site (in this case height). This numeric data only reflects sites with thriving samples. For instance, in the chart above, when two numbers appear on a vertical line (e.g., 1 July 18), this means that plant height was only measured and

recorded at two sites on the date in question. In addition to numeric data of thriving samples, categorical data describing site characteristics is recorded for all sites.

The search results of data collected are in and of themselves learning opportunities, with numeric data occasionally being added retroactively after the function of a specific measure for decision-making has been fully understood. For example, in the chart above, point 26 at Oct 18 and point 45 at Dec 18 were added retroactively from tacit knowledge gained at previous observations after an understanding was reached that the two sites with the tallest samples were each missing one data point that could provide a fuller picture of growth in time.

Observations are considered an important step toward providing feedback to site owners, who are then instructed on plant care based on site comparisons, for example, pest eradication, removal of companion plants, safeguards from potential flooding, etc.
At the end of Phase 1, the data collector wrote a narrative covering outcomes, challenges, and recommendations, based on data from WhatsApp posts, calls, field observation notes, and search queries from datasheets on citsci.org. The original narrative below has been minimally edited for language and cogency.

Reflection on Phase 1 of Bamboo Pilot, at 15 months.

With the advice of experts at [seedling source farm], Ishiara Citsci initiated the first phase of a pilot, with three species of bamboo:

- Oxytenanthera abyssinica, a solid stemmed species.
- Dendrocalamus mebranaccus, a drought resistant species.
- Dendrocalamus maximuslamina, a giant species.

Based on more than a year of interaction with all bamboo sites, I am able to deduce the following:

- During hot dry spells, the youngest seedlings are adversely affected at all sites.
- Contrary to the expectation of scientists at [seedling source farm] the species that has been the most adversely affected is Dendrocalamus mebranaccus. All units from this drought resistant species died in 2018 due to contextual variables that were not considered in recommending this species. Scientists assessed the suitability of the species based on the prevailing view of Mbeere as an arid area. It is possible that the high water table in our context, the riparian nature of a majority of the sites, and other unknown factors made this species unsuitable.
- The other two varieties are doing well.
- Young bamboos need moderate watering, and the soil should be well drained, even though in a riparian zone. Bamboo at site E does well because of adequate water combined with well-drained soil.
- Wetlands with sitting water should be avoided at all costs. Plants at site A and B, respectively, were affected by excess water due to the wetland conditions of the sites.
- Plants at site D were planted too close to a stream, in a flooding zone affected by fast flowing water. Many young seedlings were washed away by several floods after heavy rains, as they did not yet have strong root anchorage. Even though historically bamboo in Mbeere has thrived in this riparian zone, consider only transplanting developed trees in this zone for the time being, while riparian health is still compromised.
- Bamboo needs a clean environment and does not seem to like companion plants. There is potential for reconsideration as the bamboo establishes itself.
- Young plants (less than a year old) need close monitoring, to check on pests such as cutworm, cows, and goats.

As advised by experts on [seedling source farm], fertilizer is only needed during planting. We can reference Site E, where plants are doing well without regular use of fertilizer or manure.

Excerpt 2: Example of iterative report/story to inform adaptation of data protocol

Based on the above evaluative narrative, contrary to expert scientific opinion, an unexpected species has found resiliency here, while the species that was expected to thrive has died out. It appears that contextual variables are responsible for these differences. Adjusting for these contextual variables, the group has started Phase 2 of data collecting, with the datasheet considering unanswered questions about site characteristics that scientists had not considered when recommending species for suitability, unaware of altered landscapes and soils. Also, after consulting with Akūrū, we added natural propagation as a variable since they advised us on how to propagate from the individuals we already had growing instead of purchasing new seedlings.

6.3.2 Goal and process

The goal was to target issues identified but not well understood at the end of phase 1.

Data is collected monthly, to document lifecycle events of bamboo at 5 sites; and traces site characteristics, such as soil drainage, pests, and weather, that impact on lifecycle events, which can be measured against condition and growth. This was a richer data set than in phase 1, where we could not measure how soil characteristics were affecting condition and growth. Instead we relied on Steve's narrative to answer the "why" questions Variables measured Growth of two surviving varieties.

Here, we measured height (feet) and width (inches) of the solid stemmed and giant bamboo

- Oxytenanthera abyssinica, a solid stemmed variety.
- Dendrocalamus maximuslamina, a giant variety (was not expected to do well by experts).

Exponential gains were made from the decision to measure contextual variables. By the end of Phase 1, the pilot had lost three quarters of its population. By starting a process of tracking and adjusting stewardship objectives based on emergent contextual variables such as companion plants choking the plants, too much clustering, and different types of environmental hazards such as grazing livestock and flooding.

Contextual variables impacting growth trends

We may think of contextual variables as special site characteristics, conditions of soil, water, companion plants, pests, etc., that are specific to each site. Contextual variables are those issues that experts outside this context may not be aware of, because of characterization of Mbeere along generalized assumptions. They have a great impact on growth trends.

Categories of Contextual Variables Measured in Phase 2

- Soil draining
- Companion plants
- Pests

Water Example: quantifying and measuring contextual variables under one category of contextual variables.

As observed, in phase 1, water was found to profoundly affect the health of bamboo, hence we wanted to know if the amount and behavior of water on a site as beneficial or adversely impactful. Contextual variables were scored on a scale of 1-4, with waterlogging at the low end as an adverse variable (1); while good watering and draining scored high as a beneficial variable (4). A score of 5 was reserved as an unknown that may present as a favorable score beyond 4. Only one unknown could be tracked per variable.

Scoring number entries on database (scores of all contextual variables were summed up by site and graphed at the end of Phase 2)

- Waterlogged=1
- Flooding with running water=2
- Inadequate watering but good drainage=3
- Good watering and drainage=4
- Other (specify)=5

The same scoring rubric was used to quantify contextual variables under the three categories

Site visit, entries on a datasheet for Site MG

On left is a screenshot of the datasheet entries as it looks on citsci.org. On the right, highlighted beige are my notes making meaning of the assigned quantities in the datasheet.

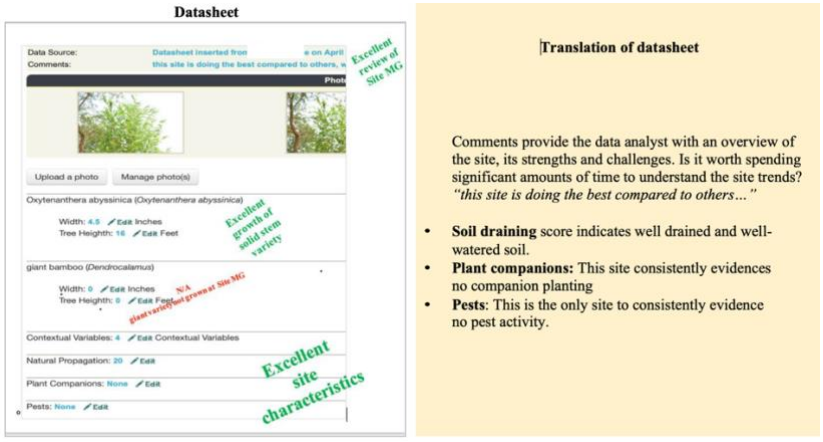


Figure 6-D: Contextual Variables Sample Datasheet

By the end of Phase 2 after one year of documenting and responding to contextual variables, the remaining ¼ of the population had experienced robust natural propagation, so that at the close of the pilot we had a count of 108 individuals, meaning that the population numbered more than twice the population of n=42, at the start of the pilot. Measuring for contextual variables also allowed us to determine the sites with the best characteristics to support plant condition for the indigenous and giant species, whereby we were able to chart the average height of the bamboo against the contextual variables, so that we saw a correlation.

In the chart below, the giant species is in blue, and indigenous species is in red indicating robustness of natural propagation. Sites registering cumulative ratings below 50 in 30 months are designated the Site IDs TM and LN, (blue line in the graph. See Figure 6-E below titled, Measuring for Contextual Variables). TM was waterlogged. This site was testing for viability of any of the species in an area with old fish ponds from a failed donor funded project. The sites have become wasteland, due to waterlogging. Experts at the bamboo nursery had opined that the Giant species would thrive there and help rehabilitate the land by soaking up the ground water. TM lamented in the project group chat that, "I did not know bamboo could drown, My bamboo has drowned." The Site LN was located by a running river whose banks had been erroded from overharvesting of indigenous bamboo among other riparian species. The owners wanted to reintroduce the bamboo population. However, by coincidence, bamboo was planted in a year of floods, making for an inhospitable environment for young plants. Due to frequent flooding with rushing water and livestock infestations from goats and cows, Site LN died altogether by the end of Phase 2. Site TM continued to experience stagnated growth but did not completely die out. Site SM

performed to a better extent but also experienced waterlogging and stagnation. On the other end of the spectrum, CW and MG thrived.

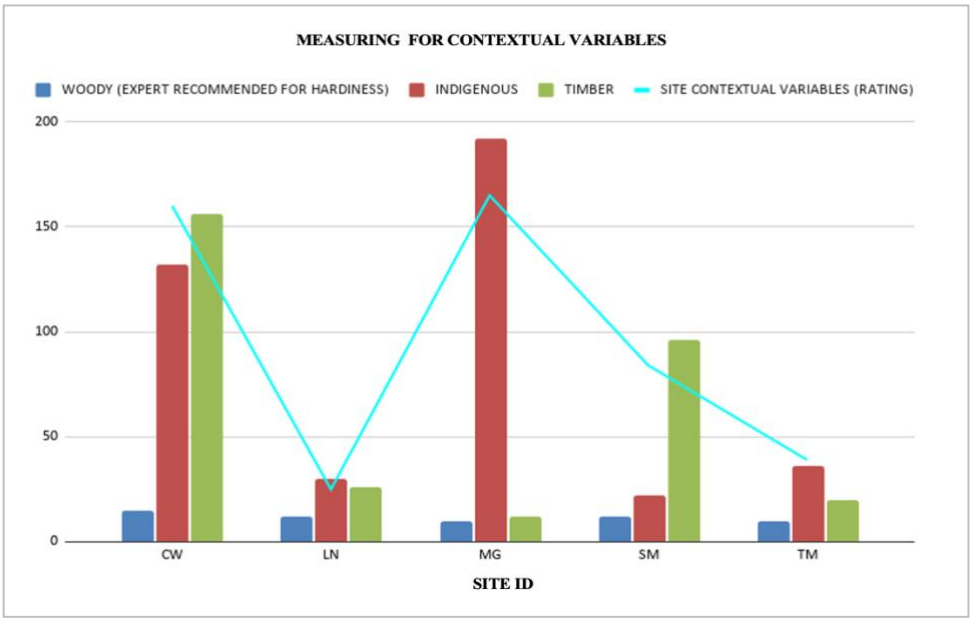


Figure 6-E: Measuring for Contextual Variables

Based on outcomes at the close of the pilot, we determined that MG and CW presented the best set of site characteristics, being close to water sources but not close enough for stem submersion. The sites also had well-drained soil and were treated to frequent cleaning, de-clumping (thinning old growth to make room for new growth), and avoidance of competitive companion plants, such as Napier grass, a popular crop for the local beef cow industry. iCitSci plans to use the findings in the data to expand the bamboo farming activity. Intercropping is not advised for bamboo. The business proposal suggests edging with a fast growing, high demand legume such as green grams, which are harvested in 3 months and perform well in Mbeere.

Additionally, the value of using data for decision-making and to attract potential partners has helped to foster an emergent citizen science orientation. The outcome is that

rika-centric, high risk experimental and embodied citizen science learning framework established by the group has paid off by changing group norms from paper to digital data management and reporting.

The latter two strategies are recognized in resilience research as strong adaptive measures of resilient systems, i.e., taking a risk to switch to learning frameworks when threats are recognized and changing system norms to avoid attrition as external environments negatively impact on different units in the system. In this case, the risky learning framework interwove citizen science, bamboo agroforestry, and an investment model to bolster self-funding. External changes in this case are ecological, whereby riparian ecological attrition has a negative impact on livelihood and health in the area. The most impactful norm that changed with positive impacts was data management practices.

In Phase 2, the group was able to prove itself resilient by bouncing back, bringing its pilot from the brink of failure to the point of providing a seedbed from which to conceivably, if useful, continue to track propagation data to inform reintroduction in wild riparian zones, one of the group goals. Successful bounce back was achieved through learning from the failures of Phase 1 and adapting for the next phase of the project, by contextualizing the measuring protocol; calling in the Rikamedia; consulting a local elder who was successfully farming bamboo; improving systems with technology solutions, using an indigenous agroforestry modeling, and taking advantage of diaspora skills with training opportunities as well as mentoring, these measures balanced a propensity for high risk.

As an immediate outcome of the micropilot, we have seen some usage of the maturing bamboo to support at least one other income generating activity of a group member's family. One of the CitSci members, the owner of Site MG (See Measuring for

Contextual Variables, above), has a cow nursery and is harvesting some of the bamboo to support her venture. The stems make for good fencing, while the leaves and small branches are excellent fodder. In an agroforestry business proposal, this very purpose was highlighted for the local market. Below are some photos Site MG's bamboo and cow nursery.

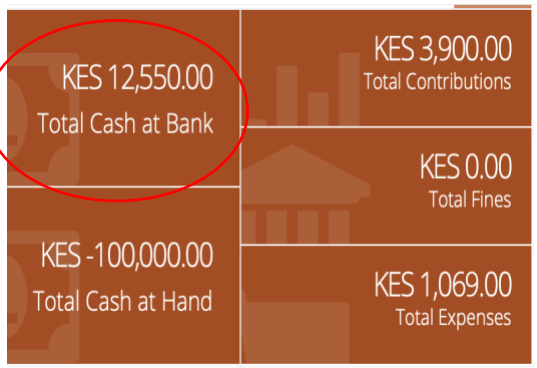
Figure 6-F: Immediate Uses for the Maturing Bamboo, September 2020.

6.3.3 Toward Self-Micro Funding

The second capacity building exercise supported the group's self-finance efforts. One of the first steps taken by the group was to establish a microfinance structure under which to fund the project. To achieve this goal, members established a collective fund from which they borrowed short term loans at high interest, the idea being to build capital over time from accumulated interest. In the first year, members met in person once a month to share financial updates based on accounting records that were stored in bookkeeping ledgers by the

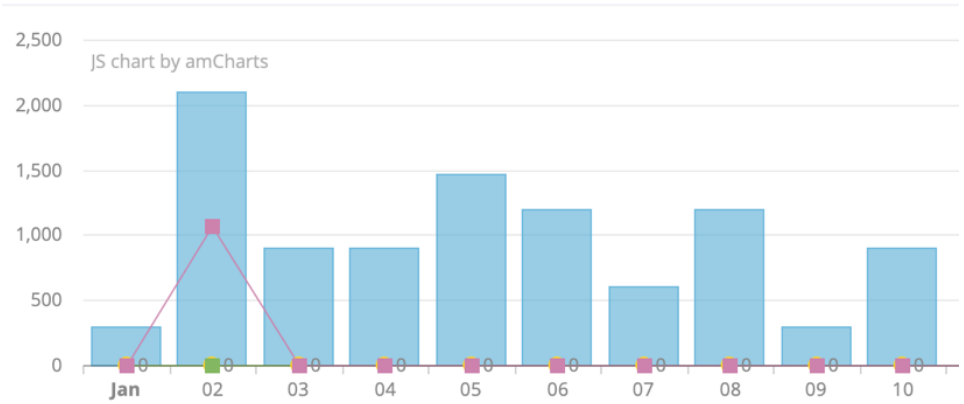
treasurer, the credit officer, and the chairperson, depending on the purpose of the specific monetary asset, such as capital from which to borrow loans, savings, welfare fund, and petty cash. Members had used this method of accounting in other Harambee microfinance groups they were a part of (By all accounts, community members on average belong in 3-8 such self-microfinance Harambee groups).

As with many other groups of its kind, iCitSci's decentralized print-based accounting model resulted in many discrepancies to build trust and increase transparency. A leader on Mbeere Social Media Ecosystem who specialized in microfinance, monitoring, and evaluation introduced yet another social computing application to iCitSci. EazzyChama, a group investment application resting on a systems database architecture, allows queries on current loans of members, repayment schedules, interest rates, member contributions, group assets, and debits over time. All group members have accounts with access to all data. The following account data was shared in 2019 with permission given by the group to post it in publications, viewed as being of potential benefit to the project.



April 2019: 12,550.00 repaid (red circle)
$1:00 =KES 98.00

Oct 2019, 45,220.00 repaid (green circle)
$1:00 =KES 98.00



Group monthly repayment means Jan-Oct 2019.
KES means Kenya Shillings. $1:00 =KES 98.00

Figure 6-G: Self Micro Finance Analytics

6.3.4 Reaching out for partnerships

A third opportunity for capacity building was in putting together a business proposal. In light of challenges inherent in framing the idea in business terms, a leader on the Mbeere Social Media Ecosystem offered to draft a funding proposal as a third party in a neutral role, building on the eight month market research undertaken by the group and couching goals in terms of long term feasibility. I have since further developed this proposal within a non-profit lens to inform the developing relationship between this research and iCitSci. Combined with several consultations with Akūrū about bamboo in Mbeere social history and ecology, the

business proposal clarifies project viability on the local county-level market. After the 2018 national ban on plastics (especially grocery shopping bags), we have projected an increased demand and tentatively scaled for the national level market with the expectation that the ban has created a gap that can be filled by natural bamboo baskets and other conveyances.

A fourth opportunity for capacity building was the co-founding of Integrated Stewards Systems Incorporated (ISS) in the United States. ISS is a 501 (c) (3) public charity with a vision to directly respond to iCitSci's stewardship needs by addressing funding, technical, and partnership needs on a global level.

6.4 Recommendations to iCitSci

The findings presented just prior, give an overview of the goals of the pilot and findings, without going into the scientific vernacular characterizing the report and Proposal.

I made the following recommendations to iCitSci in March of 2020, just before the COVID-19 quarantine took effect in Kenya. The recommendations are based findings of a more in-depth end-of-pilot report and a third party business proposal prepared by a Rikamedia Pathfinder and his business partner, following in person training, observation tours, and consultation about the structuring of the social investment banking framework. The following are my recommendations:

The draft proposal and projections submitted by a neutral third party provide additional insights as to the environmental benefits of bamboo beyond those considered by iCitSci, such as water sanitation and water catchment, increased ground cover; etc. Projections in the business proposal demonstrate that with a $50,000 initial capital budget

spread over a 5 year period; and capacitive human resources, the bamboo project has the potential to become self-sustaining in as little as five years, with economic significance for the wider community.

A well-appointed agroforest site will feature well drained, well-watered soils. The farm will possibly be close to water, but even though Bamboo is an ecological powerhouse for riparian zones, we have seen from Site LN that young bamboo are not resilient to fast flowing, flooding conditions. it is only after years of established growth and spread that the plant can safely be exposed to fast running water, flooding, or waterlogging.

A vulnerability revealed in the data but not discussed at length also turns out to be a market potentiality. I refer to the finding that livestock, especially goats and peripherally cows, are a contextual variable. A proliferate local pest, goats were found to decimate young bamboo that had been resilient to flooding at Site LN, making them a force to reckon with. At the same time, the interest shown by livestock in bamboo sites signifies an abundant potential market for fodder and silage, produced from bamboo leaves, branches, young shavings, etc. Hence, the task for the group is to establish during strategic planning, clear boundaries in which livestock are defined as a ready customer base and a review of proposed budgetary targets has been made to adequately address the potential threats.

Based on the foregoing, it is evident that the vision unfolding in these pages goes well beyond the nascent livelihood goals of iCitSci's bamboo project in 2017. Additionally, the project shows potential for replication and upscaling, increasing the project's social, economic, and ecological significance.

That said, there are considerations to be made as to the room for yet another bamboo project in the specific national context of Kenya. In the time that it has taken to carry out the micro pilot from September 2017-Dec 2019, many small scale bamboo projects have sprung up in the country. A few have been reported by the national media, while others continue to self-report on social media.

As such, iCitSci may want to consider the potential of agroforestry beyond the practice of farming and farm products; as a testing ground for science and information technology applications with potentially much larger regional impact, innovating toward an economic model for citizen science that also takes into account group investment, indigenous data processes, and stewardship mandates. Moreover, data argues for framing a public fundraising campaign to capacitate iCitSci.

The third-party proposal ought to be read, reviewed and further developed in a manner that is responsive to the considerations raised here. In particular the group may ideate toward a specific are of interest or concern, d outline how they would approach a funding partner to work towards a free or almost free technology that may

Render group communication apps more horizontal non-linear, bloggable, and robust

For example, getting the WhatsApp interface to have more horizontal data presentation or archiving capability would help with retention.

integrate the tasks currently undertaken on both the group communication apps and project data apps. retain or render interoperability with mainstream social media.

The group has also attracted the attention of an indigenous horticulturalist who has many years' experience farming local bamboo varietals on his farm, while this development points to the potential for collaboration, the presence of this and other small bamboo agroforest startups all over the country indicates a need to think beyond bamboo farming and towards innovation with integrative technology solutions, an area in which the need is vast and still growing.

6.5 Challenges for Project Strategies

Over time, both the micro level project and the Facebook leadership have faced some challenges. These are discussed below.

6.5.1 Regulatory frameworks:

The point of integration with mainstream regulatory frameworks is charged with tension on both iCitSci and The Mbeere Social Media Ecosystem as a Whole. On one hand, incorporation into legally recognized entities, i.e., community association and NGO respectively, facilitates many processes, such as the opening of bank accounts, application for project partnership with mainstream institutions, application for funding and other capacity building such as technical support, etc. The government has streamlined incorporation processes and the steps are fairly straightforward. However, the mandates of incorporation have overwhelmingly negative impacts on social dynamics: there is a real risk of losing sovereignty insured by the informality of social media, and yet "going legal" as it is called, does not guarantee effectiveness, a greater voice, or sustained mainstream support.

These uncertainties cause fissures in the group. Member skepticism is further increased by prerequisites that are difficult to adhere to, such as minimum member numbers, predetermined financial contribution mandates, mandates to use standardized formats for group bylaws, and large commitments in time at government offices.

6.5.2 The political climate in the nation state

Long periods of group dormancy are experienced before and leaving up to elections. Adding 6-8 months on either side of the 2017 general elections approximately a year and a half goes first into campaigns and then into disputes over election results. As I write in 2020, we are at the start of another election cycle, with similar expected disruptions. The attendant economic and public health challenges of the COVID crisis will expectedly compound the problem.

In the electoral cycle climate, the public sector grinds to a halt, impacting greatly on business, daily life, and ability to make decisions that involve long term plans. In addition to country wide interruptions, as we saw in the accessive study, Rikamedia incorporates political activism, openly supporting those candidates who promise to collaborate on the Rikamedia agenda once in office. During election season, as it is called, other community goals are set aside as Rikamedia fully focuses on campaigning for politicians who will support the Rikamedia community agenda.

6.5.3 Challenges with technology

I will discuss challenges with the most frequently used platforms in the applicative phase, WhatsApp, EazzyChama, and Citsci.org. We also used other technologies, such as VSee for video conferencing, Microsoft Office Word, Excel, graphing applications such as Graphml and Gephi, Google Non-Profit G-Suite applications such as Gmail, etc.

The wide range of tools needed serves as a pointer for areas that need further research focusing on integrative design and interoperability for technologies that support participatory projects. More so, there is need for platforms that are free or nearly free, yet responsive at a level close to that of enterprise asset and information management technologies. Such platforms address multidimensional community needs such as communication, project management, office tools, data management, and outfacing content management portals with the ability to assimilate third party plugins and APIs.

6.5.4 Linear structure of group chat forum

A few concerns present themselves on WhatsApp group Chat: The linear nature of chat forums such as WhatsApp can have a fragmenting impact on team communications. Users may also preferentially delete their chat histories on their devices to make room for new data and improve download speeds. Additionally, a potentially impactful move is integration of WhatsApp, Facebook and Instagram by the parent company, Facebook which owns the three applications. increasingly interoperable with Facebook Group forums. While these concerns may present little challenge for personal social communication, difficult to reference shared documents that may be deep in the chat history.

The move toward working on WhatsApp and using Facebook primarily as a news outlet began in 2016. At first glance, WhatsApp suits Rikamedia information sharing behaviors very well by using privacy scaffolds such as encryption which can reduce skepticism and increases trust. However, each WhatsApp group can only feasibly sustain communication between members when groups remain small, as opposed to tens of thousands on Facebook, where users have greater control over community space on the user interface, for example improved recall is now facilitated by advances in AI and machine

learning, whist features such as tabbed browsing, a Facebook stable, embeds learning tools to help group admins manage shared intuitively, so that for example, videos and information such as archived files with group agendas

As a result of working in small group environments on WhatsApp, the sense of connectivity and belonging that holds a community together on Rikamedia and even in Place, is reduced due to the fragmented nature of WhatsApp groups. Working in small fragmented groups in turn has implications for process, and for knowledge sharing. As an example, below is a visualization showing part of chat history from one of the WhatsApp group chats. During December 2017-June 2018, the chat went dormant as work migrated to a different WhatsApp group chat to offer space to one team member who was not able to work actively for a time. Due to the linear and personal nature of chat, moving to a different group chat was the only recourse.

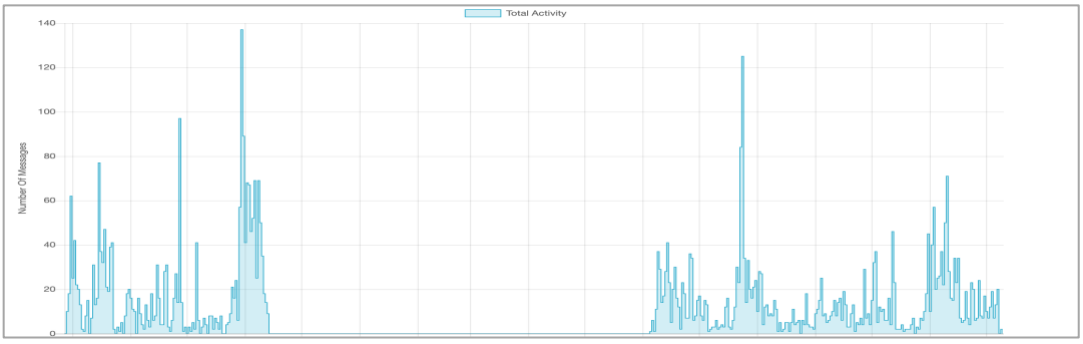


Figure 6-H: Group chat structural design affects workflow

In the visualization of a WhatsApp group chat above, loss of records and knowledge from November 2017 to June 2018 occurred due to group dormancy to accommodate one member.

6.5.5 Hierarchical data management on social banking application

This application was highly impactful for developing group transparency and trust. However, it evidenced a top-down structure, with the group Admin having to update the system after a community member had completed a transaction. The app allowed, and still allows limited user autonomy within the group.

Hierarchical management structure without flexibility to optionally increase access level for group members. As an advantage, unlike many proprietary social data management applications, EazzyChama is home grown in Kenya, similarly to the mobile money app Mpesa. Hence it allows both phone number and email use. It additionally sends period financial reports to members in an investment group. Lastly, it is interoperable with Mpesa, a well-known mobile money application widely used in Kenya for banking transactions.

6.5.6 Metadata classification on citizen science platform

The app was found to be focused on scientists' needs over volunteer needs (datasheets minimalist, this is a plus, on the downside, data sheets offer little guidance to no guidance on usage, nor is there an accessible tutorial. Yet on the plus side, the data is dynamic once variables are set properly (once data are given numerical values. For example, ratings of poor, fair, good, excellent, should be formulated in the datasheet, each category assigned an integer to allow user generated analytic charts. For this content, the user has flexibility over question-generation, so that a number of queries can be asked of the data, depending on the variables set up to retrieve queries for sites and species.

I concluded, based on my own and Steve's experience, that the underlying developer assumption on citsci.org is that project taxonomies, metadata, and data management

protocols would be defined, designed, and managed by scientists, with lay persons taking the role of data collectors. Further, I deduced that skill in information technology was not a predicator of a lower learning curve. This inference is based on my evaluation of our collective ease with technology. I am a former master librarian web designer and database content administrator e with social network graphing software and spreadsheet software such as sheets and excel. Steve has an associate degree in information management and several certifications in software and network engineering from accredited programs. Lastly, other group members, all of whom had college degrees (one owns a store that she runs and is the group's credit officer, another runs a travel leadership agency, yet another owns a cybercafe and was at the time in his third year of university acquiring a computer science degree; and two more were program managers at international donor agencies). Hence the group was not lacking in IT savvy. However, after initial attempts at data entry during the first weeks of the pilot, all group members held a meeting and decided to delegate one data collector. The job went to Steve, who was motivated to learn data and citizen science skills, as well as already being a member of the research team.

At the conclusion, I inferred that iCitSci data would need to be manually cleaned to fill in the visit dates reporting missed observations, separate incompatible data types—numerical, categorical, narrative data, and assign measurable numerical units to some of the earliest collected data dating back to October 2017-October 2018, so as to be able to retrieve measurable outcomes for the first phase of research. We requested a Skype meeting with the Citsci.org team in 2019, learned how to numericize categorical data on the datasheet so as to graph it later, but still did not grasp that each datasheet needed to contain only one type of data (since all types are possible to set up).

Additionally, the app drops data often and is very difficult to use in the field, necessitating a safeguard to first collect data on paper, then input it later using a laptop or desktop. However, data was also dropped on a laptop (Lenovo, MAC iOS Sierra, Ubuntu), especially photos. Based on the data collector's experience, which I also verified, the application gave no fore/post warning or sign that the data has not been properly entered. The user would then assume a completed task, only to find holes in data later. This increased opportunity for human error. Data for some dates was ingested into the preceding observation date, overriding it. Other data was ingested as a new row of the site preceding, so that one site featured two observations with the same date but different data. For that date, the site would appear not to have been observed.

missed due to not knowing the extent of problem until I downloaded and sent the "project data" using the platform's feature, which does not allow partial downloads, but can do CSV, PDF or XLS. To be able to share meaningful data with the community at Scistarter (default setting on the platform) we cleaned it up, using the still available paper logs to fill in the most critical gaps. This helped us also to know how to structure the datasheets/protocols, either using the same platform, or at a future date, designing our own application during the next phase of the project when we anticipate scaling up from the mini-pilot to a farm.

6.5.7 Limited interoperability between platforms

Communication outside the platform was a hurdle. Citsci.org platform did not at the time have interoperability with WhatsApp, mainstream social media, or phone numbers. We could only use emails or an inbuilt wiki if we wanted to communicate from within the platform as a group to share information or if we wanted to seek expertise from the outside

world. This communication hurdle was one of the factors that led us to delegate one person to collect data. This added a cost to the data collecting process that had not been factored in at the start, and also limited our data collecting opportunities to once a month.

The data collector had to make rounds, whereas site owners would have only needed to fold in the exercise into their own farming routines (or that of their farm help in some cases). After each data collecting exercise, the data collector would call, text, or WhatsApp individuals with feedback to help site owners with maintenance. This meant that less data was collected than if the owners were collecting it for themselves, due to access.

6.5.8 COVID-19 Setbacks

The onset of the 2019 SARS COVID 19 pandemic soon after we had wound down the pilot has proved inopportune to say the least. One of the most significant changes was the immediate cessation of the investment banking effort due to loss of income experienced by a high percentage of members. As of this writing in 2020, the accumulated capital has not yet been withdrawn or borrowed against by group members, to the credit of the collective will. However, the possibility exists that the money could serve as a welfare fund, as there are no social services in the country to draw upon. This is a thought that I have considered personally but not discussed with the team.

At present we have no way of predicting when the pandemic might be contained to allow for a return to normalcy. Needless to say, project plans for expansion are at a standstill as there is no feasible way of implementing them due to a combined intercounty quarantine and curfew. It is unlawful to cross county borders without the special permit issued to essential personnel or for emergencies such as funerals.

Despite these setbacks, the group continues to apply the aspects of the projects that are feasible during the ongoing COVID-19 crisis. An example of immediate benefit accrued from the maturing bamboo is the support of a cow nursery using bamboo from Site MG in 2020 (See Subsection titled Contextual Variables, above).

6.6 Next Steps for iCitSci

I checked back with iCitSci at the close of their data recording stage. The report and proposal below articulate ISS's perspective on the developing partnerships, highlighting areas of strength, areas that need more work, and possible next steps in the developing research and practice framework. The reader will notice that we have applied the participatory framework emergent within this research. iCitSci's project framework incorporates a fourth stage, the integrative stage, at which the project begins to scale to the larger community.

6.6.1 Project Timeline

Activities	Years 1-3	Years 4-6	Years 7-9	Years 10-12
Accessive Phase				
i. Background research on indigenous factors, soils, climate, gap analysis, scalability.	X			
ii. Micro-pilot-testing three varieties against diverse site characteristics at multiple sites.	X			
iii. In-earnest income generation from group investment portfolio	X			
iv. Social ICT apps for data transparency and monitoring of ii and iii above.	X			
v. Data analysis on iv above. Report on findings, review goals, proposal development, fundraising targets, campaign.	X	X		
Adaptive Phase				
i. Strategic planning & implementation based on findings.		X		
ii. Agroforest site acquisition and staggered establishment of farm and nursery.		X		
iii. Marginal income generation from peripheral-cropping of biannually harvested crops with established local market, such as legumes, etc.,		X		
iv. Research & development to establish responsive social ICT infrastructure; continue development of data management and reporting protocols. Report on early findings.		X		
v. Inaugural harvest of renewable bamboo products, introduction to market, report on findings, review goals and work plans.		X		
Applicative Phase				
i. Development of a community outreach program; raising awareness.		X	X	
ii. Relationship building with farmers, businesses, researchers, local government.	X	X	X	
iii. Increased income generation from harvest of renewable bamboo products and peripheral-cropping of biannually harvested crops.			X	
iv. Research & development with responsive social ICT infrastructure; continue development of data management and reporting protocols. Report mid-phase findings.			X	
v. Report on mid-stage lessons and impacts on local community.			X	
Integrative Phase				
i. Development of a local community industry producing diverse goods for the market based on bamboo raw materials; sets standards for practice; diversifies			X	X
ii. Lucrative income generation to sustain long term project goals; possible new environmental and business targets.				X
iii. Articulation of findings on responsive social ICT infrastructure, data management and reporting protocols; articulation of recommendations for research and practice.	X	X	X	X
iv. Review of social, economic, and ecological impacts; wider significance for national policy (i.e., as projected at year one and actually measured at in project lifetime).			X	X
v. Analysis and gap identification from i-iv., goal review & reformulation. Begin the iterative process again as a new accessive phase.				X

Table 6-A: Project Timeline Informs and is Informed by Research

6.7 Participatory Project Strategies Within Theory

One of the contributions of this research has been data on a micro pilot project in the bamboo sector, where such data is largely missing, yet there is much interest in use of the bamboo to reforest and supply timber, wood fuel, ornamental carving, and paper-alternative industries, to name a few, especially after a much lauded ban on Plastics in Kenya. By presenting the

research from a resilience perspective, we endeavored to determine sustainability of the crop for Mbeere, testing alien species against indigenous species for 30 months under different site variables. By using an Information World (Jaeger & Burnett, 2010, Warrick et al, 2016), we were able to leverage information and indigenous knowledge at the boundaries of social media and Place, arriving at a transformative place-based protocol for data collecting that was capacitated by diaspora and Rikamedia Pathfinders as well as Knowing Elders, Akũrũ a Kīrīra. By using Indigenist Maths, we were able to transcend both the IRM tendency to over-emphasize conversational methods, and the scientific tendencies to over-emphasis the role of scientists as the driving experts who must bring to bear the methodological paradigm in use. Both paradigms limit indigenous participation in STEM based projects, even when these projects happen in indigenous communities and use local targets to garner funding (Tucker & McKenzie, 2014).

Indigenist Maths opens up both fields to testing, so that we test for effectiveness quantitative methods, such as statistical methods encapsulated in the Good Numbers theory, posited by Walter & Andersen (2013), data visualization, etc. At the same time, we are not confined to numbers. To the contrary, we were able to primarily leverage qualitative methods (Chilisa, 2010, Warrick et al, 2016) as an accessive means by which to establish ties in the community, so that the community was a capacitating partner for ISS, rather, in a reciprocated partnership.

Our is a full departure from the competitive, deficit driven SDG project framework, whereby indigeneity is synonymized with deficits, and returning systems are synonymized with STEM knowhow. Our cross-domain framework participatory framework allows theory, method, and governance to harness the strengths of Rika: By establishing rika

between actors, we leverage their wide networks in each domain. Identified points of convergence and reciprocity capacitate the process experimentation. Thus, iCitSci and ISS both maximize the wide base of expertise held by project members and various capacitating partners in Place and on the Rikamedia. In providing the project cases, my hope has been to demonstrate the means by which, in real life participatory frameworks where diaspora and community members are in collaboration, Rika structures and processes come to bear, emboldening tolerance for risk and leading to innovative ideation.

Additionally, in Rika, all structures are integrated, therefore the same structures that guide project ideation would in effect guide legislative decisions. It has only been with growing understanding of the Rika system that I have made connections between, for example, the greeting protocols when in consultation with elders, whereby we identified ourselves extensively, including families and histories. The process undergirds equality and inclusivity, as is discussed further Chapter 7, under the subtitle, on the question of strategic resilience. It is a means of establishing where divergencies may hinder effective communication and where convergencies can be established and leveraged to facilitate effective communication, in keeping with the Rika attribute of establishing a platform of interaction between actors at any scale of society, based in *autonomous inter-reliance.* This is participatory basis that undergirds Rika as a multi-scaled, societal model for Resilience.

From a theoretical perspective, Zolli & Healy (2012) define resilience as, "the capacity of a system, enterprise or a person to maintain its core purpose and integrity in the face of dramatically changed circumstances." (2012:7). They further explain that resilient communities have tight feedback mechanisms and are able to dynamically reorganize in case of trauma and are able to detach, decouple, and reduce dependence on the larger systems

within which they may be extant, if such decoupling increases the chance for survival. Hence, resilience is about maintaining purpose and function while at the same time being able to adapt to unexpected circumstances.

To place community projects within the larger context, Kenya's government is decentralized following the mandates of millennium development goals (MDG) for 2030, under which sustainable development goals (SDG) were added in 2015 (Beisheim et al., 2018, Wu et al., 2018). Hence, counties have greater oversight regarding governance, including local decision making.

Context-based decisions such as a future rika-based affirmative action would fall under local oversight. Under the SDGs, many donor institutions, such as the World Bank, now mandate that as prerequisite to project funding there should be a sound understanding of the social, environmental, and political frameworks of indigenous peoples (Garnett et al., 2018) so as to address their needs in ways that are relevant to indigenous ways of knowing and being. Such donor responsibility covers technical and other capacity building to indigenous communities, such as sustainable resettlement when displacement occurs as a result of a project. In Mbeere's case, the hydroelectric project, which is as yet still unfinished with five dams built and two more in the long term strategic plan, this mandate to plan for indigenous community sustainability is relevant.

From the Mbeere Social Media Ecosystem as a Whole's example, it is clear that is not possible to ignore politics and provide effective assistance. Indeed, during the adaptive phase the presence of politicians on Rikamedia could be seen as a necessary part of 2030 goals, which integrate all aspects of society for sustainability, with the political system being as important as governance. Rikamedia has been accommodating in this regard, providing a

case study for sound understanding of one indigenous sociopolitical system. Donor projects have been reluctant to get involved in politics, separating it from governance and confining themselves to top-down mandates on structural adjustment from a national policy perspective (Haan, 2014). However, indigenous initiatives such as The Mbeere Social Media Ecosystem as a Whole's provide a rich context within which to explore potentially deeper integration.

Another way in which Rikamedia and other social media initiatives are poised to negotiate between the needs of Place and capacity building at macro level is by serving as coordinating boards or working groups that can be the focal point for the SDG multiple partner framework. Beisheim et al., extrapolate the challenges of the multi-sectorial approach, saying that, "lack of uniformity in the approaches of different partners, some private, others governmental, and still others nongovernmental, necessitates coordination boards and working groups" (2018, p.106). Such coordination boards and working groups, the authors say, help partners reduce redundancy of efforts whilst undergirding policy interoperability.

Additionally, such boards and groups can help governments improve visibility in projects, a rising challenge in the SDG integrated approach, where reporting mechanisms serve donor agencies and thus make donors more visible to communities on the ground than their own government. Not only can Rikamedia act as a meso level coordinating body to provide such coordination for county-bound projects that are targeted at Mbeere, it can also serve as a partner in its own right., as well as sourcing domain expertise within the ranks of the diaspora, for example for strategic planning, policy, and grant writing, to name a few. In addition, within the Rikamedia are members running small businesses, capable of serving as local contractors and service providers, thus providing continuity with Place.

6.7.1 A Place for Networked Rika Science

Through the iCitSci we have an example of dynamic, story-centered, and lived means of creating a data collecting recording and analysis protocol that enables indigenous forms of knowledge sharing to come to bear in the process. Another work looking at the use of social media for development in a marginalized Brazilian community with similar challenges such as lack of macro level "investment in social and physical infrastructure," has explored adaptation of social media for community development, specifically in the area of digital literacy.

Nemer (2016: p.13) found that unusual appropriation of technology tools and informal means of skills transfer were more effective for capacity building than conventional, globally accepted instructional methods that were biased towards ways of knowing and being to which marginalized groups could not immediately relate In the Brazilian context, Nemer traced the journey of teenage girls who were functionally illiterate in grade 7 and were terrified of school, but who then learned to read and write on Facebook, first mapping emoticons and emoji to words (such as love, like, or laugh) and then becoming increasingly motivated to use the "normal" tools of learning offered at their schools. Similarly, in Mbeere, we start at the contextually relevant, oral centered means of motivating interest toward quantitative data sense and meaning-making.

Another view of Place that is influential to this work considers the "Power of Place" (Newman et al., 2014: p.55-64) in citizen science. They posit that Place can be considered along five dimensions: social-ecological, narrative and name-based, knowledge-based, emotional, and affective, and performative. For Newman et al., these relational aspects are central to the ability of citizen science to leverage the Power of Place. The authors provide evidence of projects that, by leveraging these five relational dimensions, have improved

conservation decision-making, increased participation, and improved community resilience. Thus, by asking research to consider the human and relational aspects of the geographic locations in which they conduct research, Newman et al. widen the scope of the still emerging definitions of citizen science.

This work is not thematically conceptualized as leveraging the five dimensions of the Power of Place in Newman et al. Nonetheless, the authors' work is impactful to this work in that it enables us to define indigenous citizen science within a wider theoretical lens as a place-centric, citizen originated endeavor. Out of this understanding, Rika is suggested as an alternative approach, in response to the rising contention within the young discipline regarding the validity of citizen led efforts that are not managed by experts and that do not start out with fully realized data protocols, whereby some experts believe these kinds of efforts are not citizen science but rather stewardship participatory efforts. Based on findings here, there is great value in citizen led efforts to orient toward data informed decisions about livelihood activities that impact on environmental health, besides which Rika science is not under tight project timelines and is therefore likely to develop at an intuitive pace as members increase understandings about how to manipulate dynamic data to their business or farming advantage.

In the fields of ICT for development (ICT4D) and citizen science (CitSci), both of which advance participatory methods, social media has emerged as a separate area of multidisciplinary study. Certainly, the entry of Facebook in the same SDG informed space occupied by these knowledge domains is a promising signal that citizens may have priority of place in future projects. In these fields, the call for technology applications that are flexible enough to accommodate marginalized epistemologies has been rising but is not always met

with concrete examples of why such flexibility is needed and how to go about achieving it. Walsham, (2017), for example, points to researcher propensity to focus on questions of access to ICT in marginalized communities whilst disregarding historic, social, and governance contexts. Di Minin et al., (2015) cautions against environmental citizen science projects' disregard of data that does not meet systematized, scientist-centered data protocols.

Zhen, et al. (2018) points out that much of research and practice is anchored on the predominant linear growth-driven model that measures levels of technology adoption and diffusion whilst ignoring "contradictory effects" (p. 8) that such systems can have on communities, such as the loss of a sense of wellbeing. Resilience thinking underscores the linear growth model as a key systemic weakness in our collective global approach to development in that much of ecological loss can be attributed to projects stemming from this model. Indigenous development ideation exemplified in these pages provides one of alternative modalities to consider as we seek to mitigate widescale environmental breaches. In the next chapter, I will look at key takeaways of this work under several subheadings including conclusions, limitations, and future reseach.

7 Chapter 7: Conclusions, Limitations, And Future Research

7.1 A Review of the Phased Process

The foregoing chapters have presented a phased process of resilience thinking to uncover latent attributes of rika that bolster sustainability. The process has required triangulation of data from multiple sources straddling several disciplines. As such, an enormous amount of data has gone into the iterative exercise over a number of years.

In light of scale of findings presented, several types of summaries are presented here in chapter 7, to open discussions on possible applications of Rika in present day context: a return to previous states of Rika is neither advocated nor credible. It is also not necessary, and can in fact be counter intuitive to building resilience. For this reason, I have endeavored to avoid historicizing or idealizing Rika by leveraging present day internal mechanisms such as quantifiable social network ties, motivational impetus, and resultant evidenced community strategies and practices. These are the bases by which I have drawn out underlying structures and proposed attendant rules or attributes of resilience. We do this in chapter 4 and 5 and 6, presenting evidence of attributes of rika in indigenous terms. Here in Chapter 7, we then meaning-make with findings to start a conversation on application beyond immediate research context.

Structural factors contributing to resilience of rika are introduced in chapter 4. In chapter 5 we examine motivational role of structures of rika and technology. Based on findings, we apply the emergent structural and motivational framework to project cases in a participatory process, to validate or challenge findings on the functional role of rika attributes to undergird strategic resilience. Due to the scope of analysis needed to demonstrate that rika

is a systemic resilience model, the findings have been presented in three chapters, 4-6. At the end of each chapter, I have undertaken a discussion to situate answers to the research question within theory. This structure aligns with the progressive nature of the elaborative coding process employed throughout, in which findings progressively inform interpretation of new and existing data. An advantage of this approach is a developing theoretical anchor for the participatory process, reported in Chapter 6 under strategic resilience, useful because rika has predominantly been considered a historical artifact with little relevance for present day.

I note here that although the process may appear linear, in reality progress was made through an iterative process. The design involved data validation using several methods and involving many mini-cycles that included member checking exercises to corroborate accounts of participants, triangulation of methods, for example quantification of the motivational role of politics: First appearing in talking circle data, then quantified with survey data, the findings are triangulated with content extracted from social media, graphing and data visualization to uncover impacts of politics on network dynamics. Lastly, application of findings in participatory processes gives us a perspective of politics as a feature of actual lived experience relative to social media. An indigenist maths approach is therefore engenders both depth and breadth to capture attributes of resilience from multiple dimensions.

In this last chapter, we consider findings of chapter 4, 5, and 6, looking at insights gained at the end of the exercise, emphasizing findings that have found immediate application and those that continue to acquire new meanings, attracting questions for future research. I have found it also useful, in light of the foregoing theoretical discussion in

chapter 4 and 5 about the damaging impacts of institutional returning system projects, to present a bulleted outline of guiding concepts, based in the projects encountered in Chapter 6, that may be useful for participatory research and practice in indigenous context. After that, I will reflect on limitations of the research, share some ideas for future research, and end with closing remarks reflecting on the impacts of this research to my personal and professional meaning-making

7.2 On the Question of Structural Resilience

In the community under immediate research and others fighting for socioecological justice, findings on a range of historical and present-day factors may empower community groups in the pursuit of constitutional reform to legitimate local self-governance, including but not limited to, legislative protections against multivariate mining projects in traditionally protected ecologies, and restoration of ancestral water and land for livelihood. For the wider global community, the idea of governance by all as a capacitating tool toward noncompetitive elected government, is an attractive alternative to conflicting ideals of the democratic paradigm that thas dominated ideas of liberty and inclusion since the Roman era (Bremmer, 2009).

In the local context of the EC, it should be noted that, per historical research on the subject and as corroborated with data from Elders, the loss of knowledge on governance and impacts on Mbeere-Embu relations post 1932 has resulted in the systemic imbalances that characterize County leadership, which has essentially taken place at the meso level for the last 90 years. This is understandable, in that precolonial capacities of the dynamically reorganizing Embu community prior to restructuring of the system by Lambert's district office were at meso level. However, as with other resilient systems, the structure lies

dormant and can be reactivated with time, including beyond immediate context on a regional scale.

As the knowers of the macro level of Rika, and purpose for inclusive governance, Mbeere now has a responsibility for building on this work to codify this knowledge in a timely manner as it lives in the minds of Nyangi Elders 90+ years old, 5 of whom have passed in the 5 years since we began this research.

The conviction that I took away at the end of research was that the rika system, as designed by Nyangi, presented by Mbeere Akūrū, and as operationalized on Indigenous social media, will find wide application outside the community as possibly the world's *first model of accessive, inclusive, non-competitive and equal representation governance model.*

The system's ingenuity lies in its ability to leverage familial structures using systems binary maximization principles and mechanisms, particularly by establishing correspondence and reciprocity between otherwise hierarchical units within familial structures that scale horizontally and vertically across societies and regionally. Within this concept, one of the more surprising development to come out of this research is a growing realization as to the high value placed on autonomy and inclusivity, particularly the purposive taxonomy that renders the entire system accessive across societal divides: We established in Chapter 4 that chronological age can only be very roughly estimated by Roman calendar years. Due to the cyclical nature of Rika, all ages from birth to death join one of two macro level Rika (called generational classes in English, erroneously.) Rika or Marika in plural in this sense are more closely equivalent to jurisdictional authority. Choice is involved, the free will to join a Rika is involved, induction into the Rika, denoting individual and group level commitment to the

Rika of membership, is involved. Contrariwise, lineage and generational identities are accidents of birth.

Thus, individuals of the same generation such as GenX, can belong to different Nthuke and Rika in Mbeere. Therefore, Rika is not a generational construct in the present day sense in which the word Rika has been applied by anthropologists and conflict analysts. This aspect of Rika is a means of achieving age representation in governance. Historical research corroborates that citizens of varying ages and genders participated in the Nduīko process if they were part of the incoming Nthuke, even though age ranges could vary by more than 40 years. This is governance by all, as outlined in Fransiscus Patricius' 16th Century Panarchy. The idea of government by all has been conflated with a different one, that of non-partisan elected leadership.

With all citizens being in active participation in governance, each side chose its own representatives. These non-competitively elected leaders formed a governing body with legislative and executive authority, described in Chapter 4, whereby elected leaders falling into distinct Nthuke or chronological birth range were chosen in equal numbers by each coalition of clans under the banner of Mūrurī and Īrumbī, to form a non-partisan coalition of 7 legislators on each side. This is the dimension that Lambert dissolved effectively as reported in the Literature Search, chapter 2 and in Chapter 4, under Rika in Theory. However, he could not infiltrate beyond this legislative/executive dimension, because he only had the cooperation of colonially appointed chiefs and their administrations, not that of the entire society.

In thinking about the applicative aspect, where systems have been severely breached, it seems prudent to start with building governance, which in Rika is achieved by modulation

of sociopolitical process. Achieving consensus on a means by which to bolster sociopolitical resilience would be the first issue on the table. The idea is that resilient communities would have the self-governing capacity to begin restoring non-human ecologies that are now in critical states.

Hence, a project approach would be to start with a contextual taxonomy that would flatten hierarchies and resolve natural binaries in the community by establishing a local non-competitive framework between Mururi and Īrumbī, and, using the ideas of Rika governance by all, each side would agree on a fair number of communities that they would each elect to represent the community in county level governance. This cohort would then choose among themselves in a noncompetitive manner, to fill electoral seats in alignment with the national and county constitution. As Rika is dynamically inclusive of returning residents, a framework to establish mutuality would be established, based in shared socioecological interests in the geolocated jurisdiction.

The value of an indigenist rather than indigenous approach is clear. There is only one way to be indigenous and that is to be born into it. Conversely, indigenist approaches involve the choice to serve community goals ahead of institutional goals, to foster integration of indigenous worldviews into STEM disciplines, such as resilience attributes of Rika; and to advocate redress for past harm. In this light, the existence of a culturally and linguistically concordant etymology of rika across different language and temporal scales, in Africa, Europe, and Asia, underscores the idea of our common ancestry and therefore innate skill in reactivating rika mandates for inclusive governance and just ecological stewardship. Considering that the word has been applied in exactly this sense in present day Sweden, there exists great potential for reciprocated learning, should a framework be established to

mutually bolster areas of weakness in cooperating systems. Indeed, globally, we all have a claim to rika, rendering it a good potential fit for a global governance climate mandate.

Apart from learning about purposive structural design of rika into interactional components that that can pull apart and decouple to survive sustained threat as seen in Chapter 4 under dynamic reorganization, we also learned that, at its most ideal, rika supports neither a patriarchy nor a matriarchy; but instead modulates itself with interactional systems that allow for gender-diversity, familial and societal identities. At the micro level, Rika identities leverage but remain neutral to and address the hierarchies of familial relationships.

Based on the triangulated data, I arrived at the conclusion in chapter 4, that the idealized matriarchies of Africa were systems overcorrections (as Kenyatta 1938, reports with an attendant sense of humor). Based on my understandings of Rika, Panarchy, the adaptive cycle and other ideas about resilience that I have traced over millennia, I believe that gender bias whether toward matriarchy, patriarchy, or something else, is evidence of systemic return to vulnerable, undesirable states that ought to be addressed from interpersonal to macro level, as the Rikamedia in Kenya are now in the process of doing.

For Kenyan pre-colonial society, we may never have the full picture about triggers that led the matriarchies to change beyond thresholds of recovery; what is clear is that, Mbeere is that with rising exposure to waves of arrivals culminating in colonial occupation by returning systems African societies were set on a course similar to that of Frisian Rika, non-European and existing in free territories alongside the Roman empire in 800AD. Nonetheless,, after disappearing from books for 700 years, we start to see Rika reappear in Europe as radically patriarchal, agist, deified, ecologically unconscious, and materially identified monarchies, the Catholic Church, almost singly achieving non-competitive

governance, albeit patriarchal, through observance of Panarchy as designed for the Church by Fransiscus Patricius in the 16th century.

Perhaps not strangely, this early encounter with Rika concepts through Panarchy, as outlined in Chapter 1, may explain the more humane approach to indigenous culture taken by the Catholic Church, relative to the repressive zeal of protestant returning belief systems.

It is possible, just as the system was designed to bolster both Nyangi and Ivate rika in times of prosperity and to tightly orient to Nyangi Rika during times of prolonged stress, that the system was designed to be multriachal for this same reason as a mechanism of diversifying governance at different scales in a growth phase and possibly to allow for gender bias either way depending on the stressors during the conserving phase. As we saw in Chapter 4 and reflected in evidence based research, Embu was in the midst of such a development at first contact with returning systems.

It must be remembered that purpose of rika is to render the system resilient, by neutralizing and modulating binaries of the social system, i.e., natural bloodlines and lineage systems. When unmodulated by Rika, the social system is full of binaries and it is binaries that make for systemic weakness. Hence, inside rika there would be no room for partisan politics, the Rika framework itself is neutral, expressing rika relationships without gender, age, or status assignations, to name a few. It provides a roadmap for equal representation non-competitive governance.

I have concluded that the system would have re-corrected itself if its feedback mechanisms had not been breached past the threshold of natural recovery. As such, purposive intervention is necessary, as well as feasible given time and strategic direction; as is demonstrated by Sweden's use of internal systems thinking to bolster resilience of local

knowledge to restore the Kristianstad Rike, reported by Walter and Salt. It will be remembered that the term Rike is a variant of Rika, meaning territorial wealth, self-governance, etc.

Unfortunately, returning belief systems have triggered patriarchal overcorrection to a scale that requires deliberative resilience building through social programs. While rika itself fosters egalitarian expression of religious belief and/or spirituality, returning belief systems evidence no such liberal stance. This is concerning in that, 85% of Kenyans today are Christians by birth, according to the Kenya National Bureau of Statistics census of 2019. Some may still regard Rika as religious expression, as seen in Chapter 4 and in prior research (Wamue, 2001). It is for this and other translational reasons that I have undertaken a multifaceted analytical process.

Findings have relevance for citizen groups, research institutions, and policymakers who wish to effect sustainability targets by leveraging the capacity of Rika to modulate inclusivity across all levels of society, thereby aligning structures and taxonomies of government with those of the governed.

7.3 On the Question of Motivation

In chapter 5, we acquired knowledge about the kinds of content that build the motivation toward participation in stewardship and render this this motivation resilience in changed circumstances. As we found, the indigenous learning motivation is key to participation. Through interactions with Akūrū, we gained a framework based in ecological accounting.

We find that attributes of resilience encapsulated by Rika underlay much of the effort that went into forging the Rikamedia approximately 5 years ago in 2011, following the constitutional reforms the led to Mbeere domicile in Embu County. In that period, membership numbers on WhatsApp Chat forums and FB community groups have remained steady, with a 20% increase in new registrations during the COVID-19 2020, relative to 2019. Panarchy, that is, universal laws of order; and is moreover used by a conservative 40% of the population 18 to 74 years old.

As a community resource, Rikamedia fills a self-reported need in 98% of community members to learn about issues of importance to Mbeere. Priority of learning is given to development projects in the water, education, health and agricultural sectors. Moreover, whilst politics is as a perceived as a demotivator to contributing on active conversational. threads on both Facebook and WhatsApp, as an important precursor to the fight for self-governance, learning about politics of impact to Mbeere is of singular importance on the Rikamedia, especially given that the 4% who reported a political motivation also responded that they participated to connect with their constituents. Although only 2% joined Rikamedia to connect with their elected representatives, it appears that they are the source of a majority of the political discourse. Hence, while political discourse may discourage direct participation for most members, the content posted evidently motivates passive learning and is key to member retention on the Rikamedia.

In addition to providing opportunities for learning, the Rikamedia is valued for capacitating the desire to connect with other members of Mbeere community. Despite these positives, the Rikamedia in its current state is a self-organizing system and as such is vulnerable to systemic and external changes, and subject to eventual devolution into small

world hierarchies (Jaeger & Burnett, 2010; Folke, 2001). The community is therefore urged to purposefully assess and structure the Rikamedia for resilience. In this, it is recommended that Rikamedia reactive the mutual self-governing framework of Rika leveraging the attributes of *cooperation before competition, as f*ostered in the coeval Mbeere Rika. This will require purposive restoration of the macro-level coalition of non-partisan governance of the stewardship agenda between Nyangi and Ivate, as outlined in Chapter 4.

When treated as an introductory document to build on communally, findings of this research have potential to bolster continued liminal transformative experiences on Rikamedia. Utility of this community resource is in providing multivariate access to information, knowledge, learning modalities, transparency, trust building, alignment with Rika privacy protocols, reciprocal social networks as fostered by relational mechanisms, alignment of economic interest with stewardship through a monitored precondition of stewardship guiding socioecological accounting and justice principles; and the transformative role of rika interactions instruct, embolden tolerance for risk, support the entrepreneurial spirit encapsulated in Rika, and foster experimentation in new modalities with potential to effect change.

Self- awareness may increase the likelihood of sustainable partnerships between investors and indigenous entrepreneurs founded in authentic mutuality. Lastly, by demonstrating phased integration of indigenist maths to serve community goals, findings may have relevance for integrating science and information technology in community projects with equal benefit to returning and indigenous communities.

Operationalizing the conceptual framework was Harambee, meaning, “all pull together,” a call to action of the Mount Kenya peoples popularized by Nobel Laureate

Wangari Wa Maathai (2004) and fostering unified stewardship of the natural ecologies on which rika is interdependent. integrate the rika conceptual framework with Ubuntu philosophy and Harambee ideology. The Ubuntu way of knowing about the nature of existence, encapsulated in the mantra, *"mūndū nī mūndū nūndū wa andū,*" is translated as, "a human is human because of other humans," and aptly expressed as, "I am because we are." (Mbiti, 1969). Rika conceptualizes this way of knowing as two human beings in an indivisible, reciprocal relationship. Moreover, rika reciprocation is centered in stewardship, fostering balance between caretaking of plant and animal ecologies while remaining neutral of gender, kinships, and theistic belief systems, rendering it transferable to other contexts outside of the immediate Mbeere reality. I no longer see this as a relationship defining collectivity. Rather, I see it in light of binary resolution. The maxim that, "*there is no rika between a child and a parent*," is not a declaration of strength or a dismissal of the weak. Rather, in acknowledgement of natural law, rika activates transcendent will. Thus, to be in a State of Rika is to be both parent and child. In situations of power; donor and recipient, governing and governed, supervisor and staff; each honors the child and the parent within, in a relationship of autonomous inter-reliant equals.

Within relationship, the original manifestation of stewardship is articulated through reforestation protocols and other programs that foster reciprocal conservation, as we saw in the findings. As such, rika is an important systems concept to understand. Its tenets can be leveraged to gauge the potential for resilience and sustainability of projects in many Indigenous communities.

In my earlier work I thought of Harambee as a crowdsourcing framework. However, with this new understanding of where the Harambee ideal actually fits in the Indigenous

cosmology, especially with the conceptual understanding of how rika relationships facilitate cohesive convergence, the term crowd is forceful but lacks the depth, density, and adaptive core of systems ties implicit in rika, from which Harambee stewardship action arises. Crowd implies cogent commonality of purpose, such as found in citizen science or open source technology development crowd communities.

Nonetheless these communities are identified by a situational cogency, unlike in the Indigenous worldview. Crowd action is self-organizing, Harambee is purposive and modulated. Hence, I no longer believe Harambee stewardship is a crowdsourcing ideology but rather an attribute to undergird resilience, not unlike iCitSci's efforts to self-fund. Harambee is a capacitating resilience attribute, conceptualized to capacitate the programs of Rika. toward Ubuntu.

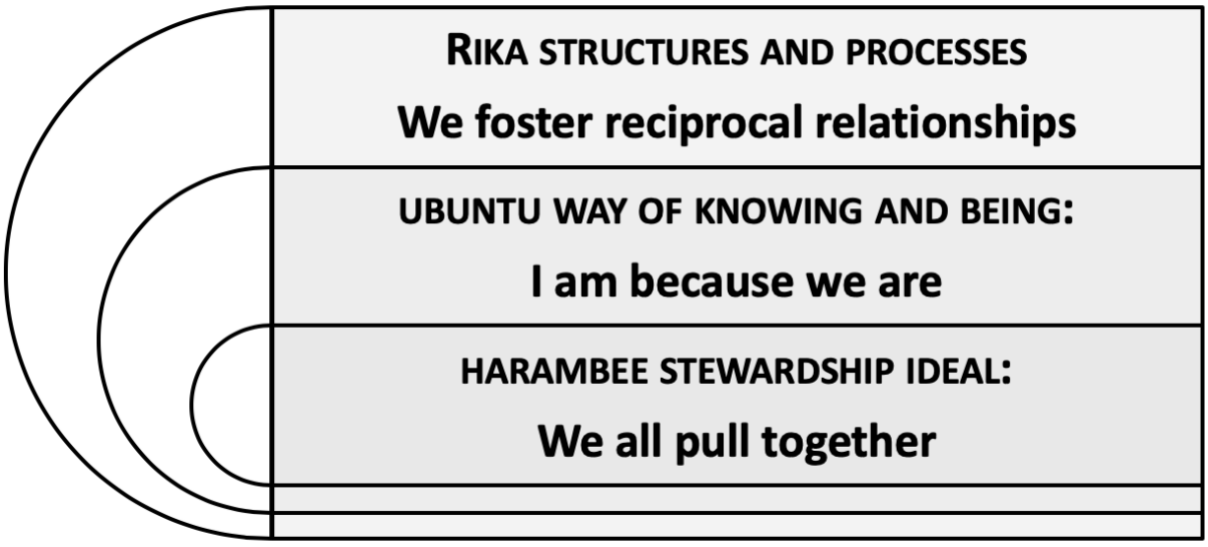


Figure 7-A: Rika in Relation to Ubuntu and Harambee

Today, macro level concepts of rika are experiencing a new wave of resurgence and regeneration in Mbeere by leveraging social media, part of an adaptive process that can be traced to precolonial era politics as we saw. Historically, societies in this region have occupied vast areas of land with low populations, hence social network density has deep implications for information and resource exchange. At the micro level, rika principles have remained in active use even as the macro level concepts have been overtaken by politics of kinship.

We have also experienced the contestation of indigenous places, with the common result that indigenous definitions of Place are not always shared at the boundaries of the nation states in which indigenous communities are extant, as we saw in the case of Mbeere being described as a desolate and parched people, while, as the Mbeere understand themselves, they are a dispossessed riparian people Survey outcomes and Facebook data extraction both show that indigenes living in Mbeere are predominantly youth and Akūrū. This finding invites deep questions about the implications of generational gaps for knowledge exchange, as well as points to possible reasons behind the widening marginalization of Place. Because youth and elder practices are markedly different, in that the younger they are, the more likely they are to engage in activism through social media, while the older they are, the more likely they are to exclusively use place based indigenous methods, such as reforestation.

As none of those methods can survive alone in today's networked world, both generations, as members of the same Rika, need to remain in correspondence, autonomously interdependent, as engendered a dynamically harnessed knowledge resource framework at

the intersection of social media and Place. This is in keeping with coeval structural design of Rika's hierarchy-flattening mechanisms.

Conversely, data suggests that members of a Rika when physically separated from Place are more likely to seek ways to get connected with the corresponding halves of their Rika in Place, rendering social media an extension of Place, a diasporic dimension in which all members can join regardless of where they are extant. Indeed, according to survey responses, the overriding motivation to join the Rikamedia is the desire to learn about Mbeere. This finding calls to mind Tuck & McKenzie's (2014) point that indigenous people who live in urban places also share in this unique indigenous connectedness to Place, and equally share in the sense of loss when displacement or imbalances occur in Place.

This understanding of indigeneity as imbued with responsibilities and rights of Place appears at first to offer a normative lens. However, following on my new understandings of indigenous motivations based in learning modalities detailed in Chapter 5 and the participatory process detailed in Chapter 6, I have concluded that this indigenous sense of rights and responsibilities of Place engenders the more experimental, risk taking, and motivation-driven aspects of indigenous stewardship. This would explain the affinities between protocols of social media and Place, given the equally experimental, risk taking, and motivation-driven aspects of technology innovation.

Such a conclusion leads to hopeful projections for Facebook's new SDG initiative, Project 17, in which the company has outlined a data-for-good initiative on gender inclusion in partnership with the United Nations. In 2016, I gave at talk at a Human Computer Interaction conference in Nairobi, Kenya, based on then emergent findings of this research (Warrick et al, 2016). Then just imagined partnership between Rikamedia (then partially

defined as UVA) and private investors such as Facebook and Twitter have slowly been realized over time.

Then just suggestions, it is now standard practice to leverage AI and machine learning to bolster collective development of marginal languages such as Kĩmbeere. As well, ASCII and Unicode based Keyboards are exponentially expanded, with good outcomes for knowledge building on mainstream social media. It is with similar hope that I suggest that the FB focus on gender expand to include the mechanisms of resolving gender inclusion barriers; so that Project 17 will result in gender balance rather than feminization through governance structures established in the ensuing framework.

Ideally, gender equality and diversities are likely to result in sustainable outcomes, since the system is designed to trigger the marginalized gender into inevitable liminality, disruption, and radical transformation. Rather, gender balance would lead to measured adaptive cycles. Certainly, little stands in the way of FB's agency and capacity to potentially demonstrate transcendence of the failure-prone poverty mandates of SDG. An innovative idea would be for FB and Twitter to form a Rika coalition with an agreement to establish a reciprocal stewardship mandate, including reciprocated monitoring for preconditions of stewardship before resource consumption, as appropriate. Both media giants have well-articulated business interests that both overlap and diverge, giving room for establishment of non-competitive zone where stewardship can be modulated at macro level, whilst diversifying contextually in Rika-Centric Africa.

The companies attract the same demographic population but to different and often non-competing purpose; the one a public square for lifeworld conversations; the other communal space for focused strategic work. We have already seen the potential for the Data-

for-Good initiative to serve the world in emergency pandemic situations with the emergence of the COVID-19 pandemic as predicted by resilience scientists almost 15 years ago (Walker & Salt, 2006) Given the links established between socioecological destruction and a projected increase in frequency and severity of pandemics, it would make sense for the companies that currently have the social pulse of the global population to help achieve the climate mandate.

7.4 On the Question of Strategic Resilience

Before speaking to project strategies, let us examine for a moment, the process of self-identification as mandated in consultation with elders. A new understanding of the detailed greetings that ensue during such meetings is that the procedure establishes interactional points of convergence, and therefore, where reciprocity may be established. Once found, each interactional point outlines its own rules and guidelines of interaction, including the information sharing and privacy protocols. An insight from my interactions with Elders these five years is that, these check-ins are not confined to the start of the conversation, as were my personal impressions as an everyday citizen participating in the system. Any time obstacles are found, the conversation may return to base, to establish rika between the actors. Indeed, Saberwal details similar mechanisms between Mbeere and Embu community representatives, with a Mbeere Nyangi officiating aspects of the Nduīko (breaking/becoming) induction ceremony in Embu. This is the induction of a polity into self-governance, part of a larger process that culminates in electoral process. As seen in Chapter 5, in Mbeere, representatives of clan coalitions are elected by a newly inducted polity, in a non-competitive electoral process and conferred the reigns of governance by an outgoing

government. The electoral process is non-competitive because Mūrurī and Īrumbī do not compete against each other for leadership positions. Instead, each coalition elects from its own membership, an equal number of elected leaders to serve in a coalition of government as legislators and executors, on a non-partisan Nyangi/Ivate coalition of government. The aim is to modulate the executive and legislative level. Once understood, it becomes clear that a key factor safeguarded by these structural processes is capacity of the executive to act regionally outside the community, at the level of Nyangi/Ivate. Hence, structurally, when Akũrũ insist on greetings in the manner of self-location as a member of the conversation and the community at large, this is a means by which structural and terminological modulation happens from micro to macro levels of society as well as dynamically through time.

By intent and effect, universal inclusivity is approached and even achieved to a high degree, comparative to the sense of exclusion that occurs in present day experience, whereby competitive governance, economics and sociality without mechanisms of resolving resultant hierarchies, have resulted in the dysfunctional states described by conflict thinkers in the region. As is seen in this work and in Hazel (2006), Nyangi in the progenitive role, historically set the regional stewardship, legislative, and executive agenda. Implicitly, Ivate and other equivalent Njaū Rika, found immediate ascendance in colonial returning system structures, mainly through education, and by rising in positions of governance. However the resultant regimes as they exist today are characterized by unaddressed problems, with an underlying structure of self governance now only seen at local level, and that needs only be scaled.

To some in the Njaū Rika such as Ivate in Mbeere, Gatavi and Ngua in Embu, and Maina in Gīkūyū, it may have seemed, that with the rise of many through colonial education,

it would be possible to effect a new regime, capacitated by would-be empire makers such as H.E. Lambert. However, these statesmen, in both colonial and Rika systems, reckoned without the power of resilience. Together with attendant factors, they ushered in a new coalition of governance by competitive alienation of the governed polity. By character, imperviousness to Africa's systemic resilience mechanisms is identified as the prevailing climate of internal conflict for which Africa is known today.

Moreover, by coalescing power in patriarchy at all levels, the balancing role of Rika was lost. As a reminder, Rika patriarchy was at the micro level of Nyomba or Mbarī, meaning, House or family; whilst matriarchy was at the meso level of clans, mīvīrīga [singular mūvīrīga. Mbarī are coalitions of nuclear families, Mīvīrīga are made of coalitions between 10-200+Mbari. In Mbeere clans are moving targets, breakable in many dimensions of affiliation. Multiple Matriarchal clans form an electoral body, also called mūvīrīga, improperly translated into English as clans. Immediate benefits of keeping a lid on the true nature of Rika as it lives in the grassroots consciousness of governed polities may seem to outweigh the heavy work required to uncover and leverage African systems of governance as coevally intended. However, the means by which to secure sustainability for Africa is through full articulation of its own systems of resilience. I bring these issues to the fore in a discussion on participatory projects because good governance is the foundation of sustainability.

The findings in this work advance the conversation by providing concrete examples of how the community has addressed or is challenged to address systemic biases that have been pointed out in prior literature. Many of these works, while grappling with larger issues of defining the larger fields, point to the robustness, diversity, and unexpectedness of user-

generated content, connectivity, and situatedness of social media as areas of future research that separate a social media focus from larger bodies of work in ICT for development and/or citizen science, respectively.

In terms of participatory projects, we have shared iCitSci's application of contextual understandings about what it means to collect data for individual enterprise, using platforms that allow for sharing with the science and information technology research. As such, we have illustrated approach in incorporation of indigenist maths (method as theory) for community project development.

We recommend articulation of an agroforestry citizen science framework, based on Rika socioecological values, with priority on indigenous species reintroduction, riparian ecological restoration, integration into the local timber and plastic-alternative economies, and technology innovation to harness the wider Rikamedia network for capacitation. Such an approach has significance for effecting constitutional and legislative mandate to protect indigenous seeds and ecological species. As well, these goals would support Kenya's ban on Plastic and a move back toward biodegradable sources of craft and woodworking materials, such as ornamental figurines and basketry, for which Kenya is world renowned.

As seen in in the micropilot, the indigenous species of bamboo proved best suited to contextual site variability when tested for 30 months against alien species that were more favored by experts at the nursery where the first seedlings were sourced. iCitSci is committed to natural propagation of the thriving indigenous species, with encouragement from supporting diaspora and knowing elders.

Our intension was to provide an example of how user perception of technology utility can be enhanced through a process of iteratively deriving variables and data protocols, rather

than rigidly imposing "the scientific process" with volunteers at the inception, as predominates expert-driven citizen science projects characterized by a research scientist playing the decision-making role. This relegates the motivated citizen to role of data collector and inhibits cognitive diversity on the part of science and indigenes alike. Intuitive and embodied means of capturing data appear to be the surest way to ensure participation of indigenous and other marginalized peoples.

No doubt the responsibility of stewardship and joint decision making that team members experienced, especially those who had an interest in data and science, were integral to other livelihood decisions, such as Steve's decision to become an information management professional. It is imperative then, to resolve the binaries scientific, funder, or other limiting returning system identities, so as to both contribute and receive in a reciprocated rika experience of stewardship before consumption and, "cooperation before competition." These concepts rest on the larger framework of autonomous interdependence.

The development of self-originated data management protocols is another way the research is useful in challenging the commonly held theory in indigenous research, that quantitative methods are patently unsuitable for indigenous communities because they are oriented toward conversational information sharing methods. The consideration is made that additionally, macro level institutions have historically disenfranchised indigenous communities through quantitative research instrumentation whereby community members provide answers to questions that are not well understood, with dire consequences. For example, an outcome might be funding reduction, or a shift toward educational frameworks that relegate community priorities to the margins of society. It is for this very reason that

indigenous people ought to make the most motivated quantitative researchers, to correct recorded "history" as only they can.

Following on this experience of research with a mixed methods approach, I recommend approaching the community with conversational methods and using indigenist maths after at least a year with the community. As well, data visualization is effective in highlighting developing binaries and false storytelling regarding the nature of returning system expertise in a Rika. In Chapter 3 under data analysis, I shared my data viz notes to illustrate how the researcher, by their role as the prompter, the one who asks, who needs to know, asks the most questions, prompts the most, when visualized, it can appear as if they are the expert in the circle. The notes detail a process by which I indigenized the coding, so that attribution was visually represented, after which there were no questions about community as the knower and I as the receiver.

The visualization notes manifest what could have turned out to be an unfair process of knowledge extraction and harnessing of local expertise without credit assignation, if I had not taken deliberative steps to identify the issues in the parsing of the conversational data and to address them so that credit was given to the actual knowers rather than to "project leaders" or "researcher experts" who usually take credit for indigenous knowledge, when their role was simply that of extraction and in many cases impartial or uninformed translation. Those who work for research institutions and global institutions need to address a problem that is only becoming more complex with a proliferation of data storage and sharing formats. It should be noted that once the team had addressed the coding I was no longer a person of interest in the data visualizations, shared in Chapter 4 and 5. Invisibility can itself present other issues of ethics, but these do not apply in our case due to a long standing relationship and prior

consent given. Additionally, the team was careful not to actually capture usable data-such as medicinal data from our most sensitive participants.

We have also hopefully challenged perceptual knowledge gaps regarding indigenous use of information and social technology for biodiversity research, proposed as an area of future research by Rotman (2013). The challenges inherent in deficit driven perceptions of indigenous context are not indigenous in nature but reside in the minds of those who work in indigenous places using the SDG poverty model. In other words, this is a returning system problem, not an indigenous one.

According to the findings of this research, Returning system institutions that work in indigenous places remain largely inaccessible to its intended community. We saw for example that social media pages of returning projects do not invite robust participation. For this and other reasons, indigenous environmental stewardship leverages mainstream social media outside of conventional project managed social media. These institutional spaces appear to be largely unresearched, except perhaps in service to institutional management, indicating a gap for future research from an indigenist, information world stance.

If such a research were to use the ACCESSIVE-ADAPTIVE-APPLICATIVE process, demonstrated in this work. Rika taxonomy and structure, an early phase would involve setting mutual goals with Pathfinders-the founders of Mbeere Rikamedia, 40-55years in 2020, identified on the Macro level of noncompetitive governance as Nyangi and Ivate. the popular name for this rika is GenX. Throughout we see the accessive role of this rika, whose self-defined mandate is to bolster micro level projects with modulated access to macro level frameworks. Though seminal, this generation is marginally living on social media compared to Millennials and the Z Generation, 18-39 yrs. old, who make up 84% of Rikamedia as well

as the membership of iCitSci. As the Nthuke currently waiting in the wings and looking to Pathfinders for due mentorship, many are either Itherū and Nangamīguī (also called Irangamīguī).[22] This macro level is inclusive, modularizing diverse interests of polarizing meso level clan identities that would indigenously coalesce around Īrumbī and Mūrurī in a non-competitive electoral process.

Despite the competitive nature of county level and national politics in present day Kenya, the period in which Mbeere knew local self governance was one of prosperity, "I saw a huge difference between what we were able to do between 1996 and 2010. We made a lot of changes. As someone whose business sometimes depends on tenders from parastatal programs, I understand how the funding works. We were able to channel a lot of money into development. That is when we saw changes." UVA Pathfinder. Another Pathfinder who was later to play a key role in capacitating iCitSci's experimental pilot with reintroduction of Bamboo in an agroforestry model, shared with me that he personally traced the raising of his own consciousness to this period, due to the concerted effort to reeducate the community about the value of indigenous trees over other species which had since proven to be invasive to local varietals, such as Lanterna and bluegum trees. Saying that many aspects of stewardship were reactivated during this time, this Rikamedia Pathfinder went on to say that regeneration of ecologies in the 15 years of local self-governance in Mbeere, between 1996 and 2010 had now halted, despite community efforts to keep the momentum through

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[22] *We established in Chapter 4 that Rika is not a generational concept in the sense of chronological age. As such, chronological ages of the different rika examined in this work can only be very roughly estimated by Roman calendar years. As seen in the discussion preceding and following Table 4-C, Elders do not attach much meaning to birth years, but rather, to the placement of their circumcision Rika in vertical, cyclical, and symmetrical relationship to those of predecessors.*

Rikamedia (The ECDIP 2019 corroborates these first hand accounts with a note that the community makes a concerted effort to restore ecologies despite their efforts being unmatched and unrecognized at County level due to external agents who have a vested interest in continual degradation of the indigenous ecologies.

Not surprisingly, the social infrastructure which has been since necessary to harness miraa without government support and considerable opposition from returning systems was also jumpstarted during this brief decade and a half of fiscal and legislative local authority in Mbeere. As it is, in present day Embu County Mbeere is not only without agency, farmers are heavily taxed for miraa without representation. Given the entry of heavyweights in the form of Chinese government and private investor in the mining industry, Mbeere must find a constitutional route toward restoration of jurisdictional authority. For one, the electoral purpose of Rika to effect non-competitive governance by all, needs to be re-learned, restored, and codified to guide present-day cooperative community programming. Secondly, the gender diversity program needs to be reenergized toward the 1:1 ideal that drove the initial Rikamedia effort. Thirdly, community members need to once more publicly donate their skills, this time toward building a robust open access library of resources with easy access in diverse data bandwidth zones, to allow for maximum access. Fourthly, the community needs to take charge of a Nyangi revitalization as a matter of Irī principle, discussed in Chapter 5. This is whereby for every private or public bad, a public good is enacted and rooted in ecological regeneration. I termed it ecological good for sapien bad. Nyangi is a force for good, its agenda for socioecological stewardship is still alive and can be a shining beacon of light to the lost half of the equation, whereby Ivate was dispossessed of its zoological jurisdictional stewardship by the colonial and global development machinery. Fifthly, the

community may aggressively seek avenues to partner with FB's corporate efforts in Project 17, even if on a purely volunteer basis, as such an endeavor would diversify knowledge and moreover keep to the original purpose of the Rikamedia, which is service to save Mbeere socioecological wealth for current and future generations. Detailed findings on which these recommendations are based were presented in Chapters 4, 5, and 6.

It should be understood that findings are scalable to communities whose language expression and cultural identity differs from that of Mbeere, as societies and indigenous communities in Kenya inherently retain related aspects of the rika framework. With regards to researchers in the political and conflict disciplines, it will be useful to gain awareness of Rika as a big idea with global significance. Findings have potential to inform commentary on undertakings of marginalized sectors in Kenyan society as well as realign African thought leaders with concepts derived from internal systems thinking, necessary to bolster structural resilience from an African perspective. Lastly, for research and practice, findings have potential to impact participatory project design to address resilience as a safeguard for sustainability

7.4.1 Aspects of Rika

The following are aspects of the Rika conceptual framework that can be used to assess systemic application of rika resilience attributes. The list is growing and open to adaptation as new findings emerge from reinterpretation of historical research in present day terms. One area I did not have the time or space to fully elaborate on is the catalogue of maxims on which Rika interactional structures draw on for binary and hierarchy resolution. This is a needed area of research, as current resilience models do more to identify assess and monitor natural binaries and hierarchies animal and plant populations than they do those of humans.

The other area in need of further elaboration is autonomy. In my considered view thus far, Rika Resilience is defined by autonomy with relationships of interdependence. Rika Structures are based in autonomous interdependence. We applied the idea of access to examine interactions across iWorlds, and thereby identified key actors, functions, resources, tools, behaviors and other aspects of information and knowledge access. We also evaluated mobile devices by function and level of access to disambiguate empowering and disempowering boundary areas, concerns, values, and possibly motivations. The first section of Chapter 4 outlines criteria used to measure and quantify stewardship as an aspect of resilience in Place and on Social media at these boundary areas. We also discuss issues to consider and how adjustments can be made when assessing between individuals and institutions. The following are aspects of Rika that we have identified as having a function to undergird resilience of environmental stewardship, when articulated in a modulated structure. They are not set in stone and are subject to evolution as more is known about the system. The list is a basic foundation for future research and practice Science Information and Technology for Sustainability.

Structural Resilience

1. The micro reflects the macro. Taxonomies, structures, processes, programs, and sectors of governing and governed mirror each other across all levels.

2. Rika Structures are Accessive: Rika is modular and infinitely scalable. Citizens universally retain rika identities, functions, and skills across structural, temporal and spatial dimensions. Thus universally accessive, rika effects governance by all, effected through induction of cohort polity into incoming self-governance rather than induction of a few into leadership. "nduīko" (to break/become)

3. Rika fosters unity in the face of potentially reductive interests of dominant hierarchies such as evidenced in clan and other lineage-based systems. Hence, it seeks to reduce harmful competitive governance. Rika fosters a noncompetitive electoral process to facilitate equal representation by a broad elected coalition of executive legislature, in governance of equals by

equals, mirrored by self-governance at local level. Thus, Rika privileges Placehood and honors Nationhood.

4. Rika fosters autonomy within relationships of interdependence from micro to macro levels. Individuals and sectors interact in networks or coalitions, connected and disconnected to allow for autonomy within standardized practice.

5. Rika pursues ideals of gender diversity and inclusion. Recognizes that gendered hierarchy is indicative of systemic vulnerability. Values embedded feedback mechanisms and bolsters them with constant structural assessment for parity during interactions at flagged boundary areas.

6. When change is desired, is facilitative of integrated systems-transfer and seeks to limit vulnerability in reciprocated relationships.

7. Is responsive to dynamically emergent goals and needs. Compassionately capacitates and guides individuals, groups, and communities toward desired change in a process of dynamic reorganization.

Motivational Resilience

1. Supports broad learning modalities to bolster participatory capacity of citizens.

2. Fosters liminal transformative experience by separation from Place and reintegration. Integrates Place information value, i.e., value for interconnectedness, awareness that responsibility for Place extends beyond political jurisdictional borders.

3. Values age diversity to facilitate cognitive, temporal, symmetrical transfer of knowledges and material properties. Fosters mechanisms of correspondence across age and time spectrum for continuity and change. Addresses resource retention and innovative capacity.

4. Fosters law of minimal requisites, value for all lifeforms.

5. Fosters identity of self as interdependent ecological being

6. Requisite to individual choice, fosters networks of support by a cumulative learning process through which citizens achieve multiplicity of Rika identities, coalitions, correspondences, and affinities beyond immediate micro level identity by accident of birth, with significance for regional cooperation

7. Fosters a justice system based in *ecological goods for sapien bads*, translated in ecological preservation terms. i.e., citizens in breach of justice invite responsibility for stewardship of concomitant endangered ecological species. Such a "Sentence" is deliberated by peers and may be conferred in perpetuity, relative to breach.

8. While remaining curious and enterprising, Rika fosters reasonable skepticism in the face of external interest in jurisdictional and ecological

properties. Seeks to leverage privacy protocols, and may decouple parts of the system to ensure survival in the event of unforeseen systemic breach.

Strategic Resilience

1. Leverages structural and motivation aspects as appropriate to bolster ideation and implementation
2. Uses digital tools to inform decisions.
3. Is open to tolerance of risk and experimentation to foster grassroots enterprise.
4.
5. Leverages Rika networks beyond geolocated experience. Seeks capacitating partnerships.
6. Seeks integration of economic goals with ecological priorities. As such, Rika places high information value on dynamic cycles of birth, growth, maturation parturition and rebirth, leveraging ensuing knowledge to legislate, modulate, and execute synchronistic ecological stewardship and resource consumption, mirrored by sociopolitical and judicial functions of the governing/governed body politic

The indigenist in Rika Context

1. Promotes Indigenist Maths in research and practice to integrate indigenous worldviews with the scientific disciplines.
2. Projects cooperate rather than compete with human and non-human communities of Place.
3. Respects cognitive, cultural and other diversities of Place including approach to scientific method and technology resource application to meet shared goals. Seeks to increase diversities of Place as a stewardship mandate.
4. Respects indigenous right to compensation and attribution. Eschews predation in research and practice.
5. facilitates liminality in self and others through integrative principles of foundational knowledge acquisition, including through separation and integration with Place.
6. Seeks to understand through accessive, adaptive and applicative approaches, the authentic indigenous information world from micro level to the global lifeworld.
7. Seeks out Rikamedia Pathfinders and connected networks to foster diaspora participation in stewardship of Place
8. Confronts and seeks to understand the value of an indigenist Maths approach in the indigenous community of collaboration.

9. Is skeptical of and deliberative in application of alien terminologies in indigenous context.

10. Develops and shares a strategic framework to guide application of development and stewardship terms for example, recognizes when it is appropriate to use development terms, such as in development of an endangered language or species, development of relationships, i.e., is increasingly aware of concepts underlying growth as well as their desirability or lack thereof, in local context. Is aware of and effectively applies appropriate alternatives when stewardship rather than development or growth are desired by the community.

11. Limits application of SDG mandates, targets, and indicators at local level.

12. Applies mandates, targets, indicators based in Rika structures, protocols, and priorities, for example, does not initiate project without an implemented reciprocated program for sustainability in perpetuity beyond funding mechanisms. This includes, sustainable and reciprocated capacity to measure, assess, monitor, and enforce indigenist stewardship criteria, including if capacity to account for and enforce *preconditions* for regenerative stewardship *prior* to commencement of resource consumption.

7.5 A Planning Outline to Support Rika Research and Practice

This bulleted list stems from Chapters 4-6 and is an outline of guiding concepts can be used to organize readings through the findings chapters, or to jumpstart ideation toward participatory projects and research in Rika contexts. By this time, I hope that I have succeeded in making it clear that the term Rika defines relationships of autonomous interdependence between people and between territories; and that authentic Rika interactions occur within modularized diversity, allowing for recognition and resolution of potentially harmful hierarchical divides.

Safeguarding Resilience of Place

- Resilience principles of rika
- Articulation of an adaptive stewardship structure
- Galvanizing pre-liminal indigenous environmental justice agenda (reclaiming authority from simplistic theistic nomenclatures prevalent in the research on

so called sacred groves, reclaiming freedom from homogenizing, marginalizing nomenclatures at meso and macro level).

- Reinterpreting rika within theory

Toward an Indigenous Resilience Motivational Theory.

- Technology design and coeval liminality.
- Separation of diaspora with Place and the speciation of Place.
- Bridging motivational mechanisms.
- Demotivated by technology design that does not support ability to decouple (increased skepticism, passive parallel participation, reduced information sharing, search for new decoupled environments). High speciation of indigenous social media groups.
- Rethinking indigenous motivations within theory.
- Long term versus short term motivations and impacts on strategic planning.

Participatory Project

- At project level, operationalizes Ūmūndū philosophy and Harambee ideal
- Incorporates entrepreneurship in non-competitive balance with Place
- Multidimensional self-capacitating framework
    - Leverages diasporic orientation for technical support.
    - Leverages social technologies for accountability and trust building.
    - Leverages Akūrū' knowledge of Place.
    - Leverages ample private land at initial project start up.
    - Uses an inclusive framework, harkening to egalitarian principles of rika.

- High risk iterative experimentation with marked tolerance for ambiguity and uncertainty.
- Develops Place-centric data and information protocols, and indigenizes. Capacitates interests.
- Is Open to cognitively diverse methodologies.
- Resolves hierarchies by accepting and embodying both a child and parent role in all binary situations, such as administrative, supervisory, funding, or mentoring.

Interrogate Assumptions About Indigeneity and Development.

- Recognizes that some projects are not development projects but stewardship. Uses the right Terminology. E.g., Language projects are development projects. Water projects are stewardship projects.
- With partners, identifies mutual grounds on which to develop reciprocated mandates for precondition of stewardship. Aims to evidence implementation of a successful activity with regenerative capacity; and back by a tangible accountable plan for periodic maintenance before damage has occurred. Stewardship begins prior to breaking ground for consumption of resource, is iterative and temporally unbound. Stewardship does not end when project/program budget ends. Acknowledges that by these criteria, most global development projects ought never to begin.
- Considers an ecological good-for- sapien-bad approach to project ideation, and thereby, takes into account the benefits to Place, of "failed project inheritance for rehabilitative purpose." Will endeavor to correct harm from a failed project rather than starting the next failure. See Chapter 6 on Bamboo site conditions for more

details iCitSci's attempts to rehabilitate land that has become a wasteland in the aftermath of failed donor projects.

Challenges of working with information and technology in geographically distributed teams.

- Low direct coordination of village level efforts.
- Fragmented ICT infrastructure, due to low interoperability of financially accessible social, science, and information technology platforms.
- Uncertainty of data sovereignty; albeit balanced by high probability of localized types of community data as platforms develop in response to global user needs over time.
- Low transferability of communication and information functions to preferred platforms; difficulty in retaining ability to meet goals at similar or increased degree of efficacy.
- High dependence on proprietary responsiveness to meet both contextual and universal user needs in order to support effective communication between macro to micro scales of the Rikamedia.
- Rikamedia under-recognizes value of own knowledge and desirability of ecological resources to outsider interests.
- Difficulty transcending historic incapacitating assumption of donor goodwill, despite reasonable skepticism due to record of failed SDG projects.
- Challenges for projects to bridge Nationhood with Placehood: difficult to identify and resolve dissonant local and national governance taxonomic structures, policy, and regulatory frameworks.

- Faces roadblocks when attempting to access mainstream frameworks for support with securing indigenous rights due to self-contradictory constitutional and legislative protections for indigenous properties and expressions.
- Limited interaction between diasporic rika and aging Akūrū A Kīrīra, the rika knowledge bank.
- Daunting search for global partners who may be comfortable with high degree of experimentation whilst using human or ecological measures of project success. Most donors use economic indicators and/or linear growth models.

7.6 Limitations of the Study

Limitations of this work are based largely in my own human experience, which is inherently subjective and consisting of multiple competing ideals, identities, and lifegoals. One of these has been how to resolve the sheer scale of this work, so that it is both of some use and within time restrictions. As such, in many instances I have had to sacrifice form for function. Given the myriad misconceptions in historical and present day research; and given also the sheer volumes of data that had to be sifted through and made sense of, I have devoted the majority of my limited editorial time to clarifying the argument on Rika Resilience, leaving the finer details of structure to future research by the team and others who may take an interest in the topic.

On a different vein, indigenous research methodology (IRM) may regard our use of a survey tool and other quantitative tools to be limiting factors, in that these are anonymized exercises designed with distance in mind, intended to scale up the participant pool to the thousands, rather than emphasizing conversational methods. While I do not share in such a

generalized view of methods, preferring to consider applicative purpose and outcomes, I do regard surveys to be a flawed tool in any setting, not just indigenous communities. In this regard, the survey was a flawed but extremely informative secondary data collecting method. Throughout, I have remained conscious of the need to constantly interrogate both the survey questions and the answers elicited. I provide an example of such interrogation below.

Perhaps one of the best examples of the limitations of the survey method is to be found in Question 13. This prompt was designed to directly inform Facebook Rikamedia leadership decisions about interests in a sectorial approach to integrated development. In analyzing the results of this question, it was useful to know that the community prioritized water over the other eight sectors. This finding is in keeping with the talking circle data and content extracted on social media, and I have concluded that the community is a riparian identity and perceives itself as having been forcibly alienated from its water sources by various macro level interests.

However, the low priority placed on the environment and governance; when in fact these are two of the most frequently discussed topics on Rikamedia and in conversational circles, tells me that this question should have been phrased differently or broken down into several different questions with different logic patterns. This might have helped determine nuanced community perceptions and to minimize acquiescence bias. As it is, participant responses were almost homogenous. I suspect that one of the reasons is that, from the question design, the answers appear to already be ranked, so community members intuitively kept to the internal order of the question itself.

These limitations also underscore the IRM injunction to conduct quantitative research only if absolutely necessary, although I do not concur with that view. Quantitative tools are

valuable for the indigenist researcher in a digital age when indigenous communities have extended Place into social media, as illustrated in this work.

However, I do not believe instruments such as survey ought to be used at the point of entry, i.e., surveys are not appropriate as primary data collecting exercises and should be set aside for use after conversational datasets have been collected and coded, and a first report has been shared with community members for validation (member checking). Once this milestone is passed, likely trust will be established, making way for the possibility of co-designing a survey tool with the community, such a codesigning process is presented in Chapter 3 under data collecting methods. This does not preclude pre-designing a survey tool and setting it aside for a while. Indeed, this may have utility for elaborative coding, also presented in Chapter 3 under data analysis. In our case, a future repeat of question 13 is indicated, in which case it would be necessary to update the survey questionnaire based on what we know now.

Another key limitation was in funding after 2017, and subsequent limitation in new participant recruitment, although once recruited, retention was not an issue for this research, as the indigenist maths stance tended to garner interest in future outcomes. Numbers were augmented to a large extent by the online survey tool (UVA Survey) and Network visualization and context extraction on FB, and WhatsApp so that we extended the participant base from the 226 who were directly recruited to approximately 10,000 in Mbeere and 750,000 in the EC after 2017. This was achieved by data synthesis and analysis of extracted content and network interactions of two FB groups UVA and Mbeere Politics: each averaging 5000 members. Additionally, an average 5% of the communities living together in the EC (Eastern Conservancy) To this purpose, the data presented quantifies network

characteristics at macro level, representing parameters such as population count, location, purpose, events, and other dynamically generated variables. Further details can be seen in Chapter 3 on data analysis.

7.7 Future Research

The Mbeere context presents a rich tableau, brimming with opportunities for research on rika. There are many threads that can be taken up from this research in a number of disciplines. These are discussed below. The most obvious place to begin is with the conclusions of this research, that rika resurgence on social media presents an attractive way for the researcher to fulfill the participant-observer role while minimizing cost and maximizing on presence as much or as little as may be mutually defined with the researched community. There are many other Indigenous communities that provide a context on which to test and improve on the ideas presented here.

My thinking about rapid ethnographic methods (Brokensha, 2007), has changed as a result of this research experience. as favored in global development to inform strategic planning including in indigenous environments. As an information scientist I still regard it a reasonable expectation to conduct some amount of work on social media and other applications that can now expand dimensions of Place . However, I believe this should be done secondarily to periodic visits with the community as much as budget allows, for contextual meaning-making. More research is needed to find out the viability of long-range research in indigenous places using social media, but I suspect that without deliberative relationship building, it too will likely recreate the marginalizing outcomes of print based

questionnaires of yesteryear. It should be noted that at no point in the last 5 years were there no team members on the ground in Place, doing the necessary work of data validation through member checking, and seeking to diversify our cognitive resources through deep engagement with growing networks.

Based on findings, work is needed to build on ideas presented here on Rika Resilience. As a theoretical direction in African context, it has promise to attract institutional funding, research and implementing partnerships. This presents opportunities for systems design research collaboration in which technical expertise combines with indigenous knowledge to create a transformative open platform or bridging API's that can intersect existing platforms favored in local context.

Regionally in African context more research is needed to support local capacity to reclaim resilience building attributes of Rika, regain indigenous conceptual understanding of the relative non-importance of tribes, patriarchies, matriarchies, and clans, would be a giant step in resolving many conflicts that Indigenous communities have experienced since the erosion of dimensionality in rika. Such an effort could begin by building a taxonomy for application of sustainable development goals in local context, one that was aligned with internal resilience thinking.

While this research was more concerned with ecological health did not delve into human health beyond learning about the stewardship of medicinal plants today, the COVID-19 pandemic underscores the connectivity of our social ecological systems on a global scale,, and highlights the need to harness all available resources for the health of humans and interdependent ecologies. In this regard, Mbeere medical practitioners are eager to partner with ethical research and practice. Mīraa also presents an interesting and untapped potential.

Its active compound is still not well understood, yet its traditional use by geriatrics may point to anti-inflammatory properties. Research that facilitates copyrightable and monetizable application of such knowledge in respectful, non-contradictory terms remains in the future.

To that effect, Riley and Brokensha (1989) have written an encyclopedic volume on Mbeere plants and their medicinal uses. The book was written in a time when Mbeere was not yet skeptical of research. It contains a useful starting place for health research in Mbeere.

More work is needed in the area of human rights, socioecological justice and protection of indigenous knowledge. Kenya offers few protections for indigenous knowledge, and these are couched in contradictory terms. Accordingly, as I discovered in the course of this research, the community now operates from a stance of reasonable skepticism, after a century of industry abuses ushered in by research. Although in most countries it is now criminal to use indigenous knowledge without a multi-step consenting process encapsulated in indigenous knowledge property rights law (Gilbert, 2016), Kenya's traditional knowledge protection act of 2016 (GOK, 2016) allows for obfuscation and seizure of property. It is imperative that multidisciplinary research continue to be conducted in Mbeere, most especially research that helps resolve constitutional and legislative contradictions regarding the role of government in protecting indigenous knowledge properties.

Currently, the citizen is not protected by the Traditional knowledge and expressions Protection act of 2016. The judicial and legislative process gives itself carte blanch jurisdiction to authorize seizure for third party exploitation any indigenous knowledge properties of which the holder or trustee are perceived by an interested party to underexploit or not exploit an indigenous knowledge resource of any category. Worse still, if a property

in question was not previously registered with the county government, including uses, formulations, and processes of utilization; or if the county or national government decides it will exploit the property to greater return, then the cabinet secretary may authorize seizure carte blanch.

In other words, citizen rights are neither protected under the constitution nor on the traditional knowledge act of 2016. The law appears to benefit unnamed third parties and government intent to exploit for maximal return. This outcome once again underscores the pernicious role of sustainable development goals in indigenous context intersecting with a fundamentally unjust mandate in national legislative reform. One may well ask, by what criteria may a government or institution obtain a legitimate claim to *exploit* an indigenous property? *Exploitation* is the very antithesis of indigeneity; many indigenous properties preclude exploitation because they embed stewardship mandates in perpetuity, intended to protect endangered species. An example is the stated "public good private for bad" stewardship mandate under which public preservations are established, as seen in Chapter 5 under ecological principles.

Elsewhere, both the constitution and the PTKPE act provide for protection against just the very action of desecration of indigenous property without informed consent, yet they equally confer right of seizure by unspecified others with or without informed consent. Indeed, this ludicrous situation further highlights inability of government to acknowledge and resolve power binaries embedded in its instruments. As we saw in chapter 5 under learning motivation others notice and take advantage of these loopholes. An example is KEMRI, or

someone claiming to be KEMRI,[23] reported to have no qualms about using questionable data collecting methods. This in itself presents an area of research that is scalable worldwide in a comparative framework.

7.8 Closing Remarks

It remains now but to share some takeaways in these last paragraphs. "knowing what you know now, what would you say is the reason there isn't more empirical, evidence based research on rika from indigenous perspective? The answer is simple. It is a difficult, tiring, and time consuming process. However, I hope that future researchers will find within these pages a motivation to build on and challenge what we have started here. Particularly as we saw in Chapter 1, science agrees that Homo sapiens originated in Africa and expanded because they developed the ability to form and to coalesce around conceptual frameworks that existed only in their minds, such as the idea of a nation or a national symbol. It is only logical that Rika should have developed as system to govern systems. Its modulating mechanisms would have been needed to achieve the resilience required for sustainable widescale expansion. On the basis of etymological and research evidence through time and space, I have suggested that we reframe the benefactor-beneficiary identities to represent the framework of sustainable development more correctly in terms of Rika and returning systems. While data shows a small number of project successes where a majority have failed to meet their own goals whilst creating ecological damage, to the contrary, many initiatives

[23] *KEMRI is the national research body in Kenya, analogous to NIH,*

are well funded via loans payable by recipient nations, and pay international staff handsomely; others are simply in Africa for the profit motive that is, resource extraction. Either way, beneficiaries are overwhelmingly external. Thus, I now believe that it would take transformative change on the part of the aid industry and governments before institutions could be accurately termed capacitive partners; I no longer believe that people-led or community driven projects, as they are currently conceptualized in Africa South of the Sahara by initiating institutions, offer enough safeguards to ecological, cultural, and linguistic diversity to be of lasting use to communities in the margins, without significant reform in global development approaches. Indeed, the high instance of development project failure points to this moot fact (Brokensha, 2007). I now believe that project priorities ought to focus on reaching profound understandings of the structures of indigenous community in present-day experience, before implementing even a single project goal. I also believe that the people's propensity toward social media invites further research into innovative partnerships and funding mechanisms outside of mainstream donor and government agencies.

The central tenet of indigenist research is service to community before institution. In the course of this research, have had occasion to consider the difficulty of serving the emergent and disparate communities of Mbeere. In the end, I have decided that my duty to the community is simply to tell the untold story of Rika as a resilience building system. In so doing, I have recognized that to attempt to resolve the inherent difficulties of form and content between three languages and many cultures within the bounds of academic exercise is to lose sight of the goal. Thus, though imperfectly told, the story itself is perfect, It remains for future research to correct, refine, challenge, and build on the concepts.

As knowers of Rika, the Mbeere community has taught me what it means to build resilient ecologies: it means building governance and social systems to align with each other By visualizing the taxonomic and interactional structure of Rika, I have come to understand the ingenuity of the ideas by which Homo sapiens became so cohesive that they built empires and conquered a good bit of the world. However, I have also understood the fragility of resilience building as an impermanent state dependent on equitable access, inclusivity, and mutuality of will toward stewardship.

The maxim that, "*there is no rika between a child and a parent*," is not a declaration of strength or a dismissal of the weak. Rather, in acknowledgement of natural law, rika activates transcendent will. Thus, to be in a State of Rika is to be both parent and child. In situations of power, donor and recipient, governing and governed, supervisor and staff, each honors the child and the parent within, in a relationship of autonomous inter-reliant equals.

Glossary of Kīmbeere Terms

Most of the words are frequently used in Kīmbeere, such as *Akũrũ,* but a few are no longer in everyday usage and are only frequently used in the work at hand, such as *mumo* or *Ivate.*

Kīmbeere Terms	**English Translation/Meaning**
Akūrū	(singular: mūkūrū) Elders. Akũrũ A Kīrīra, Members of the knowledge academy. Thinkers, scholars, legislators, orators, etc., i.e., specialists in the knowledge economy[24]
Ambeere	First people. The prefix ***A*** denotes the quality of being a people. The adjective *mbeere, mbere,* and its variants, e.g., mbele in Swahili, denotes earliest occurrence in sequence, original position, or of primary importance. Plural *Ambeere,* singular, *Mūmbeere.*
Gachoka	A place in Mbeere South where we consulted with elders and members of all ages.
Harambee	Arambīī, Karambĩ. Loosely translated as, "All pull together." An indigenous operational ideal measurable by communal action in service of targets beyond personal interests, such as charitable fundraising events.
Kīambeere	A place in Mbeere South where we consulted with Elders and members of other ages.
Ishiara	A place in Mbeere North where we consulted with elders and with 18-34 years old community members; Home of Ishiara CitSci.
Irī	Preserved public land with macro level function. Sites of long term conservation programs. Geographically removed from residential areas. See Chapter under Irī. Differentiated from kīthama (plural, Ithama), numerous village level groves set aside for regular use in ceremonial and judicial function. Both defined in social anthropology as sacred groves.[25]

[24] Mbeere knowledge economy is a noted sector. Research documents value placed on oratory skills and knowledge mastery, and reports compensation for officiating in public ceremonies, public speaking, arbitration and public justice, storytelling, etc. (Brokensha, 2007; Riley & Brokensha, 1989a, 1989b; Glazier, 1985; Saberwal, 1967,1970)

[25] Riley & Brokensha (1989a, 1989b) extensively document locations of Irī in the specific areas of Mbeere covered in their 2-volume encyclopedia of Mbeere botany and ecology.

Īrumbī	One of two sociopolitical rika. A coalition of clans for electoral purpose. Level at which noncompetitive governance is effected.
Īrua	A micro level event marking entry into a rika, vertically placed in time.
Ivate	Rika. One of two macro level governing rika. Nyangi's agenda for integrated approach to stewardship. Likely identified with Mbeere South. Likely identified with *Ndegi*, a njaū name or derivate at clan-level, meaning challengers or opposition.[26]
Kīmbeere	The language of Mbeere people.
Kĩamũringa	A place in Mbeere South where we consulted migrant workers/new residents.
Kīrīra	Foundational Body of Knowledge, theoretical, abstract, can be stored and is transferable. Centered in natural/socioecological sciences, includes civil education. Delivered in interactive learning modalities by adult members. See also Akūrū, Akũrũ A Kīrīra (above)
Kūmenyerera vūrūri	Stewardship of the nation.
Marigicīria	Environment
Mīraa	Qat. A plant endemic to the hills of Mbeere, popular in Africa and the middle East for narcotic effect. Traditional usage restricted to the aged. May have implications for geriatric pain management.
Mumo	Rika. Rika Rīa Mumo. Literary, "coming out." Induction of young adults into active service.
Mūndū	Person, a human being.
Mūndū Mūgo	Naturopath. A medical practitioner who uses herbal and other natural therapies.
Mūrurī	One of two sociopolitical rika. A coalition of clans for electoral purpose. Level at which noncompetitive governance is effected.
Muuma	An oath of honor.

[26] *In present day Mbeere **Ndegi** is a matriarchal level structure, one of the largest "clans" predominantly identified with Mbeere South. (Synonym. Nditi per elder) In Embu and Gīkūyū variants exist at different scales of structure, meaning and function, termed "Maregi" in Embu (Saberwal, 1967, 1970) and "Iregi" in Gīkūyū (Kenyatta, 2015/1938; Wamue, 2001).*

mūvīrīga	A matriarchy. Clan tracing roots to a female founder and known by the founder's name (pl. mīvīrīga).
Ndegi	In the sociopolitical structure, The opposition, challengers.
Nduīko	Rika. Literary, "breaking/becoming." Induction of a polity into government by all.
Nyangi	Rika. One of two macro level rika. Progenitor of humanity. Governs agenda for integrated approach to stewardship. Likely identified with Mbeere North.
Ūkūrū	"old knowledge" or wisdom. Embodied knowledge, associated with elders, Akūrū.
Rika	As a collective, members of a corporate body. Citizens of a sovereign territory. A coalition of corporate bodies or autonomous Jurisdictions. Governing body. (Rike[27]. Swedish, natural resources; territorial wealth. Also used in this work to corporate exercise of jurisdictional right to and stewardship of land-based resources, i.e., self-determined group coalescing to effect stewardship goals)
Ūmūndū	*Ūmūndū* or Ubuntu, the shared essence of being human. My welfare, knowing, and being, is inalienable from that of my fellow humans.
UVA	An indigenous social media group and ecosystem, mainly on Facebook and WhatsApp

[27] *See Walker & Salt, (2019/2006)*

Appendices

This section is a supplemental resource meant for further information for researchers and practitioners who may be interested in applying the Rika model or the phased investigative framework delineated in the appendices focus on instrumentation and are arranged in the order in which they are first mentioned in the dissertation. Where protocols were later edited or adapted as new findings emerged, they are presented chronologically as modified, i.e., the earliest iterations appear first. This arrangement may illustrate a level of development in instrumentation.

Appendix A: Example of Textual Analysis to Support Elaborative Coding

An example of textual analysis to support elaborative coding. This coded is a finished study, intended to support coding the findings of Warrick et al (2016a), to develop on themes outlined in the work. Green ink denotes an indigenous principle. Purpose indicates there may be an essentializing concept that I may need to examine for my own systemic bias, such as "agencies excel at organizing information." Orange indicates that further questions are needed; and blue denotes a possible barrier to access

indigenous types of access on by maintaining indigenous information and environmental norms on social media.

Maintaining indigenous types of access on Social Media

The issue of types of access as raised by Jaeger & Burnett as well as in other works that derive from IW theory [7,15,16,17,33] was raised earlier. The ability to access social media and share information through a device is central to engaging with the work of UVA. While members of UVA have this type of access, UVA's effectiveness for the community lies primarily in its facilitation of access to both indigenous and non-indigenous processes. Therefore, we look at how UVA facilitates different types of access that characterize an indigenous worldview. Three types of access, namely 1) access to immediacy and tacity of knowledge, 2) access to communality, and 3) access to equality of participation, were the most remarkable types of access facilitated by UVA and characterizing a worldview tht norms to indigenous values.

Access to Immediacy and Tacity of Knowledge: information that is made available through social media is characterized by immediacy of access at the opportune moment that it is needed for use. This immediacy more closely approaches the indigenous way of accessing tacitly held knowledge in a timely manner as it is needed, without having to navigate the gatekeepers, the NGO's and government agencies that have been put in place by modern governing structures. While these agencies excel at organizing information, they may also provide barriers to access. Conversely, social media, especially now that it is ubiquitously available on the phone, and indigenous knowledge, which is continually tacitly living in the head of the knower, share a commonality in their ability to break information barriers at the individual level. Social media's global reach extends this access beyond the small world experience of the individual. This relationship is exemplified on UVA.

Access to Communality: The way in which the Facebook group UVA has been planned to fulfill a role of maintaining old values in the new information setup is typified communality. UVA is bringing back the idea of communal ownership of all of Mbeere, *"Mbeere is yours, save it!* As mentioned earlier, until the 1970s, clans communally owned all the land in Mbeere [29]. The entire community stewarded the land together through Harambee because no one truly owned the land they farmed. A change in land tenure laws privatized the land, issuing title deeds to people wherever they were settled, and defining new public spaces such as schools, clinics and roads, etc. This has forced many to turn to forestation and reforestation of their own private lands as their main stewardship activity. The uptake on stewarding the newly defined public places, such as schools, clinics or roads, has been slow. Although most of our respondents outside of UVA were cognizant of the need to give back, they did not take ownership of such newly made public areas due to the tendency of modern governing structures to distance the individual from governing agencies that have primary responsibility of the spaces. By asking the Mbeere to once again fully engage in saving all of their land, old and new as demarcated, UVA is challenging The Mbeere to begin to see the newly defined public areas, such as schools, clinics and roads, as places to target for communally driven environmental stewardship. This highlights UVA's role in helping to reshape a community's capacity to access and identify with its post-colonial public spaces.

Access to Equality of Participation: Another striking facilitation of access is exemplified by the way in which any member of UVA can propose a project on the site, regardless of scope, based on his own immediate small world concerns. The proposal could be a problem in his village. Without further censorship, a stewardship plan can be developed from one individual's proposal. The idea finds value in how well the people buy into it. There is no attempt to categorize or rank the projects; and they are approached as they arise by the various strands of connectivity among individuals on the site. This is Harambee in its most indigenous form. To people with other ways of ordering their world, this approach might seem messy, yet it allows members of UVA to respond to their environment in ways that respect their indigenous social literacies, by which we mean the ability to navigate competently within the culture to which one belongs [34].

An example of the usefulness of equalizing participation through this localized way of prioritizing on UVA, is seen in the following two projects: One user post calling for a tree planting exercise at a village primary school got as much sustained and multifaceted user engagement as the "Proposal for a Water Project." Sustained attention was given to each of these two posts, regardless of the vastly differing scopes of their impact: the first post is a small world concern, and the second has a reach beyond the immediate Mbeere information world since it calls for policymaking with stakeholder organizations and the government, at the macro level.

The crowdsourcing power of social media allows for access to equality of participation by making visible even those concerns that are difficult to bring to the table. This is important especially for issues such as mīraa growing, whose ethical considerations resonate with the community even as it benefits economically from the crop. Yet our own research confirmed the findings of a different study [23], that the government provides no information on mīraa to the community, including those who are growing the crop. Internet searches show that little is known about this crop and its effects on the environment. This makes a resource like UVA central to closing such information gaps. As is evidenced by user posts on the site, people are seeking and dispersing through the site information that they find from other sources such as scholarly journals. In a sense then, through user posts, UVA activists can use information to

Appendix B: Information Worlds Thematic Coding 2015

Mobile Technology Access (Access signifies to where one falls in terms of being able to get a hold of the physical device, and after being able to effectively understand and use needed information (intellectual access). At the highest level, being able to communicate with others on social media using the device (social access)

- **Feature Phone** (mobile phone without internet access or social media capability)
- **Smart mobile device** (cell phone, iPad, etc.)
- **Period of Ownership of Mobile Device (**in years)
- **Number of Devices Owned** (current)
- **Type of Activities (**project related)
- **Type of activities (**everyday)
- **Social Access t**o **mobile devices** (mobile devices assumed to be information repositories, accessible at social level by those who own smart devices, i.e., they can interact with others, create new information and share it).
- **Social Access to elders** (elders assumed to be knowledge repositories. Code identifies level of interaction between community members and elders. Everyday physical interaction with elders will therefore impact indigenous knowledge acquisition and/or application).
    - **Direct**
    - **Indirect**

Social Norms (Code identifies activities that are regarded as every-day. Hence, activities or practices seen as foreign are not part of this code. Social norms are well integrated into everyday life and perceptions. This code will overlap with other codes, such as Types of activities, Information Behavior, Information Value, etc. However, the code Social Norms specifically identifies indigeneity of an overlapping information behavior, value, etc. This code may prove used when behaviors, values, or perceptions do not overlap with the code Social Norms and yet further coding does not determine their origination. Such data may

point to a boundary space—a place where other iWorlds intersect with indigenous context, resulting in shared behaviors, values, or perceptions.

Social Types (Code identifies groups or actors with key roles. Assumed for the indigenous world to include elders. Code identifies key actors in the lifeworld –at meso and macro level whose actions, behaviors, or decisions affect the community. This research does not analyze individual level phenomena. Coded responses of individual interviews (only 12) are corroborated with data from talking circles, and content extracted from social media.

Information value (Within a small world, a shared sense of which information is worthy of attention--this can be scaled from least to most important. Coder will determine the category that valued information is to be placed under, economic, historical, or cultural, according to Theory of iWorlds. Contextually, assumed to include Indigenous Value)

Information Behavior (Information behavior is user response to a perceived information gap. Do they respond by seeking information, communicating, or exchanging information with others? Does he actively avoid information because it is deemed unimportant or unnecessary or does he act by expressing a wish to have the gap filled while seeming passive to the observer. Researcher perceptions will be mindful that seeming passivity may not necessarily be passive in lived experience; hence, must be further investigated to determine underlying factors. Statements such as, 'I wish we had, I wish we could, it would be nice if...need to be followed up). Information behavior may include:

- Information creation (original data- stories, images, etc.)
- Information exchange/sharing (communicating with others to share found information, interactions between members of an iWorld)

- Information Seeking (Active search for purposeful information, e.g., by walking to a place to talk to others, calling, using the internet, etc.)
- Information hoarding (Are there social types who hoard information, for example in the lifeworld at meso and macro level? Elders are assumed to store information but with intent to share/teach. Do other social types act likewise or with contrasting behaviors?)
- Information avoidance (Researcher perceptions will remain mindful that seeming avoidance may be otherwise, for example. It may appear to the researcher as if certain prompts during interviews are not deemed worthy of discussion by the community members being prompted. Other times, it may appear that certain prompts or discussion threads activate self-perceptions of powerlessness, thus leading to avoidance of those topics. Yet, seeming avoidance may in actuality be a latent contextual factor that requires deeper understanding.

Boundaries: (Code identifies spaces that define a small world by separating it from other worlds (Note that boundary objects are things, ideas, or activities that can be used to identify and define a small world as a separate entity with characteristics within its boundaries that are uniquely different even while perhaps sharing similarities in other ways with other similar small worlds e.g., technology, projects, environmental features such as rivers)

- Marginalizing boundary space
- Empowering boundaries space

Bridges: (Code identifies actors, entities, and ideas that may have an empowering effect on a small world, by increasing access to information or to other actors with information to share. There may also be types of bridges that do not involve information. The code helps identify factors that facilitate interactions inside the small world between groups, or outside the small world with the lifeworld at meso or macro level.

External Lifeworld Forces (These are forces from the meso or macro world, the world outside of the indigenous community. Code identifies external forces that are overtly raised by participants themselves as impacting on their small world. Code additionally identifies impactful forces that are inferred in the data during analysis, even if participants appeared

unaware of interacting with these forces. For example, mobile technology is an impactful global force).

Community-identified

- Economic External Lifeworld Forces
- Social External Lifeworld Forces
- Political External Lifeworld Forces

Researcher-identified

- Economic External Lifeworld Forces
- Social External Lifeworld Forces
- Political External Lifeworld Forces

Perceptions (The way members perceive themselves and the lifeworld (important in that perceptions impact and are impacted by values, norms, and behavior, ergo this code can help deconstruct those other iWorld codes, especially information behavior, which may be less obvious. This code is an entry point into in vivo coding (Saldana, 2013/2016) i.e., using participants words to generate a set of indigenous codes).

- **Perceptions of participatory projects (**The way members perceive those projects they choose to participate in, including aspects of the projects that interest them personally, which aspect are of benefit to the community and why; use of technology in those projects; their own use of technology in those projects; how they access the projects—i.e., in person or using a mobile device. If they get paid, say a stipend, why they think the project is in the area in their own words, if this goal is being met, and impacts on biodiversity/environment, whether good or bad, according to them).
- **Perceptions of incentives to volunteering** (these are self-identified motivations to participating in identified projects)
- **Perceptions of deterrents to volunteering** (these are self-identified deterrents or demotivators to participating in identified projects)
- **Perceived small world concerns** (Code will include any perceived concern raised by participants. In the Theory of iWorlds, small world concerns may

motivate survival goals that could lead to actional change with wider reaching transformative impact; or they may point to meso and macro level concerns that need to be addressed at policy level beyond the small world. Ergo concerns may participatory behaviors of community members in the projects that they are engaged in (survival) and/or suggest need for further research at macro or meso level. *Importantly, although they may include factors such as wealth, poverty, health, safety, and other negative issues that researchers may have encountered in prior literature on the context under research, concerns will be member-identified and may not for any reason be researcher-identified.* Raised factors may be a result of the impact of external forces on the small world, or they may be generated within the small world itself. There is overlap between this code and the External Lifeworld Forces code, but this code identifies only those external lifeworld forces that are a small world concern).

Appendix C: Observational Protocol

Following on the learning from early protocols, that a less structured interview design was more effective in eliciting responses because a conversational protocol was preferred by community members, I developed the questions below, to be general enough to interrogate research instruments for social structures and strategies of stewardship. The questions were initially used by team members to guide field observations note-taking. Being geographically dispersed; we needed a standard protocol to approach the field. They turned out to be equally useful for content analysis of social media posts; and for reinterpreting datasets in the older transcripts, from our earliest talking circles in 2015; revisited for new insights on structure and strategies.

A separate set of questions was used to collect data on motivations as discussed in methods and posted below under "survey design"

1. What is the activity?
2. Where is it taking place?
3. Is it being described, observed, or recollected?
4. Is the activity planned or organic?
5. Is there a stated purpose or function? Is there a latent purpose or function (unstated)?
6. What is the expected outcome?
7. Who is involved? (their self-descriptions re demographics, relationships, etc.).
8. How is communication happening between those involved?
9. What is the process—describe steps, duration, frequency,

10. What are the commonalities of those involved? How are they identifiable as a group or not?
11. What are the divergencies of those involved? Do divergencies possibly point to connections with other groups? Which? How? How many? (for example, gender, age, where they live/work).
12. At what stage of the activity do community members describe their own involvement?
13. How do they perceive their own and others' involvement?
14. At what stage do researchers embark on observing/participating?
15. Is this a volunteer type effort or one that supports a livelihood, or is there a profit-motive (Livelihood activities such as farming do not always have a profit-motive, can you tell the difference?)
16. Does the activity primarily help others or those directly engaged in it?
17. Is there any use of devices/tools? If yes, describe these. If no, describe why not. Are any of the tools technological? What other devices are identified?
18. Has any concern been expressed about the activity? Why and by who?
19. Do groups differ about what constitutes a concern?
20. Have any solutions been attempted, suggested, or embarked on?

Appendix D: Early Question Formulation in The Summer of 2015

RQ: What is the role of Mobile Technology in engagement with biodiversity and conservation issues in Mbeere?

a) To what extent is mobile technology integrated into Mbeere information worlds?	
i) To what extent do Mbeere community members own and use mobile devices?	Do you have a mobile device? How many? What kind? Please tell us how long you have had your (mobile device)
ii) To what extent can we identify information worlds within Mbeere mobile device users?	What kinds of things do you use it for (probe about daily use, get into specific activities if participant gives general answers)? What do you do for a living (or in your daily life)? (If participant has not yet stated)
iii) What are the value systems that suggest themselves within these information worlds	What motivates you to keep your (mobile device) handy and usable? What sorts of things do you think are most important to use a mobile phone for (even if you don't do them or rarely do them yourself)? Why? (or why not, if the participant also tangentially states things, they think are not important).

b) To what extent is biodiversity and conservation valued within Mbeere information worlds?	
i) Are there conservation and biodiversity issues that are of concern to Mbeere small worlds?	In your daily life, what do you notice about the environment around you? Do you have any concerns about the nature around you? (If yes, ask for specifics, if no, ask for an explanation)

ii) To what extent and by what means do small worlds seek to engage with conservation or biodiversity issues of concern to them?	Have you ever been involved in a cleanup or greening project (if participant is hazy, give Maathai's Greenpeace efforts or the Kibera sewage cleanup as examples)? If no, would you be interested in taking part in such an effort—why or why not? If yes, what motivated you to get involved and how long were you involved? If yes, do you feel as if your efforts paid off? Would you get involved again?
iii) What are the barriers to engagement with conservation or biodiversity issues?	If no, would you be interested in taking part in such an effort? What would stop you from participating if you were interested? What would be a reason you feel you may not be interested/want to be able to?

C) To what extent is mobile technology viewed and used as a current or potential tool to engage with biodiversity and conservation questions?	
i) To what extent is mobile technology viewed as a current tool to engage with conservation or other biodiversity questions?	Are you aware of any nature, cleanup, or greening efforts in which you can use your (mobile device) to give information in your location? If yes, ask to name and ask about interest level. If no, provide Birdmap or Kibera balloon project examples and show on mobile device. What do you think about this effort?

ii) To what extent is mobile technology used to engage with conservation or other biodiversity questions?	How do you feel about using your mobile device to contribute to this effort? How do you feel about others using their mobile device to contribute to this effort?
iii) To what extent do participants identify/claim alternative ways of engaging in conservation or other biodiversity issues?	(Depending on previous Answer) Would you engage in (participant or researcher named biodiversity effort) in a different way? Are there ways you would act on this (describe participant-contributed action) without using technology? (specify devices). (Depending on previous answer, ask the question as and/if/or).

This protocol is intended for use with individuals and with talking circle focus groups. The researcher will self-introduce, state the purpose of the research as to find out about Mbeere people's everyday participation in conservation and biodiversity using mobile technology.

The interviewer will then prompt the participant(s) for an introduction and ask them to state what they do for a living.

The interviewer will ask about the participant's devices if they are in view. If not, the question will be tactfully asked to probe for ownership. The following prompts will guide the interview.

Determining level of mobile technology integration in the information system.

1. Please tell us how long you have had your (mobile device) and what kinds of things you use it for (probe about daily use, get into specific activities if clarification is needed) (addresses questions of phone ownership and usage and relates to both RQ's but how?)
2. What motivates you to keep your (mobile device) handy and usable? (Mbeere small world idea).
3. For small worlds without mobile devices, ask questions 1-4 as wish questions.

Determining awareness of conservation & biodiversity in general.

1. In your daily life, what do you notice about the environment around you?
2. Do you have any concerns about the nature around you? (If yes, ask for specifics, if no, ask for an explanation)

Determining motivation/value around engagement with conservation.

1. Have you ever been involved in a cleanup or greening project (if participant is unsure of meaning, give Maathai's Greenpeace efforts or the Kibera sewage cleanup as examples)
2. If no, would you be interested in taking part in such an effort—why or why not? If yes, what motivated you to get involved and how long were you involved?
3. If yes, do you feel as if your efforts paid off? Would you get involved again?

Determining perception of technology as a tool for conservation.

1. Are you aware of any nature, cleanup, or greening efforts in which you can use your (mobile device) to give information in your location?
2. If yes, ask to name and ask about interest level. If no, provide Birdmap or Kibera balloon project examples and show on mobile device.
3. What do you think about this effort?
4. How do you feel about using your mobile device to contribute data to this effort?

Determining localized or alternative ways of engaging with conservation and/or biodiversity.

1. Would you engage in (last identified biodiversity effort) in a different way? How?
2. Are there other ways you would act on this (describe participant-contributed action to probe for ways that do not use technology) without using technology? (Name examples of what is meant by technology—mobile devices)

(Depending on the answer to the last question, ask this question as an and/if/also/or).

Appendix E: Protocol for Talking Circles in Summer 2015.

The Talking Circle Protocol was developed in 2015 after lessons learned from the Initial semi structured interview protocol. There was need to aim for connection, relationship building, and researcher-learning, rather than to focus on efficiency and precision (repeating the same questions over the same amounts of time regardless of the interviewee). This protocol accounted for the expert role of the community members. The outcome was that I was invited to observe conversations on community projects on closed FB groups.

Introduction

Thank you so much for coming today. I value your time and your participation in this conversation about our community and how we are engaged in keeping our community and our environment healthy.

1. Let's us each introduce ourselves. I will start by telling you my name and what I am doing.

2. Let's now talk about things that we think are just important in general, in our lives, that we feel like we value in our lives.

3. So now that we have talked about things we value in our lives, let's have a chat about some environmental concerns that come up around us.
   a. For example, what are we thinking and talking about mīraa?
   b. What are we thinking and talking about water?

4. What about activities that help us make a living? What connections are we seeing here between the things we do every day and the environment in Mbeere?

5. Are you communicating with friends, family, and colleagues, others, about these things that we have been talking about? If you are, how are you doing this?

6. Tell us about some of the technology you like to use in your daily life.

7. What are some of the things you would like to see happening regarding the environment around you?

8. Does anyone have a concern or achievement they would like to share that we have not discussed yet?

9. Do you have any questions for me about this research?

Appendix F: Elder Consultation Protocol in The Fall of 2015-Followup With Gachoka Elders

Goal of elder consulting circle: This session is meant to elicit information about the indigenous lifeworld, its perspectives, values, and concerns in relation to the environment. In addition, the session is meant to be a bridging exercise, between social media and indigenous knowledge. We will elicit elder wisdom about the endeavors of UVA, by exploring the site together on Facebook.

This protocol is prepared for use with Skype and WhatsApp. The Senior Research Assistant will make this word of mouth call, for elder participation. At least 4 elders are expected to attend. The Principal investigator has returned to the U.S. at the time of this circle, hence the SRA will be the one physically present. She will bring with her a driver for off-road driving. He will assist with setting up the laptops, phone, and microphone for the circle. One of the elders, Mũ kũrũ, will host the session at his farm. The scripted part of this session is expected to be two hours long, however this will likely be a half-day event, counting the time it takes to gather everyone together, share a tea break, prayers and other social openers that are required by local protocol.

Appendix G: Research Question Development

Questions Mapped to Interview Prompts

a) What is the underlying structure that supports environmental stewardship in an indigenous community with place-based and social media approaches?	
Further sub questions	Prompts
i) To what extent can we identify social ties within the Facebook group? ii) To what extent do these social ties reflect place based ties? iii) What types of Harambee-centered posts generate the most engagement and how can these inform understandings about a. user motivation toward participation on the site? b. User strategies towards stewardship?	Interrogate the dataset by applying codes generated from talking circles as measures for thematic content analysis and data visualization. (Provides insights into access, perceptions of dominant social types, motivations, and strategies. Triangulates talking circles and field observations).

i) To what extent is Harambee-Stewardship an embedded in the psyche of elders? ii) To what extent are values a bridge for knowledge transfer between elders and UVA (the identified place based and social media loci of philosophic sagacity)? iii) What is the elders' perspective of Mbeere social-environmental motivations and strategies? iv) What do elders perceive as barriers to Stewardship?	1) A-kũrũ (Elders), (Translates into, "please tell me about harambee in the history of Mbeere"). (Na nīngwendaga kūvoya ūkūrū wa Harambee. Kambūrie atīrī, indiiriya yari ya tene kwaugagwa atia uvoro wa Harambee. Wana indi ya mukoroni Mbeere ya uhuru mbigucaga nikwari Harambee Mbeere, tiguo. Yekagwa atia?) 2) What advice do you have for the young people in Mbeere? (Together, using researchers' laptops, go to the Facebook group, UVA) We know about coming together here, (point out features, navigate the site), What do you want to say to them? (Aravu makavangira wira kuu computeri, makerana "tugatungana jumamosi tuvande miti." Nimwenda kumera atia?). 3) "to please tell me what you know about nature") (Tr: Tuve ūkūrū wa miti na manji. Uria tungika kumenyerera indo iria tuvetwe ni ngai) 4) If we could reach the government, what would we say to them? (Tukavota gukinyira Thirikari ungienda tumire atia uvoro ucio tuaria?)]

b) What motivates engagement in environmental stewardship within this information framework?	
Further sub questions	Prompts for user testing/pilot with 5 participants.

Online survey explorative study i) how accessible is the survey to participants? ii) What are usability issues and how can they be resolved? iii) What items are perceived to be of high importance on the survey? iv) What items are perceived to be of low importance on the survey v) To what extent do participants offer suggestions and comments to increase the survey's perceived relevance?	1. What kind of phone are you using? 2. Were you OK getting in? 3. Did you/would you go to a café to open a survey like this one, why or why not and under what circumstances? 4. What did you like about (particular question) on the survey? 5. What did you find potentially useful about (particular question) on the survey? 6. Was there anything you could not see/click on? 7. Did you experience any other kinds of issues? (bandwidth, data plan, usage, no smart phone, etc). 8. Would you share this survey with your own circle on UVA? Why or why not?

i) What are the demographics of user participants on UVA, and how can these be mapped onto motivations towards participation through other survey responses? ii) What are the participant identified participant recruiting/self-recruiting patterns? iii) What motivation users towards participation on UVA? iv) What do participants perceive as their own motivations towards participation? v) To what extend can we uncover the social media information system in patterns of use among UVA members? vi) How do user definitions of UVA as an open or closed platform within the context of the wider society influence motivations towards participation	**Prompts for the survey, shared with UVA Admin Group, Dec 2016—intended for further development with the group before release.** 1. What is your age 2. What is your gender? 3. How long have you participated on UVA? 4. Please tell us where you lived when you joined UVA. 5. How did you first hear about UVA? 6. Are you a member of other Mbeere Facebook groups? 7. If yes, which other Mbeere groups do you participate in? 8. On UVA, what conversations on UVA are of greatest interest to you? 9. On UVA, what kinds of activities do you currently participate in? 10. What motivates you to participate on UVA? 11. What is the most important motivation for you to participant on UVA? 12. Are there other activities you would like to contribute to or see others contribute to on UVA? 13. What other modes of communication do you use for community activities (WhatsApp, Twitter, face to face etc) 14. Should UVA remain a closed group? Why or why not? 15. Thank you (Provides raffle details with disclaimer). Please see the full protocol of the survey, in Appendix E below.

c) What strategies do community members employ to address environmental concerns within this information framework?	
Further sub questions	Interview protocol

i) What do participants value in their everyday lives? ii) How do environmental values influence strategic action towards the environment? iii) What connections can we make between these values, access to social media and actions taken by the participants? iv) What is the relationship between livelihood priorities, environmental values and social media use? v) What is the participant perception of research relevance and how can this point to future directions? (member checking)	1) Lets now talk about things that we think are important in general, in our lives, that we feel like we value in our lives. 2) How do we tend to communicate to others about these things that are important to us? What social media are we using in our everyday lives? 3) So now that we have talked about things we value in our lives, let's have a chat about some environmental challenges that come up around us. Are we talking about these challenges on social media? What do we do about these challenges? a. For example, what are we thinking and talking about mīraa? b. What are we thinking and talking about water? 4) What about activities that help us make a living? One imagines cell phones play a big role. Could you describe some of the things you do on social media to make a living? Looking at how we use social media to make a living, how do we make connections between our business and professional activities and the environment in Mbeere? 5) Do you feel that our report on YouTube has been representative of UVA and Mbeere? Please feel free to include those ideas that came through clearly for you and add things you feel may be needed to communicate the report of last year's research to the community. 6) Are you likely to share any of the report (linked paper, YouTube Vid)? How? 7) Are there activities on UVA and in Mbeere that you would like to see discussed in future reports? 8) Do you have questions or comments for me or for anyone here today, regarding the things we have talked today?

	Field observations will primarily center on the participant Mũtwĩri as he interacts with his community at Ishiara. Mũtwĩri is also an UVA activist. We will shadow him and his closest associates as they engage in place based water monitoring and management activities. We expect to observe the participant segue into other environmental activities, in keeping with Harambee-Stewardship. We plan for at least 3 observational days over a 4-week period. The following notes will guide our note-taking over the course of 3 weeks: 1) What is the activity? 2) How many participants are involved? 3) What are the genders of those involved and what roles do they appear to be playing? 4) Is this a volunteer type effort or one that supports a livelihood, or is there a profit-motive (Livelihood activities such as farming do not always have a profit-motive, can you tell the difference?) 5) Does the activity primarily help others or the one who is engaged in it? 6) Is there any use of tools? Describe these. 7) Are any of the tools technological? 8) Which technology devices are being used? 9) How is communication happening? 10) Is social media being used? 11) How long/often does this activity occur? 12) At what stage did you find it? 13) What is the process—describe the process 14) What is the expected outcome? 15) Who benefits from this expected outcome?

Appendix H: Research Protocols 2016-2017

Method: Social Media/Network Data Extraction and Analysis
Tool: APIs and Plugins for Platforms (e.g., Graphml.com, Gephi.com)
Purpose: Call up, visualize, synthesize, and analyze user posts, demographics, ties, etc.

Interrogate the dataset by applying codes generated from talking circles as measures for thematic content analysis and data visualization. (Provides insights into dominant social types, access, motivations, and strategies. Triangulates talking circles and field observations).

Identifying social ties within the Facebook group UVA (and linking ties to the Mbeere information world, access, and land based resources).
1) To what extent do these social ties reflect place based ties?
2) to what extent do these social ties reflect online-only ties?

Determining user motivation to participate
iii) What types of Harambee-centered posts generate the most engagement and how can these inform understandings about
c. Can we identify patterns of user motivation toward participation on the site based on user posts?

Determining the relationship between posts that generate the most engagement and user strategies following those posts.
d. What are the users saying, planning to do and actually doing? How are they planning/claiming to do it?

Method: Elder Consultation
Place: Kĩambeere, Kĩamũringa, Ishiara and Environs.
Purpose: New elder participants in a different part of Mbeere, to increase validity of explorative study findings with elders in Gachoka.

Based on lessons from 2015, the researchers will make all efforts to appear less "outside expert interrogator" and more of "learners," in order to avoid alienating knowledge expertise). Only questions found to inform findings (partially reported in Warrick et al, in submission, 2016; and in the IRB continuing Review for July 2016) have been retained to maximize elders' interactions with each other in the circle.

Protocol
Wait to be introduced by appropriate person.
Proffer visitor offerings.
Accept tea/meal/offerings from host.

Participate in greetings, self-identification and identification of selves as members of community.[28]
On signal, begin with the following, giving leeway for asking less of the outlined questions, and listening more than speaking.

Determining universality of Harambee-stewardship.
1. A-kũrũ (Elders), I have come to ask for knowledge, firstly about Harambee. How people were invited for communal work and how was it organized-even before independence. (Translates into, "please tell me about harambee in the history of Mbeere"). (Na ningwendaga kuvoya ūkūrū wan Harambee. Kamburie atiri, indiiriya yari ya tene kwaugagwa atia uvoro wa Harambee. Wana indi ya mukoroni Mbeere ya uhuru mbigucaga nikwari Harambee Mbeere, tiguo. Yekagwa atia?)

Determining values as bridge to knowledge transfer between elders and UVA (the place based and social media loci).
2. What advice do you have for the young people in Mbeere (or for us)? (Together, using researchers' laptops, go to the Facebook group, UVA) We know how they are coming together here, (point out features, navigate the site), and they are saying, wiva? What do you want to say to them? (Aravu makavangira wira kuu computeri, makerana "tugatungana jumamosi tuvande miti." Nimwenda kumera atia?).

Determining elders' perspective of environmental actors, agency, motivations, and strategies.
3. On wisdom about trees and water, how do we as Mbeere people care for the things that the Divine has given us. "--or words to convey concept of environmental stewardship. Listen for correction, clarification, etc and adjust lexicon" Tr: Tuve ūkūrū wa marigiciria, uguo ta, mītī, manjī. Yani, Uria mumbeere agicaga uvoti ucio wa kumenyerera indo iria tuvetwe ni Ngai, twamwitaga Mwene Nyaga, na rimwe Murungu.)

Determining elders' perspectives of barriers to stewardship.
4. I am sure that things have changed in Mbeere over time. Thinking back to your youth and up to today, are there environmental changes that you feel are significant/changes you'd want to tell us about? Tr. Okī riu maundu mathiite magicenjagia. Mukiroria uguo kuavuana murianini noguo gukariī riu, rī, muno marigicīria, ni maundu ta mariku magarurukite muno. Kana wana akorua ni ti muno, gugakorua ati ni maudu tuagirirue ni gukorua tukimenya uvoro wa urua kwari mbererī, na uria kugarukite.
5. Akūrū, what would you like to those who are in power, in government and elsewhere, to know about the things we have talked about here today? Which of these issues would you

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[28] *I have come to a new realization of this protocol. I now believe self locating as a participant in a conversation is a rika mandate to establish rika between conversationists, by establishing where hierarchies may lie and where points of convergence may be found to flatten the identified binaries/hierarchies. In present day, the same mechanism may possibly be appropriated to different purpose with some members misinformed or ignorant of coeval intent. Therefore, A key contribution of Elders was translation of conversational protocols such as this one.*

want to bring to their attention? (Mungiaria na andu a Thirikari mungienda kumira atia uvoro ucio tuaria?)

Method: Survey Pilot
Place: WhatsApp discussions and file sharing, emails, phone calls, survey monkey.

Purpose: Conduct pilots, facilitate mutual goal identification, survey co-design, and possible research-practice (diaspora/Place/diaspora) partnership. Research team discusses their role in developing the survey tool to support the following goals research goals:

- Expand participant base
- Quantify motivation towards participation.
- Possibly increase female participation.
- Define structural aspects of social media participation
- Determine ties of users with Place.

Team Planning/Implementation Protocol:

For each pilot cluster, research team member in charge of exercise will state objective, to test the UVA online survey for ease of use and relevance; i.e., Initial Cluster consists of 5 participants who previously self-reported in conversational talking circle data as members of UVA. Secondary cluster consists of research team members. Using feedback and design ideas shared by members of the Initial Cluster, the team will iteratively test and contextualize content and format). The process will be synchronous whenever inperson meetings or video chats are possible, otherwise communication will be asynchronous.

As appropriate, team member conveys goal, instructions, and expectations for pilot on WhatsApp: Please take the survey I've just shared with you (on WhatsApp. It should take about 10 minutes. Afterwards, feel free to share anything about the experience--what was easy, hard, clear, not clear, improvements needed, etc., how your devise behaved, etc. will get together and think about how we might jointly modify the survey so that it is relevant, accessible, and easy to fill out.

Instruct users to provide immediate feedback if survey fails to load. Check if more than one device was used. Troubleshoot if needed. Reassure them that the objective isn't to "get to the finish line," but to improve the tool based on their feedback on ease of access, relevance of content, appropriateness of language, type of questions; and/or design ideas.

If participant(s) are able to get in the survey, discuss user experience and perceptions with specific questions and with the survey as a whole.

Questions to guide user experience feedback:
A: Determining accessibility of survey to UVA participants and usability issues to be resolved.

1. What kind of phone are you using?
2. Were you OK getting in?
3. Was there anything you could not see/click on?
4. Did you experience any other kinds of issues? (data, usage, no smart phone, etc).
5. Did/would you go to a café to fill this survey or others like it? Why, why not? (also a relevance question)

B: Determining questions perceived to be of high importance and low importance
6. What did you like about (particular question) on the survey?
7. What did you find potentially useful about (particular question) on the survey?

C: Determining the relevance of the survey in participants' everyday experiences
8. Do you have suggestions to make this survey more relevant to your current or past activities on UVA?
9. Would you share this survey with your own circle on UVA? Why or why not?

Survey questionnaire protocol
(goals A-G were used to guide research development. They were not included in the survey questionnaire).

A: Introduction, instructions, and disclaimers
B: Determining the demographics of user participants on UVA.
1. What is your age
2. What is your gender?
C: Determining participant recruiting/self-recruiting patterns
3. How long have you participated on UVA?
4. Please tell us where you lived when you joined UVA.
5. How did you first hear about UVA?
6. Are you a member of other Mbeere Facebook groups?
7. If yes, which other Mbeere groups do you participate in?
D: Determining patterns of motivations towards participation.
8. On UVA, what conversations on UVA are of greatest interest to you?
9. On UVA, what kinds of activities do you currently participate in?
E: Determining participant perceptions of own motivations towards participation.
10. What motivates you to participate on UVA?
11. What is the most important motivation for you to participant on UVA?
12. Are there other activities you would like to contribute to or see others contribute to on UVA?
F: Determining the social media information system and patterns of use among UVA members.
13. What other modes of communication do you use for community activities (WhatsApp, Twitter, inperson, etc.)
G: Determining how user definitions of UVA as an open or closed platform within the context of the wider society influences motivations towards participation
14. Should UVA remain a closed group? Why or why not?

15. Thank you (Provides raffle details with disclaimer).

The final survey after adaptation for context is in the Methods chapter Under "Data Collection"

Method: Talking Circles.
Places

- Gachoka
- Ishiara
- Kĩambeere
- Kĩamũringa

Purpose:

- Garner new participants in two different parts of Mbeere, to increase validity of explorative study findings at Gachoka and Ishiara.
- Increase gender balance (Skewed in 2015 4:1 by propensity of males to respond to randomized individual interview recruitment relative to females. Co-ocurring predominant view of "expertise" by elders 60-84 yrs old as a male domain 2015)
- Increase age range participation to include older elders. Ramp up purposive recruitment of elders educated indigenously to balance neoteric perspectives of elders educated in Returning Systems.

Participants 18 years and older are eligible to participate.

A: Determining everyday values of participants.
1) Lets now talk about things that we think are important in general, in our lives, that we feel like we value in our lives.
2) How do we tend to communicate to others about these things that are important to us? What social media are we using in our everyday lives?

B: Determining environmental values and strategic action towards the environment. .
3) So now that we have talked about things we value in our lives, let's have a chat about some environmental challenges that come up around us. Are we talking about them on social media? What do we do about these challenges?
a. For example, what are we thinking and talking about mīraa? What are we doing?
b. What are we thinking and talking about water? What are we doing?

C: Determining relationship between livelihood priorities, environmental values and social media use.
4) What about activities that help us make a living? One imagines cell phones play a big role. Could you describe some of the things you do on social media to make a living? Looking at how we use social media to make a living, how do we make connections between our business and professional activities and the environment in Mbeere?

D: Determining participant perception of research relevance and future directions (member checking)

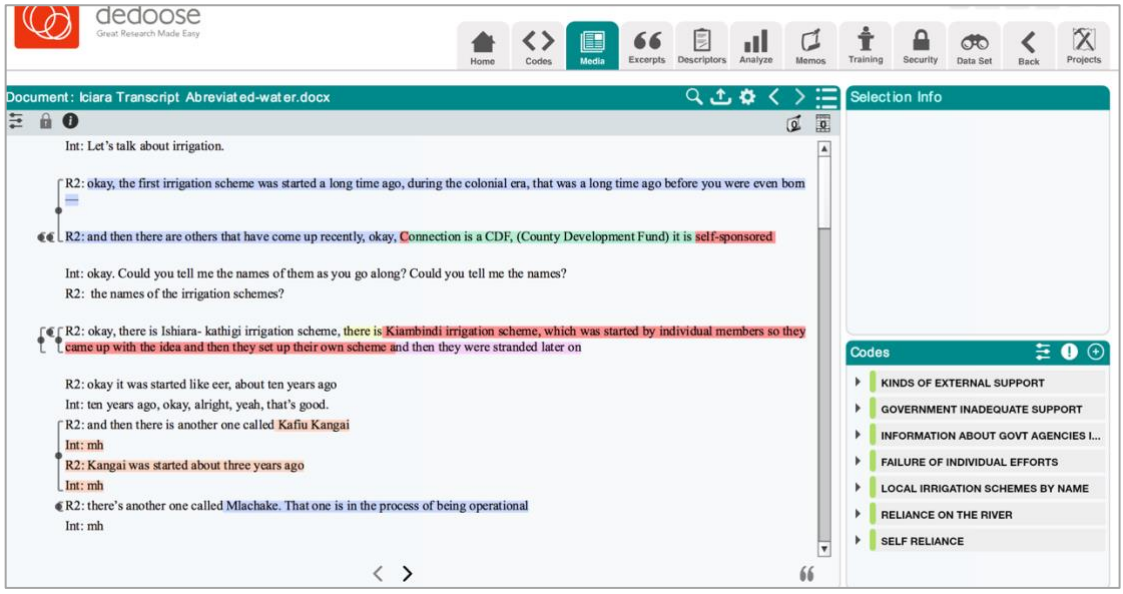
5) Do you feel that our report on YouTube has been representative of UVA and Mbeere? Please feel free to include those ideas that came through clearly for you and add things you feel may be needed to communicate the report of last year's research to the community.

6) Are you likely to share any of the report (linked paper, YouTube Vid)? How?

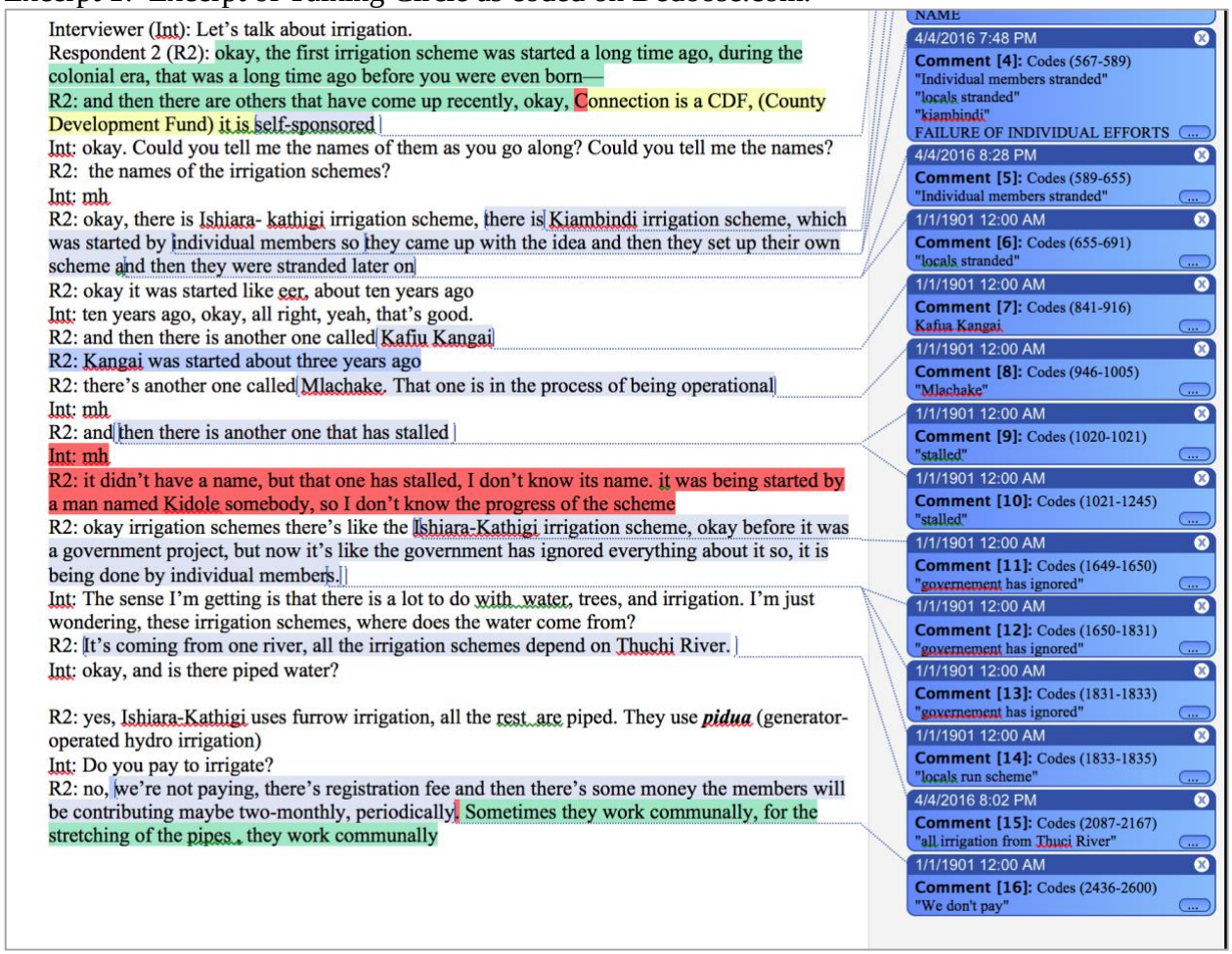
7) Are there activities on UVA and in Mbeere that you would like to see discussed in future reports?

8) Do you have questions or comments for me or for anyone here today, regarding the things we have talked today?

Appendix I: Excerpts of Coded Transcripts



Excerpt 1: Excerpt of Talking Circle as coded on Dedoose.com.



Excerpt 2: The same coded excerpt, exported from Dedoose.com, into Microsoft Word. This talking circle had 5 community members, of which R #2 was the green irrigation expert. He dominated this part of the conversation.

Appendix J: Institutional Projects

The table below shows community perception of its participation and role in different types of projects, as provided by community members; and later confirmed by research team members through interviews with staff at the projects. I have termed them macro level projects because they originate outside the community out of macro level initiatives predominated by government, donor agencies, the returning belief system, and research institutions. Projects use people-led, participatory or community driven' approaches. Responses about indigenous perceptions of how they participate in these projects have been tabulated below with data from various talking circles, interviews, emails, WhatsApp chats, and conversations with community members. As far as we know this information has not been put together in one resource before. Except for two projects (Ishiara Kathĩgĩ canal irrigation scheme; Ishiara Youth Group) where they have planning, managerial, and creative oversight, local contribution to these projects is seen as occurring predominantly through manual labor. The community sees its role as that of beneficiary rather than owner or originator. As stated in findings of the explorative phase, community members indicated that they did not have reason to visit the social media sites of projects.

Table of Community members' perceptions of own participation and role in projects.

Organization Or group name	**Information and Communication Channels**		**Organizational Focus**	**Level of community Involvement**	**Do Citizens monitor Data?**
	Website	Social media			
Community Self Help Groups					
Ishiara dynamic youth group	N	Y	Public education and environment conservation	Grassroots direct self help	N
E-EEPO	N	N	Aqua culture and tree planting	Manual Labor	N
Kiambindu CBO	N	N	People led development activities like soil conservation	Manual labor mixed with limited self-management	N
Ishiara Kathĩgĩ	N	Y	Canal (green) irrigation	Self-funded and managed/was a neglected gov projects from 1930s.	Y/tacit
Kiambindu	N	N	Piped irrigation	Manual labor	N

Kangai	N	N	Piped irrigation	Manual Labor	N
Murachaki	N	N	Piped irrigation	Manual Labor	N
National Organizations (Government Agencies and National level Non-Profits)					
WRMA	Y	N	Water resource management	Encourages locals to form WRUAs	N
WRUA	Y	N	Management of a common water resource	Locals form association/ co-operative With WRMA supervision	Y/tacit
UTaNRMP	Y	Y	Reduction of rural poverty in the upper Tana river catchment through funding of projects	Beneficiaries contribute a % to the funding of their respective projects	N
KEFRI	Y	Y	Research in forestry and allied natural resources	No local partnership	N
NEMA	Y	Y	Environment management	No local partnership	N
KARI	Y	Y	Strengthens capacity for climate change adaptation on sustainable land and water management	No local partnership	N
International organizations (*May provide sponsorship of environment-related projects that fit within organizational goals)					
CARITAS	Y	Y	Poverty alleviation	Participatory development e.g. microfinance and soil conservation	N
TROCAIRE	Y	Y	Development and emergency relief in developing countries	Locals participate manually in implementation of projects	N

JICA	Y	Y	Development assistance for evolving countries	Locals participate manually; at completion hands over management	N
UNDP	Y	Y	Poverty eradication	No local partnership	N
ACTION AID	Y	Y	Enlighten the marginalized locals and support them to uplift their living standards	Locals participate manually in implementation of projects	N
USAID	Y	Y	Provide economic, development and humanitarian assistance	Locals participate manually in implementation of projects	N
TIST*	Y	Y	Tree planting aimed at transfer of carbon credits to European and other countries abroad.	Locals are paid for every tree that TIST plants on their private land from six months to 60 years -Carbon credits traded by company on open international market-locals have no direct stake on open market trading.	Y Restricted to phenological data (period reports of incremental breadth/height of plant growth, posted on company website by location and other clustering variables)
COMPASSION INC*	Y	Y	Welfare of Needy children, incl environmental causes	Project funding through local returning belief system	Y
APHIA PLUS	Y	Y	Integrated approach to health incl. Environmental projects	Locals participate manually and through informal learning	N
KenGen (Kenya Power)	Y	Y	National level hydroelectric development project	-No local partnership -Dispossessive and marginalizing practices. 70% gov shares 30% open market investors-Europe, Africa.	Access to confiscated land forcibly denied on pain of death

Appendix K: In-Person Meeting With UVA Admin Protocol

I request your administrative permission to automate a data call-up on UVA: Universal Voice for All-The Chance for Mbeere! in a research study conducted by myself, Elizabeth Muthoni Warrick. I am a PhD student from the UNIVERSITY OF Maryland's College of Information Studies. I hope to learn how the Mbeere people are using social media spaces such as UVA to address environmental issues in Mbeere. UVA was selected for possible participation in this study because of the role that it is playing in environmental stewardship in Mbeere. Roughly 1/5 (a fifth) of the people I interviewed when I began research in 2015 indicated that they were members of UVA. It is on their invitation that I seek a deeper understanding of UVA and its impacts.

The permission I seek includes

· Calling up data with software such as Netvizz (https://apps.facebook.com/netvizz/) and NodeXL, (http://nodexl.codeplex.com/) . This is the same as simply observing what users are posting on the page, however, using software allows me to collect and work with a large number of posts, in a way that I cannot do manually. Attached is an example of data that has been visualized in the way that we intend to visualize data from UVA.

· Analyzing the data and possibly sharing findings with UVA members through a user post. This is for "member checking." (i.e. to determine the validity of research findings).

· Posting the attached survey on UVA for members to fill. There is a randomized drawing of 10 prizes each at Ksh.2500 (two thousand five hundred Kenya shillings. In the lifetime of the research, ksh100 has equaled approximately $1.00). This is a participation incentive only and if members choose not to enter in the drawing it will not prejudice us against them in any way.

· Your guidance in ensuring that the survey is mutually useful for UVA and for our research.

The research will take approximately 1-2 years. The process is similar to any field work in which the researcher makes observations and takes notes in the physical world; except that unlike in the physical world, the researcher's observation on Facebook is invisible and does not in any way interfere with posts or conversations between members. There is no inconvenience or risk posed to members; nor is there risk posed to their daily interactions on the site. There is also no risk posed to the group UVA.

The benefit of this research is to bring awareness to and broaden understanding of how social media, such as Facebook, can be used in everyday experience to serve the environmental needs of communities all over the world. However, I cannot guarantee that UVA will receive any direct benefits from this research, beyond those offered by such exposure.

Any information that is obtained in connection with this study and that can be identified with individual members of UVA will remain confidential. In addition, if a paper is published as a result of the study, no names or exact locations of participants will be shared, and activities on UVA will be reported in the aggregate rather than as the singular activities of single identifiable individuals. In other words, we will report on the general activities of UVA as they relate to the group's work in Mbeere, and not on the activities of any one traceable individual. Data will be stored securely on a server at the University of Maryland. We do not share collected data with third parties.

UVA's participation, as well as that of individual members, is voluntary. As Administrator you are free to withdraw consent and discontinue UVA's participation at any time without penalty. Individual members are also free to request a withdrawal of their user posts at any time. We will do our best to respect the wishes of members regarding participation.

If you have any questions about the study, please feel free to contact the investigators using the contact information below. If you have questions regarding your rights or those of UVA as a community participating in research, Please contact the Institutional Review Board Office, University of Maryland, College Park, Maryland, 20742; (e-mail) irb@umd.edu; (telephone) 301-405-0678

The investigator:
Elizabeth Warrick
(Contact details of investigator here)

Faculty advisor and instructor:
(Name and contact of Advisor)

Please indicate that you have read and understand the information provided above; that you accept the invitation for UVA to participate in the study; and that as Administrator you may withdraw consent at any time and discontinue UVA's participation without penalty.

_____

Note that the letter was shared as is, but signed consent was neither expected nor required. By this time, the University of Maryland Internal Review Board had approved oral consenting. More details on this process are presented in Chapter 3 on Methods, under data collecting.

Appendix L: Rikamedia Pathfinders' Macro Vision

In the table below, two versions of vision, mission, and objectives for the social media ecosystem are under development by Pathfinders. At this point, the team has already edited the version on the left. It therefore already incorporates some but not all research findings. I did not save the original pasted directly onto a post on WhatsApp, an oversight on my part. However, the version on the right incorporates enough adaptations to illustrate contributions of research findings. The numbers in brackets under selected items on the right denote significant adaptations or additions from the list (1-4) above. Changes and additions are highlighted.

Co-Edited Early Draft	***Final Version Incorporating Research Findings***
Vision: To build a progressive community in which people can actualize their potential by utilizing unity of purpose principle and resources within and without, while nurturing posterity.	Vision: To build a prosperous community in which individuals can actualize their potential by utilizing unity of purpose, principle, and resources within and without, while safeguarding the welfare of future generations. (1, 3)
Mission: To promote decentralized and participatory development through a Participatory Integrated Development approach to build on the potentials and strengthen the initiatives and capacities of the community for self-development through- partnerships at all levels.	Mission: To promote decentralized and participatory development through a Participatory Integrated Development approach that is aimed at building existing potential, supporting initiatives, and strengthening capacities of the community for self-development that incorporates partnerships at all levels. (2)
Objectives: Mobilize and sensitize the community to initiate, participate and contribute in projects through non-formal education. Form, promote and sustain a multi-channel delivery system through advocating partnership against poverty among the community, government, development organizations and the private sector so as to co-ordinate and foresee the realization and implementation of specific community identified and prioritized projects. Develop a rural skills inventory to mobilize human resources and build on the potentials, initiatives and capacities of individuals, families, and the community to plan and implement community prioritized projects. Promoting sustainable organizational and resource development by identifying community capacity building needs and devising appropriate interventions.	Objectives: Mobilize and sensitize the community to initiate, participate in and contribute to projects through non-formal education. Form, promote and sustain a multi-channel delivery system through advocating collaborative partnerships between the community, government, development organizations and the private sector; so as to plan, coordinate and implement specific community identified and prioritized projects. (1) Develop a rural skills inventory so as to activate human resource building, based on the potentials, initiatives and capacities of individuals, families, and the community to plan and implement self-prioritized projects. Promote sustainable organizational and community resource development by identifying capacity building needs and devising appropriate interventions. Continue to serve as an exemplar for social media born self-development groups. (4) Safeguard sustainability of capacities and initiatives through proactive, multi-directional mentoring of youth. (3)

Based on side by side comparisons of the original and the final versions of the Vision, Mission and Objectives, not all changes that I suggested to the leadership team were adopted. For example, the group decided to keep some of the wording that defined UVA as a community development group in the participatory tradition.

Appendix M: Selected Articles of The Constitution of Kenya, 2010

The Articles below are taken verbatim from the published Constitution of the Government of the Republic of Kenya (GOK, 2010). They reflect constitutional coverage of Indigenous Rights and Environmental Justice Obligations. Articles 11, 40 and 69(1) are given effect in the Protection of Traditional Knowledge and Cultural Expressions Act of 2016 (GOK, 2016). There are more than 180 articles, each of which is subject to amendment.

ARTICLE 7
National, official and other languages.
7. (1) The national language of the Republic is Kiswahili.
(2) The official languages of the Republic are Kiswahili and English.
(3) The State shall—
(a) promote and protect the diversity of language of the people of Kenya; and
Constitution of Kenya, 2010 15
(b) promote the development and use of indigenous languages, Kenyan Sign language, Braille and other communication formats and technologies accessible to persons with disabilities.

ARTICLE 11
Culture.
11. (1) This Constitution recognises culture as the foundation of the nation and as the cumulative civilization of the Kenyan people and nation.
(2) The State shall—
(a) promote all forms of national and cultural expression through literature, the arts, traditional celebrations, science, communication, information, mass media, publications, libraries and other cultural heritage;
(b) recognise the role of science and indigenous technologies in the development of the nation; and
(c) promote the intellectual property rights of the people of Kenya.
(3) Parliament shall enact legislation to—
(a) ensure that communities receive compensation or royalties for the use of their cultures and cultural heritage; and
(b) recognise and protect the ownership of indigenous seeds and plant varieties, their genetic and diverse characteristics and their use by the communities of Kenya.

ARTICLE 40
Protection of right to property.
40. (1) Subject to Article 65, every person has the right, either individually or in association with others, to acquire and own property—
(a) of any description; and
(b) in any part of Kenya.
(2) Parliament shall not enact a law that permits the State or any person—
(a) to arbitrarily deprive a person of property of any description or of any interest in, or right over, any property of any description; or
(b) to limit, or in any way restrict the enjoyment of any right under this Article on the basis of any of the grounds specified or contemplated in Article 27 (4).
(3) The State shall not deprive a person of property of any description, or of any interest in, or right over, property of any description, unless the deprivation—
(a) results from an acquisition of land or an interest in land or a conversion of an interest in land, or title to land, in accordance with Chapter Five; or
(b) is for a public purpose or in the public interest and is carried out in accordance with this Constitution and any Act of Parliament that—
Constitution of Kenya, 2010

(i) requires prompt payment in full, of just compensation to the person; and
(ii) allows any person who has an interest in, or right over, that property a right of access to a court of law.
(4) Provision may be made for compensation to be paid to occupants in good faith of land acquired under clause (3) who may not hold title to the land.
(5) The State shall support, promote and protect the intellectual property rights of the people of Kenya.
(6) The rights under this Article do not extend to any property that has been found to have been unlawfully acquired.

Article 65
Landholding by non-citizens.
65. (1) A person who is not a citizen may hold land on the basis of leasehold tenure only, and any such lease, however granted, shall not exceed ninety-nine years.
(2) If a provision of any agreement, deed, conveyance or document of whatever nature purports to confer on a person who is not a citizen an interest in land greater than a ninety-nine year lease, the provision shall be regarded as conferring on the person a ninety- nine year leasehold interest, and no more.
(3) For purposes of this Article—
(a) a body corporate shall be regarded as a citizen only if the body corporate is wholly owned by one or more citizens; and
Constitution of Kenya, 2010 45
(b) property held in trust shall be regarded as being held by a citizen only if all of the beneficial interest of the trust is held by persons who are citizens.
(4) Parliament may enact legislation to make further provision for the operation of this Article.

ARTICLE 69
Obligations in respect of the environment. 69. (1) The State shall—
(a) ensure sustainable exploitation, utilisation, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits;
(b) work to achieve and maintain a tree cover of at least ten per cent of the land area of Kenya;
(c) protect and enhance intellectual property in, and indigenous knowledge of, biodiversity and the genetic resources of the communities;
Constitution of Kenya, 2010 47 (d) encourage public participation in the management, protection and conservation of the environment;
(e) protect genetic resources and biological diversity;
(f) establish systems of environmental impact assessment, environmental audit and monitoring of the environment;
(g) eliminate processes and activities that are likely to endanger the environment; and
(h) utilise the environment and natural resources for the benefit of the people of Kenya.
(2) Every person has a duty to cooperate with State organs and other persons to protect and conserve the environment and ensure ecologically sustainable development and use of natural resources.

ARTICLE 70
(Not referenced in Protection of Traditional Knowledge and Cultural Expressions Act of 2016)
Enforcement of environmental rights.
70. (1) If a person alleges that a right to a clean and healthy environment recognised and protected under Article 42 has been, is being or is likely to be, denied, violated, infringed or threatened, the person may apply to a court for redress in addition to any other legal remedies that are available in respect to the same matter.
(2) On application under clause (1), the court may make any order, or give any directions, it considers appropriate—
(a) to prevent, stop or discontinue any act or omission that is harmful to the environment;
(b) to compel any public officer to take measures to prevent or discontinue any act or omission that is harmful to the environment; or

(c) to provide compensation for any victim of a violation of the right to a clean and healthy environment.

(3) For the purposes of this Article, an applicant does not have to demonstrate that any person has incurred loss or suffered injury.

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