

Research

The *Kere* of Madagascar: a qualitative exploration of community experiences and perspectives

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ABSTRACT. The *Kere* is a recurrent famine occurring in the south of Madagascar that emerged substantively in the 1930s. Each major event claims thousands of lives and keeps many in a cycle of impoverishment, despite the existence of various aid-based responses. This assessment presents qualitative research exploring two *Kere*-affected communities' experiences of the phenomenon. Through focus group discussions, we learn that the *Kere* is a complex social-ecological disaster, compounded by an intricate chain of causation and impacts. Seeking a deep understanding of affected peoples' perceptions and experience of the phenomenon, this paper challenges the idea that the *Kere* is a famine caused by recurring drought that can only be solved with provision of water and aid-based solutions. Based on community views and research literature, and the application of Ostrom's social-ecological systems framework, we demonstrate that the *Kere* is a phenomenon compounded by multiple interacting, debilitating factors including deforestation, drought, pests and diseases, food insecurity, extreme poverty, lawlessness, and political malaise; thus, solutions require a comprehensive, sustained, holistic response.

Key Words: *famine; Kere of Madagascar; pastoralists; qualitative research; social-ecological disaster;*

INTRODUCTION

The *Kere*^[1] is a recurrent catastrophic starvation phenomenon^[2] that occurs in the southern semiarid and arid parts of Madagascar called the "Deep South"^[3]. It claims thousands of lives per year and keeps the subregion in a cycle of poverty. Affecting an area of about 50,000 km² stretching from the Onilahy River in the north to the Mandrare River in the south, it covers two regions, the Androy and the Atsimo-Andrefana. Although it has been the focus of relief-aid interventions for decades, *Kere* events persist. In the *Kere*-prone zone, 97% of the population are classified "very poor" (INSTAT 2014) while 67.5% are in continuous undernourishment^[4] (Razanakoto 2017).

In recent decades no year has passed without a *Kere* event in the Deep South. However, aside from media broadcasts depicting horrifying images of starved individuals and humanitarian-driven reports of casualties, few know exactly what the *Kere* is. Research about the *Kere* is scarce and no holistic view of the phenomenon has been formed. Government documents do not use the term *Kere* or "famine," instead, they refer to "drought and food insecurity." The recent Drought Recovery and Resilience Plan refers to drought induced by El Niño, aggravated by a high vulnerability to natural hazards (PRR BNGRC-PNUD 2016). The National Contingency Plan for Nutritional and Food Insecurity in the Grand-South refers to the phenomenon as a drought-related food insecurity (NCP-NFI BNGRC IASC 2015). Similarly, the National Desertification Action Plan 2008-2018 refers to it as a poverty-driven desertification (Madagascar Gouvernement 2008).

The study described in this paper explores the *Kere* as a lived experience. We seek to build a comprehensive understanding of the *Kere*, how it develops, persists, and impacts communities. In so doing, we aim to highlight affected communities' views of the *Kere* phenomenon and explore their ideas about why it is so

resistant to decades of aid interventions. Essentially, this approach moves away from the conventional understanding of the *Kere* as a famine induced by droughts. Instead, we adopt a social-ecological systems perspective that contextualizes the *Kere* within the complex system made of humans and nature that constitutes the Deep South (Ostrom et al. 2007). This systemic view allows not only the in-depth exploration of the root causes of the phenomenon, but also a holistic understanding of dynamics between the *o'ndaty* (tribal members and natives of the Deep South) and their natural system (Petrosillo et al. 2015).

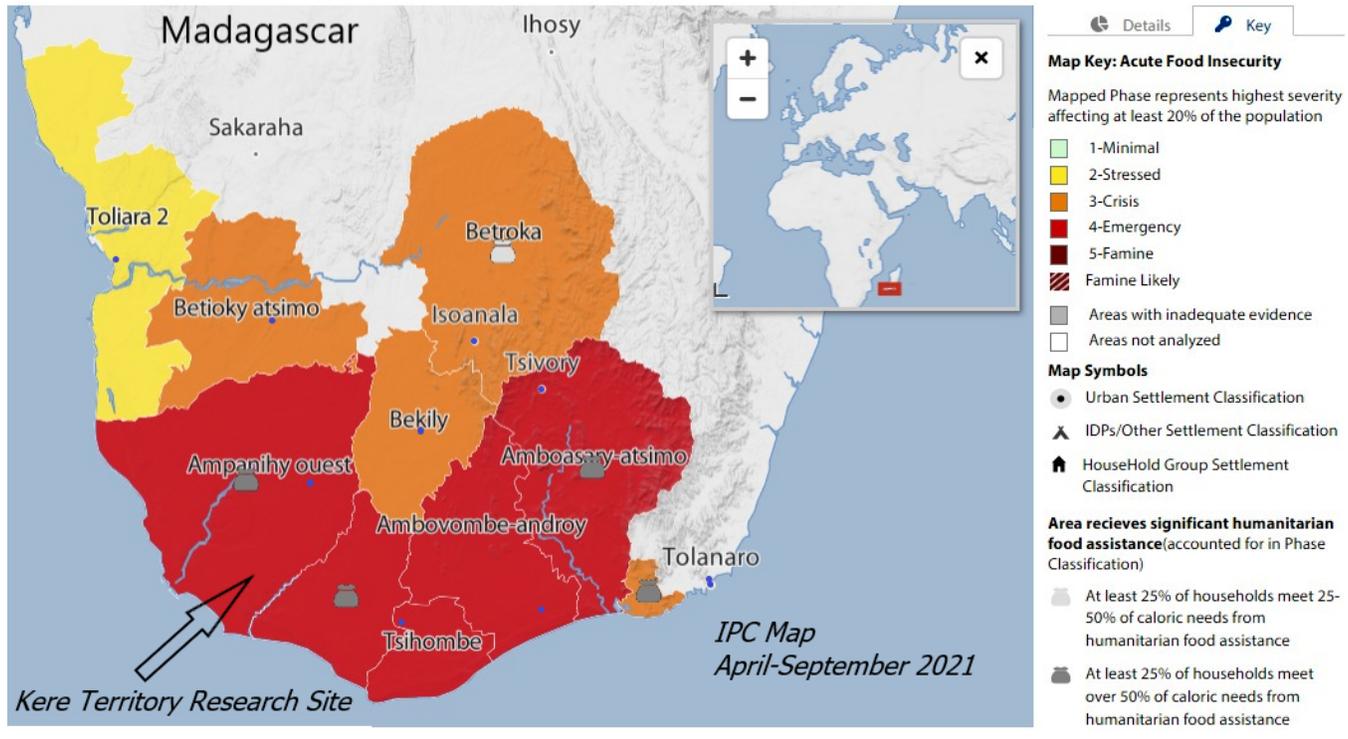
Social-ecological systems (SESs) are complex open systems, made up of many interacting parts of coupled social and ecological systems. According to Mitchell (2006) and Siegenfeld and Bar-Yam (2020), the individual parts of the system interact in a chaotic way to engender behavioral changes in the whole system that are difficult to understand by studying the individual parts in isolation. These collective effects, known as "emergent behaviors," are episodic and self-organized, and may engender catastrophic behavior especially when the system undergoes perturbation (Hayes and Andrews 2020). Embracing the SES perspective, this qualitative study is a deep inquiry into the *Kere* to holistically unpack the underlying factors that contribute to its formation and recurrence.

BACKGROUND

In 1923, pressured to complete the annexation of Madagascar, the French colonial administration decided to eradicate the *raketa* (cacti: *Opuntia ficus-indica*, *O. tomentosa*, *O. robusta*, *O. monacantha*, and *O. vulgaris* [Decary 1929]) vegetation of the Deep South with an introduced beetle parasite (Kaufmann 2001). Prior to that, the Deep South was densely vegetated by thorny bushes dominated by *raketa* plants that provided an effective food source and served as a barrier to colonial military control (Decary 1929, Kaufmann 2000, 2001). Tribal anti-colonial fighters,

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Fig. 1. The research site.



referred to by participants in this study as the *Sadiavahe* (“loincloth made from wood-root”), utilized the protection afforded by the *raketa* to resist the French colonial forces for over two decades (Pearson 1997, Middleton 1999, Kaufmann 2001). In November 1924, the French introduced canisters of biologically manipulated cochineal beetles (*Dactylopius coccus*) into healthy *raketa* thickets in the region of Tsongobory (Allorge and Matile-Ferrero 2011). The parasite decimated the plants at a rate of ~100 km per year (Kaufmann 2000). By the end of April 1929, an official report of the “death of the *raketa*” was sent to the colonial governor (Kaufmann 2000). In the same year, the growing number of dead animals and a looming great famine was reported in the journal, *Echo du Sud* (Kaufmann 2000, 2001). The result of the *raketa* war of 1924–1929 was the onset of the first great famine, commencing in 1930 and eventually abating by 1933 (Middleton 1999). This first *Kere* claimed an estimated half a million lives (Decary 1947), numbers that Middleton (1999) has argued are too conservative. Thenceforth, the *Kere* has involved a recurring set of catastrophic events.

STUDY SITES

The *Kere*-prone zone is a tribal territory associated with two pastoralist ethnic groups, namely the Mahafaly and the N’tandroy. The Mahafaly is a tribal group of the Atsimo-Andrefana region that occupies the semiarid territory of the Plateau of Mahafaly (Kaufmann and Tsirahamba 2006). With their capital at Ampanihy, Mahafaly social structure comprises a confederation of hundreds of subgroups called *tariha* (clans) and *karaza* (groups), each led by a *Hazomanga* (Chieftainship or royalty; Eggert 1981). The N’tandroy is the tribal group occupying

the southernmost tip of Madagascar, with the capital city of Ambovombe (Fig. 1). Socially conservative, they observe a strict set of traditions (Tsimanova 2015) and function with a complex tribal structure organized around the royal system of the *Zafimanara* and the *Karimbola* clans. There are also other ethnic groups that dwell in the *Kere* prone-zone including the Antanosy and the Bara amongst others (Tsimanova 2015).

People of the Deep South are 94% pastoralists (Razanakoto 2017). They are mostly subsistence peasants and rely heavily on the forest for life sustenance (Tsimanova 2015). The typical occupation of women is homecare and crop growing, while men herd the *aombe* (zebu cattle, *Bos indicus*). This animal is highly significant in local culture, as a symbol of social status and a fundamental form of wealth; in fact, it functions as the banking system (Kaufmann and Tsirahamba 2006, Klein et al. 2008). In the Deep South, approximately 60% of households own zebu cattle with herds of up to 200 (Kaufmann and Tsirahamba 2006, Klein et al. 2008). The average zebu cattle per household is approximately 17 (Goetter 2016). Raising cattle is undertaken in rudimentary ways; during *anjagne* (non-*Kere* periods), pastoralists implement open-herding, moving from grassland to grassland. However, during the *Kere*, fodder is reduced to *raketa* leaves.

The geographic distribution of the *Kere* comprises mostly the semiarid chalcographic lands of the Mahafaly Plateau, specifically the districts of Ampanihy and Betioky in Mahafaly territory (FEWS NET 2017), and the arid crystalline sandy ferruginous land of the districts of Ambovombe, Bekily, Tsihombe, and Beloha of the N’tandroy territory (PRR BNGRC-

PNUD 2016). With a temperature range of 22–35 °C and an average rainfall of 400 mm/year, the *Kere* territory is characterized by vegetation comprising thorny shrubs, and xerophyte and euphorbiaceous thickets interspersed by grassy savannahs (PRR BNGRC-PNUD 2016). Known for being a region of *sarodrano* (difficult access to water), the Deep South's five main rivers (Onilahy, Linta, Menarandra, Manambovo, Mandrare) are wadi/ endoreic rivers that remain dry except during the rainy season (PRR BNGRC-PNUD 2016). The groundwater table is located at the depth of about 90 meters in the north to 200 meters in the south (JICA 2006). The Deep South where the *Kere* occurs is the research site presented in Fig. 1 (IPC 2021).

METHODS

A qualitative approach, using focus groups and inductive thematic analysis, was used to answer the question “What are *Kere*-affected communities' experiences and perspectives of the *Kere* phenomenon?” The focus group discussion (FGD) involved engaging people from *Kere*-impacted backgrounds to discuss their *Kere* experiences and perceptions (Krueger and Cassey 2009). To gain a more comprehensive picture, purposive and convenience sampling methods were used to ensure the inclusion of heterogeneous adult participants from *Kere*-prone selected communities (Etikan et al. 2016). However, during the fieldwork, large scale military operations were announced in the Deep South with many districts declared no-go zones (with curfews) for security concerns. This caused an accessibility problem, and in consideration of recommendations issued by local officials, i.e. National Bureau of Disaster Management, District Chiefs, the research team had to adjust by reviewing the field work approach. The team decided to convey participants to safer towns and to increase the number of participants by including as many community members as feasible. Accordingly, the FGD for the Region of Atsimo-Adrefana was organized in Ampanihy, and in Ambovombe for the Region of Androy. This accessibility issue meant we were unable to sample *Kere* stakeholders from across the entire impacted region. However, as much as possible, we have augmented FGD data with other pertinent sources where available.

The selection of participants was done with district chiefs and tribal clans' chiefs with the assistance of the local BNGRC (National Bureau of Disaster Management). Each *fokontany* (village) of *Kere* hot-spot communities was summoned to select one adult individual representative to the FGD. Twenty-four adult participants (including 7 females and 17 males) from nine communities of Ampanihy attended the FGD on 11 September 2019, and 22 adult participants (including 6 females and 16 males) from seven communities of Ambovombe attended on 25 September 2019. Focus groups were semi-structured and facilitated by a local moderator. Discussions were carried out in tribal dialects and discussions were audio-recorded, then transcribed and translated into English for analysis.

The role of the FGD moderator became crucial to maintain group dynamics and coherence of the large number of participants. The moderator must speak the dialects of both tribes, which carries sensitive cultural codes. We hired a local bi-ethnic moderator (of Mahafaly mother and N'tandroy father) who, in addition to being a native speaker of both dialects, has worked in *Kere* response for decades and was familiar to some participants. This

increased participants' confidence to speak about their experiences and thoughts. Furthermore, we informed participants that they could speak with the researcher or moderator privately at any time to clarify any issues or provide their views in private.

Data were analyzed into themes in response to the research question. This involved coding transcripts using the reflexive method of Braun and Clarke (2006), and theme structuring utilizing the framework of Attride-Stirling (2001). Transcripts were scanned for patterns, commonality, relationship, consistency, contradiction, and inconsistency of meaning. They were then coded using latent-reasoning, which involves a deepened interpretation of what lays beneath the surface.

The first author (MIR) was present at all focus groups and oversaw the translations of audio data. MIR is a native member of the southeastern tribe of Antesaka, and is a fluent speaker of Mahafaly and Antandroy dialects. We acknowledge, however, that there may be some loss of subtle meanings in translation. Local terms are given in italics, with translation where needed throughout this article.

FINDINGS

With a general aim of building a comprehensive understanding of the *Kere* through the perceptions and experiences of local communities, four central themes emerged from the data: (a) the meaning of the *Kere*; (b) elements of the *Kere*; (c) *Kere* development; and (d) impacts on community. Each of these central themes is explored in detail (Table 1).

The meaning of the *Kere*

The meaning of the *Kere* is centered on three themes: the origin and the utilization of the term; the killing of the *raketa* plants; and the importance of the *raketa*. The term *Kere* comes from the Antandroy people's dialect, meaning “starved to death.” It has been utilized in disaster management (initially by the World Food Program) since 1993 to describe the recurring deadly famine in the Deep South. To *Kere* survivors, the *Kere* disaster infers a severe and prolonged lack of food, rain, groundwater, and money, and involves a significant death toll. Participants described the *Kere* using ideas such as:

- ... no rain ... for months, even a year, or two years;
- it can take 5, 6, maybe 7 years before we will see rain again;
- difficulty of finding food stuffs;
- shortage of food and inflation of the price of vital needs;
- lack money to buy food;
- no food ... to buy.

Participants tied the *Kere* to the destruction of the *raketa* during the early stage of French annexation of Madagascar when anticolonial resistance (the *Sadiavahe*) utilized the thorny forest as their hide-out. After two decades of guerrilla war, the French Administration annihilated the cactus with a parasite that the *Kere* community refers to as the *pondifoty*. The cactus was an inconvenience to the French but very important to the local people. The plant still plays a vital role to the pastoralists, as *hanerano* (food-water). The barbed, water-bearing cladodes provide fodder and water to livestock (zebu-cattle, sheep, and goats)

Table 1. Participants sample quotes.

Central Theme A. The Meaning of the <i>Kere</i>	Sample of Participant' Quotes
Sub-themes	
1. Defining the <i>Kere</i>	"... a <i>voj</i> (disaster)...such as <i>mosare</i> , <i>sakave</i> , or <i>main-tane</i> " (other tribal terms for <i>Kere</i>); severe and prolonged shortage of <i>mahakama</i> (food); inflation "... prolonged lack of rain; failed crops; many people ... die from starvation ..."
2. Genesis of the <i>Kere</i>	"... we southerners resisted ... the French annexation ... the colonial French Army could not penetrate the spiny-thicket forest where our ancestors, the <i>Sadiavahe</i> , established their bases; they introduced a biological weapon ... the <i>pondefoty</i> [Cochineal beetle, <i>Dactylopius coccus</i>] to kill the <i>raketa</i> forest"; "... the <i>pondefoty</i> decimated the cactus forest in a couple of years and provoked the first known <i>Kere</i> ... that is how it started." "... <i>pondifoty</i> ... vermin ... infestation ... can wipe out a forest of <i>raketa</i> in couple of weeks ..." "... <i>raketa</i> ... sick of the <i>pondifoty</i> ...becomes <i>malazo</i> (phlegmatic) ... color changes ... as they die out, they melt into muddy kind of liquid, that is, how the <i>pondifoty</i> kills <i>raketa</i> ." " <i>Raketa</i> is a <i>hane-rano</i> (food-water) ... both humans and animals depend heavily on this plant." "... vital to our life ... it is a <i>hane</i> (food) and a <i>rano</i> (water)." "Raketa ... makes our habitation fences." "We eat cactus fruits every day and as a matter of survival."
3. The <i>Raketa</i> Cactus	
Central Theme B. Elements of the <i>Kere</i>	
1. Governance & Institutions	"We have never seen or received any aid from the BNGRC (the National Bureau of Disaster Management)." "The problem is ... the implication of the government ... there is no visibility of them ... that includes the famous BNGRC; one visible government entity is the Health Centres that provide under-age child feeding and treatment activities." "There is nothing happening around here, no tangible economic project ..."
2. Geo-Climatic Conditions	"In the northern ... crystalline zone ... groundwater usually can be found at a depth of about 40–50 meters ... the southern zone is sedimentary, finding groundwater is almost impossible ... we dug deep-down to 90 meters but in vain ..." "For five years ... no ... rain." "In 2019, it has been raining a lot but it won't last long ... it can take 5, 6, maybe 7 years before we will see rain again. Consequently, people's souls are lost."
3. Deforestation	"... we do not have forest anymore ... the forest ... has disappeared." "Trees ... are being massively chopped down to make charcoal." "... within 5 or 10 years from now, with the charcoal-mania, the increasing practice of <i>teteke</i> and <i>hatsake</i> (slash and burn), I do not think there will be any more trees left around here, which will make our land <i>karakay</i> (desert) and the chance of any rain is reduced ... when your land has nothing green on the top of it to influence rain."
4. Pests Infestation	"... pests and parasite destroy stored seeds ..." "This year, there was plenty of rain and people planted seeds, then came the plague of <i>valala</i> (locusts) along with the <i>olitse</i> (armyworms)."
5. Lack of basic Infrastructure	"...there is no paved road around here, just dirt roads ..." "... many communities ... have neither school nor health posts."
Central Theme C. The Development of the <i>Kere</i>	
1. <i>Kere</i> Early Signs	- ...when the moon skews northward, <i>Kere</i> will occur in the south-and when it skews southward, the north is in trouble "... strong <i>Tsiok'atimo</i> (the trade wind) ... in May for about four months, informing us of a severe drought is coming right after the wind stops."
2. <i>Kere</i> Forms	"We have two forms of <i>Kere</i> , people <i>Kere</i> and animals' <i>Kere</i> , however, they can occur to both-meaning, human and animals are simultaneously affected by <i>Kere</i> , that's the worst form of this <i>voj</i> ." "Other form ... people are hungry, animals are not, then animals will feed people, or animals are impacted by <i>Kere</i> not the people, so people may still save animals. When both are experiencing <i>Kere</i> , that's the worst situation."
3. Ancient vs Recent <i>Kere</i>	" <i>Kere</i> exists for a very long-time ..." "... recent <i>Kere</i> are ... more clement than the old ones ... they are shorter than those before ..." "...last year <i>Kere</i> struck the Beloha district ... lasted for a few months killing about 10 persons per day ..."
4. Storyline of the <i>Kere</i>	"... my grandfather ... talked about a previously never seen starvation that hit the Androy ... around the year 1933." "My father ... escaped the great famine of 1944 ... he had spoken of many deaths ..." "...the name of that grand famine ... was the <i>Marotaolagne</i> ("Scattered human skeletons"). "... it could go up to several months, or even a year or more." "... can last ... 2 years ..."
5. Duration	
Central Theme D. Impacts on Community	
1. Direct Impacts	"A lot of people are dead from hunger in the bush and valleys ..." "... empty stomach causes hypoglycaemia, people become comatose and death follows ..." " <i>Kere</i> !! Nothing in the stomach, mostly weakened from hunger and just dead." "... death ... most vulnerable such as children and elders ..." "... malnourished ... too weak to resist illness and can't do work." "... <i>Kere</i> is ... also the thirst ... no water to drink." "... we walk for about 25 km from our house ... we may die while searching for water." "...many died from drinking seawater." "Begging, prostituting, stealing, anything!" "...hungry and desperate <i>o'ndaty</i> (human) will do anything to survive including to rob or to kill." "Crime goes on the top of the list ... the increase of <i>dahalo</i> ." "... the northern part of the Androy become no-go zones right now, the region of Manombo is a no-go zone, people live with fear every day so many have moved out because of heavy <i>dahalo</i> activities."
2. Indirect Impact	"Rural <i>Kere</i> victims immigrate to urban area ..." "... many <i>fokontany</i> (villages) are now deserted of their populations ..." "... youth immigrate massively ... or becoming <i>dahalo</i> ..." "... we are <i>miheake</i> (purposeless), our daily activities are reduced to zero." "So many people roam around looking for jobs ..."

during the dry season, and its fruit is eaten by *o'ndaty*. The plant also provides a defensive living hedge to villages, cowsheds, and croplands, and is used for property demarcation. The following participant quotes show the link between the *pondifoty* and the destruction of *raketa*, and the impact of this.

- *Pondifoty ... vermin that moves from raketa to raketa ... infesting ... wipe out a forest of raketa in couple of weeks;*
- *Raketa forest ... provides us with supplementary food, wood to cook and to build our house, and to feed our animals—thus, when the raketa forest died, part of us also died.*

Elements of the *Kere*

Participants discussed how the *Kere* encompasses an interlinked set of four factors that construct this *voy* (disaster): deforestation; lack of government support; plantation pests; and the geo-climatic conditions. They recognized that deforestation has occurred at an unprecedented rate in recent decades and acknowledged their part in this. They discussed the increasing practice of *teteke* and *hatsake* (slash and burn, or swidden), and the over-harvesting of forest trees for charcoal and *kitay* (cooking wood) that has contributed to this. Although participants are aware of the impacts of deforestation, they claimed to have few other choices for income. Consequently, the Deep South is becoming a *tane karakay* (naked land) which further exacerbates the effects of drought.

Participants claimed to have been ignored by the central government and discussed the insensitive attitude of successive regimes to their plight. Many believe that this attitude triggered the bloody secessionist rebellion in 1972 following a *Kere*. Some participants claimed to have never received assistance from government agencies other than through health centers. Aid has been provided only through external aid organizations, such as United Nations agencies and NGOs (non-government organizations). Others disputed this and claimed to have benefited from government aid for undernourished infants, free care provided by local health centers, and cash transfers (though difficult to access and insufficient) from the government's FIAVOTA Project. Nonetheless, this sense of abandonment by the government engenders the feeling of marginalization, demonstrated by the nonexistence of viable development initiatives and lack of basic infrastructure that act as additional supporting drivers of *Kere*. The mix of views can be seen in the following participant quotes.

- *We have never seen or received any aid from the BNGRC (National Bureau of Disaster Management);*
- *Our lives were saved by the government's FIAVOTA program;*
- *Yes! WFP [World Food Program] helped with ... the "Food for Work" program;*

Participants expressed distress caused by insect pests on food production and storage. Crops that survive harsh weather conditions are damaged by the swarm of *valala* (Malagasy migratory locust, *Locusta migratoria capito*) and armyworms. Armyworms have only recently been found in Madagascar and inflict significant damage to young plants and seeds. The damage to stored crops and seeds due to the *kirokiro* (weevil) and the Khapra beetle also devastates food supplies and income sources.

Associated geo-climatic impacts were expressed by participants as the *saro-drano* (lack of water), characteristic of the Deep South. They asserted that the groundwater table can now be found only at between 50 to 90 meters depth, and that average annual rainfall (~400 mm) is poorly distributed across subregions. Communities anticipate up to 80 mm/month average rainfall during the rainy season (December to March), while during the dry season of April to September, there is no rain. However, participants discussed the recent recurrence of a longer dry season that can continue for several years. They refer to this as the *asaramaika* (the dry rain-season).

The development of the *Kere*

Participants explained that the development of the *Kere* occurs gradually, with small changes seen over time. The analysis found five processes that describe its progression: (1) the *Kere* Early Signs; (2) the Duration; (3) Ancient Vs. Recent *Kere*; (4) *Kere* Forms; and (5) the Storyline of the *Kere*. *Kere* emits early signs that the community has learned to read in preceding months. Changes in the natural system, e.g., wind, stars, moon, rain, and animals, provide forewarning. For instance, if the regular wind intensifies to become the *tsiokatimo* (trade wind) with sandy red dust around May or June and lasting for 4–5 months, a severe regional *Kere* is almost guaranteed to follow.

Some participants asserted that severity of the *Kere* is contingent upon its duration. However, their opinions about duration varied from six months to three years. Others argued that *Kere* lasting more than a year have been rare during recent decades, providing the example of a *Kere* called *Baramino* (Digging Bar) in 1997, which was felt locally for less than a year. Peoples' views on the duration of the *Kere* is impacted by their geographic location as illustrated by the following quotes from participants in Ambovombe:

I am from the South, but I am doing pasturage in the north ... my zebu-cattle are based there.

in the east, we are currently "anjagne" [opposite of the Kere, meaning good or peacetime] ... no Kere because there has been rain for the last two months ... food products are ... abundant.

These statements are indicative of the different manifestation of *Kere* in two districts of the same region. Although the northern districts are *anjagne* (in peacetime), the southern districts are in *Kere*. Participants argued that communities are impacted by *Kere* one after another but also can be affected simultaneously. Nevertheless, these locations share a relatively similar geomorphology, microclimate, soil and vegetation types, and population features. This results in communities thinking of *Kere* as a "moving target," experiencing *Kere* one month, and *anjagne* the next.

Each *Kere* is perceived to differ from another as it has evolved through time. Participants thought the *Kere* of earlier times were more pronounced than recent events. To them, ancient *Kere* were pre-1993. The "SOS Sud" *Kere* of 1993 killed many and triggered mass migrations, prompting the implementation of the first emergency management response and subsequent international aid program. Participants asserted that *Kere* of recent times have been of modest magnitude and duration, with some attributing this to the presence of emergency response aid that did not exist 25 years ago.

Fig. 2. Forms of the *Kere*.

A Kere Framework of Classification

System	The Anjagne	Form 1 The Mosare	Form 2 The Sakave	Form 3 The Kere
Humans	Not Famished	Not Famished	Famished	Famished
Animals/Livestock	Not Famished	Famished	Not Famished	Famished

— Vulnerability Pathway +

According to *Kere* survivors, the gradual development of the *Kere* is exhibited in four stages. The *anjagne* represents the good time when food and water are abundant. The situation gradually changes as food for animals/livestock becomes scarce but food for humans remains abundant, allowing people to prioritize the saving of animals (Fig. 2, Form 1). Slowly, food for humans becomes scarce but food for livestock is abundant; therefore, livestock become food for people (Fig. 2, Form 2). Then, the situation evolves such that both *o'ndaty* and livestock are famished, characterizing the deadliest form of the *Kere*— (Fig. 2, Form 3).

When discussing *Kere* events over time, participants tended to use *Kere* names, not dates, e.g., years and months, because of high levels of illiteracy. They referred to the initial *Kere* as the *Marotaolagne* (Scattered human skeletons) or the *Tsimivositse* (Uncircumcised: tribal subgroups stopped circumcising their boys to symbolize this tragedy), which occurred from 1930 to 1933. This was followed by another *Marotaolagne* around 1945, the *Beantane* (Many downed) around 1955, the *Malalakakanjo* (Loose shirts) around 1970, etc. Participants argued that each of these (pre-1993) *Kere* were of cataclysmic proportion and killed hundreds of thousands, if not millions of people, and caused mass migration and widespread social disruption.

Impacts on community

Direct impacts

Participants identified two devastating and interrelated end-results of the *Kere*, the *fate* (death) and *haosa* (agony). The *death* comes in four interconnected forms that are hunger, thirst, violence, and illness. During *Kere*, availability of food is scarce, causing hunger. Participants reported agonizing pain in the abdomen followed by a terrible headache and subsequent collapse. If help does not come at this point, death ensues. One participant expressed that the starved body organs shut down. An empty stomach causes hypoglycemia, exhaustion, and death. To find food, many wander far on foot seeking food to bring home to the family. Often, they do not return, while those who do may find deceased relatives or empty households.

Kere victims are subject to severe dehydration. Some participants reported walking 25 km from homes to search for water. If lucky,

water is stored in *gorogoro* (calabash) or jerrycans and carried home on foot. Pressed by the severity of thirst, some drink seawater and, as one participant stated, “leave the rest to the god.” Illness kills many during *Kere*. The body is weakened by the prolonged lack of food and water and is prone to illness. It was reported that water-borne diseases inflict most damage because of the consumption and use of dirty water collected from street puddles and boreholes.

The *Kere*-prone zone was described as a place of violent crime where bandit *dahalo* (cattle-rustling, bandit, bushrangers) challenge law and order. Although agreeing that violent crime was wrong, some participants tied it to cultural practices where behaviors are commanded by tribal social norms. A community may reject or endorse the practices of *dahalo*, which can lead to violence, at times resulting in death.

Agony caused by the *Kere* can be physical, mental, and social. Participants stated that *Kere* tests the resilience of *o'ndaty*; that is, the extent to which the mind and body systems can tolerate and recover or collapse from it. *Kere* communities may experience a quasi-recovery, being narrowly saved from starvation, only to experience it again soon after. This cycle of starvation and brief recovery takes a high toll on mental health and erodes hope and resilience. Many participants discussed disillusionment in the face of the emotional stress caused by so much profound loss.

Social agony inflicted by the *Kere* touches all aspects of community life. At the peak of the *Kere*, energy is focused on securing food and water. All other aspects of life grind to a halt. At this stage, participants report a shift in attitudes to one of self-concern and survival of the fittest. One participant shouted, “carry your own shovel” (tribal expression meaning care for your own self), demonstrating the deterioration of the social fabric. Another expressed, “we are human with no pride and dignity.” Others pointed to the increasing numbers of youth cattle-rustlers and sex-workers, demonstrating the impact of *Kere* on social norms and deviation from customary mores.

Indirect impacts of the Kere

Indirect ramifications of the *Kere* are twofold: depopulation and unemployment. Weary of the *Kere*, many depart their homelands in search of a better life elsewhere, resulting in migration of the

Table 2. The *Kere* storyline. Complemented with Bidou and Droy (2007).

The <i>Kere</i> Storyline							
Number	<i>Kere</i> Name	Year of Occurrence		Scope	Notes	Duration	Range
		From	To				
1	<i>Marotaolagne</i> or <i>Tsimivositse</i> (Uncircumcised)	1930	1934	Deep South	Approx. ½ million dead; Trigger: Death of Cactus Forest; (Decary 1947)	4	9
2	<i>Marotaolagne</i>	1943	1946	Deep South	Approx. 1 million dead; Trigger: El Niño, Vichy war (Fenies 1957)	3	9
3	<i>Beantane</i> (Many-downed)	1955	1958	Deep South	No detailed record found	3	12
4	<i>Menaleogne</i> (Red-pounder)	1970	1972	Deep South	Engendered proclamation of Androy secession; Trigger: El Niño	2	8
5	<i>Santira-Vy</i> (Iron-belt)	1980	1982	Deep South	No detailed record found	2	0
6	<i>Malalak'akanjo</i> (Loose-shirt)	1982	1983	Deep South	No detailed record found	1	3
7	<i>Bekalapake</i> (Dried-cassavas)	1986	1987	Deep South	No detailed record found	1	1
8	<i>Tsimitolike</i> (Don't turn)	1988	1989	Deep South	No detailed record found	1	3
9	SOS Sud	1992	1994	Deep South	Trigger: Political Crisis; El Niño	2	1
10	<i>Arikatoke</i> (Surrounded)	1995	1996	Manambovo	No detailed record found	1	1
11	<i>Baramino</i> (Digging-bar)	1997	1998	Bekily, Beloha	No detailed record found	1	6
12	No name assigned	2004	2005	Deep South	Trigger: Political Crisis; El Niño; Insecurity	1	4
13	<i>Tiomena</i> (Red dusty wind)	2009	2013	Androy, Ampanihy	Trigger: Political Crisis, Insecurity, El Niño	4	1
14	<i>Taviovio</i> (Wobbly-walking)	2014	2017	Tsihombe, Anjapaly, Ampinihy	Unkown Death; Trigger: El Niño, Insecurity	3	3
15	No name assigned	2020	2021	Deep South	Trigger: El Niño, Insecurity, Covid 19	1	0
Total						30	61
Mean						2	4.067

o'ndaty from homelands. Narratives of mass-migration are not new, and neither are the push factors. Among the core push factors expressed by participants was the never-ending recovery from recurrent crop failures and the deteriorating social order, especially the proliferation of bandit *dahalo*.

Unemployment is high in the *Kere*-prone zone. Participants discussed the lack of sustainable developmental projects that could provide a stable living. Livelihoods in the Deep South revolve mostly around livestock, crop growing, and the *kinanga* (small trading) of farm products. At the peak of the *Kere* crisis, farming activities cease, halting related employment. During this period, participants discussed being *miheake* (purposeless), i.e., dependent on Food for Work (FFW) programs of aid agencies. In FFW, selected individuals from a few targeted communities are hired daily to do intensive labor work such as rehabilitation of dirt-roads and tracks, compensated with food-rations. This may be the sole source of employment available and has proven invaluable in saving lives; however, only a few dozen individuals can be hired because of the widespread magnitude of the *Kere*.

DISCUSSION

This study has revealed a complex set of local understandings and experiences of the interlinked elements that comprise the *Kere* phenomenon. Participants discussed the origin, constituents, development, and impacts of the *Kere*. However, they typically referred to specific instances of the *Kere* using the local name for it and not in reference to a date. To better understand the patterns of the *Kere* over time, we examined historical references to famine and mapped them to the terms for *Kere* used by participants. Key

Kere events as described by participants completed with literature are summarized in Table 2. The first great famine of 1930 was attributed to the eradication of the *raketa* plant (Decary 1929, Middleton 1999, Kaufmann 2001). The *raketa* was not only the dominant vegetation but also a pivotal life support to pastoralist autochthons (Kaufmann 1999, 2001). Thus, its eradication triggered a multifaceted change to social-ecological systems, including decimation of the land cover to become what participants referred to as naked land. Decary (1947) and Middleton (1999) asserted that the first great famine of 1930 reduced the population of the Deep South by half and drove 15% of survivors to migration. During this period, the tribal territories of Mahafaly, Antandroy, and Antanosy were filled with carcasses of dead cactus and piled with the cadavers of both humans and animals (Decary 1947, Kaufmann 2000). This event came to be known as the *Marotaolagne* or *Tsimivositse* (Decary 1947, Tsimanova 2015).

Availability of data regarding the death toll is regrettably lacking. According to GFDRR (2011), the five major *Kere* that occurred between 1980 and 2010 claimed an estimated death toll of one million, and the *Santira-Vy Kere* of 1983 killed ~230,000 children. Since its genesis in 1930, the *Kere* has occurred 15 times over 91 years (Table 2). According to participants, each instance has had its own trigger factors (e.g., cochineal beetles, political unrests), and varied impacts (e.g., many deaths, mass-migration). Based on Table 2, the average duration of the *Kere* is about two years with an average cycle of recurrence of four years. As at 2021, since 1930 the Deep South has endured 30 years (cumulative) of *Kere* events. While a *Kere* event kills many (human and animal) and

Table 3. Summary of key variables from Ostrom’s (2009) social-ecological system framework as these relate to the *Kere* (social-ecological disastrous phenomenon).

SES Framework’s Variables	
(S) Social, Political, Economical	
S1. Social Performance Indicator: shift to conservation incurs an annual income loss of $\approx 6\%$ to pastoralist <i>o’ndaty</i> (Casse 2012)	
S2. Ecological Performance: between the years 1983 and 2000, a net increase of 4% vegetation coverage at the same time experiencing a decrease of 8% vegetation coverage ((Elmqvist et al. 2007).	
S3. Externalities: impact of cyclical political unrests, arrival of charcoal, mining, and timber barons (Casse et al. 2004, Pollini and Lassoie 2011).	
(RS) Resource System: The Deep South	
RS1: Sector: Regional Vegetation	(GS) Government System: Ministry of Environment
	GS1: Government Institutions: The Madagascar National Parks (MNP) and the Gelose (Community Based Natural Resources Management; World Bank CEA 2013).
RS2: System Boundary: Regional governorate of Androy and Atsimo-Andrefana	GS2: Non-Government Institutions: Environmental advocate groups; national conservation and environment NGOs, national civil societies; WWF, Conservation International (World Bank CEA 2013)
RS3: Size: $\approx 25120 \text{ km}^2$ (Du Puy and Moat 1996)	GS5: Operational Choices: the Alliance Voahary Gasy platform; the Tany Meva Foundation (World Bank CEA 2013)
(RU) Resource Unit: trees, shrubs, grasses	
RU1: Resource Mobility: legal/illegal overharvest for regional use and smuggling (Elmqvist et al. 2007)	(A) Actors: the <i>o’ndaty</i> , livestock (zebu-cattle)
RU2: Growth and Replacement Rate: Slow growth rate at $\approx 203 \text{ ha/year}$ (IPC 2021, Kaufmann and Tsirahamba 2006)	A1: Number of Actors: the <i>o’ndaty</i> population $\approx 2,683,420$ with 3.5% growth; and livestock about half the number of the <i>o’ndaty</i> (Kaufmann and Tsirahamba 2006, IPC 2021)
RU7: Vegetation Distribution: 95% endemic species; grow only at specific altitude and soil geo-climatic characteristic (Du Puy and Moat 1996, Elmqvist et al. 2007)	A2: Socioeconomical Attributes of Actors: 94% Pastoralist; Extremely poor (IPC 2021, Kaufmann and Tsirahamba 2006)
	A3: History and Experiences: Loss of 80% Madagascar vegetation since colonial times; Loss of 45% of the Deep South vegetation during last 4 decades (Rives 2012, Hanish 2015).
	A5: Norm, Trust, Social Capital: Application of traditional customary laws to police the forest: Dina [†] and taboos
	A8: Level of Dependency: <i>o’ndaty</i> are 96%, their livestock are 100%.
(I) Interaction: Swidden agriculture, wild food collection? Livestock grazing, over-harvesting, and land clearing?	(O) Outcomes: forest conservation policies failed to stop vegetation loss, increased desertification and soil degradation, drought, crop failures, hunger, ill-health, and pauperization
I1: Harvesting/destruction Capacity: 1.13% per year (Elmqvist et al. 2007, Casse et al. 2004)	O3: Externalities to other SES: health effect of the “Tiomena” phenomenon, and deterioration of the already archaic food production system.
I2: Information Sharing: The COBA, a community organizations for forest management and a platform of discussion (Casse 2012)	
I4: Conflict: confusion if vegetation is a state, private, or common property and related access (Casse 2012)	
(ECO) Related Ecological System	
ECO1: Climate Patterns: effects of El Niño and climate oscillation including the Tiomena that affect health and food production (https://earthobservatory.nasa.gov), longer dry-spell soars forest harvest (Casse 2012);	
ECO3: Flows: loss of vegetation reduces availability of wild-food, expansion of desertification and soil infertility reducing arable cropland hampering food production.	

[†]Dina is a traditional customary law established by tribal community pacts. The Dina is operational upon ratification of regional judiciary authorities.

pushes survivors into a vicious cycle of collapse and recovery, the cumulative effects of 30 years of recurrence constitutes a formidable constellation of forces that traps the population in chronic poverty—the well-described condition of poverty traps (Dutta 2015, Ghatak 2015).

The *Kere*: a social-ecological disaster

The analysis presented here reveals that the *Kere* is understood by locals as having multiple constituents, e.g., deforestation, government inertia, and geo-climatic conditions, which together induce a chain of causation impacting each other across time and space. According to Belausteguigoitia (GIWA Approach 2004), chains of causation are the way elements of coupled human-natural systems influence one another. For example, deforestation is driven by over-harvesting and unsustainable slash and burn

practices as a way of survival. Harsh geo-climatic conditions attributable to lack of rain and groundwater replenishment lead to drought and subsequent crop failures. These factors and their interaction may differ across *Kere*-prone districts. For instance, violence driven by *dahalo* bandits is higher in communities with large zebu-cattle populations than those with less (Goetter 2016). Factors also change with time. Levels of drought-induced crop failure may fluctuate or dissipate in accordance with seasonal rainfall. The longer the dry season the more likely severe crop failure will follow, further exacerbating food insecurity.

We suggest that the *Kere* phenomenon encapsulates what Reckemmer et al. (2016) has called a social-ecological disaster resulting from disharmonic interaction between humans and the

natural system, i.e., overharvesting of natural resources, and compounded by a complex chain of causation between various elements of a system. For a more nuanced analysis of the social-ecological dynamics of the *Kere*, we turned to the social-ecological (SES) framework developed by Ostrom (2009). The SES framework decomposes the complex system into six key subsystems (Ostrom 2009). They are resource units (RU), resource system (RS), governance system (GS), actors (A), interactions (I), and outcomes (O); all framed by social, economic, and political settings (S) under a constant influence of the related ecosystems (ECO). Each of these subsystems has a nested second tier of variables (53 in the initial version) aimed to capture key features of the first tier six key elements (McGinnis and Ostrom 2014, Rocha et al. 2020). However, this study only looks into variables that are relevant to the *Kere* as shown in Table 3 and focuses on resource vegetation of the Deep South.

Key features listed in Table 3 can be further summarized as follows. Loss of vegetation is caused by the extensive harvesting of native trees and the *tavy* (swiddening) by the *o'ndaty*. Appreciated for being quality hardwood, i.e. fuelwood or timber, the endemic trees of the Deep South are subject to continual harvesting to supply both internal and external demand. Practicing a traditional rain-fed agriculture in arid land, the *o'ndaty* swidden expansively, the practice of slash and burn agriculture, to access fresh soil nutrients. This practice, coupled with savanna burning to expand livestock grazing, has caused 45% loss of the Deep South vegetation over the last four decades (Rives 2012, Hanish 2015), hence the increase of barren land.

From a governance perspective, two sets of laws and regulations are implemented by the Ministry of Environment through the Gelose program (Community Based Natural Resources Management) and the Madagascar National Parks (MNP). The MNP administers three forest reservations that cover ~49,150 ha in the Deep South (<http://www.parcs-madagascar.com/>) and the Gelose transfers the management of the natural resources to the local community (Casse 2012). Porous to infraction of all kinds, i.e. logging or mining, these reservation areas suffer from ineffective policies implementation and lack of resources, becoming “paper parks” (Dudley and Stolton 1999) that are legally protected, but receive no management at all. These infractions intensify during major sociopolitical crises that are common in Madagascar.

Although analysis of the SES using Ostrom's framework (Table 3) establishes robust linkages between loss of vegetation, soil, drought, and the poverty and hunger among locals, community representatives argued that the *Kere* encompasses more than that. They also consider harsh geo-climatic conditions (natural hazards) responsible for the periodic drought, difficult access to water, and the effects of El Niño. Participants' views on the duration of rain deficit vary from 6 months to 7 years. They also stressed that wells must be about 50 meters deep to reach the water table. According to JICA (2006), the water-table in the sandy calcareous soil in the north is about 90 meters deep while in the crystalline south it is about 200 meters; this renders finding groundwater a major problem.

The effects of El Niño on the microclimate of the region are manifested through increased weather temperature tailed by a severe and longer dry season (PRR BNGRC-PNUD 2016). The

El Niño is a complex interaction of weather factors (sea and land temperatures, the Indian Ocean Dipole oscillation, and the wind parallelism) that shifts every few years (Cane and Zebiak 1985). This weather system suppresses the accumulation of rain in the region to cause a periodic drought (Cane and Zebiak 1985). Furthermore, participants highlighted the distress caused by pest insects on food production and storage (e.g., locust, armyworm, weevil) attributable to the effects of warmer climates. According to Deutsch et al. (2018), climate warming increases the metabolic rate of insect pests to cause crop losses of 10–25% per increased °C of temperature. In sum, the cyclic drought that induces an idiosyncratic quasi-permanent food crisis is the compound effect of the ecosystem dynamic exacerbated by increased inharmonic anthropic activities. According to Scrimshaw (1997), although these natural factors precipitate famine, they rarely constitute the root cause. The *Kere*-famine begins when other hazardous events, e.g., *dahalo* raid, strike the already precarious social-ecological system.

The *Kere* and social insecurity: the causal nexus

Social insecurity is both a cause and consequence of the *Kere*, especially the impacts of *dahalo* (cattle rustlers). As a cause, zebu-cattle raids can ruin households triggering a cycle of attack-revenge which results in many deaths and hampers food production. Consequently, depauperized individuals, especially the youth, become easy recruits for professional *dahalo* (Goetter 2016). According to participants, scores of villages and communes become deserted no-go zones because of insecurity when the *Kere* unfolds. Cattle rustling has evolved from being a traditional rite to a profession. In many pastoral societies, especially in sub-Saharan Africa where livelihoods are centered on cattle, pastoralists' cultural songs and dances cherish cattle rustlers' bravery (Mkuku 2001) whereby raids against each other's animals are events of common occurrence. In the Deep South, cattle rustling is a traditional practice that has existed well before the pre-colonial era (Ribard 1926) and has evolved into a network of criminals involving high-ranked government officials and elected politicians (Tarabey 2014; D. Myers 2015, *unpublished manuscript*, https://digitalcollections.sit.edu/isp_collection/2285). *Dahalo* raids result in an annual loss of about 30% of national cattle production, posing a pressing threat to the region's social order (Fauroux 2004). Between 2012 and 2017, ~100 military, ~900 civilians, 3000 *dahalo* were killed, 2000 *dahalo* were arrested, and ~30,000 zebu were stolen (D. Ramarlah 2017, blog, <https://sites.google.com/site/barademadagascar/societe/zebu/01-vols-de-zebus>).

The *Kere*: a regional health concern

The *Kere* is an enduring health problem of public concern. It has caused many deaths and those who survive face a variety of health problems including physical (e.g., cachexia, kwashiorkor, stunting), mental (e.g., poor cognitive abilities), and social disorder (e.g., anti-social, self-centered behavior; Scrimshaw 1987, Dugassa 2019). Participants stressed that a continuous state of inanimation results in being prone to illness, mostly from water-borne diseases and malaria. What differentiates the *Kere* from other famines is its persistence and duration. As a result, survivors are trapped in a state of undernourishment making them highly vulnerable to disease. According to Razanakoto (2017), ~67.5% of the local population is continuously undernourished. They consume an average food intake of ~1700 kCal/day/person

(Hänke et al. 2017), way below the SPHERE minimum standard of 2100kCal/day/person (https://handbook.spherestandards.org/en/sphere/#ch007_003). Sen (1981) asserts that most deaths in famines are caused by illnesses. Because of unavailability of data, Sen's assertion cannot be verified in relation to the *Kere*. However, phlegmatic undernourished *o'ndaty* cannot take part in physically demanding agricultural activities, further hampering food production.

The *Kere*: a poverty trap

As a sociological disaster, *Kere* poverty traps are driven by poor regional connectedness and lack of innovative capacity (Carpenter and Brock 2008). Four sets of poverty traps contributing to poor regional connectedness and lack of innovative capacity emerged from the data, namely: the lack of road infrastructure; no structural social support; poor access to education; and systemic marginalization. The lack of road infrastructure renders the in/outflow of goods and critical needs, e.g. food, water, and medication, to the Deep South difficult. If these critical needs are available, their prices escalate so that in order to acquire them, especially food, households must monetize productive assets, e.g., land or cattle. Because of the absence of social support, poor households are left with no means to resist the repetitive *Kere* and lose resilience when their endowments erode (Thomas and Gaspard 2015).

The lack of innovative capacity is sustained by poor access to education, resulting in high levels of illiteracy, a lack of skilled workers, and systematic marginalization. Lack of education is a key poverty trap for rural households in Madagascar (Thomas and Gaspard 2015). Some participants noted that school was not a priority for people with empty stomachs (others disagreed). This mindset alone, coupled with the broken regional school system, can explain the high prevalence of illiteracy (~66%) in the Deep South (Healy 2017). Participants highlighted their marginalization by the central government. Bird et al. (2010) stressed that systematic marginalization poverty traps often entail ethnopolitical motives to sideline inhabitants living in remote areas. This thesis is supported by Althabe (2000) and Tsimanova (2015), where they describe various ways colonial administrations have institutionalized punishment of rebellious southerners. This policy was pursued (intentionally or not) by successive post-colonial administrations. As a consequence, major innovative problem-based projects, e.g., sea desalination plants, which could help to address *Kere* traps, are often announced by the central government but never see the light. This has led to the *Kere* territory being labelled as a "cemetery of projects" (UNICEF 2011, Hanisch 2015:2).

The *Kere*: a governance failure

The *Kere* is a cascading failure of governance. Although successive post-colonial administrative regimes (neo-colonial and Marxist-Leninist) gagged *Kere* information, successive post-cold war governments have learned to market it (Tsimanova 2015). Little was known about the *Kere* until the first liberal government of the early 1990s brought the calamity to public attention through a national telethon called SOS-Sud (Ramambazafy 2020). Since SOS Sud, the *Kere* has received national and international attention whence food security and disaster management policies were established, and relief interventions began to take place. Yet, the *Kere* persists.

Raikes (1988) and Dodo (2020) reasoned that Sub-Saharan Africa food crises are the outcome of policy failure. These authors attribute the demise to foreign imposed policies, e.g., the World Bank's structural adjustment programs, that enforce capitalist economic imperatives as foundational requirements for receipt of aid by poor countries. These imperatives include the stoppage of aid grants and subsidies to farmers (Dodo 2020). Application of these prescribed policies has resulted in African farmers' loss of government supports that subsequently have led to deficit in food production, and the increase of food imports tied with the dependency on foreign aid (Dodo 2020). Typically, food-aid comprises surpluses of subsidized cheap food from developed countries (Raikes 1988). Whatever these policies' possible benefits, their application by the neopatrimonialist bureaucrats that use public office for private gain is the true cause of the failure (Sandbrook 1986). Famines capture international aid, thus, more *Kere* famine, more aid.

The *Kere* has attracted a plethora of aid organizations engaged in a self-absorbing battle of diverse and competing financial interests, resulting in aid-based emergency responses as the dominant solution (Tsimanova 2015, Razanakoto 2017). Often, a small food crisis is announced as a deadly *Kere* to mobilize international aid. Paradoxically, aid-based solutions to a complex disaster may have immediate effects but fail to address long-term causes and thereby outcomes (Riddell 2014), as was the case of the cataclysmic famine that hit Ethiopia in 1984 (Vestal 1985). International aid is tied to systemic problems including dependency and mismanagement (Arndt et al. 2013, Broberg 2014, Riddell 2014). According to Riddell (2007, 2014) and Arndt et al. (2013), it cultivates dependency to aid while minimally contributing to the rebuilding of recipients' capacities. Broberg (2014) and Salifu and Abdulai (2018) stress that mismanagement of international relief aid, which involves aid gone astray, embezzlement, and other forms of corruption, may benefit only officials while the needs of the intended beneficiaries remain unmet. The *Kere* as a major recurrent event is no exception to this. According to Tsimanova (2015), in 2015 alone the Madagascar government received around US\$70 million for *Kere* reduction programs from multilateral donors; yet little has been done to tackle the root cause of the *Kere*. As such, focus group participants complained about the invisibility of the government in *Kere* business, as if it has relegated the *Kere* responsibility to foreign aid agencies. Consequently, participants expressed no surprise that sustainable solutions to the *Kere* have not been achieved to date.

The *Kere*: a famine caused by failure of food entitlement?

Famine occurs when many people are starved from not having enough food for an extended period (Scrimshaw 1987). Starvation is a process that leads to famine outcomes (Conley and deWaal 2019). The *Kere* evolves from food insecurity to famine but the process leading up to its cyclical recurrence begs for a deeper theoretical consideration. Theoretical debates on how food insecurity becomes famine are shaped by two opposing but complementary views (Bush 1996). The first views famine as the ultimate result of food availability decline (FAD) and the second perceives famine as the failure of people's entitlements to food (FFE). However, key features of the *Kere* presented by participants included the prolonged lack of food and the money to buy it, which encompass issues of food availability and the inability to purchase it.

The FAD is a Malthusian view that famine occurs when population growth exceeds food supply capacity (Ambirajan 1976, Sen 1976). In this line of thinking, the decline of food supply can be caused by natural, e.g., drought or pest infestations, or man-made disaster, e.g., civil disturbance or transport failure (Mabbs-Zeno 1987, Scrimshaw 1987). The main livelihood of the *o'ndaty* is animal husbandry centered on zebu-cattle (Feldt 2015, Goetter 2016). Subsistence peasants (Razanakoto 2017) grow only what they consume which accounts for ~21% of their total annual diet (Hänke et al. 2017), with a small portion for sale. Because of this, crop production occupies only ~15% of the total land surface (WWF 2010), which leads to an annual food deficiency of ~79% and permanent shortage of food even during *anjagne*. When the *Kere* develops, food supply rapidly decreases from insufficient to none.

Sen's FFE approach (1981) hypothesizes that famines are not necessarily caused by the absence of food, but instead the inability to acquire food. Based on the market economy, this view postulates that people's income, goods for barter, ability to grow food, and access to relief "entitles" them to certain amounts of food. When the price of food exceeds peoples' purchasing ability, entitlement failure occurs caused by the erosion of their endowment, then famine happens (Sen 1981). With the *Kere*, this holds true to a certain extent. The *o'ndaty* monetize properties, e. g., livestock and personal belongings, to procure food for as long as food is available. However, when the *Kere* grows in length and scope, food prices hike while availability declines. Meagre purchasing power, atrocious roads, and insecurity hinder transportation of food supplies from abutting regions. Participants claimed that trouble begins when stored food is finished and there is no more food to buy or to barter. When food reappears at higher prices, people may sell or barter remnant assets to secure as much food as possible, until nothing is left (erosion of endowment). At this point, their only hope is relief food-aid. Thus, the primary cause of *Kere*-famine is the dearth of food (FAD); FFE only occurs when food prices hike before it disappears as the *Kere* grows.

In theory, localized food shortfalls can be met by importing food from surplus areas (Hasell and Roser 2013). This depends, however, on the functionality of local markets, and whether trade between *anjagne* areas with food surplus and *Kere* areas with food deficit is sustainable. With the effect of demand elasticity, food shortages escalate prices that would entice traders to bring in more food supplies. In the Deep South however, two interconnected parameters contest this theory: a high level of poverty (*o'ndaty* live with less than US\$1.9 per day [Healy 2017]), and lack of roads. Madagascar's road network is one of the poorest in the world, and national road sections in the Deep South are mostly impassible, trapping the entire region in a state of isolation (FAO 2000). Dirt roads connecting chief districts and major towns, e. g., Ampanihy, Bekily, and Beloha, are oxcart trails crossing the spiny forest and valleys, home to *dahalo* bandits that present a constant risk to both vehicle damage and road ambush (Healy 2017). If food supplies reach the market, prices hike while traders may not be able to sell them quickly because penniless *o'ndaty* are highly "hooked" with free food aid. Although oxcart ambulant traders from abutting *anjagne* areas may, from time to time, bring in small amounts of food, e.g., water, dried cassavas, or sweet potatoes, these factors render the local market highly unprofitable

to traders, thus hindering regional import of food supplies, portraying what Sen (1981:47) called the "trade entitlement failure." Clearly, lack of usable roads is a major obstacle to food availability, and hence a key driver of the *Kere*-famine.

The *Kere*: a by-product of political events

The relationship between famine and political unrest is well established in the literature. According to Maxwell (2013), food crises can be the trigger and consequence of political unrest. Scrimshaw (1987) and Bush (1996) assert that Africa's famines are mostly caused by political crisis, e.g., the Sudanese famine in the 1980s. The specificity of the *Kere* lies in its social-ecological features and cyclical recurrence. Scrimshaw (1987) asserted that although natural hazards precipitate famine, they are mostly man-made. Participants noted the occurrence of the *Kere* in the wake of critical political events. One possible explanation is the absolute centralization of government power in the capital city of Antananarivo, and repeated coups, e.g., coup d'états of 1992, 2002, 2009, 2018. Each coup has engendered a governance vacuum at regional level and a disruption to the already poor public services and social order (World Bank 2013). *Kere* history (Table 2) validates the claim that every *Kere* was preceded by a major political event. For instance, the *Kere* of 1945 was associated with the end of the Vichy War (Fenies 1957), and the *Kere* of 1993 marked the collapse of the Marxist-Leninist regime, etc. The relationship between famine and political unrest entails intuitive effects (Adams 2013) that are tied to each case; this makes generalization difficult. Even so, this implies that the *Kere* has been captive to broader political events and imperatives.

The *Kere*: social repercussion

Social repercussions of the *Kere* are profound and extensive, with family breakdown a critical threshold, i.e., a critical state when a system becomes very fragile. Family breakdown begins when heads of households depart to *ankarama*, or perish during the *Kere*, e.g., thirst, starvation, illness, or *dahalo* raid. Participants explained that *ankarama* is a practice whereby adult males migrate far away and send money back home. Razakanoto (2017) stressed that since the initial *Kere* of 1930, adult males between 18 to 40 years of age were conscripted as part of the colonial SMOTIG (colonial public services) system to work in vanilla and sugarcane plantations in the north of Madagascar. This has become a migration route. According to Droy and Rasolofo (2004), this practice results in a high incidence (~30.5%) of single female heads of household. Analogous to this, similar migration patterns occurred following Ethiopia's episodic war-famines. From 1960 to 1989, Ethiopia had experienced recurrent war-famine every 5 years with each instance inducing waves of migration of young people: young men migrated to the southern Ethiopian coffee plantations (Mabbs-Zeno 1987), while young women migrated to Ethiopia's urbanized cities (Berhanu and White 2000). Most migrants however returned home when crises ended, exemplifying a circular migration that characterizes famine induced migration in the horn of Africa. *Kere*-induced migration however is not circular because, although the *Kere* is a temporally circular event, the *o'ndaty ankarama* rarely return home unless culturally obliged, e.g., funerals. During the last decade, pressed by the growing hardship, more males of younger age have also been migrating away while females remained sedentary (Droy and Rasolofo 2004). Acting as a system perturbator, male depopulation furthers the deterioration of *o'ndaty* nuclear families and their social system at large.

Kere causes orphans. According to participants, relatives often reject orphans for economic burden. In a country that lacks social assistance infrastructure, orphans are frequently left on their own to grow up as beggars, sex workers, illegal loggers, and above all *dahalo* bandits, heightening lawlessness. Although there is no specific data to assess the link between *Kere* and orphans, the INSTAT (2010) reports that orphans (single or both parents) constitute ~6.4% of population < 18 age in the Deep South. This rejection is a clear indicator of the deterioration of family kinship during the *Kere*. Scrimshaw (1987) emphasized that family mutual help is vital at the onset of the famine, but gradually deteriorates as the famine grows. In their work on the psychological effects of famine, Jelliffe and Jelliffe (1992) explain how the survival of the fittest mindset overtakes family bonds, whereby father and son may fight for a loaf of bread. Shoshan (1980) and Scrimshaw (1987) exemplified famine-induced food riots can grow from family dismay to social disturbance and cause large-scale revolts, such as the Egyptian revolt of 1470 and the French revolution of 1789. Correspondingly, the *Kere* triggered a secessionist revolt of *o'ndaty* in 1971 (Raison-Jourde and Roy 2010). Because families are the foundation that society is built upon, the higher the number of families affected, the larger the repercussion to the social system.

The *Kere* forms: social-ecological systems' regime shifts

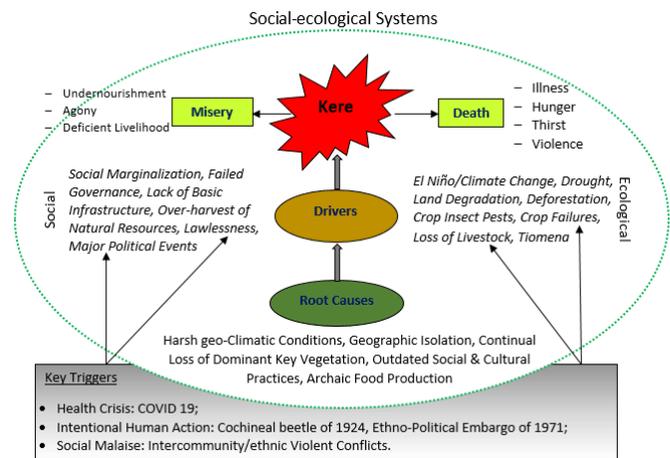
As noted previously, participants described four progressively more devastating forms of the *Kere*. We suggest that these forms are essentially SES regime shifts. SESs are complex adaptive systems that, in order to maintain functionality, must adapt to perturbations by evolving to a new state where it may find some stability (Biggs et al. 2018). When the SES in the Deep South is pushed to a transitional state it can either slow down and recover if perturbation abates (revert to *anjagne*), or escalate into a new regime if perturbation augments (shift to Form 1, 2, or 3; Scheffer et al. 2001). At the onset, the *Kere* impacts livestock fodder calling for the *o'ndaty* to mobilize resources to save their animals—a shift from *anjagne* regime state to *Kere* Form 1. As the *Kere* progresses in time and scope, livestock are saved but resources at hand are depleted while availability of food items diminishes, signaling a system escalation to a new regime: the *Kere* Form 2. At any time, *Kere* may abate, e.g., a good rainfall, and the *o'ndaty* may begin recovery by planting fast growing crops, e.g., sweet potatoes. If the *Kere* further escalates in time and scope, resilience depletes while vulnerability augments. At this point, food items for both *o'ndaty* and livestock disappear, indicating a system shift to a catastrophic regime: the *Kere* Form 3. Notably, discussions with participants revealed that *o'ndaty* have learned to identify warnings of system saturation (Carpenter et al. 2011) by observing changes in the behavior of the natural environment, e.g., moon, wind, and stars. This systemic examination of the *Kere* forms provides an ideal platform for policy design that can break the cycle of its recurrence.

The *Kere*: not a single cause

Our analysis, and the perceptions of affected study participants, makes clear that the *Kere* is both the result and cause of a variety of interacting social-ecological factors. Thus, the understanding that the *Kere* is caused by lack of water, or any single cause, is simplistic and erroneous. In a public speech on 20 February 2020, the Governor of the Androy Region declared that "... because of

the lack of rain ..., *Kere* looms ...” (<http://www.cycloneoi.com/archives-blog/infos-diverses/le-kere-famine-menace-dans-le-sud-de-madagascar-suite-a-la-secheresse.html>). Lack of water is an inherent characteristic of the Deep South. It is a common idiosyncratic hazard that causes hardship, but alone does not constitute a *Kere*. The *Kere* unfolds only when the socioeconomically crippled community is hit by additional shocks. A hypothetical framework illustrating the interlocking elements of the *Kere* is presented in Figure 3.

Fig. 3. The *Kere* conceptual construct.



CONCLUSION

This research has explored the experiences and perceptions of *Kere*-affected communities to develop a comprehensive understanding of the *Kere* phenomenon. Survivors perceive the *Kere* as a *voy* made of multifarious interrelated hazards, including drought, insecurity, and ill-health. Relationships between these hazards involve a dynamic chain of causations with pastoralists being both catalysts and victims. These chains of causation are compounded by increased socioeconomic impacts on the Deep South's ecological system, exhibiting the characteristic of a social-ecological disaster that is an aggregate of natural (e.g., drought, *Tiomena*) and anthropogenic hazards (e.g., insecurity). A social-ecological systems framework was mobilized to unpack the range of issues at play, and the means by which they influence one another to generate the *Kere*.

Under the duress of food crises, people's overreliance on the ecosystem intensifies despite existing forest protection laws, leading to amplified loss of vegetation, ecosystem degradation, and desertification. Compounded by the effects of extreme geo-climatic oscillation, e.g., El Niño, with associated warmer weather, extended dry-spells, emergence of *Tiomena*, and crop pest infestations, crop production is diminished resulting in food crises. The hardship breaks family bounds and strains social fabric. Stressed and desperate youth become *dahalo*, leading to community unrest. Violent cattle raids ruin communities and disrupt regional food production and supply, leaving survivors that are highly undernourished, prone to illnesses, and too feeble to work the land. Governments either ignore the issue or, in recent decades, have abdicated their socio-political responsibilities to the short-term

priorities of aid agencies. These causal links between drivers and outcomes, which characterize a social-ecological disaster, makes the *Kere* a formidable poverty trap.

In sum, the *Kere* is a wicked problem and its resolution requires a robust holistic approach that includes an examination of *Kere*-affected communities' own understandings and experiences of the phenomenon. Such an approach calls for the deployment of a new paradigm whereby governments and aid agencies take heed of community knowledge and experience, invest in social, educational, and physical infrastructure, and support local communities to be more self-reliant and self-sustained.

^[1] Different from the Judaism *Kere* term, which is a traditional Jewish mode of reading the Hebrew Bible.

^[2] According to the IPC standards threshold, a catastrophic famine, classified IPC Phase 5, occurs when a jurisdiction has at least 20% of households facing an extreme lack of food, at least 30% of children suffering from acute malnutrition, and two people for every 10,000 per day die from lack of food (https://www.ipcinfo.org/fileadmin/user_upload/ipcinfo/docs/IPC_Famine_Factsheet_2020.pdf).

^[3] The island of Madagascar is divided into 22 administrative regions, of which three regions, Atsimo-Andrefana, Androy, and Anosy, in the arid and semiarid south, are referred to as the Deep South or the Grand Sud (Healy 2017).

^[4] FAO, defines undernourishment as the proportion of the population whose dietary energy consumption is less than a predetermined threshold (<http://www.fao.org/3/a-al936e.pdf>).

Responses to this article can be read online at:
<https://www.ecologyandsociety.org/issues/responses.php/12975>

Author Contributions:

This study was organized by MIR and GE. Conception of research tool was initiated by MIR and GE followed by sequence of revisions by JRS, KS, and TR. Fieldwork was carried by MIR in full coordination with GE, TR, JRM, and KS. Data analysis and coding was conducted by MIR under the guidance of GE, JRM, KS, TR. Writing of the manuscript carried out by MIR, GE, JRM, KS, and TR. All authors read, revised, and approved the final manuscript.

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Data Availability:

The data and codes that support the findings of this study are available on request from the corresponding author, MIR. None of the data and codes are publicly available because of the non-disclosure agreement with research participants. Ethical approval for this research study was granted by the Charles Darwin University Human Research Ethics Committee, (CDU-HREC) with reference H19037.

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