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Reducing climate adaptation deficits using revolving fund network schemes in rural areas of Kenya: Case study of Loitoktok district

(revised version)

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Abstract
The ability to overcome poverty through wealth contained in natural resources offers significant opportunities to developing countries. This concept drives Kenya's economic growth strategy through revolving fund schemes within the grand Vision 2030 plan. Though successful in empowering citizens these schemes lack strong environmental and climate change aspects. Thus, to avoid future predicted resource scarcity, climate adaptation barriers among stakeholders must be identified and solved using local measures. Using data from Loitoktok district, this paper examines the community aggregation and identifies the local barriers to climate adaptation. We confirm high group activity in sectors sensitive to climate variability and by analysing the Loitoktok stakeholder network, we describe how adaptive capacity can be mainstreamed via the funding schemes network avenues. A collaborative network is proposed to coordinate community actions to exploit "beneficial climate change opportunities" and strengthen the adaptive capacity to sustain livelihoods in Loitoktok.

Keywords: Adaptation deficit, revolving fund schemes, economic growth, Kenya, vision 2030, sustainable development, barriers, stakeholder network and adaptive capacity.

1. Introduction

Economic growth is a critical part of national development, and natural resources are likely to be a key source of such growth (ERD, 2012). This growth can derive directly from land and water in the form of rents, from putting them to productive use or by drawing on their ecological functions. The ability to capitalise on and improve access to the wealth contained in natural resources offers significant opportunities to developing countries to overcome poverty (ERD, 2012). Land and water are essential for agricultural production whether of traditional crops such as food and fibre, or of crops for biofuels. Natural and cultivated forests and pasturelands are also important sources of raw materials (ERD, 2012). Rivers, lakes and artificial water bodies can be used for wild or farmed fish, and running water can be harnessed to produce electricity. In addition, land and water also facilitate critical ecosystem functions such as carbon sequestration by biomass and soil, and the provision of habitat for biodiversity that can be used for tourism (ERD, 2012). However, there is a growing recognition that the current business-as-usual approach is pushing the limits of the planet's natural systems to cope with irreversible environmental changes such as land degradation, desertification, soil erosion, the depletion of groundwater and the reduction of fish stocks.

Though the supply of natural resources – water, wildlife, and pharmaceutical plants – may sustain utilisation to a certain extent, large climate variability might ultimately hinder development by enhancing resource scarcity (ERD, 2012). Climate change

related to global warming is one of the most serious and potentially destructive consequences of the disruption of natural life-supporting systems (IPCC, 2007). Fundamentally, global warming occurs because human activity has overwhelmed the ability of the atmosphere, oceans, soil and forests – the major natural sinks – to absorb carbon dioxide and other green-house gases (GhGs) (ERD, 2012). It is predicted that ultimate damages of climate change may significantly affect economic growth (Lecocq and Shalizi, 2007). In Kenya, many people at the grassroots cannot differentiate between climate change impacts and problems caused by local environmental degradation since fundamental climate adaptation and mitigation measures are still unknown (IPCC, 2007; Mutimba et al., 2010). To further complicate this situation, accelerated resource utilisation by entrepreneurial individuals and groups through government initiatives such as the revolving fund schemes is likely to lead to more conversion of fragile ecosystems such as forests, wetlands and protected areas. Ultimately these conversions will cause the loss of the global ecosystem functions such as hydrological services, landscape beauty, carbon sequestration and biodiversity (Ravnborg et al., 2007). Thus, the challenge currently facing Kenya is how to promote economic growth by exploiting natural resources while at the same time build a more sustainable future in a variable climate (ERD, 2012).

The aim of this paper is to give a practical framework of building cross-sector adaptive capacity. It begins with a brief review of the climate adaptation agenda by the Kenyan government. Secondly, it expounds on the livelihood development schemes via two similar revolving fund schemes at the grassroots: the Women Enterprise Fund and the Youth Enterprise Development Fund and how the stakeholders are networked in Kenya. The paper uses data from Loitoktok district to evaluate community aggregation and identify local barriers that hinder effective adaptation. Finally, it recommends an integrated stakeholder network model to enhance the institutional capacity for effective local resource development and adaptation planning.

2. Climate adaptation management in Kenya

Governments have an important potential role in helping people to adapt to climate change through building their adaptive capacity but little attention within the climate change literature has been devoted to addressing social and cultural limits to adaptation (AMCEN, 2011; IPCC, 2007). In Kenya, two government Ministries are directly involved in climate change related activities, namely the Ministry of Environment and Mineral Resources (MoEMR) and the Ministry of Forestry and Wildlife (MoFW). The Climate Change Secretariat (CCS) established under the MoEMR is responsible for initiating and coordinating climate change related activities and consists of 25 members from key ministries as well as from universities, the private sector and local authorities (Schilling and Remling, 2011). Another parallel institution known as the Climate Change Coordination Unit (CCCU) was established in 2008 under the office of the prime minister of Kenya with support from the Danish embassy in Nairobi. On one hand the

CCCU has increased pressure on the Ministry of Environment and Mineral Resources (MoEMR) to make climate change a priority. On the other hand the overlapping purposes of the CCCU and the Climate Change Secretariat have led to disagreements concerning issues of competence, leadership and the distribution of financial resources (Schilling and Remling, 2011).

Climate change risks link with other challenges facing rural communities and cannot be addressed in isolation. Such challenges include socioeconomic, policy-related, technological, environmental, or financial factors that may influence vulnerability or create barriers to adaptation (Spearman and McGray, 2011). According to the Stockholm Environment Institute (SEI) (2009) the impact of climate change will have a tremendous impact on the Kenya's economy as well as people whose livelihoods are closely connected to ecosystems status. This is because most people derive their livelihoods from their surrounding environment agriculture and trade in its products and if this environment is interfered with then the level of poverty in Kenya will increase.

Literature differentiates two forms of adaptation: autonomous (spontaneous) adaptation and planned adaptation. Autonomous adaptation is done by households and communities acting on their own without public interventions. For example, farmers are already adapting to actual or foreseeable changes in precipitation caused by global warming by changing the crops planted and sowing time (UNEP, 2007). Planned adaptation is a deliberate public policy decision to increase the adaptive capacity of a country, community or ecosystem to adjust to climate variability and extremes; to moderate potential damages; to take advantage of opportunities; or to cope with the consequences (IPCC TAR, 2001; World Bank, 2010). For example, agricultural extension officers are promoting area-specific maize seeds that are drought and pest resistant to Kenyan farmers. Much national adaptation planning has been top-down, spurred by global processes but it is about time to promote adaptation planning from the bottom up with vulnerable communities (Dixit et al., 2012). This is because there is often significant overlap between good adaptation and good development (Dixit et al., 2012). For instance, a reduction of drought risks to farmers and pastoralists in Kenya could support increased food security for the entire country as well as boost food exports.

Adaptive capacity is the ability to design and implement effective adaptation strategies or to react to negative climatic stresses (Brooks and Adger, 2005). The capacity to adjust and readjust as conditions shift and as new global and local climate change knowledge emerges may be more important than any one effort to address a particular climate risk (Dixit et al., 2012). In other words, adaptation underpins success in development as the climate changes, but development success can also facilitate adaptation (Spearman and McGray, 2011). Conversely, adaptation deficit refers to countries or communities that are underprepared for climate change because of a complete lack, insufficient frequency or poor content of communication about climate

uncertainty, and therefore do not rationally allocate or utilise resources sustainably to adapt to climate change events (Moser, 2009; World Bank, 2010). On the extreme, such communities may practise maladaptation that inadvertently increases vulnerability to climatic stimuli (Agrawal, 2008; IPCC TAR, 2001).

Recognizing this, the United Nations Framework Convention on Climate Change (UNFCCC) has worked collaboratively with member states to identify priority actions required for effective adaptation to climate change. Already, Kenya has published the National Climate Change Response Strategy (NCCRS) that includes details of formation of the National Adaptation Facility (NAF) (Mutimba et al., 2010). However, the legal framework for environmental concerns in Kenya, known as the Environmental Management and Coordination Act (EMCA) No. 8 of 1999, has minimal content relating explicitly to either climate change adaptation or mitigation (Mutimba et al., 2010). In addition, political interference to control funds associated with climate change from donors such as Danish International Development Agency (DANIDA), United Nations Development Programme (UNDP), International Development Association (IDA) and the German government coupled with inadequate qualified human resources complicate the situation further. In a nutshell, Kenyan adaptation deficit is propagated through lack of coordination between the numerous adaptation programmes that duplicate project objectives and poorly mobilise citizens. Subsequently, the current economically driven resource exploitation by an adaptation deficit community might meet resource scarcity with severe social consequences like environmental migration and conflict (Scheffran and Battaglini, 2011). There is therefore an urgent need to address obstacles hindering the transfer of adaptation knowledge from research institutions to resource users in Kenya.

3. Grassroots livelihood development schemes

The Kenyan government has increased incentives towards natural resource utilisation especially in rural areas to improve human security through multiple components that include economic, food, health, environment, personal, community and political security (GOK, 2007). The main goal is to create livelihood opportunities at the grassroots level that reduce poverty, food shortages, crime and other negative societal concerns. This target is embodied in the "Vision 2030" as the official road-map to Kenya's development that was launched in 2008. It is based on economic, social and political pillars that aim to make Kenya an industrialized middle income economy, providing high quality of life in terms of poverty reduction, livelihood security, and improved well-being for all its citizens by the year 2030 (LDDP, 2009). The economic pillar promotes utilization of natural resources in agriculture and tourism sectors through several initiatives, including Arid and Semiarid Lands (ASAL) Development Projects, Development of Resort Cities, Premium Parks Initiative and Underutilised Parks Initiative. The political pillar advocates for a democratic system that is issue-based and people-centred, results-oriented and accountable to all Kenyan citizens. The social pillar creates an enabling

environment for livelihood promotion opportunities mainly through the revolving fund system. This scheme is decentralised from the national to the constituency level and operates from monies set aside by the government for the public to borrow at zero or lower interest rates than commercial banks for a business purpose and repay according to business performance. The submitted proposals are judged by appointed financial intermediaries according to a cost and profit criteria to ensure business sustainability. The subsequent repayment ensures circulation of money that contributes to economic growth and has proved to be a success among entrepreneurs at the grassroots (AfDB, 2012). Also, the funding scheme has enlarged development coverage area and citizen participation, positively boosting general perception of the government. This paper will focus on the social pillar and more specifically on two active revolving fund schemes; the Women Enterprise Fund (WEF) and Youth Enterprise Development Fund (YEDF) that empower resource utilisation for wealth creation.

3.1. Women Enterprise Fund (WEF)

In developing countries, women are active in seeking solutions to lack of food, energy and drinking water, access to health and education, and reducing factors of vulnerability of their communities in the face of climate variability by establishing networks with other women to increase their social capital (Ariyabandu, 2004). In 2006, the Ministry of Gender, Children and Social Development established the Women Enterprise Fund (WEF) under section 26 & 35 of the Financial Management Act (2005) as a strategy for gender equity by improving women access to resources. In addition to providing finances to women, the mandate includes promoting community-based projects to make use of local resources, supporting women to set up and operate small enterprises and providing support to women organizations serving the community (GOK, 2005).

3.2. Youth Enterprise Development Fund (YEDF)

Youth unemployment in Kenya is blamed for rise in insecurity, drug abuse and other social evils. This is because the high economic growth has not been sufficient to guarantee formal employment among the youth, whose unemployment rate stands at 70% (AfDB, 2012). Since poverty and unemployment are related, the highest rates of poverty are also observed among the rural youth (AfDB, 2012). To tackle unemployment among the youth, the Youth Enterprise Development Fund (YEDF) was established in 2006 under the State Corporations Act, Cap. 446. It became fully operational as a state corporation in 2007. It focused on removing obstacles in the informal sector by providing funds to create decent jobs for entrepreneurial youth (GOK, 2007). Over the last five years, it has among other actions, disbursed almost KES 6 billion to some 157,538 youth enterprises; organized youth trade fairs; built simple infrastructure for young people; and started pre-financing training for the young (AfDB, 2012). As of September 2011, the fund had disbursed KES 8,955,000 ($ 104,200) to 198 group projects within the greater Kajiado County.

3.3. The revolving fund stakeholder network

The on-lending component of these two schemes mainly works through financial intermediaries such as banks, Non-Governmental Organizations (NGOs), Savings and Credit Cooperatives (SACCOs), and Micro Finance Institutions (MFIs). Interested people with sound business initiatives access funds directly either as legally registered individuals or organized entities such as groups, cooperatives and companies. However, before the groups apply for funds, they have to get a certificate of registration from the Ministry of Gender, Children and Social Development. The entire fund transfer process results in a complex linkage system with many intermediaries across public & private sectors, urban & rural agencies, gender, age and livelihoods (Figure 1).

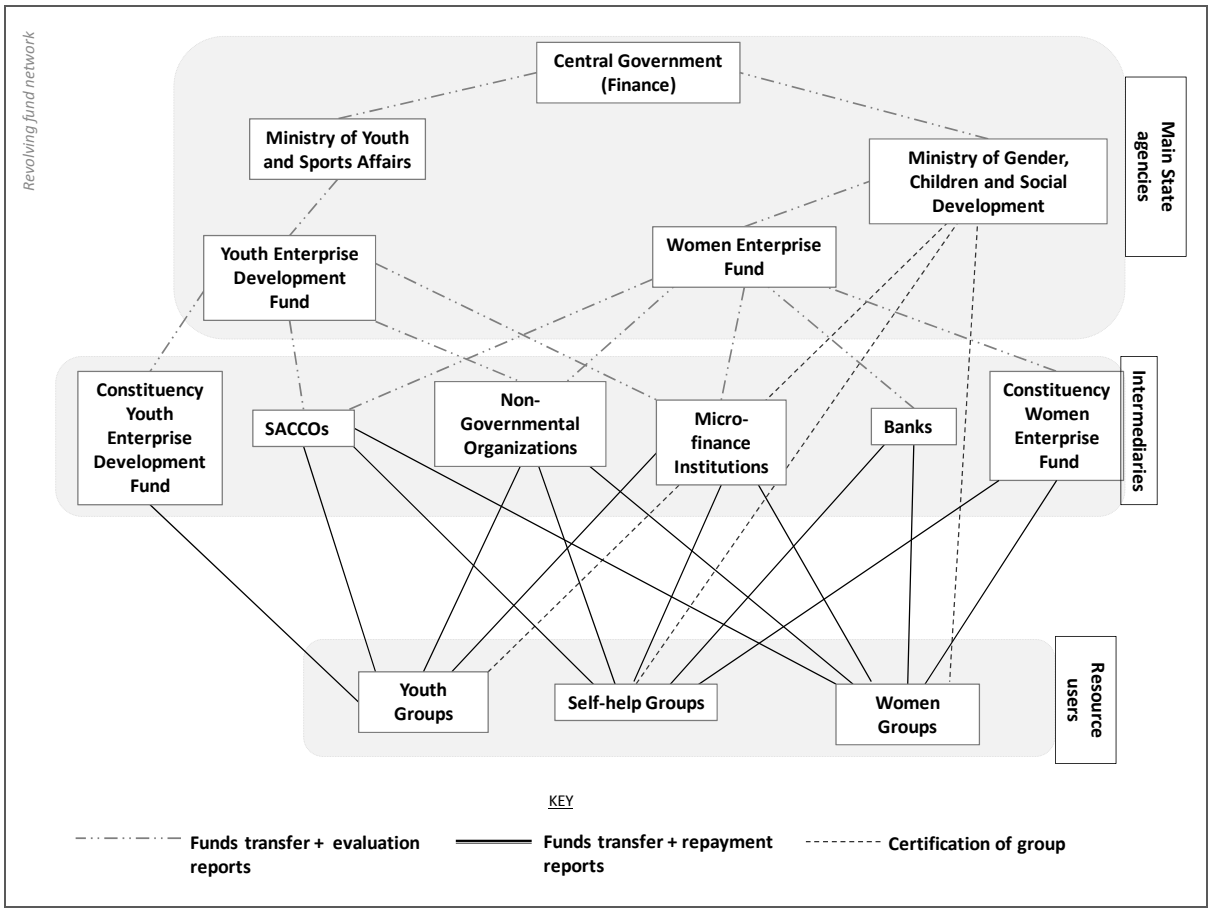

Figure 1: A sociogram of the general revolving fund stakeholder network in Kenya.

Studies indicate that mapping social networks provides a better understanding of institutional linkages to gain a grasp on how local rural institutions are likely to shape adaptation practices and responses in any given context. Thus, a clear stakeholder network gives a sense of the possible synergies among existing institutions, key entry points for external interventions, the identity of key institutions and their capacities, the nature of flow of resources across institutions and from institutions to social groups. It also offers opportunities to identify the appropriate leverage points to channel resources for adaptive development in a given context (Agrawal, 2008).

At Loitoktok, the local revolving fund network is a narrowed into a triad whereby the CYEDF /CWEF offices form the intermediary link between Equity Bank and the funded community group. Thus CYEDF /CWEF field officers as the central actors are responsible for publicizing official program guidelines from their respective ministries; facilitate business proposal writing by interested community groups and oversee the subsequent repayment of the money.

4. Barriers to effective climate adaptation

Current studies show that barriers arise at each stage of the adaptation process, including infrastructure and ownership, cost and finance, regulation and policy. The barriers may vary, depending on national context and economic sector, project, pathway and technology, application area, region and geography but ultimately affect economic development. This article is based on Loitoktok district, Kajiado County, an area undergoing rapid subdivision, high population and fast economic growth. It is located at the southern tip of the Rift Valley province and is categorized among the arid and semi-arid districts in Kenya (LDDP, 2009). It supports several high income economic activities, including agriculture and tourism. The agricultural sector is divided into nomadic pastoralism, small scale subsistence farming, horticultural farms of fruits (oranges, tomatoes, mangoes, bananas) and vegetables (tomatoes, onions and chillies) (LDDP, 2009). The very vibrant tourism industry is driven by an environment rich with wildlife around Amboseli National Park, scenic Mt. Kilimanjaro and the colourful Maasai culture. This section investigates Loitoktok barriers to adaptation knowledge and potential paths for building feasible adaptation strategies.

4.1. Identification of Loitoktok stakeholders in the network

The main barrier to optimal adaptation is poor coordination between agencies and a network complexity that obscures efficient assessments of all economic activities at the grassroots. Understanding the context in which an adaptation intervention takes place requires practitioners to explore the specific relationship between the development status of the intervention's beneficiaries and their vulnerability to climate change (Spearman and McGray, 2011). According to data obtained from the MoGCSD officer, the total number of registered community groups in Loitoktok was 1153 and the highest groups recorded are under crop farming (130), business activities (106), and livestock keeping (51) (Figure 2).

Only 34 community groups were mainly involved in environment related activities such as maintenance of tree nurseries and tree seedlings sale projects. The WEF funded activities include poultry farming, cattle trade, cereal trade, purchase of water tanks and micro-finance initiatives by the women groups. Similarly, the YEDF funded activities include crop farming, bee-keeping, curio trade, barbershops, carwash stands, steer fattening, cattle trade and poultry keeping. This confirms high economic dependence of

the community on natural resources that are susceptible to unreliable rain patterns and frequent droughts associated with climate change. The vulnerability of this community due to unpredictable weather patterns can be managed by dissemination of relevant adaptation knowledge and efficient agricultural practices to ensure continual productivity.

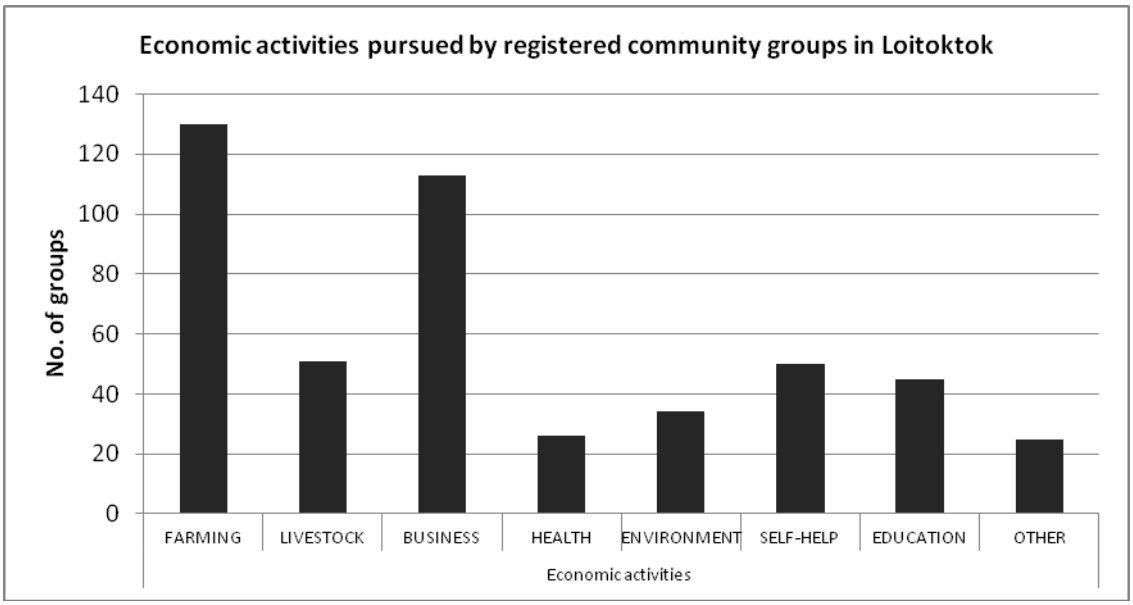

Figure 2: Graph indicating the distribution of registered groups according to economic activities in Loitoktok district

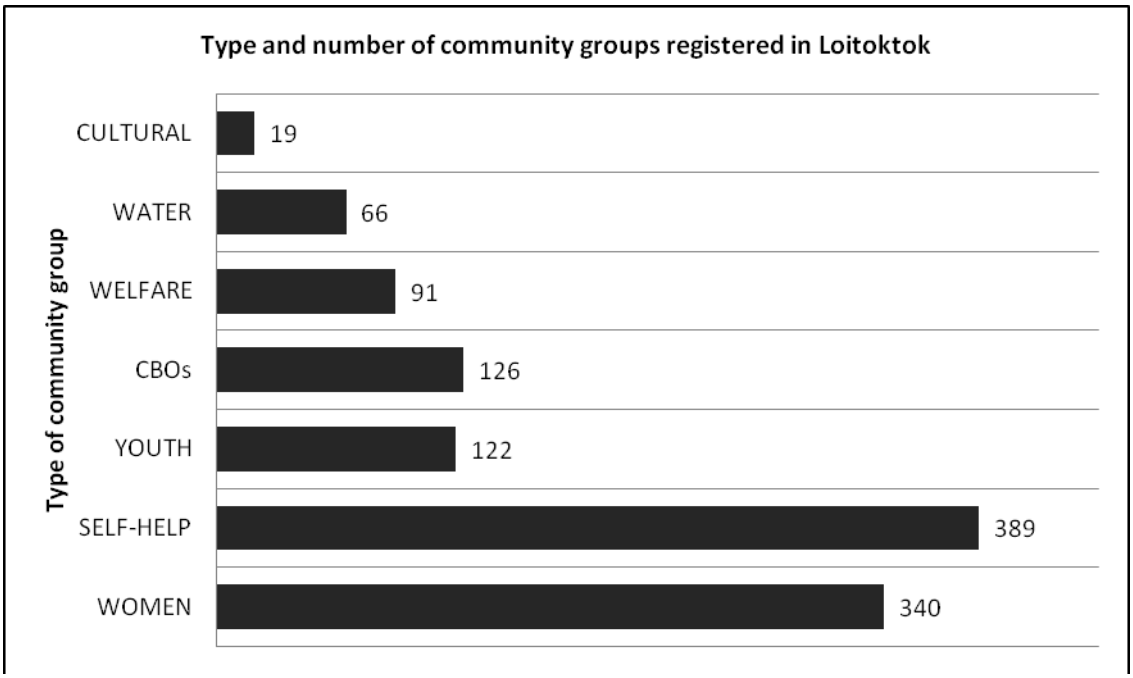

Figure 3: Diagram showing the diversity of registered community groups in Loitoktok.

Secondly, out of a total of the 1153 registered groups in Loitoktok; 389 were self-help groups, 340 were women groups, 122 were youth groups and the rest composed of smaller groups (Figure 3). The self-help number is higher because it includes both women groups and mixed young men/women groups.

WEF has disbursed funds in Loitoktok twice; the first phase of KES 1,000,000 ($11,700) to 20 community groups that recorded a 66% repayment rate. In the second (current) cycle, it increased its funds from the initial KES 50,000 to KES 250,000 to each of the groups applying for a top-up. YEDF has funded 71 groups since 2007 that have recorded an average repayment rate of 40%. Despite successful business plans, one identified common issue that prevented a 100% repayment rate was the 2009 drought and subsequent unpredictable rain patterns that lowered productivity for the funded groups. Since the financial stakeholders could not solve or ignore effects of the drought they instead were forced to renegotiate repayment plans. If this business-as-usual scenario continues whereby groups are funded without access to consistent and reliable climate adaptation knowledge then future of the revolving fund scheme is at jeopardy.

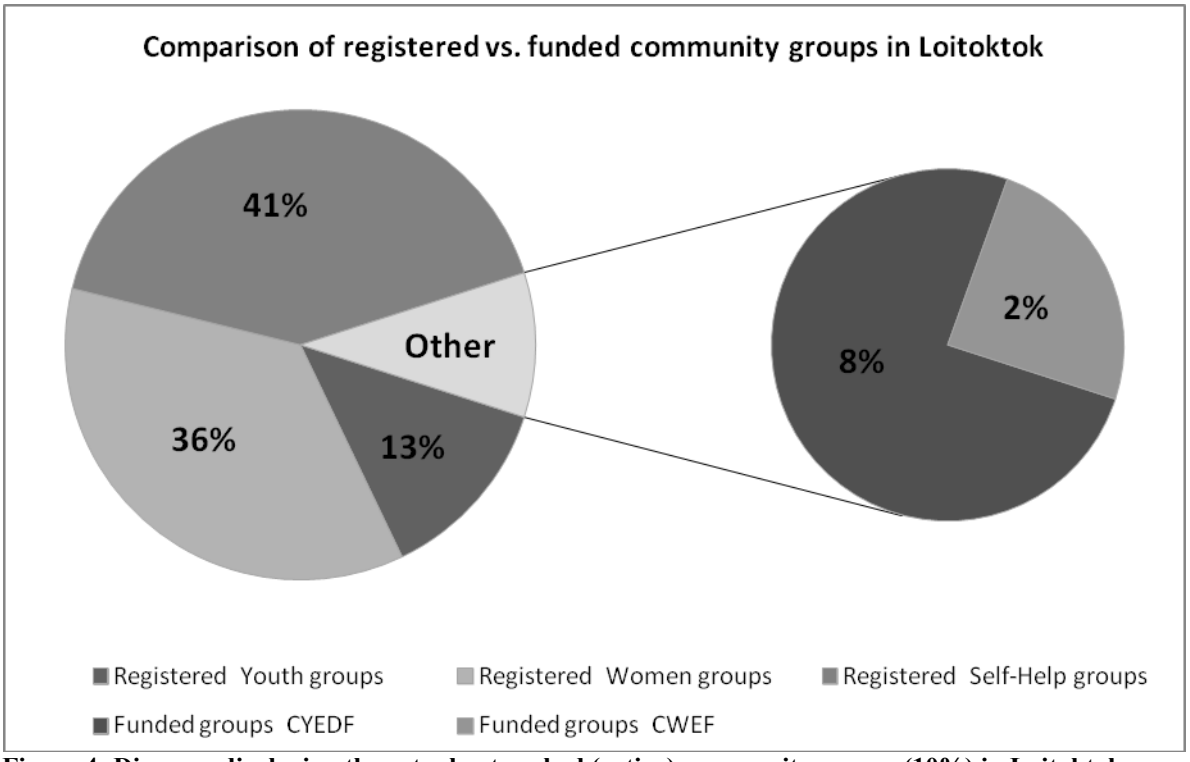

Figure 4: Diagram displaying the actual networked (active) community groups (10%) in Loitoktok

However, deeper analysis of this network revealed that the registration institution (MoGCSD) and the revolving fund institutions are not connected to each other. Hence, out of the 1153 registered groups only 94 groups (~10%) are visible in the official fund network meaning that the remaining 757 registered youth, women and self-help groups together with their activities are unaccounted for in Loitoktok (Figure 4). WBGU (2001)

stresses that all actors should participate in adaptation so as to benefit from the education and training measures that address local concerns and economic development priorities successfully and cost-effectively across all decision-making levels. If Loitoktok will have an effective adaption strategy then these missing groups need to be identified and weaved into the network to safeguard the local resource stock. This is because if only 10% of the groups are adaptation-aware then the rest of the groups could be busy conducting economic activities with their own information which could contribute to maladaptation or other negative environmental effects such as pollution or erosion.

In addition, identification of the groups could reveal extra fund sources such as non-governmental organisations (NGOs) or faith-based organisations (FBOs) that could be incorporated in the knowledge network to exchange opportunities for other interested actors.

Thirdly, it may be easy to assume that rural communities organize themselves into informal amorphous groups near urban centres; data records show that the registered groups are found in every division within the district. These are 249 groups in Kuku, 246 in Rombo, 167 in Kimana, 139 in Entonet, 52 in Mbirikani and 16 in Lenkism. This distribution of registered groups in the district exposes paths that can be utilised to transmit adaptation information even to the remotest corner of the district through official contacts during project assessment by program officers.

This extensive fund transfer network between government, fund management agencies, extension officers and the stakeholder groups has potential to form the main framework for adaptation knowledge transfer from the top government level to resource users. However, assessment of the data register revealed several weaknesses that could hinder implementation of any integrated adaptation strategy in the district. Laxity in data capture of the groups during registration resulted in incomplete data entries, common being missing registration dates. Also, 284 groups did not have the location data and 503 groups did not have the activity data recorded. Such attitude in the administration stakeholder networks indicates ignorance of the importance of proper record keeping which could affect coordination during follow-up, support or audit activities. Blanks in the register could be a result of inconsistent manual data entry in books for lack of a computer. The headquarters could purchase the district office a computer with a simple database management program to enable entry of essential details of community groups during registration. This will establish a standard data record method, facilitate assessment of group activity and ensure effective communication between relevant stakeholders.

4.2. Loitoktok adaptation deficit analysis

An actor's ability to overcome a barrier depends not just on his or her capabilities, but also on the source or origin of the barrier (Ekstrom et al., 2011). After identification of stakeholders the next step was to diagnose actual causes of adaptation deficit in the local network and identify intervention spots in the "adaptation architecture". We used a simple matrix framework to analyse issues hindering adaptation functions in our study (Table1). Ekstrom et al., (2011) described four main types of barriers namely proximate, remote, legacy and contemporary barriers that can undermine the efficiency of adaptation strategies and investment policies. A proximate barrier is a prohibitive issue within reach of the actor's sphere of influence and can directly be resolved by the affected actor. A good example in Loitoktok is the lack of a consolidated stakeholder record that prevents effective transfer of knowledge from climate experts to the community. Additionally the lack of a common resource database prevents efficient monitoring of resource utilisation in the district. Remote barriers are factors from far beyond the actor's scope of control but affect the local climate adaptation like a nation-wide policy. For example, the finance ministry allocates low funding to research and training in the Kenyan budget which in turn has created a shortage of trained experts in climate change science and poor circulation of area-specific adaptation measures. Contemporary barriers are hindrances that arise in the present-day and clearly interfere with the adaptation development. A common case is when stakeholders oppose taking a recommended action because of culture misinterpretation or political propaganda. Locally, the Maasai believe that medicinal trees are planted by God for their benefit thus when reforestation and afforestation are advertised as a viable adaptation measure, the activity uptake is low within the community despite the high use of herbal plants. Legacy barriers are a product of a decision made in the past, either an earlier (separate) process or an earlier stage in the adaptation process. Key case in point is the lack of long term weather data that hinders application of climate models to compare present conditions as well as forecast future trends.

Table 1: The matrix framework used for identifying adaptation barriers and related solutions in Loitoktok (adapted from Ekstrom et al., 2011).

Adaptation barriers		Actual barriers in Loitoktok	Proposed remedial measures
Spatial/ Jurisdictional	**Proximate**	Non-existent stakeholder & natural resources database	Collaborative database maintenance by all stakeholders
	Remote	Few trained manpower on climate and development	Independent local sourcing of adaptation training opportunities
Temporal	**Contemporary**	Lack of participation in adaptation projects due to culture & politics	Creative and regular public awareness campaigns
	Legacy	Lack of local long term data of past climatic conditions	Promotion of a 'start today' attitude towards weather data collection

A distinct difference between legacy and contemporary barriers is that contemporary obstacles can be resolved by present-day individuals whereas legacy barriers cannot be changed except for adapting circumstances to the barrier (Ekstrom et al., 2011).

We propose various creative solutions for identified barriers that tailor action to the specific area interests, culture and influences of identified stakeholders (Table1).

According to our study, the solution to the identified proximate barrier of absent data is to encourage all resource managers to add their individual records to a local database available to all stakeholders and to share that data regularly with the community during 'barazas'. Remote barriers arising from poorly funded research and training institutes are difficult to alter from the grassroots, however thanks to the widely available internet, resource users can independently apply to international institutions for training local representatives and search for relevant adaptation information to strengthen local capacity. Creating transparent channels of communication that hold accountable every stakeholder can be useful for disentangling political contemporary barriers related to land tenure. Also, positive cultural aspects can be promoted though creative public awareness campaigns such as 'trees are life' to promote good environmental stewardship. Finally, though legacy barriers like absence of past weather data may be a permanent blank in the climate database, installing a local weather station to record weather parameters can be used to calibrate available climatic models for forecasting future local scenarios and boost evaluation of climate risks.

5. *Building the national adaptive capacity*

Nearly all countries have strengths that can be used for adaptation, but these may not be obvious at the start of planning, given the diversity of institutions that are involved (Dixit et al., 2012). The potential for adaptation and alleviation of an adaptation deficit lies on social structures, institutional capacity, knowledge and education, access to infrastructure and, financial resources (World Bank, 2010). Therefore, a transformation towards inclusive and sustainable growth requires the participation of all stakeholders and entails a broad change in institutions, policies and values. An ideal planned adaptation process requires a policy framework that integrates human development with adaptation strategies, policies and 'climate friendly' economic measures to enhance survival as climate change progresses (UNDP, 2005). The revolving fund business model seems successful at empowering the grassroots but lacks a strong component of environmental monitoring of natural resources and transfer of climate adaptation knowledge. Therefore, the existing challenge is how to develop adequate institutional connections to help overcome identified barriers and create conditions in favour of beneficial outcomes. For example, the Ministry of Environment and Mineral Resources (MoEMR) can deploy ecologists or environmental managers to the different

fund agencies to vet business proposals before they are implemented and give recommendations on acceptable business practises (Figure 5). Also, using the local stakeholder database and the already created business forums, MoEMR can be able to train mobilized stakeholder groups collectively on resource-specific adaption measures as well as teach comprehensive environmental education instead of relying on cumbersome bureaucratic procedures to mobilize people. In addition, the National Environmental Management Authority (NEMA) can disseminate simple evaluation forms to extension and fund officers to monitor local environmental effects of financed projects. As an incentive, projects that substantially reduce climate vulnerability, or are identified as priorities in national adaptation strategies like green energy proposals, can be given preferential treatment (Burton et al., 2006).

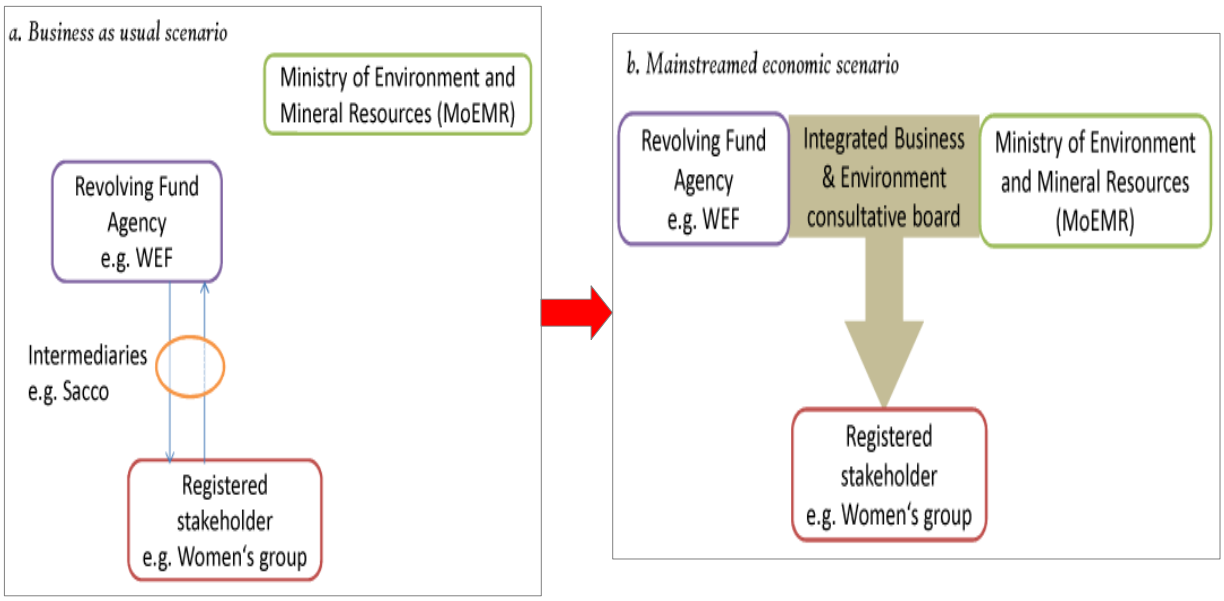

Figure 5: Diagram showing (a) current 'business as usual 'scenario and (b) a proposed 'mainstreamed' business model.

Secondly, institutional mechanisms are important to overcome the limits of individual action through coordinated collective action by disparate actors at multiple levels, both within and outside of government. This helps to avoid activity duplication or omissions and can create economies of scale in responding to challenges. This coordination may be horizontal (e.g., among ministries), vertical (e.g., among national, global, and subnational actors), or among stakeholders (e.g., between government and business) (Dixit et al., 2012). The social structure formed by the revolving fund can also serve as a basis for cooperation in the adaptation process between governments, citizen groups and business to reduce vulnerability to climate risks or to exploit opportunities (Figure 6). Whereby, identified actors can help in information gathering and dissemination, resource mobilization and allocation, skills development and capacity building, providing leadership, and relating to other decision makers and institutions (Agrawal, 2008).

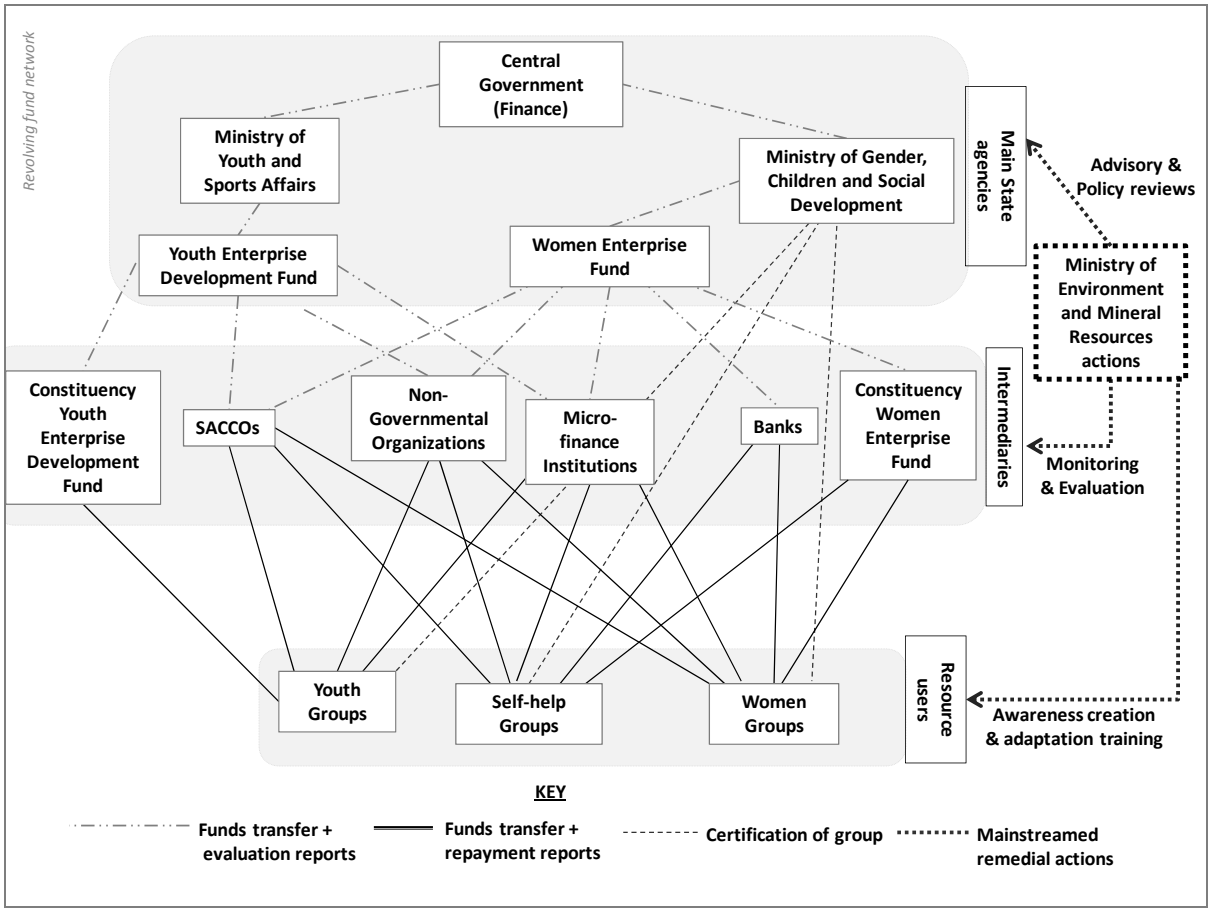

Figure 6: An adaptation strategy sociogram showing how policies and knowledge can be mainstreamed into the revolving fund schemes in Kenya.

In many developing countries macroeconomic and market conditions are poorly developed and there is a lack of financial institutions or systems to support climate related innovations. Climate change provides new opportunities for Kenya which, if embraced, can create new development opportunities and drive economic growth through reforestation projects for carbon credits trade and renewable energy innovations. However, many Kenyans are still not aware of climate change opportunities nonetheless timely formation of effective relationships across different stakeholders can improve access to relevant and credible information by the community to promote local inventions. Experience suggests that the necessary competencies can only be improved slowly, and that many of the requirements are cumulative, and involves tacit and uncodified knowledge. Since revolving fund schemes are only a few years old, working through its fund distribution network might be the most direct and effective tactic of discouraging investments that heighten climate vulnerability and promote those that strengthen climate resilience making (Burton et al., 2006).

6. Conclusion

The history of improvement of human living conditions reveals that economic growth has been coupled with an absolute increase in the consumption of natural resources and energy (Krausmann et al., 2009). Sustainable development and integrated adaptation strategies through institutional innovations can enable communities to sustain their livelihoods even in a highly variable climate (IPCC, 2007). However, this strategy is feasible only through a practical framework that identifies local adaptation deficit sources and then systematically develops effective policy tools that create efficient socio-political structures that foster cooperation rather than conflict. By practically using the established revolving fund network, relevant climate adaptation measures and investment opportunities can be communicated to policy-makers, stakeholders, and the public in Kenya. Such multitasking can strengthen the adaptive capacity and resilience of communities to better anticipate and resist future climate shocks. Also, this focused network weaving will mainstream adaptation into core government decisions and increase sustainability of funded businesses to guarantee that economic activities are not at odds with climate risks and the masses can exploit "beneficial opportunities" (AMCEN, 2011).

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