

Actors and networks in resource conflict resolution under climate change in rural Kenya

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Abstract

The change from consensual decision-making arrangements into centralised hierarchical chieftaincy schemes through colonization disrupted many rural conflict resolution mechanisms in Africa. In addition, climate change impacts on land use have introduced additional socio-ecological factors that complicate rural conflict dynamics. Despite the current urgent need for conflict-sensitive adaptation, resolution efficiency of these fused rural institutions has hardly been documented. In this context, we analyse the Loitoktok network for implemented resource conflict resolution structures and identify potential actors to guide conflict-sensitive adaptation. This is based on social network data and processes that are collected using the saturation sampling technique to analyse mechanisms of brokerage. We find that there are three different forms of fused conflict resolution arrangements that integrate traditional institutions and private investors in the community. To effectively implement conflict-sensitive adaptation, we recommend the extension officers, the council of elders, local chiefs and private investors as potential conduits of knowledge in rural areas. In conclusion, efficiency of these fused conflict resolution institutions is aided by the presence of holistic resource management policies and diversification in conflict resolution actors and networks.

1. Introduction

Most African ethnic groups coexist peacefully with high degrees of mixing through inter-ethnic marriage, economic partnerships, and shared values that have been nurtured patiently over millennia (Aapengnuo, 2010). As a result, the management of

33 conflicts before colonization was guided by indigenous governance institutions that
34 established consensual decision-making arrangements at the grassroots (ECA, 2007).
35 This administrative role was later transferred to chieftaincies created by colonial
36 governments that sought to impose hierarchical rule on its subjects (Osaghae, 1989).
37 After independence, many African countries opted to maintain colonial administrative
38 structures and chieftaincy. To increase effectiveness in rural governance, local chiefs
39 were elevated to custodians of customary law and communal assets, with a
40 responsibility to dispense justice, resolve conflicts and enforce contracts (ECA, 2005).
41 This action created co-management regimes composed of diverse stakeholders,
42 representing divergent interests and interacting directly over a period of time to resolve
43 a specific conflict within their locality (Brunner et al., 2005).

44 However, the seemingly “stable” African conflict dialogue is currently becoming
45 complicated through additional socio-ecological factors from unpredictable climatic
46 conditions (Carius, 2009). There is a broad scientific debate whether and how climate
47 change may act as a ‘threat-multiplier’ and will increase resource conflicts in sub-Sahara
48 Africa (Lobell et al., 2008) among resource-dependent rural communities with low
49 adaptive capacity (AMCEN, 2011; Haldén, 2007; WRI et al., 2005). For clarity, a resource
50 conflict is defined in a wide sense as a situation whereby two or more parties
51 (individuals or groups) have or perceive to have, a) incompatible livelihood goals and
52 interests, or b) are in direct resource competition with each other and act upon these
53 differences (UNEP, 2009, 2011).

54 Adaptation measures addressing impacts of climate change on rural livelihoods have
55 already been instituted globally to moderate potential damages and/or exploit
56 beneficial opportunities (IPCC, 2007). But rigid demarcation into sectoral tasks of
57 adaptation programmes can fall short when it comes to conflict. Thus, a more
58 systematic, integrated approach is necessary to meaningfully incorporate existing
59 conflict dynamics—as well as overarching socio-political and economic conditions—
60 into the design of adaptation measures. This creates the need for conflict-sensitive
61 adaptation strategies to enhance sustainable development (Tänzler et al., 2013).
62 Conflict-sensitivity refers to approaches and measures that display cognisance of how:
63 climate change can cause conflicts; climate adaptation projects themselves can
64 contribute to conflict and; adaptation measures would operate in conflict zones (Yanda
65 and Bronkhorst, 2011). Such knowledge allows planners and decision-makers to

66 address current vulnerabilities and development priorities, while aiming to ensure
67 long-term sustainability and peace through a basic understanding of future projections
68 (Yanda and Bronkhorst, 2011).

69 Consequently, this article seeks to address two knowledge gaps through this paper.
70 First, effectiveness of the fusion between indigenous mechanisms with conventional
71 and western conflict resolution approaches is still in question (ECA, 2007). Second, few
72 studies have documented actual rural structures and mechanisms used to resolve
73 resource conflicts in the sub-Saharan grassroots (Hyden et al., 2005). To this end, we
74 critically evaluate conflict resolution mechanisms of the water, agriculture and wildlife
75 sectors of Loitoktok Sub-County in Southern Kenya. We then use the brokerage concept
76 under social network analysis to identify central conflict resolution actors with the
77 potential to guide implementation of conflict-sensitive adaptation (Yanda and
78 Bronkhorst, 2011). We hypothesise that the presence of diverse stakeholders in the
79 conflict-resolution process contributes to high potential success in implementation of
80 conflict-sensitive adaptation in Loitoktok. Our discussion intends to further clarify local
81 conflict dynamics influencing adaptive capacity, social cohesion and rural development
82 in Kenya, as well as to contribute to the climate-security discourse in Africa.

83 The paper begins with a brief summary on the evolution of resource governance in
84 Africa. Then it elucidates capacity challenges of current rural resource governance in
85 dealing with potential climate-driven conflicts in sub-Saharan Africa and expounds on
86 the use of social network theory in diagnosing resource governance. Thirdly, a
87 description is given of the case study area of Loitoktok and the method used for
88 collecting and analysing social network data. The results and discussion are thereafter
89 presented based on identified conflict resolution mechanisms at the grassroots and
90 their potential in the climate adaptation discourse. A brief conclusion is given on key
91 highlights from the study.

92

93 **2. Evolution of resource governance in Africa**

94 Governance is defined as “the effective management of public affairs through the
95 generation of a regime (set of rules) accepted as legitimate, for the purpose of
96 promoting and enhancing societal values sought by individuals and groups”(Hyden et
97 al., 2005). It takes place through diverse institutions in a society, whereby, an institution
98 is likewise defined as an enduring collection of formal laws and informal rules, norms,

99 customs, codes of conduct, and organized practices that shape and govern human
100 interaction (IDRC, 2009).

101 African indigenous institutions of governance were altered radically by colonial
102 occupation that established a centralised governance system through the formalized
103 chieftaincy tactic that became the foundation of post-colonial governments of many
104 African countries (Cheka, 2008). After independence, the chieftaincy mandate was
105 further altered during fundamental restructuring of socioeconomic systems by African
106 political entities (ECA, 2007). Maintenance of the chieftaincy position was disputed by
107 some who were concerned with rapid growth and transformation of African economies.
108 For example, the late Tom Mboya quoted in (Osaghae, 1989) stated “Chieftaincy
109 impedes the pace of development as it reduces the relevance of the State in the area of
110 social services”. Proponents of the chieftaincy stratagem highlighted differences
111 between the two systems that were clearly seen especially during conflict resolution, for
112 example the colonial (modern) legal system operates on the basis of an adversarial
113 approach while the traditional decision-making systems function on the basis of
114 consensual decision-making and reconciliation arrangements(ECA, 2007; IDRC, 2009;
115 IIDEA, 2011). Furthermore, since traditional institutions are indispensable for political
116 transformation in Africa, post-colonial governments opted to incorporate indigenous
117 knowledge into local administration regulations to increase positive perception of the
118 government by the masses(ECA, 2007).

119 Similarly, natural resources are embedded in a shared social space where complex
120 and unequal relations are established among a wide range of social actors, e.g. in the
121 case of the production of primary products, agro-export producers and farmers, ethnic
122 minorities, government agencies and others (Mwanika, 2010). However, the “one-size-
123 fits-all” governance approach introduced by colonialists gave poor outcomes especially
124 in the water, wildlife and forest sectors, thereby necessitating establishment of rural
125 participatory resource management approaches to promote community-based resource
126 management and conservation in developing countries (Berkes, 2004). The inclusion of
127 indigenous institutions and knowledge was important because they guide how people
128 negotiate access to resources and reduce (though not avoid altogether) negative effects
129 of conflict or drought (Eriksen and Lind, 2009). Apart from indigenous institutions,
130 many developing countries are currently implementing poverty-reduction schemes that
131 target the unemployed and marginalised groups. In Kenya, the state has established

132 among others the Revolving Fund for women and youth community groups seeking to
133 access business funds to improve their living standards (Ngaruiya and Scheffran, 2013).

134 Consequently, three main types of institutional governance systems are active in
135 rural Africa.

136 a) *Traditional institutions* are defined as a power, permission or an institution
137 emanating from indigenous authority that draws its legitimacy, whether wholly
138 or partially, from tribal/ethnic/cultural values of a group of people that share
139 them (Cheka, 2008). Such traditional institutions have either centralized or
140 decentralized governance systems. Centralized systems had kings and monarchs
141 such as the Abyssinia (Ethiopia), Buganda (Uganda) and Ashanti (Ghana) while
142 decentralized systems comprise of council of elders found among the Kikuyu
143 and Maasai (Kenya), the gada (age-set) system of the Oromo in Ethiopia, or the
144 Ibo village assembly in Nigeria (ECA, 2007).

145 b) *Formal institutions* are state-sponsored institutions that were mostly inherited
146 from colonialism and constitute the written or codified rules such as the
147 constitution, judiciary laws, organized markets, and property rights (IDRC, 2009;
148 Mowo et al., 2013).

149 c) *Informal institutions* are the patterns of interdependence and actions among
150 individuals who build themselves into different structural configurations to
151 improve their living conditions or enhance resource exploitation. The actor
152 linkages formed across the community vary by religion, ethnic identity, mode of
153 production and are manifested as social networks (Prell et al., 2010).

154 When formal, informal and traditional institutions complement each other at
155 different prefectures and different tiers, stakeholders are able to integrate diverse but
156 relatable sources of knowledge to broaden resolution alternatives that might otherwise
157 have been missed (Irwin et al., 2007). However, *institutional incoherence* is a major
158 obstacle to effective governance. Incoherence occurs when governance institutions
159 become incompatible to each other, with consequences such as hindrances in decision-
160 making, wastage of financial resources or even deepened conflictual relationships at the
161 grassroots (IDRC, 2009; Mowo et al., 2013). A practical incoherence example is seen in
162 local adaptive capacity projects that are characterised by conflicting, overlapping
163 mandates and dysfunctional arrangements in inter-agency integration as a result of
164 weak coordination that subsequently gives poor outcomes (Madzwamuse, 2010). In

165 relation to this study, effective resource conflict governance calls for incorporation of
166 indigenous knowledge with a formal conflict resolution institution to create flexible
167 systems of resource management termed as “*adaptive co-management*” systems. These
168 systems become tailored to specific places and situations and are supported by and
169 work with various organizations at different levels (Folke et al., 2005). Furthermore,
170 effective adaptive co-management must involve multiple stakeholders to enhance
171 governance outcomes because local people know each other better, have more rapport
172 and sense of belonging that creates opportunities for cooperation and collective action,
173 for managing natural resources on a self-ruling and self-sufficient basis at the
174 grassroots (Mowo et al., 2013).

175 Against this background, issues of governance and institutional coherence turn out to
176 be relevant for our inquiry into the role of culture in social cohesion at the grassroots.

177

178 **2.1. Capacity challenges in addressing climate-driven rural conflicts**

179 Climate change has been described as a ‘threat-multiplier’ that may intensify existing
180 social, economic, political and environmental problems that communities are already
181 facing. Impacts of climate change are predicted to exacerbate grievances; overwhelm
182 coping capacities; and, in extreme times, spur forced or proactive migration (WBGU,
183 2008; Yanda and Bronkhorst, 2011). Climate change predictions for Africa suggest
184 increasing scarce water resources associated with declining and failing agricultural
185 yields in the Horn of Africa (Carius, 2009). Some studies predict a significant increase in
186 armed conflicts in sub-Saharan Africa by 2030 compared to the 1980 to 2000 period
187 (Burke et al., 2009; Lobell et al., 2008) though others challenge this claim (Buhaug,
188 2010; O’Loughlin et al., 2012). Various studies find mixed results on the climate-conflict
189 link in East Africa (Ide et al., 2014; O’Loughlin et al., 2012; Raleigh and Kniveton, 2012;
190 Schilling et al., 2012; Witsenburg and Adano, 2009).

191 Land is not just a material resource that people compete over, but it also forms the
192 basis of a particular way of life (farmer, pastoralist, fisher etc.); gives an ethnic identity;
193 and defines gender and age roles (Mwanika, 2010). Figure 1 illustrates possible paths to
194 conflicts induced by climate change in a typical rural village scenario in Kenya
195 (Ossenbrügge, 2009). These paths are termed as conflict constellations which are
196 divided into four, namely - water stress, food insecurity, drought as a natural disaster,
197 and migration issues (WBGU, 2008). Cumulative impacts from climate change on key

198 rural livelihood activities, such as agriculture and wildlife tourism subsequently,
199 decrease (or cause failed) harvests and also increase farm raids by wildlife from
200 neighbouring protected lands. Subsequent loss of income in rain-dependent
201 communities lowers the spending power and increases local poverty levels. This affects
202 the vulnerability of households with land as their main asset and additional source of
203 income, especially for rural households experiencing poor harvests and livestock
204 productivity in Kenya (Ntiati, 2002). Consequently, subdivision and sale of land to
205 “outsiders” due to their perceived higher capability of enhancing the “locals” economic
206 status disrupts the cultural norms and trusts of indigenous host communities through
207 exposure to dissimilar immigrant norms and attitudes.

208 On the one hand, introduced norms could be beneficial like reduction of female
209 genital mutilation. On the contrary, immigrants are perceived as “threats” who reduce
210 power and influence of tribal chieftains, elites or local politicians. Such divisive thinking
211 is grounded on the parochialism of communities in conceding the rights and interests of
212 other communities (Western, 1994). On the extreme, if civic education is not foremost
213 in the community then such a fragile “host vs. immigrant” situation creates fertile
214 grounds for mobilizing citizens along ethnic or cultural lines by politicians vying for
215 elective posts by promising “equal” resource allocation. Subsequently, people may
216 retreat to their ethnic cocoons and agitate for social respite from the government. Such
217 a “domino” effect clearly demonstrates the link between climate change impacts and
218 resource conflicts whereby a decrease in ecosystem services production leads to
219 increased rural poverty that gradually draws ever-deeper lines of division in social
220 relations and triggers resource conflicts (WBGU, 2008). Hence, the sale of land to
221 “outsiders” leads to reduced land holdings, reduced grazing area, increased incidences
222 of overgrazing, fencing – all of which lead to reduced adaptive capacity. In the absence
223 of conflict-sensitive adaptation programs, these resource conflicts become cyclic and
224 reduce the ability of the community to adapt.

225 Adaptation funding is already being made available and adaptation projects are
226 under way in many rural communities (Yanda and Bronkhorst, 2011). However,
227 escalating cases of resource conflicts are projected to overwhelm rural conflict
228 resolution mechanisms and reinforce the trend towards general instability and
229 insecurity that already exists in many societies and regions (WBGU, 2008). We find that

230 this prognosis is supported by three main capacity concerns drawn from the literature
231 on climate change and resource conflicts in Africa:

232 a) Handmer et al., (1999) posit that poorer regions and countries will have
233 difficulty in adapting to climate change, since they lack comprehensive technical
234 and financial ability. In addition, African governments are faced with other major
235 developmental issues such as conflict, diseases and poverty that require direct
236 engagement by the state (AMCEN, 2011). Hence, at the moment climate change
237 adaptation policies seem unlikely to be successful or minimize inequity in Africa.

238 b) Adaptation is *not just* a technical process but also a political process since power
239 relations need to be adjusted for individuals and groups to achieve discrete
240 interests to maintain their own livelihoods (Eriksen and Lind, 2009). Poor
241 understanding of the African society structure and preference for “foreign” non-
242 governmental organisations (NGOs) with disparate interests in formulating the
243 African adaptation agenda has resulted in poor representation of the grassroots
244 level in the climate discourse, yet they are the most affected group (Hellmuth et
245 al., 2007; Madzwamuse, 2010).

246 c) Poor representation subsequently creates the third capacity challenge of
247 marginalisation of customary law in climate change policy-making at both
248 national and international levels, despite the high significance of indigenous
249 knowledge in the African society (AMCEN, 2011). Moreover, education systems
250 also neglect indigenous knowledge in school curricula concerning environmental
251 studies due to the negative undertone given to cultural practises by colonial
252 governments.

253 These three adaptive capacity issues infer that coherence between governance
254 institutions is critical in preventing competition over resources turning into a violent
255 conflict (Adano et al., 2012; Young, 2011). This is because effective adaptation can also
256 serve as a “threat minimiser” that brings together actors from security arrangements,
257 conflict resolution and asset management sectors to strengthen local adaptive capacity
258 while reducing predicted conflict cases (Donnelly-Roark et al., 2001). Furthermore,
259 opportunities for incorporating climate information into development activities in sub-
260 Saharan Africa are largely being missed at the moment (Hellmuth et al., 2007). This is
261 mainly because selecting representatives in resource governance institutions becomes a
262 complicated process since African rural communities are composed of diverse informal

263 interest groups that are formed as forums for exchanging knowledge, accessing
264 development funds and markets for their products (Ngaruiya and Scheffran, 2013).

265

266 3. Use of social network theory in resource governance studies

267 Incorporation of social network analysis into resource governance has rejuvenated
268 studies in natural resource management by introducing a quantitative approach to
269 political, economic or social processes in connection to structural and environmental
270 processes (Bodin and Prell, 2011). A social network is composed primarily of
271 interdependent actors together with the social relations (ties) linking these actors
272 together for transfer or flow of resources (Bodin and Prell, 2011). Social networks can
273 be viewed as a graph that consists of nodes (actors) joined by lines (relations) which
274 allows researchers to uncover patterns that might otherwise go undetected (Prell et al.,
275 2010). Network analysis fundamentally differs from standard social science research
276 because rather than focusing on attributes of autonomous individual units; it views
277 characteristics of the social units as arising out of structural or relational processes to
278 reveal theoretical motivations behind social relationships that shape environmental
279 outcomes (Wasserman and Faust, 1994).

280 Of interest to this study is how social network analysis facilitates
281 identification of stakeholder positions in a network and how these actors link various
282 parts of the network together (Bodin and Prell, 2011; Ngaruiya et al., 2015). Several
283 mathematical indices are used to quantitatively define this importance or prominence
284 of an individual actor within their social network. Equation (1) defines the *betweenness*
285 *centrality* index that counts the number of network pathways passing through an actor
286 and is used to measure how much potential control an actor has in disseminating
287 accurate and relevant information across the community network.

$$288 \quad C_B(k) = \sum_{i \neq j \neq k} \frac{\partial_{ikj}}{\partial_{ij}} \quad (1)$$

289 Where:

290 $C_B(k)$ = betweenness centrality of actor k

291 ∂_{ikj} = number of paths linking actors i and j that pass through actor k

292 ∂_{ij} = number of paths linking actor i and j

293 This definition is based on the assumption that interactions between two
294 nonadjacent actors might depend on other actors, especially the actors who lie on the

295 path between the two (Wasserman and Faust, 1994). A practical implication of this
296 index is that if actors rest between many others, then they have the ability to “broker”
297 adaptation information to other actors and thereby influence the level of collective
298 knowledge in the community. If brokers are active within a community, they will not
299 only influence the quantity of knowledge but will also enhance the quality of knowledge
300 circulating because they are able to connect diverse stakeholders to solve a common
301 resource problem. For example, if a community has well-equipped brokers then the
302 local ability to adapt to climate change increases the potential for peaceful conflict
303 resolution and conflict transformation (Tänzler et al., 2013). On the other hand,
304 unrestrained brokerage can create organisation chaos, manifest in errors such as
305 resources allocated to conflicting goals and units in the same organisation competing
306 against one another (Burt, 2011). A practical example of poor brokerage is how
307 immense adaptation funding has caused a proliferation of actors offering diverse
308 “expertise” in rural communities but with poor performance outcomes in many rural
309 areas (Madzwamuse, 2010). Despite this flaw, brokerage is an interesting concept that
310 is yet to be exhaustively applied in resource governance in Africa.

311 For that reason this paper uses social network analysis concepts to evaluate rural
312 conflict resolution mechanisms, their structure and how central actors can be used to
313 implement conflict-sensitive adaptation strategies at the grassroots.

314

315 **4. Method**

316 **4.1. Area description**

317 Our area of focus is Loitoktok Sub-County in Kajiado County, located at the southern
318 tip of the former Rift Valley province in Kenya and covers c. 6,356.3 km². It is situated
319 between longitudes 36° 5' and 37°5' East and between latitudes 1°0' and 3°0' South and
320 borders the Republic of Tanzania to the West adjacent to Mt. Kilimanjaro (Government
321 of Kenya, 2009). Ecologically, it is categorized among the arid and semi-arid areas in
322 Kenya. The first census in 1962 showed a population of 24,027 persons while the
323 current estimated population for 2012 is 171,520 persons. The Sub-County has an
324 estimated annual population growth rate of 4.51% as per last census count
325 (Government of Kenya, 2009). Loitoktok was formerly known as a district but changed
326 into a Sub-County following promulgation of the 2012 constitution that created new
327 administrative units consisting of Counties and Sub-Counties.

328 Loitoktok was selected as representative of a typical Kenyan rural area because of a)
329 it's vibrant water, agriculture, and wildlife sectors, b) rapid land subdivision, c)
330 introduction of diverse cultures by immigrants with different livelihood practises apart
331 from pastoralism of the Maasai community. In addition, evidence of environmental
332 impacts related to climate change have locally been documented through changes in
333 precipitation (Thompson et al., 2009), temperature fluctuations (Altmann et al., 2002),
334 wildlife mortality (Wangai et al., 2013) and agricultural production (Ngaruiya 2014) in
335 Loitoktok.

336 In terms of governance institutions and stakeholder diversity, Loitoktok's rich
337 wildlife supports a strong tourism sector characterised by many hotels and lodges and
338 is rated as one of the key wildlife tourism areas in Kenya. Interestingly, unmonitored
339 land subdivision and climate variability, increased cases of wildlife poaching and
340 human-wildlife conflicts also created opportunities for establishment of several wildlife
341 organizations promoting conservation of local biodiversity. Additionally, due to the Sub-
342 County's' remote and semiarid location, several non-governmental organizations have
343 been started to boost the education, water and health sectors in collaboration with
344 government agencies.

345

346 **4.2. Data collection and analysis**

347 Field work was conducted in March-May and October-December 2012. Information
348 was sought on the resource conflict resolution process for water, wildlife and
349 agriculture sectors. A simple questionnaire collected relational (social network) data of
350 actor linkages using the saturation sampling technique within the Loitoktok community.
351 A respondent was asked to name five persons they share collaborations with during
352 conflict resolution and resource governance, whereby the named actors were located
353 (where possible) and asked to name their collaborators, which went on until no new
354 names were mentioned.

355 Thereafter, the social network data was converted into an actor matrix and analysed
356 for brokerage using the algorithm for betweenness centrality that finds the geodesics in
357 the network and then computes potential connections of every actor in the community.
358 The resultant data was then visualised as a sociograph using NetDraw™ that efficiently
359 illustrates the actual situation at the grassroots (Borgatti et al., 2002).

360

361 **5. Results and discussion**

362 The respondents comprised of 152 persons drawn from four sectors (water,
363 agriculture, wildlife tourism and community) and also included expert interviews in
364 Nairobi, Kajiado and Loitoktok towns. The questionnaire also guided 6 group
365 discussions in Loitoktok All respondents agreed that inclusion of culture in the conflict
366 resolution process gave the community confidence in decisions agreed after
367 deliberations and that the main aim of a conflict resolution was to reduce tension or
368 violence by bringing the conflicting parties together. This coincides with principles of
369 natural resource management that emphasize the need for cooperation as a necessary
370 precondition for sustainable conflict resolution.

371 Table 1 illustrates practically how different resource conflicts were resolved between
372 November 2011 and November 2012 at Oloolopon Division in Loitoktok. It is evident
373 that resolving resource conflict is not the responsibility of a single person or institution,
374 but that minor conflicts were resolved by a small stakeholder meeting that was trusted
375 to recommend fair decisions for aggrieved parties, e.g. conflict over water at Impriron.
376 The most recommended discipline measure is compensation by the guilty actors to the
377 aggrieved party according to the level of destruction or damage. In extreme cases, when
378 the community felt aggrieved and the situation was thought to likely spread community
379 tension, the chief was obligated to call for joint meetings (*barazas*) for all relevant
380 stakeholders and the entire community.

381 This real-life reflection confirms that chiefs and other traditional authorities also
382 have the potential to mitigate ethnic conflicts by applying traditional conflict-resolution
383 mechanisms to narrow differences (ECA, 2007). The survey also confirms coherence
384 among the different institutions involved in resource conflict resolution.

385

386 **5.1. Rural conflict resolution schemes**

387 Three main conflict resolving systems borne from cooperative efforts were identified
388 in Loitoktok (Fig. 2). These are:-

389

390 a) Policy-guided conflict resolution plan

391 Water scarcity was identified as a driver for resource conflict, especially during the dry
392 seasons in Loitoktok. As stipulated in the Water Act of 2002, the Ministry of Water
393 mandates its local government agency - Water Resources Management Authority

394 (WRMA) - to resolve local water conflicts together with the Water Resource Users
395 Association (WRUA). The local chief is an optional mediator in the presence of water
396 officials. If the conflict is not resolved through negotiation then it is either forwarded to
397 the courts for legal action against the offender or to the Water Appeals Board for further
398 arbitration. An interesting aspect is that WRMA also gives grants to approved WRUA's
399 projects that target enhanced water supply and quality. This clearly has encouraged the
400 community to participate in the prescribed regular training sessions for enhancing local
401 water governance.

402 Evidently, a well formulated resource policy is recognised as the first key step in
403 effectively resolving resource conflicts at the grassroots level. Thus the Water Act
404 clearly sets out the conflict resolution process and also empowers the resource users
405 with knowledge of their rights as resource users. For example, Loitoktok WRUA
406 members undertake citizen arrests of persons breaking water laws, especially upstream
407 farmers who over-extract water.

408

409 b) Quasi-formal conflict resolution plan

410 This structural arrangement is predominantly used to solve two forms of conflict that
411 affect agricultural output. These are: i) Human-wildlife conflicts that occur when
412 wildlife invades farms for fodder or livestock (prey) and/or to access water sources. ii)
413 Farmer-pastoralist conflicts that occur when livestock destroy crops while trying to
414 access watering points since communal grazing areas have been lost following
415 subdivision of community group ranches. The agricultural conflict resolution
416 committee comprises of the formal council of elders (administrative type), the local
417 chief, agricultural extension officers and police. This arrangement is termed as quasi-
418 formal because the elders and chief are nominated from the community by the
419 government, unlike in the water sector that only works with civil servants in conflict
420 resolution. The committee uses a crop damage or livestock death report prepared by
421 the extension officer to guide negotiations after which the aggrieved party is
422 compensated either in kind (livestock) or in cash form. Police is involved to ensure that
423 the conflict resolution process can be transferred to court if the offender fails to fulfil
424 the stipulated compensation. Though the council of elders is part of the community
425 sometimes the community perceives their unfavourable rulings with suspicion as if they
426 represent the government.

427

428 c) Hybrid site-specific conflict resolution plan

429 The wildlife sector exhibits a unique conflict resolution strategy as a result of
430 inadequate government policies. This strategy comprises of the traditional council of
431 elders, formal government agencies, private investors and researchers who come
432 together to cover shortcomings of the wildlife conflict management strategy. For
433 example, previous absence of compensation for livestock deaths and crop destruction
434 by wildlife led to wanton slaughter of lions, elephants, or zebras. Now, modest payments
435 to aggrieved families by private investors such as Mr Luke of Olkeri Sanctuary for losses
436 incurred by predators or elephants have reduced cases of revenge wildlife killings.
437 Another example was seen at the Mbirikani group ranch whereby game scouts
438 (members of the community) conduct regular patrols. Respondents stated that since the
439 *community wildlife policing* project has begun, the poaching levels have been reduced.
440 This site-specific measure infers that community members are prone to cohesively use
441 their own knowledge if they are assisted in developing an efficient way of collaboration
442 to enhance their livelihoods.

443 Though this mechanism seems to be effective, it does not comprehensively deal with the
444 fundamental cause of human-wildlife conflicts. This is because no policy exists on how
445 to ensure survival of wildlife during drought episodes to prevent the recurrent human-
446 wildlife conflicts. In addition, poor understanding of the wildlife management policy has
447 also exposed the community to manipulation by politicians seeking voter mileage at the
448 expense of the human-wildlife incidents.

449 From this study, it is evident that the resource conflict resolution process involves
450 interaction among diverse actors which in turn increases local civic knowledge,
451 community participation and shows respect to cultural practices that together
452 strengthen rural community networks. This also signals effectiveness of the fusion
453 between indigenous and conventional conflict resolution mechanisms. Furthermore,
454 integration of diverse stakeholders provides a basis to broaden institutional networks
455 and partnerships through alternative livelihood activities that may boost the local
456 economy. However the need to overhaul the land policy in Kenya cannot be overlooked.
457 Respondents stated that a comprehensively developed land policy will establish zones
458 for different development purposes and allocate buffer zones to reduce incidences of
459 encroachment and human-wildlife conflict in protected areas. This action will ensure

460 that future urban expansion will not lead to resource competition or unequal
461 distribution in rural areas of Kenya.

462

463 **5.2. Loitoktok social governance structure**

464 Scrutiny of the resource governance and conflict resolution structures reveal 86
465 actors in 23 formal institutions (government agencies), 16 informal institutions
466 (community groups), 46 private organizations and 1 traditional institution. These
467 institutions belong to four main sectors namely, agriculture, wildlife & forestry, water
468 resources and community management that implement resource governance through
469 collaborative actions from 30, 31, 11 and 14 actors from the respective sectors.

470 Figure 3 gives an illustration of how actors are connected and also identifies actors
471 who occupy the central position in Loitoktok. Full names of actors are contained in the
472 supplement. These actors are more visible, have the highest degree of ties and are
473 involved centrally in resource conflict resolution in the network. They include: Sub-
474 County Agricultural Officer (SCAO), Sub-County Kenya Wildlife Service (SCKWS) Officer,
475 Sub-County Livestock Officer (SCLO), Sub-County Government (SCG) Officer, Social
476 Development Officer (SDO), Sub-County Water Officer (SCWO), Sub-County Kenya
477 Forest Service (SCKFS) Officer and game scouts. The calculated betweenness scores that
478 indicate the network influence of the identified central actors are 718.5, 670.5, 179.5,
479 165, 151, 80, 78 and 78, in the same order respectively. These values represent
480 currently missing links to neighbouring actors that can be potential links available for
481 each actor to use in increasing the number of connection in the network. The eight
482 actors have the highest ability to build resource knowledge and ecosystem dynamics so
483 that the community can collectively respond to environmental feedback in a fashion
484 that contributes to resilience. The rest of the actors have betweenness scores of less
485 than 10 and thus have a small effect on information dissemination and control within
486 the larger community.

487 By empowering the central actors to actively create connections that span across
488 different resource sectors then the community can strengthen the local governance
489 strategy for effective problem-focused community resource management. This is
490 discussed below.

491

492 **5.3. Building conflict-sensitive adaptation**

493 Conflict resolution is critical to adaptation as conflict restricts many drought
494 adjustments involving peaceful interaction between many diverse stakeholders.
495 Conflict-sensitive adaptation becomes therefore a holistic, multi-scaled and multi-
496 sectored approach that taps into the wealth of traditional knowledge regarding the
497 management of resources and conflicts at a community level (Yanda and Bronkhorst,
498 2011). Conflict-sensitive adaptation processes must be approached using a multi-
499 dimensional system that incorporates different levels, both administrative and societal
500 (Tänzler et al., 2013). This study postulates that central actors, who hold the network
501 together in times of distress, also have potential to influence adaptation information
502 quality and flow in the network.

503 Loitoktok actors who should be equipped with adaptation knowledge to “broker” to
504 the community are:

505 a) Extension officers

506 These are the Sub-County Agricultural Officer (SCAO), Sub-County Livestock Officer
507 (SCLLO), Sub-County Kenya Forest Service (SCKFS) Officer and Sub-County Kenya
508 Wildlife Service (SCKWS) Officer. The extension officers are well connected to their
509 respective community interest groups (informal institutions) and thus can be effective
510 in transfer of adaption knowledge. The community indicated that water and wildlife
511 sectors recorded the highest number of conflicts and subsequent studies have
512 confirmed low adaptation measures in these two sectors. Conversely, crop and livestock
513 sectors have the most diverse adaptation measures due to a close public-private actor
514 partnership (Ngaruiya, 2014). Therefore, specialised training of extension officers in
515 adaptation technology and water harvesting for subsequent transfer to the community
516 will not only buffer food security (crop and livestock products) but will also strengthen
517 the local economy through creation of additional livelihood opportunities in a climate
518 change context.

519

520 b) Council of elders

521 In Loitoktok, the outstanding traditional institution is the Council of Elders that is
522 made up of persons of integrity and objectivity who have distinguished themselves in
523 one way or another and have been recognized as such by the community (Cheka, 2008).
524 There are two types of Council of Elders. First, the Council of Elders that is appointed by
525 the State and is made up of men from the three major tribes in the Sub-County to help in

526 administration issues such as immigration and conflict resolution in the agriculture
527 sector (quasi-formal). Secondly, the dominant host Maasai community exclusively
528 selects its indigenous Maasai Council of Elders (traditional institution) according to its
529 culture which is also respected by other communities in Loitoktok. This council is highly
530 regarded in the wildlife sector where it plays a key role in either agitating for action by
531 the government and investors or calming the Maasai community after a serious human-
532 wildlife incident. Interestingly from the social network analysis, the council of elders is
533 not among the top central actors because of the administrative dichotomy in the Sub-
534 County. But the fact still remains that they are well connected to each resource sector,
535 thereby giving them a stronger knowledge dissemination power in the community.

536 In terms of judgements and costs, indigenous conflict resolution mechanisms have
537 been found to be effective for both lesser criminal cases such as stock theft, land
538 disputes and serious crimes such as genocide as seen in Rwanda (ECA, 2007). Hence
539 incorporating such respected institutions originating from customary law and
540 indigenous knowledge into climate change policies is likely to result in formulation of
541 effective adaptation strategies that will be participatory and highly acceptable by the
542 rest of the community.

543

544 c) Local chief

545 Loitoktok has 16 locations each governed by a chief and 31 sub-chiefs who are in-
546 charge of sub-locations. These chieftaincy positions are not elective but the person is
547 nominated by the government to participate in decision-making at the grassroots. The
548 chiefs work under the Sub-County Government (SCG) office and are called upon by the
549 government depending on the conflict situation in the community. The administrative
550 council of elders also falls under the SCG office as a physical representation of the
551 government in the community. These quasi-formal arrangements are alternative
552 institutions that are peripherally involved in resource governance but can also improve
553 the climate change discourse in Africa. The chiefs and council of elders can identify
554 isolated rural community interest groups for training in resource governance including
555 conflict resolution since unmanaged informal groups form many small and dense
556 clusters with little or no diversity and little adaptation knowledge that become resistant
557 to change. An example is pastoralists who view livestock as a form of wealth and calls by
558 extension officers to dispose of healthy animals before onset of drought is viewed with

559 suspicion. Furthermore, chiefs can conduct civic lessons among their constituents as a
560 means of promoting integration and coexistence and dispelling false information to
561 foster the concept of “a common people with a common destiny” (Aapengnuo, 2010).

562

563 d) Private investors and researchers

564 Loitoktok network has many private organisations such as hotel owners, seed
565 companies’ researchers, humanitarian workers etc. in all the resource sectors. Most
566 private actors are seen to be more effective in resolving conflicts in the wildlife sector as
567 a way of preserving the wildlife resource that attracts tourists to the area. Societal
568 decision-making is nested in a wider set of societal changes, such as institutional
569 changes and altered relations between public and private actors. Thus, for a community
570 to increase its adaptive capacity then it should incorporate all stakeholders in
571 developing land and resource management designs to make them more effective and
572 relevant to investors. Apart from formal institutions and the non-governmental
573 organisations, communities should incorporate local investors who have financial and
574 technical ability to support the community in sustainable use of biodiversity and
575 practical knowledge to maintain ecosystems in good condition to avoid conflicts over
576 scarce resources especially during drought.

577

578 **6. Conclusions**

579 A number of studies have used economic, political and ecological aspects to expound
580 resource conflicts in several African countries. However, few studies (some of which are
581 discussed in section 2.1) have documented the social structures that induce or resolve
582 conflicts at the grassroots. This study confirms that in post-colonial Kenya, resource
583 governance still contains vestiges of traditional institutions, especially in collective
584 discussion of grievance towards effective conflict resolution. The innovative
585 arrangements make use of indigenous knowledge to calm the aggrieved and agitate for
586 compensation by the government. As a result, this integration binds the society together
587 by its inherent customs based on brotherhood notions for enhanced resource utilisation
588 and livelihoods, regardless of climatic conditions.

589 Secondly, climate change threatens to disrupt conflict resolution mechanisms that are
590 operational in rural centres because of capacity challenges associated with Africa’s low
591 technical ability to manage climate governance, poor integration of diverse opinions

592 and marginalisation of indigenous knowledge into adaptation and mitigation agendas.
593 We based the field study on the Loitoktok Sub-County that is expanding in terms of its
594 cultural diversity, economic sectors and profile of resource conflict which is
595 representative of many rural areas in Kenya as well as sub-Saharan countries. Results
596 indicate that conflict resolution was achieved through three forms of institutions, each
597 unique to its natural resource. The water sector relied upon its comprehensive policy;
598 agriculture used a quasi-formal arrangement while the wildlife sector formulated its
599 own hybrid arrangement that involved private investors and the traditional council of
600 Maasai elders. In extreme cases, the community came together in *barazas* to air their
601 concerns and agree on a collective decision acceptable to all relevant stakeholders.

602 Implementation of conflict-sensitive adaptation requires a deep understanding of the
603 context in which climate-driven resource-conflicts are resolved in a community and
604 clearly delineated actor interactions between local resource-related activities.
605 Therefore, we used the betweenness centrality index drawn from the flourishing field of
606 social network theory to evaluate the central actors with potential to broker adaptation
607 knowledge across the Loitoktok network. Results indicate that extension officers,
608 council of elders, local chief and private investors are the suitable central actors who
609 should be financially and technologically equipped for building conflict-sensitive
610 adaptive capacity in the community. Thus government and non-government
611 stakeholders must work together to identify risks and formulate strategies and
612 programmes that can help raise awareness among civil society of the impact of climate
613 change.

614 As a contribution to the climate and security discourse, this study advocates for two
615 adaptive co-management measures to help overcome climate change-related capacity
616 challenges at the grassroots in Africa. First, clear conflict resolution policy in natural
617 resource governance as seen in the water sector will help solve local conflicts and also
618 enable stakeholders to understand local conflict genesis and effectively prepare for
619 unpredictable climatic conditions. Secondly, involving diverse actors from the
620 community in resolving conflict as seen in the wildlife sector, also has potential in
621 serving as a conduit of the adaptation knowledge sector that empower the community
622 despite policy inadequacies. Moreover, traditional institutions like the council of elders
623 have been seen as a source of civic knowledge, and encourage respect of local values

624 and customs that contribute to community self-reliance and empowerment in the
625 community.

626 To conclude, natural resource regulations and governance arrangements play
627 important roles in handling potential conflicts over scarce natural resources,
628 particularly water in arid and semi-arid lands (ASAL). Thus resource conflict resolution
629 and positive culture transmission should be part of an effective conflict-sensitive
630 adaptation strategy. These two aspects encourage growth of cohesive social capital that
631 in turn enhances economic development at the grassroots and effective governance of
632 the commons.

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641

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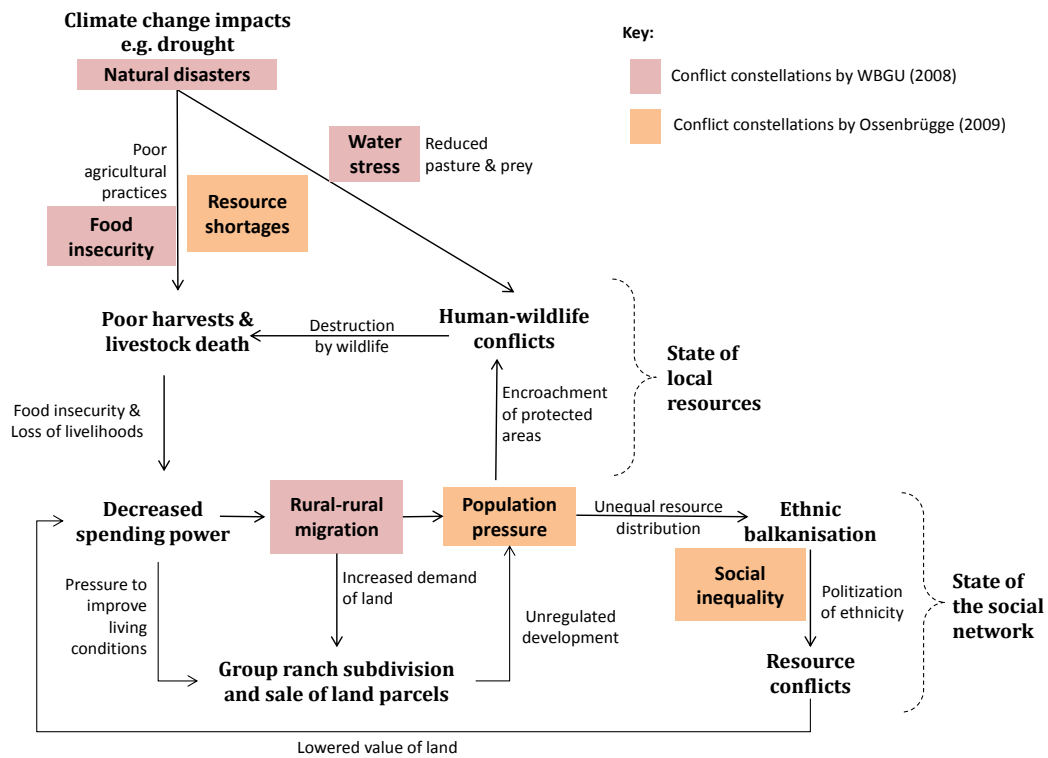
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765 Table 1. The annual resource conflict report of Chief Leonard Kasine in-charge of
 766 Oloolopon Division in Loitoktok Sub-County. (WRMA: Water Resources Management
 767 Authority, KWS: Kenya Wildlife Service).

Resource	No. of conflicts	Conflict site	Resolution	Stakeholders involved
Water	3	Shurie	Compensation	Council of elders, Chief and residents
	7	Impiron	Community discussion	WRMA and Chief
	1	Airstrip	Community discussion	Nolturesh Water Board and Chief
Livestock	16	Korinko village	Fine after agricultural assessment	Agricultural extension officers, police, Chief
	26	Inkariak-Rongena	4 fined by court 22 fined after agricultural assessment	Agricultural extension officers, police, Chief
	11	Kamukunji	Compensation to farmer	Agricultural extension officers, Chief
Wildlife	30	Sompet	Compensation	KWS, Private investor – Elephant Research Org.
	6	Ilmisigiyo	Compensation	KWS, African Wildlife Foundation

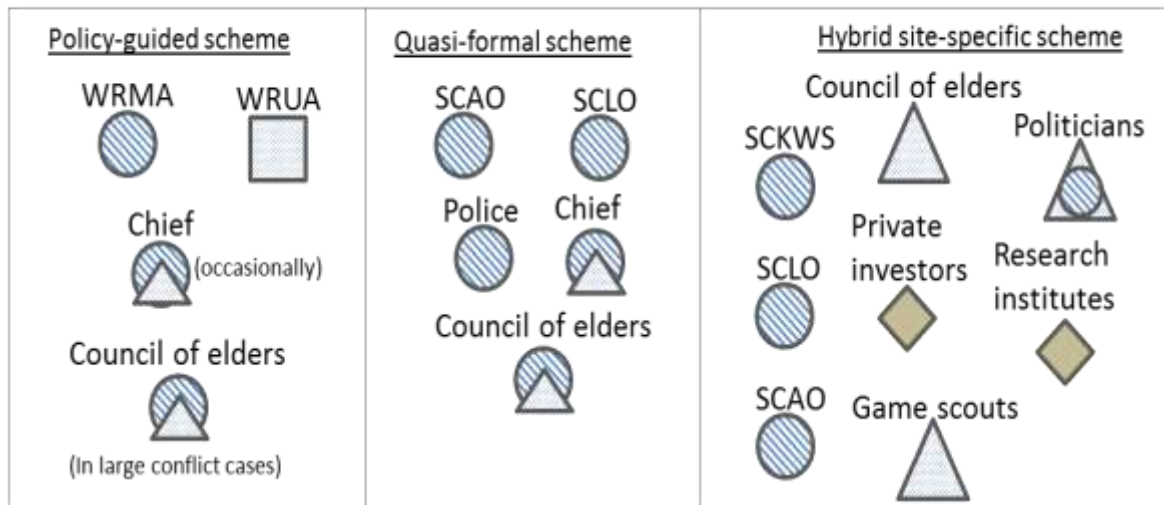
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770
771

Figure 1. Conflict constellations in relation to climate change and rural land tenure. Source: The authors.

Water



Key:



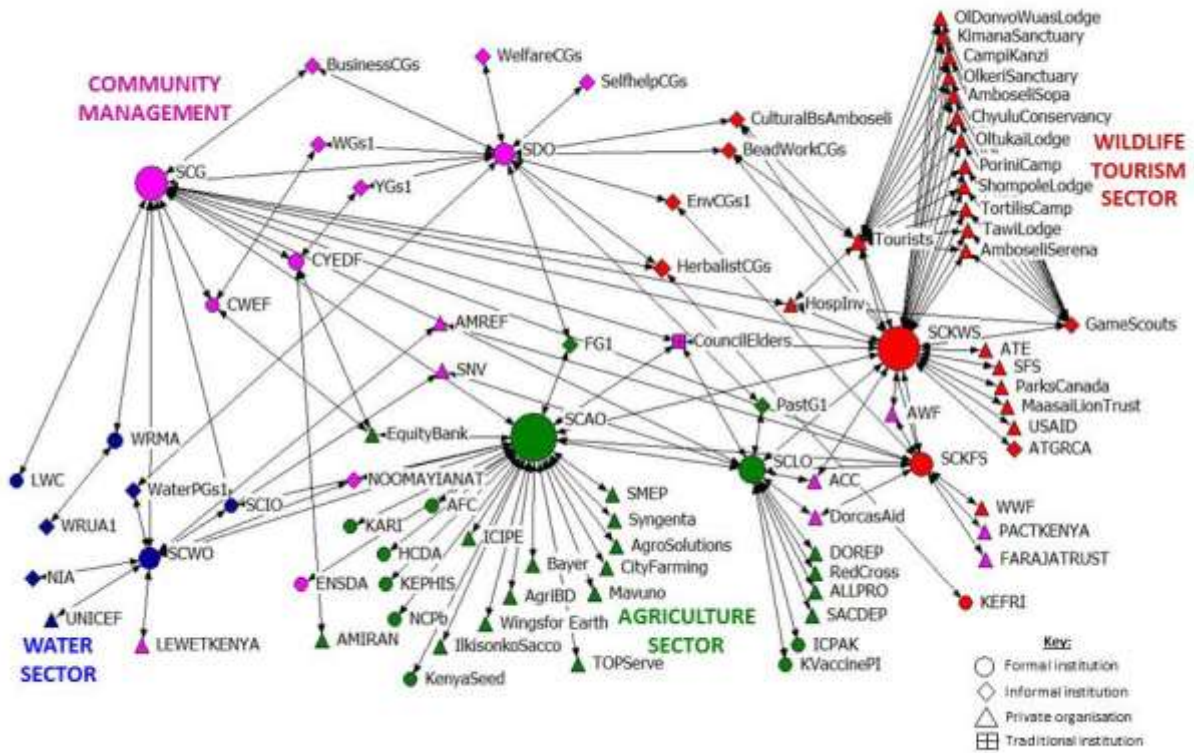
Acronyms:

WRMA - Water Resource Management Authority
 WRUA - Water Resource Users Association
 SCAO - Sub-County Agricultural Officers
 SCLO - Sub-County Livestock Officers
 SCKWS - Sub-County Kenya Wildlife Service Officer

773

774 Figure 2. The diverse resource conflict resolution schemes in Loitoktok Sub-County.

Loitoktok resource governance network



775
 776 Figure 3. Social network illustrating actor linkages in resource governance at Loitoktok
 777 community.