



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

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10

11 **Abstract**

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

28

29 **1. Introduction**

30 Most African ethnic groups coexist peacefully with high degrees of mixing through
31 inter-ethnic marriage, economic partnerships, and shared values that have been
32 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). Adaptation measures addressing impacts of climate
54 change on rural livelihoods have already been instituted globally to moderate potential
55 damages and/or exploit beneficial opportunities (IPCC, 2007).

56 But rigid demarcation into sectoral tasks of adaptation programmes can fall short
57 when it comes to conflict. Thus, a more systematic, integrated approach is necessary to
58 meaningfully incorporate existing conflict dynamics—as well as overarching socio-
59 political and economic conditions—into the design of adaptation measures. This creates
60 the need for conflict-sensitive adaptation strategies to enhance sustainable
61 development (Tänzler et al., 2013). Conflict-sensitivity refers to approaches and
62 measures that display cognisance of how: climate change can cause conflicts; climate
63 adaptation projects themselves can contribute to conflict and; adaptation measures
64 would operate in conflict zones (Yanda and Bronkhorst, 2011). Such knowledge allows
65 planners and decision-makers to address current vulnerabilities and development



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

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

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

91

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

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



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

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

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



131 community groups seeking to access business funds to improve their living standards
132 (Ngaruiya and Scheffran, 2013).

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

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

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

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

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



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

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

176

177 2.1. Capacity challenges in addressing climate-driven rural conflicts

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

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



197 rural livelihood activities, such as agriculture and wildlife tourism, subsequently
198 decrease (or cause failed) harvests and also increase farm raids by wildlife from
199 neighbouring protected lands. Subsequent loss of income in rain-dependent
200 communities lowers the spending power and increases local poverty levels. Affected
201 households are thus left with land as their only asset which is viewed as an additional
202 source of income, especially for rural households experiencing poor harvests and
203 livestock productivity in Kenya (Ntiati, 2002). Subdivision of land disrupts the cultural
204 norms and trusts of indigenous host communities through exposure to dissimilar
205 immigrant norms and attitudes.

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

221 Despite that adaptation funding is already being made available and adaptation
222 projects are under way in many rural communities (Yanda and Bronkhorst, 2011).
223 Escalating cases of resource conflicts are projected to overwhelm rural conflict
224 resolution mechanisms and reinforce the trend towards general instability and
225 insecurity that already exists in many societies and regions (WBGU, 2008). We find that
226 this prognosis is supported by three main capacity concerns drawn from the literature
227 on climate change and resource conflicts in Africa:

228 a) (Handmer et al., 1999) posit that poorer regions and countries will have
229 difficulty in adapting to climate change, since they lack comprehensive technical



230 and financial ability. In addition, African governments are faced with other major
231 developmental issues such as conflict, diseases and poverty that require direct
232 engagement by the state(AMCEN, 2011). Hence, at the moment climate change
233 adaptation policies seem unlikely to be successful or minimize inequity in Africa.

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

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

249 These three adaptive capacity issues infer that coherence between governance
250 institutions is critical in preventing competition over resources turning into a violent
251 conflict (Adano et al., 2012; Young, 2011). This is because effective adaptation can also
252 serve as a “threat minimiser” that brings together actors from security arrangements,
253 conflict resolution and asset management sectors to strengthen local adaptive capacity
254 while reducing predicted conflict cases (Donnelly-Roark et al., 2001). Furthermore,
255 opportunities for incorporating climate information into development activities in sub-
256 Saharan Africa are largely being missed at the moment (Hellmuth et al., 2007). This is
257 mainly because selecting representatives in resource governance institutions becomes a
258 complicated process since African rural communities are composed of diverse informal
259 interest groups that are formed as forums for exchanging knowledge, accessing
260 development funds and markets for their products (Ngaruiya and Scheffran, 2013).

261

262 **3. Use of social network theory in resource governance studies**



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

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

$$284 \quad C_B(k) = \sum_{i \neq j \neq k} \frac{\partial_{ikj}}{\partial_{ij}} \quad (1)$$

285 Where:

286 $C_B(k)$ = betweenness centrality of actor k

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

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

289 This definition is based on the assumption that interactions between two
290 nonadjacent actors might depend on other actors, especially the actors who lie on the
291 path between the two (Wasserman and Faust, 1994). A practical implication of this
292 index is that if actors rest between many others, then they have the ability to “broker”
293 adaptation information to other actors and thereby influence the level of collective
294 knowledge in the community. If brokers are active within a community, they will not



295 only influence the quantity of knowledge but will also enhance the quality of knowledge
296 circulating because they are able to connect diverse stakeholders to solve a common
297 resource problem. For example, if a community has well-equipped brokers then the
298 local ability to adapt to climate change increases the potential for peaceful conflict
299 resolution and conflict transformation (Tänzler et al., 2013). On the other hand,
300 unrestrained brokerage can create organisation chaos, manifest in errors such as
301 resources allocated to conflicting goals and units in the same organisation competing
302 against one another (Burt, 2011). A practical example of poor brokerage is how
303 immense adaptation funding has caused a proliferation of actors offering diverse
304 “expertise” in rural communities but with poor performance outcomes in many rural
305 areas (Madzwamuse, 2010). Despite this flaw, brokerage is an interesting concept that
306 is yet to be exhaustively applied in resource governance in Africa.

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

310

311 **4. Method**

312 **4.1. Area description**

313 Our area of focus is Loitoktok district in Kajiado County, located at the southern tip of
314 the former Rift Valley province in Kenya and covers c. 6,356.3 km². It is situated
315 between longitudes 36° 5' and 37°5' East and between latitudes 1°0' and 3°0' South and
316 borders the Republic of Tanzania to the West adjacent to Mt. Kilimanjaro (Government
317 of Kenya, 2009). Ecologically, it is categorized among the arid and semi-arid districts in
318 Kenya. The first census in 1962 showed a population of 24,027 persons while the
319 current estimated population for 2012 is 171,520 persons. The district has an estimated
320 annual population growth rate of 4.51% as per last census count (Government of Kenya,
321 2009).

322 Loitoktok was selected as representative of a typical Kenyan rural area because of a)
323 its vibrant water, agriculture, and wildlife sectors, b) rapid land subdivision, c)
324 introduction of diverse cultures by immigrants with different livelihood practises apart
325 from pastoralism of the Maasai community. In addition, evidence of environmental
326 impacts related to climate change have locally been documented through changes in
327 precipitation (Thompson et al., 2009), temperature fluctuations (Altmann et al., 2002),



328 wildlife mortality (Wangai et al., 2013) and agricultural production (Ngaruiya 2014) in
329 Loitoktok.

330 In terms of governance institutions and stakeholder diversity, Loitoktok's rich
331 wildlife supports a strong tourism sector characterised by many hotels and lodges and
332 is rated as one of the key wildlife tourism areas in Kenya. Unmonitored land subdivision
333 and climate variability increased cases of wildlife poaching and human-wildlife conflicts
334 but these also created opportunities for establishment of several wildlife organizations
335 promoting conservation of local biodiversity. Additionally, due to the districts' remote
336 and semiarid location, several non-governmental organizations have been started to
337 boost the education, water and health sectors in collaboration with government
338 agencies.

339

340 **4.2. Data collection and analysis**

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

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

354

355 **5. Results and discussion**

356 The respondents comprised of 152 persons drawn from four sectors (water,
357 agriculture, wildlife tourism and community) and also included expert interviews in
358 Nairobi, Kajiado and Loitoktok towns. The questionnaire also guided 6 group
359 discussions in Loitoktok All respondents agreed that inclusion of culture in the conflict
360 resolution process gave the community confidence in decisions agreed after



361 deliberations and that the main aim of a conflict resolution was to reduce tension or
362 violence by bringing the conflicting parties together. This coincides with principles of
363 natural resource management that emphasize the need for cooperation as a necessary
364 precondition for sustainable conflict resolution.

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

375

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

381

382 **5.1. Rural conflict resolution schemes**

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

385

386 a) Policy-guided conflict resolution plan

387 Water scarcity was identified as a driver for resource conflict, especially during the dry
388 seasons in Loitoktok. As stipulated in the Water Act of 2002, the Ministry of Water
389 mandates its local government agency - Water Resources Management Authority
390 (WRMA) - to resolve local water conflicts together with the Water Resource Users
391 Association (WRUA). The local chief is an optional mediator in the presence of water
392 officials. If the conflict is not resolved through negotiation then it is either forwarded to
393 the courts for legal action against the offender or to the Water Appeals Board for further
394 arbitration. An interesting aspect is that WRMA also gives grants to approved WRUA's



395 projects that target enhanced water supply and quality. This clearly has encouraged the
396 community to participate in the prescribed regular training sessions for enhancing local
397 water governance.

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

404

405 b) Quasi-formal conflict resolution plan

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

423

424 c) Hybrid site-specific conflict resolution plan

425 The wildlife sector exhibits a unique conflict resolution strategy as a result of
426 inadequate government policies. This strategy comprises of the traditional council of
427 elders, formal government agencies, private investors and researchers who come



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

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

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

458

459 **5.2. Loitoktok social governance structure**



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

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

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

486

487 **5.3. Building conflict-sensitive adaptation**

488 Conflict resolution is critical to adaptation as conflict restricts many drought
489 adjustments involving peaceful interaction between many diverse stakeholders.
490 Conflict-sensitive adaptation becomes therefore a holistic, multi-scaled and multi-
491 sectored approach that taps into the wealth of traditional knowledge regarding the
492 management of resources and conflicts at a community level(Yanda and Bronkhorst,



493 2011). Since conflict-sensitive adaptation processes must be approached using a multi-
494 dimensional system that incorporates different levels, both administrative and societal
495 (Tänzler et al., 2013). Then, this study postulates that central actors, who hold the
496 network together in times of distress, also have potential to influence adaptation
497 information quality and flow in the network.

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

500 a) Extension officers

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

513

514 b) Council of elders

515 In Loitoktok, the outstanding traditional institution is the Council of Elders that is
516 made up of persons of integrity and objectivity who have distinguished themselves in
517 one way or another and have been recognized as such by the community (Cheka, 2008).
518 There are two types of Council of Elders. First, the Council of Elders that is appointed by
519 the State and is made up of men from the three major tribes in the district to help in
520 administration issues such as immigration and conflict resolution in the agriculture
521 sector (quasi-formal). Secondly, the dominant host Maasai community exclusively
522 selects its indigenous Maasai Council of Elders (traditional institution) according to its
523 culture which is also respected by other communities in Loitoktok. This council is highly
524 regarded in the wildlife sector where it plays a key role in either agitating for action by
525 the government and investors or calming the Maasai community after a serious human-



526 wildlife incident. Interestingly from the social network analysis, the council of elders is
527 not among the top central actors because of the administrative dichotomy in the district.
528 But the fact still remains that they are well connected to each resource sector, thereby
529 giving them a stronger knowledge dissemination power in the community.

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

537

538 c) Local chief

539 Loitoktok has 16 locations each governed by a chief and 31 sub-chiefs who are in-
540 charge of sub-locations. These chieftaincy positions are not elective but the person is
541 nominated by the government to participate in decision-making at the grassroots. The
542 chiefs work under the District Local Government (DLG) office and are called upon by the
543 government depending on the conflict situation in the community. The administrative
544 council of elders also falls under the DLG office as a physical representation of the
545 government in the community. These quasi-formal arrangements are alternative
546 institutions that are peripherally involved in resource governance but can also improve
547 the climate change discourse in Africa. The chiefs and council of elders can identify
548 isolated rural community interest groups for training in resource governance including
549 conflict resolution since unmanaged informal groups form many small and dense
550 clusters with little or no diversity and little adaptation knowledge that become resistant
551 to change. An example is pastoralists who view livestock as a form of wealth and calls by
552 extension officers to dispose of healthy animals before onset of drought is viewed with
553 suspicion. Furthermore, chiefs can conduct civic lessons among their constituents as a
554 means of promoting integration and coexistence and dispelling false information to
555 foster the concept of “a common people with a common destiny” (Aapengnuo, 2010).

556

557 d) Private investors and researchers



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

571

572 **6. Conclusions**

573 A number of studies have used economic, political and ecological aspects to expound
574 resource conflicts in several African countries. However, few studies have documented
575 the social structures that resolve conflicts at the grassroots. This study confirms that in
576 post-colonial Kenya, resource governance still contains vestiges of traditional
577 institutions, especially in collective discussion of grievance towards effective conflict
578 resolution. The innovative arrangements make use of indigenous knowledge to calm the
579 aggrieved and agitate for compensation by the government. As a result, this integration
580 binds the society together by its inherent customs based on brotherhood notions for
581 enhanced resource utilisation and livelihoods, regardless of climatic conditions.

582 Secondly, climate change threatens to disrupt conflict resolution mechanisms that are
583 operational in rural centres because of capacity challenges associated with Africa's low
584 technical ability to manage climate governance, poor integration of diverse opinions
585 and marginalisation of indigenous knowledge into adaptation and mitigation agendas.
586 We based the field study on the Loitoktok district that is expanding in terms of its
587 cultural diversity, economic sectors and profile of resource conflict which is
588 representative of many rural areas in Kenya as well as sub-Saharan countries. Results
589 indicate that conflict resolution was achieved through three forms of institutions, each
590 unique to its natural resource. The water sector relied upon its comprehensive policy;



591 agriculture used a quasi-formal arrangement while the wildlife sector formulated its
592 own hybrid arrangement that involved private investors and the traditional council of
593 Maasai elders. In extreme cases, the community came together in *barazas* to air their
594 concerns and agree on a collective decision acceptable to all relevant stakeholders.

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

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

619 To conclude, natural resource regulations and governance arrangements play
620 important roles in handling potential conflicts over scarce natural resources,
621 particularly water in arid and semi-arid lands (ASAL). Thus resource conflict resolution
622 and positive culture transmission should be part of an effective conflict-sensitive
623 adaptation strategy. These two aspects encourage growth of cohesive social capital that



624 in turn enhances economic development at the grassroots and effective governance of
625 the commons.



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634

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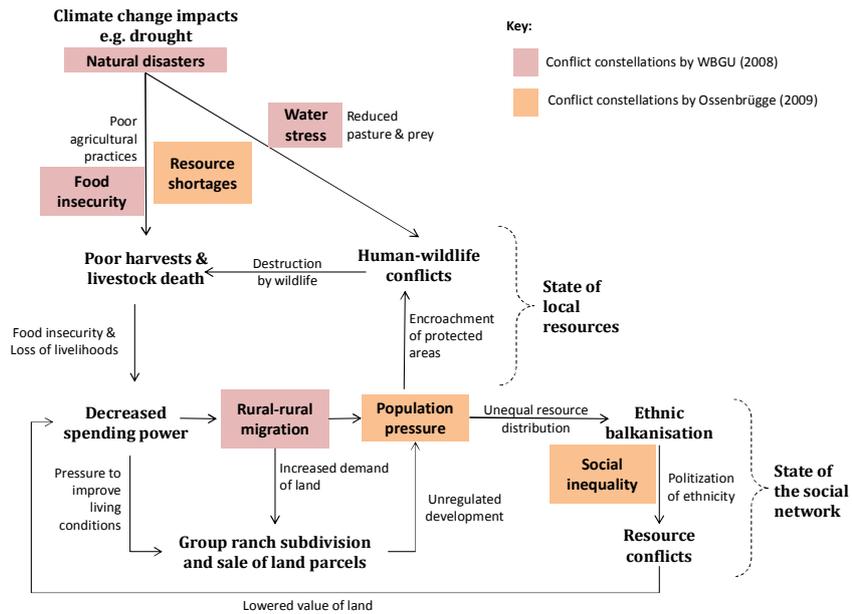
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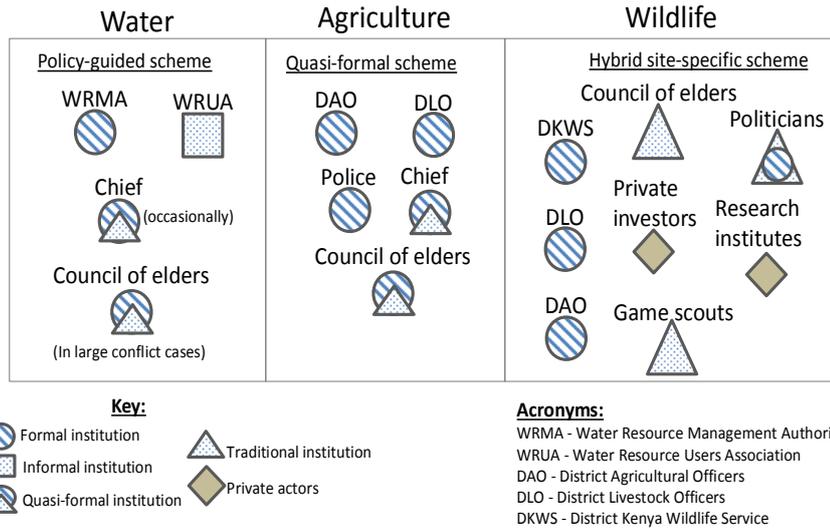
758 Table 1. The annual resource conflict report of Chief Leonard Kasine in-charge of
 759 Oloolopon Location in Loitoktok district. (WRMA: Water Resources Management
 760 Authority, KWS: Kenya Wildlife Service).

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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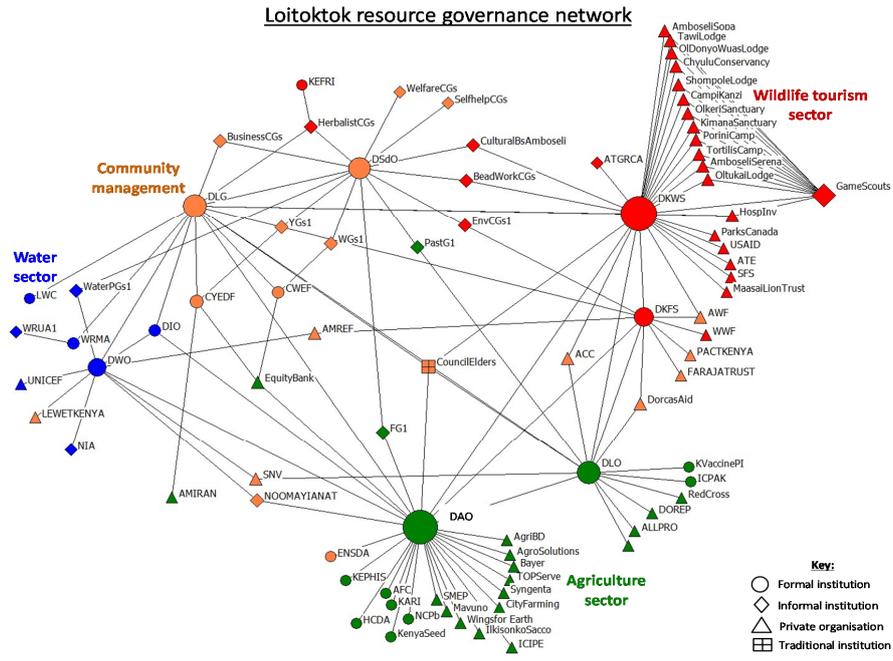


762
 763 Figure 1. Conflict constellations in relation to climate change and rural land tenure.
 764 Source: The authors.



765

766 Figure 2. The diverse resource conflict resolution schemes in Loitoktok district.



767

768 Figure 3. Social network illustrating actor linkages in resource governance at Loitoktok
 769 community.