Stretching Beyond the Limitations of Social Based Land Dispute Classifications; Formulation of a Cadastral Land Dispute Classification Model
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Key Words: Land Disputes, Cadastral Classification, Geographical Data Modelling, Typologies

SUMMARY

This paper explores cadastral classification of land dispute to overcome limitations of the *de facto* land dispute classifications; the social based classifications. First, the paper introduces social science based land classification models. The paper then discusses the weakness of these models and their limitations in serving land professionals. Based on a study of land dispute claims in a district in western Kenya, the paper highlights the development of a cadastral land dispute classification model by geographically modelling land claims, proprietorship, land rights, land delivery process, encumbrances and cadastral properties. Resultant cadastral land dispute claims, typologies and their subtypes are highlighted and discussed.
1. INTRODUCTION

Land disputes are assertions of conflicting claims on land ownership, land rights, legal system or a combination of them. Conflicting claims arise because of varied proprietary and/or user interests usually appended to land. Often, these interests are driven by; market value of the parcel in question (Casseneli et al, 1996), lineage and identity of disputants (Rolfes, 2006), cadastral properties of the parcel, political jurisdiction within which the property falls (Dale, 2007 and Ogendo, 2007). No matter the interests in contention, the resultant land dispute has destructive effects. The effects include; tenure insecurity and social upheaval. Tenure insecurity is a major contributor to reduced food production and slowed down economic production. Land dispute related Social upheaval is directly responsible for among others; displacement of the affected (into informal settlements, ecologically preserved lands and refugee camps), destruction of property, deaths etc.

In total; land disputes undermine the human dignity globally through their direct contribution to; food insecurity, environmental degradation, informal settlements, and the swelling numbers of refugees and the homeless. Yet deep understanding of land disputes and their underlying causes is lacking (Centre of Advanced Study, 2006). Many of the land dispute related studies are theoretical. Scientific analysis and clarifications are little (Wehrmann, 2005). Land professionals; professionals with scientific; tools (geo-tools), data (authorities in collecting, processing and loading land information on land management platforms and systems) and management systems (predominantly the managers of cadastres and land administration systems) have not classified and exhaustively defined individual land disputes. Instead; social based land dispute classification models are commonly and widely relied upon.

Social classification models include commendable efforts by Ashley (1999), So Sovannarith et al. (2002: 33–6), Mahaphohn (2007; 20) and (Wehrmann 2008; 32) (Table 1). Ashley (1999), classified land disputes into three typologies; Disputes between the state and ordinary citizens, Disputes between citizens and representatives of the state and Disputes involving private parties. So Sovannarith et al (2001) classified them into six land dispute typologies that included; Conflict between neighbours, Conflicts within families, Conflict involving local authorities, Conflicts involving state institutions and
Conflicts between villagers and private parties and companies. Wehrmann (2008; 32), preferred the method of land dispute classification based on the social dimension of conflicts. Classification offered by this model is the distinction according to the social level at which a conflict takes place: intrapersonal, interpersonal, intrasocietal or intersocietal/international levels. This worthy method of classification moves attempts of Ashley (1999), So Sovannarith et al. (2001) and Mahaphohn (2007) a notch higher by considering parties to a dispute but at a social level.

| Interpersonal level | Micro-social dimension | • Boundary conflicts between neighbours  
|                     |                        | • Ownership conflicts due to inheritance conflicts  
|                     |                        | • Occasional multiple sales of private property by individuals without administrative assistance and without harming third parties  
|                     |                        | • Individual occupation of private land  
|                     |                        | • Building extensions on the private land of another  
|                     |                        | • Illegal lease/sale of somebody else’s private land  
| Intrasocietal level | Meso-social dimension  | • Boundary conflicts between tribes or villages  
|                     |                        | • Illegal sale/lease of communal land/tribal land  
|                     |                        | • Illegal allocation of state land by private individual  
|                     |                        | • Group invasion of private land  
|                     |                        | • Land use conflicts between farmers and pastoralists (e.g. animal corridors due to transhumance)  

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### Table 1: Classification of land conflicts (Wehrmann, 2005)

| Macro-social dimension | Occasional building extension on state land | Occasional illegal use of state land | Illegal use of one’s own land | Violent attacks on property | Ownership conflicts due to legal pluralism | Land grabbing | Illegal sale/lease of state land | Evictions (by force) by governmental authorities | Improper land privatisation | Land use conflicts between private and public utilisation due to a general disregard of land use regulations by a majority of people | Expropriation without compensation | Illegal acquisition and sale of somebody else’s private property by individuals, supported by corrupt public agencies or courts | Multiple allocation of particular plots by officers working at the land registry |

Whereas these worthy social models are indispensable to social scientists analyzing land based conflicts and attempting to craft intervention measures from a social viewpoint, they are quite limiting to a surveyor wishing to use them for the same purpose. This is because; first the classifications models give forth heterogeneous land dispute typologies despite the fact that they use a similar classification criterion. Heterogeneity in definition of land disputes typologies poses a great challenge in crafting of common management/intervention approaches and is often a cause of duplication of efforts in the formulation of resolution mechanisms. Further it greatly limits boundaries of practice of land professionals interested in resolution of land disputes in a world where practice boundaries for professionals are largely diminished. In total, it restricts the ability of the land professional to alleviate human suffering.

The second limitation of these models is; they do not put into consideration that each disputed parcel is not only subject to parties involved but also a function of one or a combination of a number of a parcel’s cadastral properties administered in (a) legal system(s). These models thus not only leave out an important parameter of land dispute-
Zitelmann (2005) noted these classification models were schematic presentations of the situation with regard to land disputation and are not analytical. Wehrmann (2006) recommended an integral system-oriented approach that would take into consideration the complexity of causes leading to these land disputes as well as their diversity and huge number of actors involved. Such an approach requires Land administrations to create GIS-related databases, not only describing the type of land dispute but also indicating the location and size of the property/properties involved (Wehrmann, 2008; 50). The question that needs to be answered is how would land administrations come up with land dispute typologies universally recognised by land professionals? The aim of this paper is to provide an answer to this question.

2. METHODOLOGY

A data model is a set of constructs for describing and representing selected aspects of the real world in a computer (Longley et al., 2005). Geographic Data Model is one such type. Geographical Data Modelling is a methodology for the analysis and synthesis of geographical data. It applies map algebra to sets of single-factor maps, which are treated as variables that can be manipulated using map algebra functions. With these functions, variables can be transformed or combined into new variables (Tomlin, 1991). This study applied the geographical data modelling method on disputed parcels’ cadastral data, processes and properties to come up with a cadastral land dispute classification model.

The study abstracted land dispute claims, parcels affected, the parcel’s cadastral data, properties and processes into a data model. There were three levels of abstraction: First, the abstraction of reality into a conceptual model, secondly, the abstraction of conceptual model into a logical model and finally the implementation of the logical model into the physical model.

During abstraction of reality to a conceptual model; entities in the land disputes were identified. The study identified land conflict claims from land dispute tribunals, the provincial administration, the district land registrar and the district magistrate’s court registry. Each disputant to a claim was traced and interviewed to validate dispute claims and chronology as had been identified from the judiciary, administrative offices and dispute resolution agencies. After validation of claims, attempts were made to link each dispute claim to a physical geographical parcel and spatial unit on the official map cadastre. Land registers for each affected parcels were identified and information pertaining proprietorship, land rights, land rights delivery process and encumbrances...
were extracted. A global description of these entities and their relationships was developed.

The conversion of the Logical Model to the Conceptual model entailed the structuring of land dispute entities (spatial and non-spatial) identified in the conceptual model. This was done through the extraction of attributes of entities in the conceptual model and the transformation of these attributes into clearly defined variables. The variables were tabulated and constraints set. Common fields were defined and introduced in related tables to ensure joining and relating of the tables was possible.

The physical model was an implementation of the logical model in a relational database in an ArcGIS geo-database. Joins and relates between the spatial and non-spatial tables were developed. Classification of the claims was done within this physical model using the ArcGIS Model Builder. In the ArcGIS Model Builder, multiple Geo-processes and GIS queries were strung together in a process (A process consisted of a tool- ArcGIS system tool or a custom tool and its parameter values i.e. input and output data, a cluster tolerance and a reclassification table) to constitute a model.

The model was constituted by three major processes (Figure 1). The first process involved the validation of land dispute claims by linking each claim to a physical parcel and/or on a map cadastre. The second process ensured classification of dispute claims model into predefined dispute classes based on known cadastral principles and knowledge. The third and final process was the disintegration of each dispute claim type into its subtypes.
Validation of land dispute claims sort to link each dispute claim to a physical parcel and/or a parcel on the map cadastre. Claims appended to physical parcel and/or parcel on the map cadastre were pooled together to constitute the disputed parcels (Figure 2).

The classification of dispute claims model led into classification of disputed parcels into the following predefined cadastral classes:

i. Classes derived from land rights – Land Rights’ Dispute Claims

ii. Classes derived from land rights delivery process
   - Subdivision Dispute Claims
   - Succession Dispute Claims

iii. Classes derived from Cadastral elements
    - Cadastre dispute Claims
    - Title Dispute Claims
Boundary Dispute Claims

Figure 2: Validation of the dispute claims

A class in which a dispute was grouped varied based on aggregation of claims appended to the parcel (Table 2).

<table>
<thead>
<tr>
<th>Type of Claim</th>
<th>Proprietor Claim</th>
<th>Death Claim of Proprietor</th>
<th>Occupation Claim</th>
<th>Beacon Claim</th>
<th>Cadastre (Register) Claim</th>
<th>Cadastre (map) Claim</th>
<th>Rights Claim</th>
<th>Land Delivery Claim</th>
<th>Right Delivery Claim</th>
<th>Lineage Claim</th>
<th>New-Reg.No Claim</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Rights’</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

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Table 2: Land Claims Classification Criteria

| Subdivision | Y | N | Y | Y | Y |
| Succession  | Y | Y | Y | Y | Y |
| Boundary    | Y | Y | Y | Y | Y |
| Cadastral   | Y | Y | Y | Y | Y |
| Dispossession | Y | Y | Y | Y | Y |
| Sectarian   | Y | Y | Y | Y | Y |

Y/N - Non italic - Have AND (Mandatory) value
Y - Italicized Bold - OR (optional) value
Blank - Either Y or N values (also optional)

After the classification of dispute claims the study sort to discretely identify dispute subtypes in each individual dispute claim type. This was achieved through iterative spatial and non spatial analysis of individual claim types. Each land dispute typology identified was discussed detailing the cadastral specifics.

3. LAND DISPUTE CLAIMS

Four types of land dispute claims were identified (Figure 3 and 4). They included; Land Rights’ Delivery Claims, Land Rights’ Claims, Proprietor Claims and Cadastral Claims. At first glance, most of these land dispute claims seem simple and straightforward. Some really are. Many, however, are not that easy to comprehend (Wehrmann, 2008; 36). They vary from quite straightforward arguments to complex series of differences of opinion involving intent and motive.

_Cadastral Claims_ cast aspersions on cadastral elements like cadastres, title certificates, mapping and boundary systems etc. _Proprietorship_ claims revolved around ethnic and/or lineage of the proprietor/claimant, intent and motive of proprietor/claimant etc. _Land Rights_’ related claims concerned efforts and counter efforts to enforce restrictive and/or easement rights. _Land rights delivery process_ claims predominantly questioned legality/timeliness and manner of execution of cadastral processes.
4. CADASTRAL LAND DISPUTE TYPOLOGIES

Cadastral Land Dispute typologies were the end product of the geographical data modelling. They were a synthesis of the land dispute claims into distinct classes simulated from cadastral fundamentals and principles. The study revealed 7 principal land dispute typologies and 18 subtypes (Figure 4 below).

First on the list were succession disputes. Succession land disputes were reached at after modelling of the land delivery system, proprietor and claimant (heirs and/or beneficiaries) line of descent, will and will execution. The model revealed succession disputes were constituted by competition amongst heirs, next of kin or distributee for inheritance of land ownership and land use rights of a decent. Three succession land disputes subtypes were identified from this study; testamentary, intestate and irregular succession land disputes.

Testamentary succession land disputes- These were disputes resulting from disagreements of the composition of heirs and their respective shares as contained in a testament executed in the form prescribed by law. The composition of heirs was a controversial issue especially in polygamous families. A number of decedents were found to have willed property to their wives without due regard to the number of children each
wife had. This meant each wife was expected to subdivide the property to her children. Problems arose when stepchildren got less than the others from a different household. Another major cause of testamentary succession land disputes was the doctrine of primogeniture. Under this doctrine, the first male is preferred and has more property passed to him than all the rest. In most cases, the rationale for such acts was later questioned and disputed by the elder male’s siblings.

_intestate succession land disputes_—These involved incidences where there was no will and thus succession was established in favour of the nearest relations of the deceased. These disputes began at identifying successors to an intestate’s estate. The deceased’s relatives sought to implement the distribution that most intestates would have provided had they made wills. Theories of distribution were often as varied as the disputants with each disputant rooting for what would favour them.

_irregular succession land disputes_ were those that resulted from nullification of heirs either intestate or instituted by testament in favour of non heirs or the state. This was common in cases where land had been sold or compulsorily acquired before the death of the proprietor. As a general rule, property subject to descent and distribution included all vested rights and interests owned by the deceased at the time of death. If a proprietor died prior to the completion of sale of real property, the legal title to land that the seller contracted to sell vests in the heirs at law on the owner's death, subject to their obligation to convey the land to the purchaser according to the contract. Irregular disputes arose when the state/court authorised the transfer of the parcels to the purchasers as per the contract.

The second dispute typology revealed by this study was the **Subdivision dispute**. This dispute typology was as a result of modelling of the land delivery process and parcels’ topology. Subdivision disputes were noted to have topological errors of overlap type. In addition, when these parcels were modelled for land delivery process (registration), each registered parcel was identified to be a parent of more than one unregistered parcels. The study deduced this as a subdivision land dispute. Subdivision land disputes were two in nature; Parcellation and Title agitation.

_Parcellation land disputes_ were constituted by:

i. **Disputed subdivision processes** - This was constituted by refusal of an ascendant to partition his parcel to legally/customarily qualified heirs. Objection to the subdivision process by the heirs also constituted parcellation disputes. Heirs therefore did not have their parcels marked out and though they could have developed and tilted portions of their ascendant’s parcel, such portions were found
not to have been legally or customarily willingly apportioned to them by their ascendants.

ii. Disputed outcome of the subdivision process - In this case, the outcome of the subdivision was found disputed either partially or in entirety. Commonly disputed aspects in a subdivision included parcel contiguity, parcel size, legality of heirs etc.
Figure 4: Land Dispute Claims and Cadastral Land Dispute Typologies
Title agitation subdivision disputes were disputes that came up as a result of agitation for registration of parcels of a successful subdivision process. Such agitation was driven by insecurity of the heirs activated by domestic Circumstances, ill health of the ascendant etc

Cadastral Disputes were a dispute typology revealed after modelling parcels topology, land delivery process (registration/titling) and the cadastres. The model revealed two types of cadastral disputes; title and cadastre register disputes.

Title disputes- Title disputes were found out to include;

i. Multiple titles disputes; involved what the model revealed to be parcels that exhibited complete overlap (containment) topological errors though each of the parcel involved had a valid registration number. Further, respective registers indicated titles to these parcels were still open and not closed. The study thus deduced multiple disputes to be disputes constituted by the existence of two or more valid titles under a defined spatial unit (the same parcel of land). Multiple title disputes were found to be commonly propagated by myth of sanctity of title (Government of Kenya, 2002) and acts of corruption.

ii. Transposition of title- Model revealed transposition of proprietorship on the register cadastre as compared to occupation on ground. Contiguous parcels were the most affected. Disputes arose when individuals discovered and those advantaged by the transposition began transfer the parcels to avoid revision of land records.

Cadastre disputes were revealed after modelling the registers of the parcels with land dispute claims. For this particular dispute, the model revealed statutorily inconclusive registers. A major contributor to this dispute typology was noted to be inconsistency of the registers. This inconsistency mostly stemmed from Mismanagement of land registries leading to misfiling or loss or alteration of registers (Figure 5).
In some cases, inconsistency of the land register was born out of and *Poor land registration and land rights delivery procedure*. This resulted in registers that were unable to authoritatively and incontrovertibly mirror accurately the totality of parcels and interests affecting them (Figure 6).

The study noted the information gathered as a result of the adjudication, demarcation, survey and registration services in the study area was rarely organized in a form that...
could easily be retrieved or utilized for other purposes such as planning or land use management. Indeed, cadastral information attached to land parcels in registries were rarely disaggregated in terms of nature, quality or production characteristics, nor updated in response to changes in resource characteristics as a result of use, population pressure and technological change. Consequently that information was often inaccurate and of little use even for the purposes of land registry management (Ogendo, 2007). The divergence between the land register and actual patterns of access on ground led to uncertainty and dispute regarding claims to titled/untitled land and further fuelled corruption in land related institutions.

Boundary disputes were an outcome of a model constituted by overlay analysis and geoproducting of registered parcels with land dispute claims. Boundary disputes were found out to be constituted by the indefiniton of the spatial line separating two spatial units of registered ownership thus resulting into overlapping ownership of two or more adjoining registered parcels. Most boundary disputes were noted to have begun off by either a claim of encroachment past the spatial line separating parcels or by desire to verify exact area of a parcel in question. Two subtypes of boundary disputes were identified;

*Riparian boundary disputes*-Two kinds of riparian boundary disputes were noted. The first one involved river course diversions whereas the second one involved terraces in use as boundaries. For diverted river/stream course (Figure 7), arguments mainly featured the evidence of river/stream course diversion if it ever occurred and ownership of land cut off by the diverted water body course.
Disputants who allegedly changed river course always denied that the diversion ever occurred and if they did admit they felt the cut off portion was as an act of God or as result of their reclamation effort. On the other hand, disputants claiming river/stream course diversion felt the cut off portion was just an extension of their parcel. In incidences where there were agreements as regarding the diverted river course, the question as to where the boundary lay in relation to the river/stream course always came up. The most cited presumption was the *ad medium filum* (to the centreline) rule, whereby the line of the boundary was presumed to be centre line of an adjoining stream/river. Of course, with claims of a diverted river course determination of the centreline remained very contentious.

For terrace/ditch boundaries, argument arose as to where the exact boundary lay and who really owned the ditch/terrace. As it infrequently happens, the ownership of the terrace/ditch is unknown and there is no conclusive evidence one way or the other. Some disputants presumed the boundary to lie at the edge of the ditch further from the bank because an owner ditching the border of his land is likely to throw the spoil back onto his own and not somebody else’s property. Opposing disputant thought otherwise.
**Non riparian boundary disputes** involved affirmation of conflicting claims on the line which marked the confine of a parcel or the physical objects delineating the line of division between parcels. The major cause of non riparian dispute was noted to have been asymmetry between boundaries on the ground, those on maps and verbal descriptions which were used to define the units of property recorded in the register. The study noted Boundary disputes were a making of the inadequacy of the boundary and mapping systems in use.

Conflicts resulting from interpretation or enforcement of restrictions in use of land were considered as **land rights’ disputes**. The study modelled land rights as a bundle of sticks. From parcel to parcel and over a length of time, the ‘sticks’ varied in number (representing the number of rights), in thickness (representing the size or ‘quantum’ of each right), and in length (representing the duration of each right). In some cases, the whole bundle was held by a single proprietor/ claimant, in other cases it was held by a group of proprietors/claimants. Sticks out of the bundle could be acquired in different ways and held for different periods depending on the tenure regime, but the ownership of the land was not itself one of the sticks; it was regarded as a vessel or container of the bundle. These bundles of rights were girdled around a number of restrictions; restrictions imposed by statute, by the physical contiguity or proximity of one unit of land to another, and by existence of inferior and superior interest in the same unit of land. Conflicts resulting from interpretation or enforcement of restrictions in the physical model were inferred as land rights’ disputes. Land rights’ disputes were found to include:

i. **Restrictive Rights Disputes**; Restrictive rights were rights effectively limiting a proprietor for the benefit of another from building on his land to a certain extent or restricting its use in a particular manner. Restrictive rights’ disputes involved cases where enforcement of such rights was contested. Restrictive rights’ disputes identified in the study area were land use and transactional related. Restrictive land use disputes mainly involved restriction of building of houses of worship, planting of certain trees on boundaries, restriction of burying sites etc.

Restrictive transactional rights disputes were mainly disposal land rights disputes. Mostly disputes of this nature arose restricted a proprietor from disposing/leasing his parcel. Such restrictions were often found to have been imposed by claimants who had interests in the parcel.

ii. **Easement Disputes**; Easement was considered a right attached to a parcel of land which allowed its owner to use the land of another person in a
particular manner or to restrict its use to a particular extent; but this right, by definition did not include profit, which is a right to go on the land of another and do something on it (Ojienda, 2008; 112). Easement disputes majorly included right of way (Figure 9) and right to water points.

Modelling of lineage (temporal aspects) of proprietorship, land delivery processes and encumbrances and the relationship between subsequent proprietors to a parcel revealed the fifth dispute typology; the Dispossession Disputes. This particular dispute was constituted by registration of (an) individual(s) as (a) proprietor(s) in breach of land rights delivery processes and/or encumbrances. Dispossession dispute typologies were identified to include; disinheritance, land grabbing and expropriation.

Disinheritance Land disputes were found out to mostly result from irregular succession disputes. Legally and customarily, the first determinant of who inherits property of a person intestate is the blood relationship. Cases in which a distant blood relative was considered for inheritance of property of a person intestate, at the expense of an immediate relative without a contractual purchase agreement with the deceased resulted into disinheritance. The following were identified to be the major causes of disinheritance in the study area;

Figure 9: Easement Dispute- Right of way
i. Gender bias - Customarily, women were not allowed to inherit land. Parents who bore no sons had to give their land back to the community. The practice was found still rampant in the study area. A number of women who had no sibling brothers were denied the right to inherit their father’s land and the land shared amongst their step brothers or uncles resulting into disinheritance disputes.

ii. Trustee relationships - In the study area, it was identified that both in the intestate and testamentary succession an executor acts on behalf of the family until grants are issued to the beneficiaries. Often the trust relationship between the beneficiaries and the trustees is abused with the executor going all the way to have all the property registered in his name. Disinherited family members found it almost impossible to challenge a first registration where the registered trustee proprietor was an executor of the estate. Adversely affected family members were subjected to the rigours of having to establish that a trust relationship exists between them and the dishonest family member (Government of Kenya, 2002). Because of the high cost of litigation, lots of victims were found to suffer silently.

The seizure of registered private or government or trust land by individuals or institutions constituted land grabbing. In the study area, land grabbing disputes included; illegal or irregular allocation of public land and fraudulent acquisition of private/public land through manipulation of land records, multiple sales and forceful occupation;

i. Irregular allocation of public land; In the study area, though most Trust and Public Lands were set aside for certain purposes because of their ecological integrity, cultural relevance or strategic location and could not be allocated to private use unless public interest dictates that they should (Government of Kenya 1999; 15), corrupt officials had allocated such land without reference to the foregoing imperatives. Because of this, public resentment set in leading to land grabbing related disputes.

ii. Fraud; this was noted to have contributed to grabbing disputes for both public and private land. Disputes of this nature included;

   - Incidences where a purchaser transferred more land to himself than he had bought.
- Ignorant land owners being tricked to sign land transfer documents or swear affidavits in court only to realise they had sworn to transfer their parcels.

- Multiple sales of parcels and

- Gazetting of titles as lost titles to land and acquisition of new titles to the same parcel

iii. *Expropriation Disputes*; One of the residual powers that the state derives from the Constitution as the owner of radical title is *eminent domain* which gives the state or its assigns (e.g. county councils) the right to compulsory acquire private land for public purposes. In the study area, this was implemented through the Land Acquisition Act. The Act empowered the Commissioner of Lands upon demonstrable public interest, issuance of due notice in the government gazette and upon full payment of full compensation to all persons having interest in the property, to acquire any piece of land which the minister is satisfied that it is required for public use (Ojiena, 2008; 91) and ensure the parcel is not used for the purpose other than the one it was acquired for. The model revealed a number of cases where one or a number of these conditions had not been met. A case in which the government failed to meet these requirements stipulated in law and moved on to compulsory acquire private property or set apart trust land was considered expropriation. Assertion of conflicting ownership or land rights claims by government/agent of government like municipal council and individuals from whom such land has been acquired from constituted expropriation disputes (Figure 8).

**Sectarian disputes** were a result of modelling private ownership systems of the disputed parcels. Two systems of private ownership of land were identified and modelled. One where all land was held in common and another one where land was held privately by individuals. Common Land was created by the guarantee to each individual that he will not be excluded from the use of or benefit of a certain parcel; private land was created by the guarantee that an individual can exclude others from the use of the parcel in question (Macpherson, 1978). Though both kinds of ownership systems being guarantees to individual persons are individual rights, only one system of ownership could be enforced on a parcel at a time. Conflicts resulting from enforcement of multiple private ownership systems i.e. both common and
private ownership on a spatial unit (parcel) at the same time led to the model deducing such conflicts as sectarian disputes. Two types of sectarian disputes were identified. They included family/clan and ethnic land disputes.

Figure 8: Expropriation Disputes; Parcel EW EKERO 798- Register not indicating parcel compulsorily acquired as indicated by vacate notice given by council

Family/clan disputes-Tenure relationship under the common land revealed that family land was controlled by some socially distinct authority usually comprising of a functionary e.g. a council of elders, spiritual leader etc (Ojienda, 2008; 12). Family/clan disputes were found to involve contestation of family/clan boundaries and agitation to have common land individualised. Also common were disputes sparked by misuse and even transfer of family/clan sites by those who had been holding the parcels in trust for the community to individuals not appointed (known) by family/clan.

Ethnic disputes - Were revealed to be disputes resulting from affirmation of ethnic (common) ownership on a parcel privately owned by individuals from a foreign ethnicity. Mostly they were a result of negative ethnicity. Ethnic Land Clashes were instigated in the misconception that some communities could chase away individuals from foreign ethnicities/communities, thus reduce competition over land, quell land disputes and acquire their land (Government of Kenya, 1992)
5. CONCLUSION
The paper revealed the utilitarian social based classifications are limited in serving land professionals. The paper highlighted a cadastral land dispute classification model that uses geographical data modelling. Results of these models are discussed detailing the cadastral specifics (principles and fundamentals) of each dispute typology. Though cadastral institutions, systems and practices appear as expressions of the modern nation-state, with the function to get an understanding and control of diverse local forms of relationships to land (Scott, 1998: 36) and may vary from jurisdiction to the other, cadastral specifics employed in these systems, institutions and practices are universal. By modelling and defining land disputes based on cadastral specifics, the paper helped find a universal definition for a universal problem. It is expected this will; diminish practice boundaries for land professionals interested in resolution of land disputes and enable formulation and sharing of intervention measures to land disputes by land professionals.

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BIOGRAPHICAL NOTES
William KALANDE qualified with a Bsc in Surveying and Photogrammetry (Hons) from the University of Nairobi. He is currently pursuing an Msc in Surveying-Land Information Management in the Department of Geospatial and Space Technology in the University of Nairobi. He worked as a land Surveyor carrying out Cadastral Surveys around the Republic of Kenya with Ramani Communications and the Ministry of Lands and Settlement for Three years. He later joined the Somaliland Cadastral Survey as a Land Surveyor where he resettled refugees, solved land disputes and carried out cadastral surveys for issuance of titles before joining Mumias Sugar Company in December 2006 to take up his current position as the Land Information Manager. He is currently charged with surveying and managing the Agricultural Management System (AMS); a land based information system of 70,000 contracted farmers and the 6000Ha company’s nucleus estate. He is also frequently involved in solving land disputes amongst farmers and carrying out Cadastral and farm boundary surveys for the company.

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