The Impact of Changing Land Tenure and Land Use on Wildlife Migration within Group Ranches in Kenya: A Case Study of the Amboseli Ecosystem

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Key words: Land tenure, wildlife migration, human/wildlife conflict

SUMMARY

Wildlife migration is an instinctive activity that takes place daily due to food and water needs or annually due to climatic changes. For small Wildlife Parks such as the Amboseli National Park, migration corridors are vital for survival of Wildlife as they establish connection between different habitats and facilitate animal dispersal. The long-term survival of migrating species of animals depends on their ability to cross landscape through migration corridors and interbreed with wildlife of different genetic setup, creating a genetic exchange.

Rangelands of Kenya have traditionally been identified with Wildlife Conservation, Nomadic Pastoralism and Tourism. In the recent past, increasing subsistence demands of a growing population, within these lands, have led to subdivision of a number of Group Ranches and changes in land tenure and land use arrangements. This has subsequently led to interference with major Wildlife migration routes and diminishing in size of Wildlife dispersal areas. This situation threatens a number of Wildlife Parks and the Amboseli Ecosystem in particular.

This paper discusses the changing land tenure and land use arrangements within the Amboseli Ecosystem and their impact on Wildlife migration, with special reference to migration of Elephants. It also demonstrates the use of GIS to identify land tenure and land use conflicts.

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1. INTRODUCTION

The Republic of Kenya has an area of 582646 sq. km with current population estimates of about 31 million. 75% of the population occupies about 20% of the country, which may be classified as medium and high potential areas for agriculture. 80% of the population is rural and agriculture provides employment to 70% of the labour force. It is estimated that the Tourism sector employs slightly over 10% of the workforce. Land in Kenya is currently categorized into Government Land (10%), Trust Land (70%) and Private Land (20%). A number of land reform programmes are taking place in Kenya, but the most significant is land formalization on Trust Land. Where land formalization has taken place on Trust Land, unrecorded rights held under customary forms of tenure are determined after systematic adjudication.

Three different approaches are used in land tenure reform programmes on Trust Land. Consolidation and demarcation of land fragments, after preparation of new plot layouts, is done where fragmentation is deemed excessive. Identification of landholdings on the ground is commonly done using enlarged and unrectified aerial photographs where the plots are enclosed well and economical in size and require little rearrangement on the ground. In Rangeland (Pastoral) areas, large parcels (Group Ranches) are identified on 1:50000 series map sheets. Njenga (2004) mentions that there were 387 Group Ranches, covering 2.5 million hectares in Kenya in 2004.

Group Ranches are large parcels of land that were demarcated under the Land Adjudication Act (Cap 284) of 1968 and legally registered to a Group such as a tribe, clan, section, or family, duly constituted under the Land (Group Representatives) Act (Cap 287, Laws of Kenya) of 1968. Members of these Ranches jointly own legal title to land and elect Group Representatives to manage the land. Individuals retain certain rights such as residency rights, tillage, and use of water resources. For many years these Group Ranches have provided free dispersal areas and migration corridors for Wildlife from various National Parks. Pastoral communities living within the Group Ranches also interact freely with Wildlife and provide protection against poachers.

The Masai Community that lives within the Amboseli Ecosystem has coexisted in harmony with Wildlife and the community's nomadic lifestyle within these Group Ranches has worked well for both their livestock and wild animals. In the recent past, increasing subsistence demands of a growing human population within the Group Ranches has led to increasing subdivision of land (Mwenda (2001) and Njenga (2004)). There have been major changes in land tenure, from group to individual ownership, subsequently resulting in land resources in

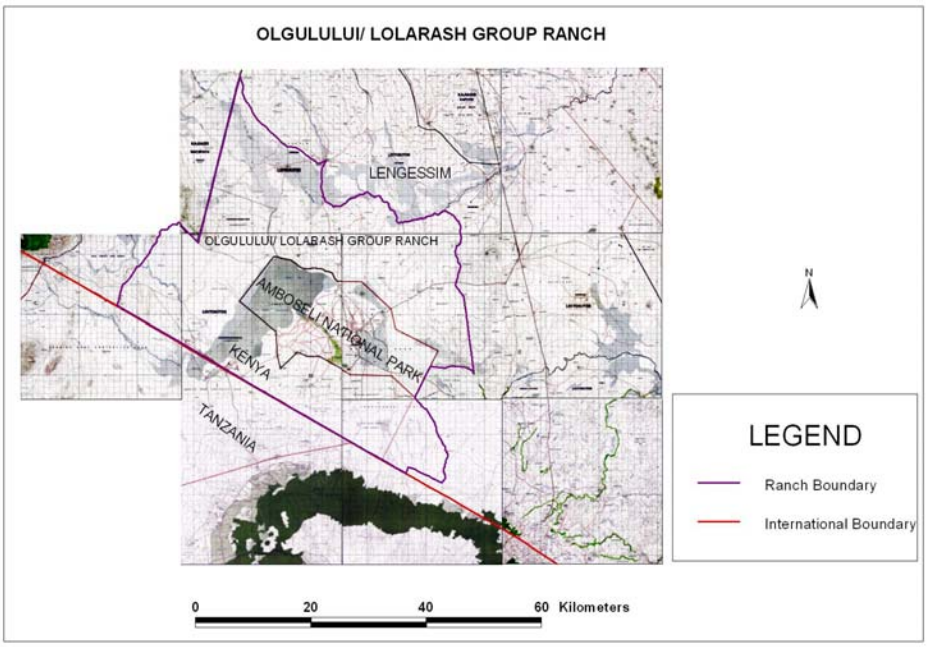
these areas being torn between pastoralism, agriculture and wildlife conservation. An increasing number of land parcel subdivisions are causing some ecological and socio-economic land use conflicts resulting in prominent Wildlife migration routes being blocked and wildlife dispersal areas diminishing in size.

These series of land use/ land tenure conflicts, are threatening the survival of National Parks and the Tourism Industry, which are essential for foreign exchange earnings. It is important that these conflicts are properly mapped in order to develop mitigation strategies. The main drawback in the mapping of this phenomenon, however, is that most of the spatial data related to these issues are scattered in various organizations and have not been collated into an integrated Geospatial database that can be used for holistic analysis of activities and land use planning of these areas.

2. THE STUDY AREA

The Study Area is located in the Olgulului/Lolarash Group Ranch in Kajiado District, in the Southern part of Kenya, which lies between longitudes 36º 5′ and 37º 5′ East and between Latitudes 1º 0′ and 3º 0′ South. Within this Group Ranch lies the Amboseli National Park, home to many wild animals with a rich ecosystem. Amboseli is a semi-arid Savanna environment that receives a mean annual rainfall of 350mm with bimodal distribution. The Park is fed by underground water, which seeps in from the nearby Mt. Kilimanjaro. It covers about 388.45km² of the greater Amboseli basin. The Study Area also exhibits differing land tenure types and land uses. It is a fascinating tapestry of contrasting and diverse landscape filled with Africa's mega herbivores (such as Elephants, Buffaloes, Rhinos and Giraffes), the mini herbivores (such as Zebras and Gazelles) and the big cats (such as Lions, Leopards, and Cheetahs) all in a tiny National Park. (Odede, 2003)

Location of the Study Area



Map showing Olgulului/ Lolarash Group Ranch with Amboseli National Park located within its bounds

3. LAND USE

Land use information is an essential element for nearly all development. Changes in land use are to a large extent a reflection of how society responds to socio-economic, institutional and management practices (Adeniyi, 1980. UNECE (2004) defines land use as the manner in which land is used, including the nature of the vegetation upon it surface. Land use can therefore includes activities that take place upon land such as cultivation, grazing of domestic animals, buildings (such as schools), and animal migration, among other activities. Adequate knowledge and information about land, such as its location, size and boundaries are important for its use and effective planning. For many years, classification and inventory of land use changes have been captured on topographical maps, air photos and satellite imagery. These methods had a deficiency in that it is difficult and time consuming to manually merge these data sets. These deficiencies have been overcome by the ability to digitize the data and combine it in a Geospatial Database for query and analysis.

4. WILDLIFE MIGRATION

Wildlife migration is an instinctive movement that takes place daily due to water and pasture needs or annually due to climatic changes. The most famous and spectacular wildlife migration in East Africa takes place every year between July and August in the Masai Mara National Park. This migration involves movement of large herbivores from Serengeti National Park in Tanzania to the Masai Mara National Park in Kenya. In the Amboseli Ecosystem, elephant migration routes lie between the Amboseli National Park and Mt. Kilimanjaro in

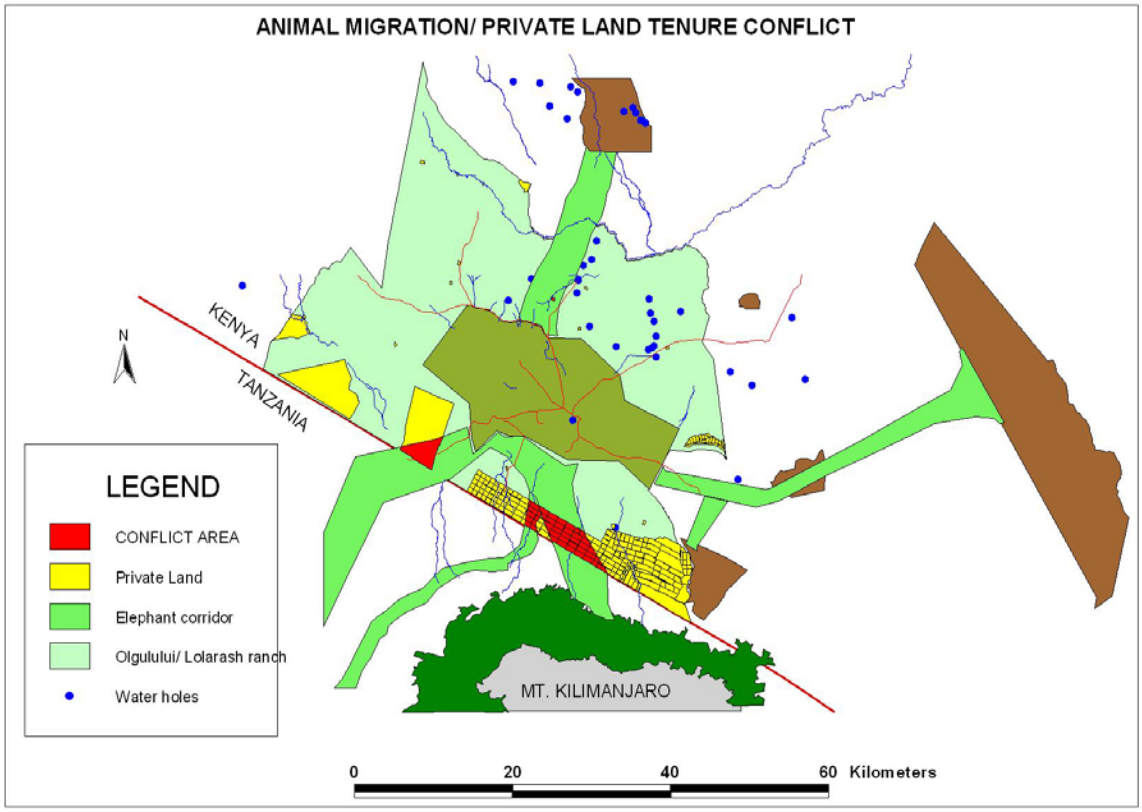
Tanzania. There is also another route between the Amboseli National Park and Chyulu Hills in Kenya. There is a third migration route between the Park and the Esselengei Area. There are two other elephant migration routes into Tanzania to the West of Mt. Kilimanjaro.

Migration corridors have been described as biological corridors, which are essential for the genetic survival of wildlife (Banko, 2001) and can be compared to lifelines for the animals. These corridors establish connections between different habitats and enable unrestricted movement of the wild animals and can be mapped using state-of-the-art technology such as Global Positioning System (GPS) and Satellite Imaging. In the past, Wildlife Scientists used ground-based vehicles to map migration corridors and plot animal tracks onto topographical base maps. Cross and Western (1974) initiated the use of "*collar-radio trackers*" in tracing movement of Wildlife in the Amboseli National Park. The system involves placing a radio beeper onto a collar of a family Matriarch (old female elephant), who is always the leader of a herd of migrating elephants. A combination of GPS and GSM technologies is currently used by various agencies (such as the Kenya Wildlife Service) in Kenya to track movement of wild animals.

5. DATA CAPTURE

To perceive the interaction between land use and land tenure within the Amboseli Eco-system, different types of data were combined. Data that was used for this study included topographical maps (1:50,000), Wildlife migration corridor maps, cadastral plans and data for various land uses. Hard copy maps of the Study Area were converted into digital form by scanning. Image processing was then carried out to remove radiometric degradation that had resulted from the 'yellowing effect' on maps due to long storage and stains on the maps. After removing all forms of 'dirt' from the maps, they were then georeferenced to allow for real world querying from the maps. To enable querying of the map, attribute (non-spatial) information was added to various features on the map. This was done using a relational database, which comprised of a set of tables, each two-dimensional array of records containing attributes about the object under the study. Through this process various datasets covering the study area were combined in a GIS, to analyze the impact of changing land use/ land tenure within Olgulului/Lolarash Group Ranch on Wildlife migration.

6. RESULTS



* The Africa Wildlife Fund provided elephant migration data

1. The above map shows interaction between various land tenure types and land use within the Olgulului/Lolarash Group Ranch, and the possible areas of conflict. The Amboseli National Park, which lies in the middle of the Group Ranch, is Government Land. The Group Ranch itself is under group tenure and the yellow bits show Private Land (sections of Group Ranch that have been subdivided and sold to individuals). It is observed that Private Land that has been sold to individuals completely blocks two of the Elephant migration corridors between Amboseli National Park and Tanzania. Private Land owned by individuals also blocks more than half of the third Elephant migration corridor from the Park to Tanzania.

2. Various developments of permanent such as schools, health facilities and permanent buildings along the migration corridors are indicative of worsening land tenure/land use conflicts in this area.

Table 1: Land use/ wildlife migration conflict

Type of land use	Area (km²) under conflict with migration corridor	Area (km²) NOT under conflict with migration corridor	Percentage under conflict
Cultivation Areas	40.42	146.55	28 %
Grazing land (Communal land)	194.88	1784.97	11 %

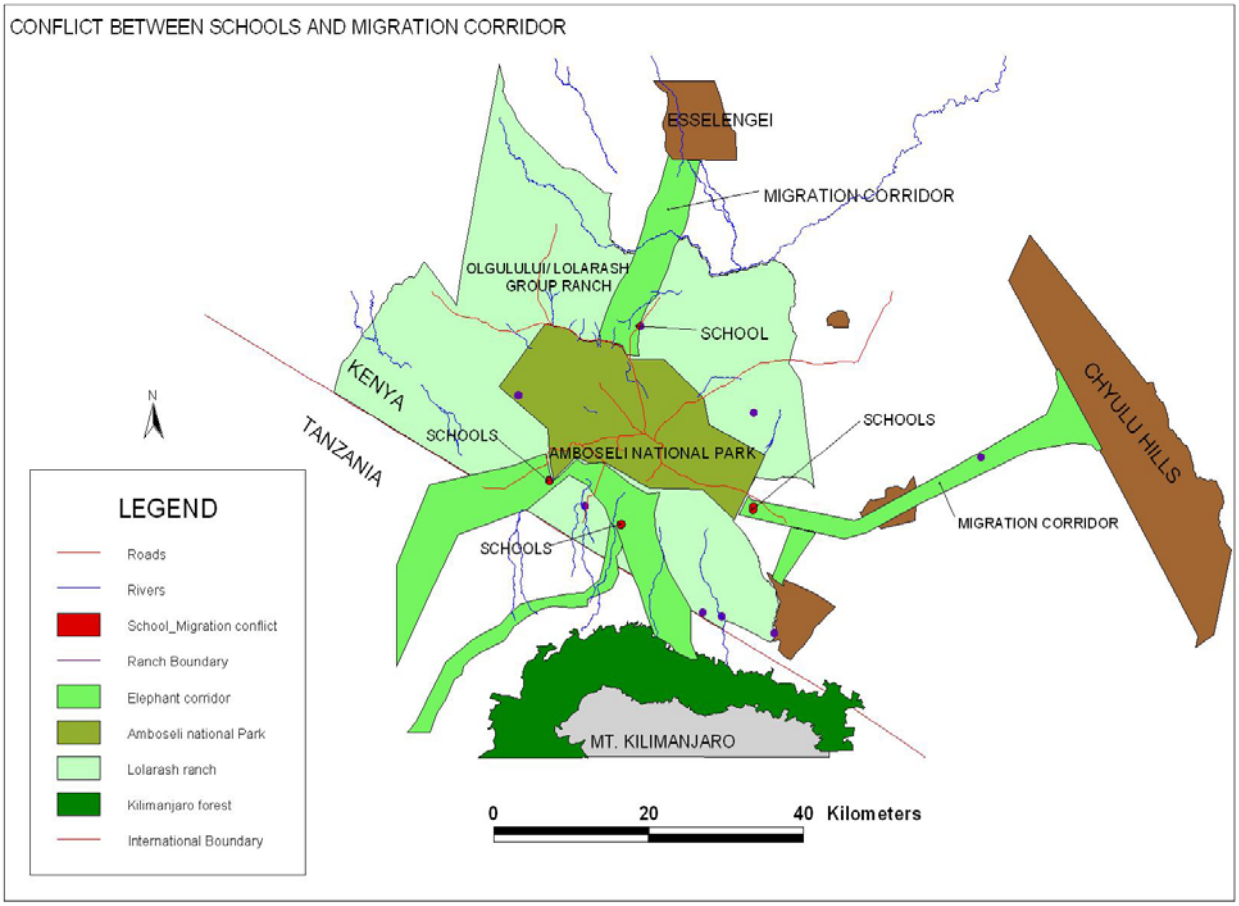


Table 2: Primary schools that lie in the Elephant migration corridors.

	Within elephant corridor	Within Group Ranch	% at risk of injury by migrating elephants
Number of Primary school students	284	1052	27
Number of Teachers	13	35	37

7. CONCLUSION AND RECOMMENDATIONS

If the different types of data above were viewed separately, it would not be easy to pinpoint possible areas of human/ wildlife conflict. But by looking at it holistically, it is possible to see that change in land use from nomadic grazing to sedentary agriculture, which has led to sub-division of land, has subsequently led to blockage of some of the prominent wildlife migration routes in the area. We recommend that Government Agencies and other Organizations dealing with Wildlife Conservation and Land use policies, in Kenya, make increased and effective use of GIS technology for enhanced decision making.

The authors recommend that the Government of Kenya should take urgent action to stop conflicting land use/ land tenure along Wildlife migration corridors, not only in the Area of Study but also in other Wildlife migration corridors such as the ones between The Masai Mara in Kenya and Serengeti in Tanzania to enable various Ecosystems to sustain both man and wildlife.

ACKNOWLEDGEMENTS

The authors would like to acknowledge the following organizations

1. Africa Wildlife Fund Kenya, for generously providing the Elephant migration data.
2. International Livestock Research Institute for providing the schools data
3. Survey of Kenya, for providing the cadastral data.

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BIOGRAPHICAL NOTES

Robert Nilson Wayumba has recently (2005) graduated from the University of Nairobi with a first class honors in BSc.Surveying. His major research interest is on Land use/ Land tenure and GIS. He has worked with Geometer Surveys Company Ltd. As a graduate surveyor, and has been involved in carrying out cadastral survey and topographical surveys in various parts of Kenya.

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