

Spatial Analysis of Land Disputes in the Ashanti Region [Ghana]

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ABSTRACT

Context and Background:

Land is an important resource for human survival as well as that of other living organisms. Despite its importance, there are many problems that come with its management. There are increasing controversies and disputes over the ownership, access, and use of land. This is due to the increase in land demand, owing to factors such as population growth, urbanization, and food security. Land disputes in the Ashanti Region have drastically escalated recently as a result of these factors. Many land parcels have been left underdeveloped as a result of these disputes.

Goal and Objectives:

This study investigates land dispute cases from 2016 to 2021 in the Ashanti Region using survey records of land dispute cases from the Ashanti Regional Lands Commission.

Methodology:

The study reviewed 203 land dispute case files from the Lands Commission to perform spatial analysis in identifying the hotspot zones of land disputes in the area of study. Ripley's K-function was used to test the null hypothesis of complete spatial randomisation and Moran's I was used to measure the spatial autocorrelation of the land dispute incidences. A kernel density map was used to show the intensity of recorded disputes in the hotspot zones.

Results:

It was evident from the study that most of the land dispute cases were recorded in and around the central part of the study area. A map depicting the spatial extent and hotspot zones of the land dispute cases was developed to provide contextual background for policy makers, and researchers. Based on the Moran Scatterplots, Local Indicators of Spatial Association (LISA) cluster maps were used to identify hotspot zones in the study area. A total of 12 localities were identified as hotspot zones in the study area. The incidence of land disputes was mostly in the peri-urban areas with proximity to the Central Business District. Further research is recommended to probe into factors that influence a locality or town's vulnerability to land.

Keywords:

Land Disputes, Spatial Analysis, Spatial Autocorrelation, Ashanti Region, Ghana.

1.0 INTRODUCTION

Land is a valuable resource and asset in Ghana, with economic, social, political, and cultural implications. Existential disputes have afflicted land tenure systems, including chiefs, family leaders, the government, individuals, and groups. Multiple land transactions, uncertain boundaries of customary-owned property due to unreliable maps and plans, and conflicts of interest between and within land owning-groups are among the reasons for land conflicts in Ghana, according to the National Land Policy (1999). The difficulties with Ghana's land tenure system highlight the need to improve traditional land management, as well as conflict resolution methods as a way to improve tenure security.

Land disputes have various political, economic, and social implications, including the loss of life, livelihoods, and property, relocation, and social and economic instability. Land disputes, as well as the mistreatment or neglect of land issues in post-conflict scenarios, can have severe consequences for economic, social, spatial, and ecological development. Land conflict prevention and resolution, as well as the establishment of a responsible land governance framework in both conflict and post-conflict situations, are essential for inclusive and sustainable development, peace and stability, and the realization of human rights, making land conflict prevention and resolution – as well as the establishment of a responsible land governance framework – key cornerstones for the achievement of the Sustainable Development Goals (Wehrmann, 2017).

The equitable and relatively open access to land that characterized Ghanaian communities is a thing of the past (Aryee et al., 2011). To have a stake in land, reforms have been implemented in areas such as title registration and land demarcation by surveying. Acquisition of undeveloped lands, especially in the customary (traditional) land sector, dominates the Ghanaian land market. Land markets are being promoted in order to boost transparency and efficiency, as well as security of tenure and, to some extent, fairness for people who have traditionally been excluded from land ownership, notably women (Herbst, 2000). There are increasing controversies and disputes over the ownership, usage, and access to land. This is due to the recent increase in land demand in Africa, owing to factors such as population growth, urbanization, and food security. As a result of commoditization, individualization, and commercialization of land in a new period of 'land grabbing,' the situation worsens, with rising land values and scarcity.

Land and its related disputes have piqued the interest of numerous stakeholders, which has been important to address the intractable and divisive phenomena of land conflicts in order to guarantee social peace, stability, and socioeconomic progress. An alternate dispute settlement mechanism, as well as the Land Administration Project (LAP) of 2003, which is the most comprehensive program to date, are among the steps taken to resolve the problems and their underlying causes. However, these efforts have not been successful in resolving Ghana's land management issues and disputes. This paper focuses on performing spatial analysis to identify land disputes hotspot zones in the Ashanti region.

1.2 Land Conflicts in Ghana: Nature and Causes

In Ghana, there are two forms of land ownership: state or public lands and customary or private lands. Stools/skins, families, clans, and persons are recognized as either customary or private

ownership under Article 257 of the 1992 Constitution. Compared to the 20% owned by the state for which compensation has been issued and the 2% held by the President on behalf of the stools/skins, families, and clans. Customary or private lands account for 78% of the entire land area (Aryee et al., 2011). The confluence of customary land tenure systems with formal law, it has been argued, generates complexity in the administration of land rights. This is owing to the fact that the two systems impose differing standards for title security, resulting in conflicts (Kasanga and Kotey, 2001).

In most African countries, the land question and related disputes have sparked research interest. Numerous researches have been done on land conflicts occurring in Ghana. The main causes of these conflicts have been well documented. Wehrmann (2017) linked political, economic, social, sociocultural, demographic, legal/juridical, administrative, technical (land management), ecological, and psychological elements as some of the causes of land conflicts in Ghana. Based on how they develop, Aryee et al., (2011) recognized nine (9) different forms of land conflicts. The National Land Policy noted, that in Ghana, uncertain boundaries of a customary-owned property, multiple land transactions, conflict of interest between and among land-owning groups, and the state are all factors that contribute to land conflicts (Ministry of Lands and Forestry, 1999).

In some parts of Ghana, especially the Ashanti region, Crook (2005) cited intra-family disputes, boundary disputes, and chiefs' improper disposal of property rights as common causes of land disputes. Bofo-Anang et al. (2021) noted that a number of factors, including inadequate or missing supporting documents, ignorance, a lack of historical family knowledge, a plot on the part of the land seller to mislead the buyer, multiple land sales, forced encroachment, and ineffective land administration system, contribute to land disputes or conflicts.

Land disputes, according to Yaro (2010), are becoming more common as lands become more commercialized. According to him, lands in Ghana are rapidly being sold for both residential and agricultural uses. According to Yaro (2010), customary lands are characterized by high levels of land tenure insecurity.

The difficulties with Ghana's land tenure system highlight the need to improve customary land management, as well as conflict resolution methods so as to improve tenure security for majority of the population. Land disputes also reflect the entrenchment of local power structures and social group membership in customary land rules (Cook, 2005). It's worth noting that the state's position in land management and reform programmes has a hand in some of these land conflicts, both at the individual and collective levels. As Cook (2005) points out, certain land disputes are connected to the state's involvement, particularly in its desire to actively manage land, which tends to further marginalize and exclude poor and vulnerable populations.

According to Tsikata and Seini (2004), Ghana's tenure policy has worsened and fostered land conflicts and insecurity, with negative consequences for national development. Customary tenure is dynamic, changeable, and negotiated (Berry, 1993), and it is based on people's perceptions and experiences. This opens the door to misuse through authoritative interpretations by traditional authorities, frequently to the detriment of vulnerable populations such as women and youths.

2.0 Methodology

To examine the various land conflicts and map out the conflicts in selected districts in the Ashanti Region. Land dispute data were obtained from the Survey and Mapping Division of the Ashanti Regional Lands Commission. The dispute data collected from The Lands Commission were land dispute cases recorded from 2016 to 2021, which contain information about the type of land dispute, date of the event, locality and district of the dispute, and surveyor’s observations. Even though the data sets collected did not contain any spatial information, the study developed a geodatabase for further spatial analysis after geocoding the incidents by locating the central position of the locality where the incident had occurred. A kernel density map was created based on the number of incidences to identify the hotspot zones. **Figure 1** shows the methodological process adopted for the study.

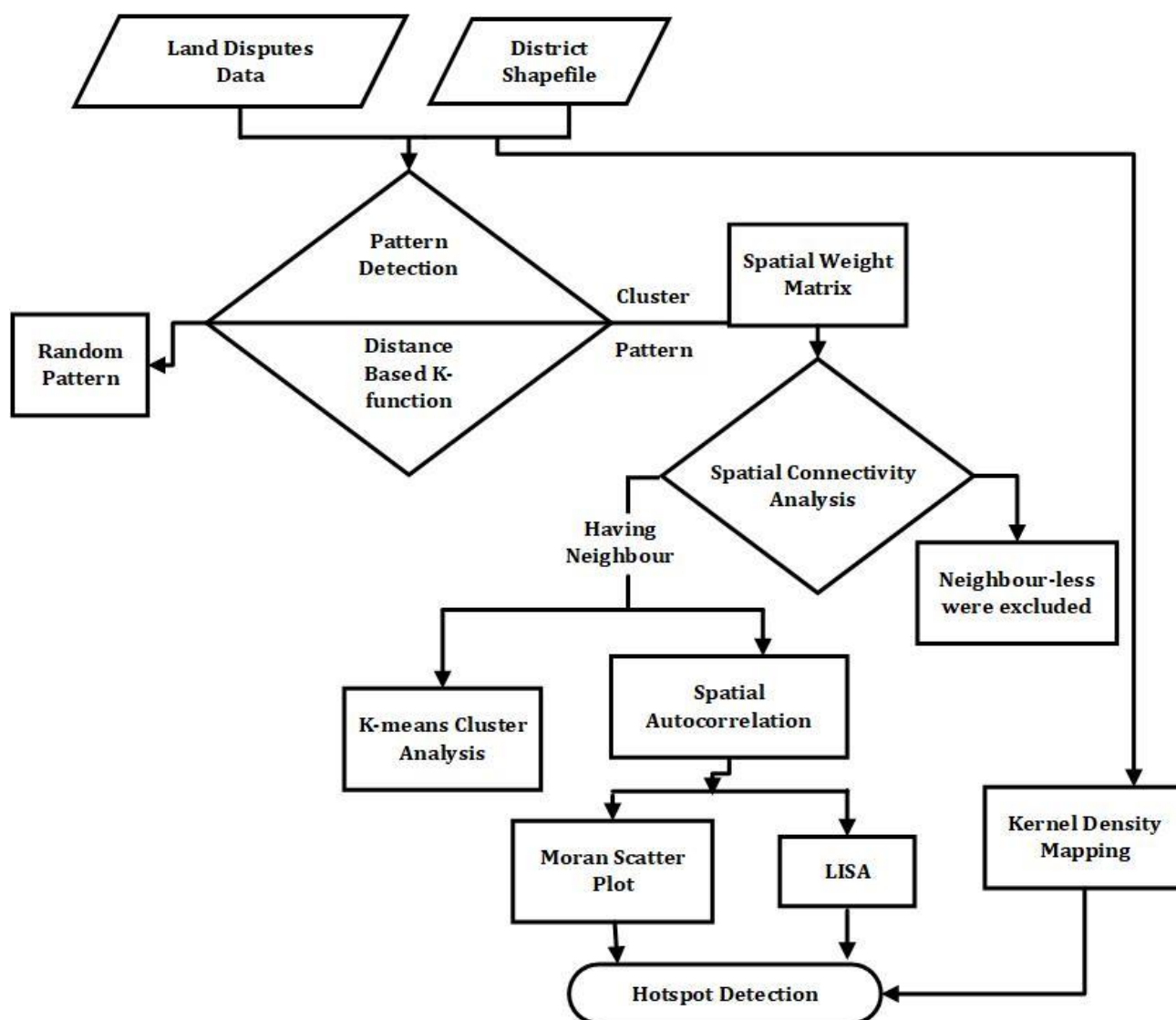


Fig. 1. An outline of the study's methodology.

3.0 Results and Discussion

3.1 Spatial Patterns in Land Dispute Cases

The results of Ripley's K-function test showed that total spatial randomisation was not the case. It proved that the spatial patterns observed from the land dispute incidences were clustered significantly (**Figure 2**). It was observed that land dispute incidences proved to be clustered at even greater distances than was expected.

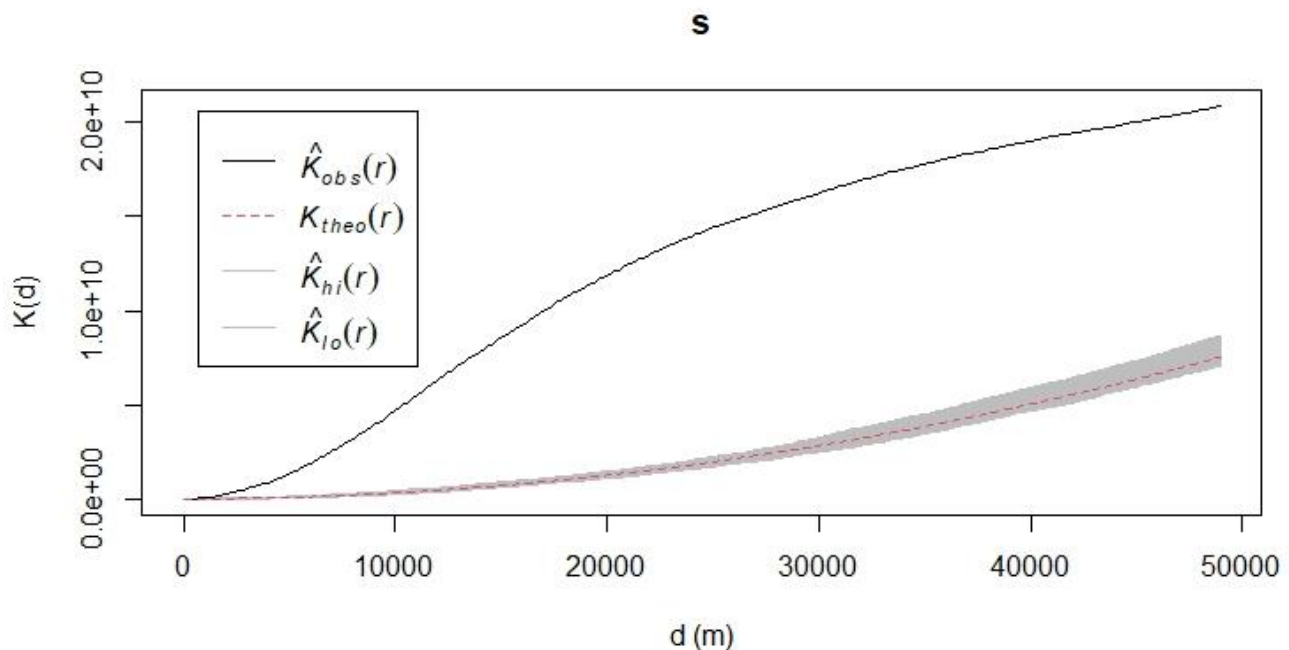


Fig. 2: Inferential Analysis of the K-function

The graph (**figure 2**) shows that the results from the K-function are statistically deviating from complete spatial randomisation. The observed values or true values of $K[K_{obs}(r)]$ were compared to the expected values of $K[K_{theo}(r)]$, and the confidence intervals $K[K_{hi}(r)]$ and $K[K_{lo}(r)]$.

3.1.1 Characterising Clusters in Land Disputes Incidences

In order to choose the Optimal K (**Figure 3**), a group sum of squares chart was used to demonstrate how the clusters are different from one another. Finding the point when the curve begins to flatten out was challenging because the curve is monotonically declining. As the number of clusters decreased from 4 to 3, it was observed that there was an increasing trend in the within-cluster sum of squares.

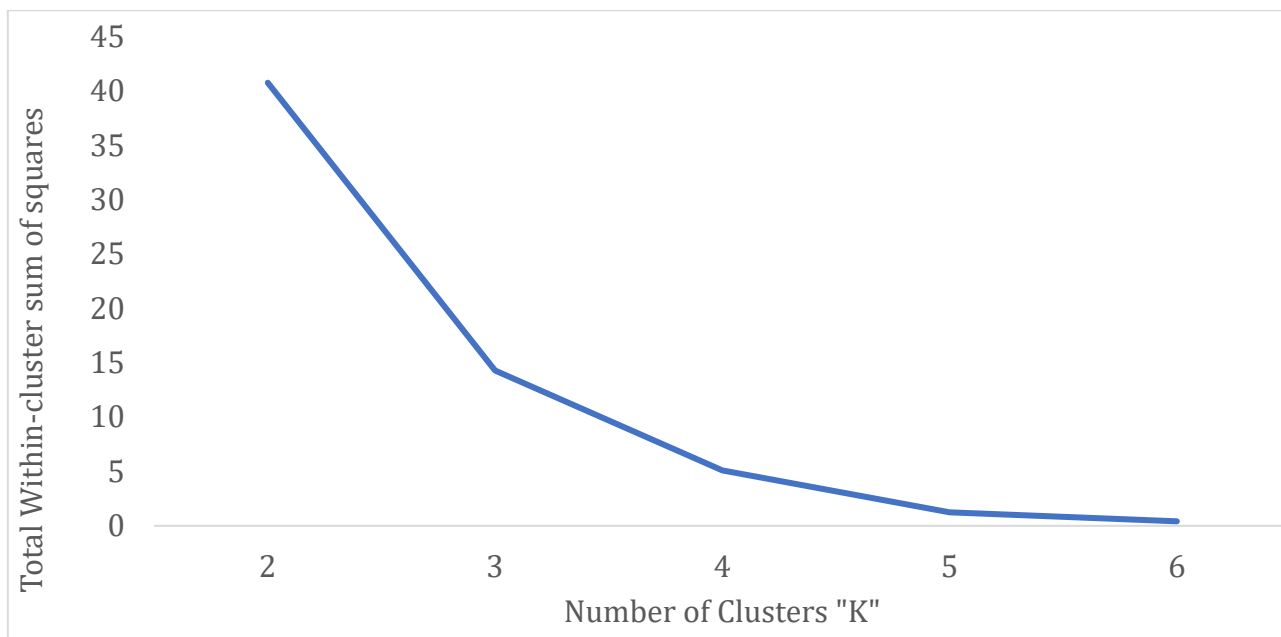


Fig. 3: Total within-Clusters Sum of Squares

The within-cluster sum of squares for the proper cluster size is used in the graph (Figure 3) to highlight how the clusters differ from one another. There is no clear beginning of the curve's flattening out point visible in the curves. But looking at the curves, it is apparent that it starts to decline around $k = 3$, which can be regarded as the optimum K.

3.1.2 Identifying Hotspots in Land Dispute Cases

The parameters for the Spatial Weighted matrix of distance band for the dispute cases are listed in Figure 5. In a connectivity histogram Figure 4, the number of neighbours for each observation is displayed.

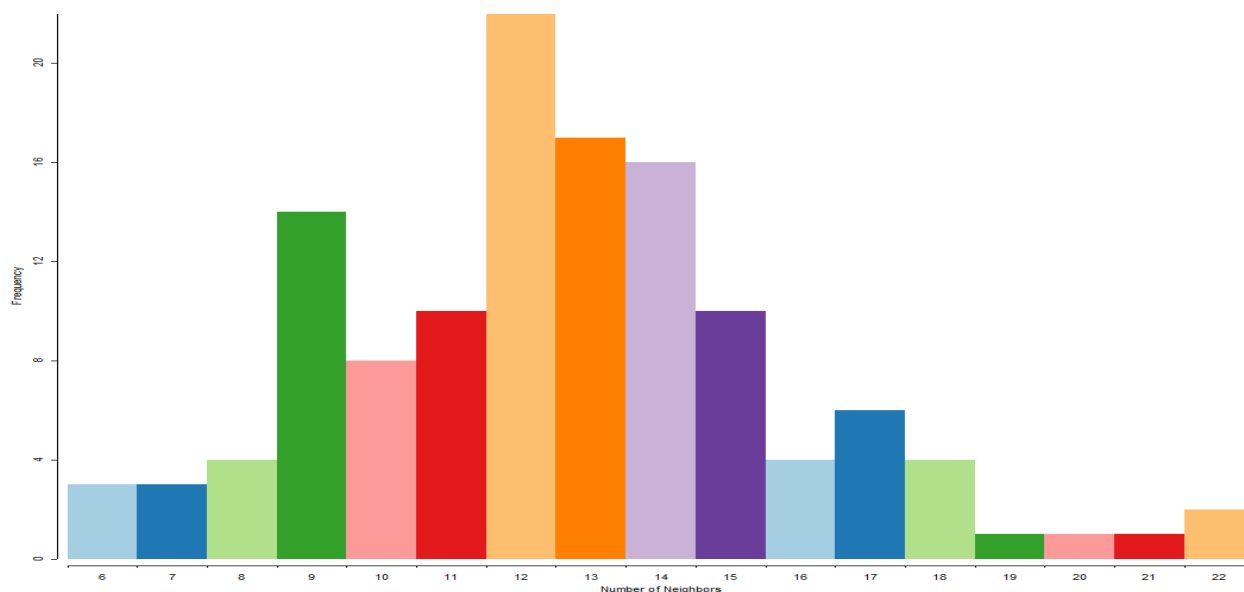


Fig. 4. Number of Neighbours for each observation

Property	Value
type	threshold
inverse distance	TRUE
power	2
symmetry	symmetric
file	Dispute_v2.gwt
id variable	POLY_ID
distance metric	Euclidean
distance vars	Total Disp
distance unit	unspecified
threshold value	0.908555
# observations	126
min neighbors	1
max neighbors	119
mean neighbors	104.78
median neighbors	113
% non-zero	83.16%

Fig. 5. Spatial Weighted Matrix Parameters

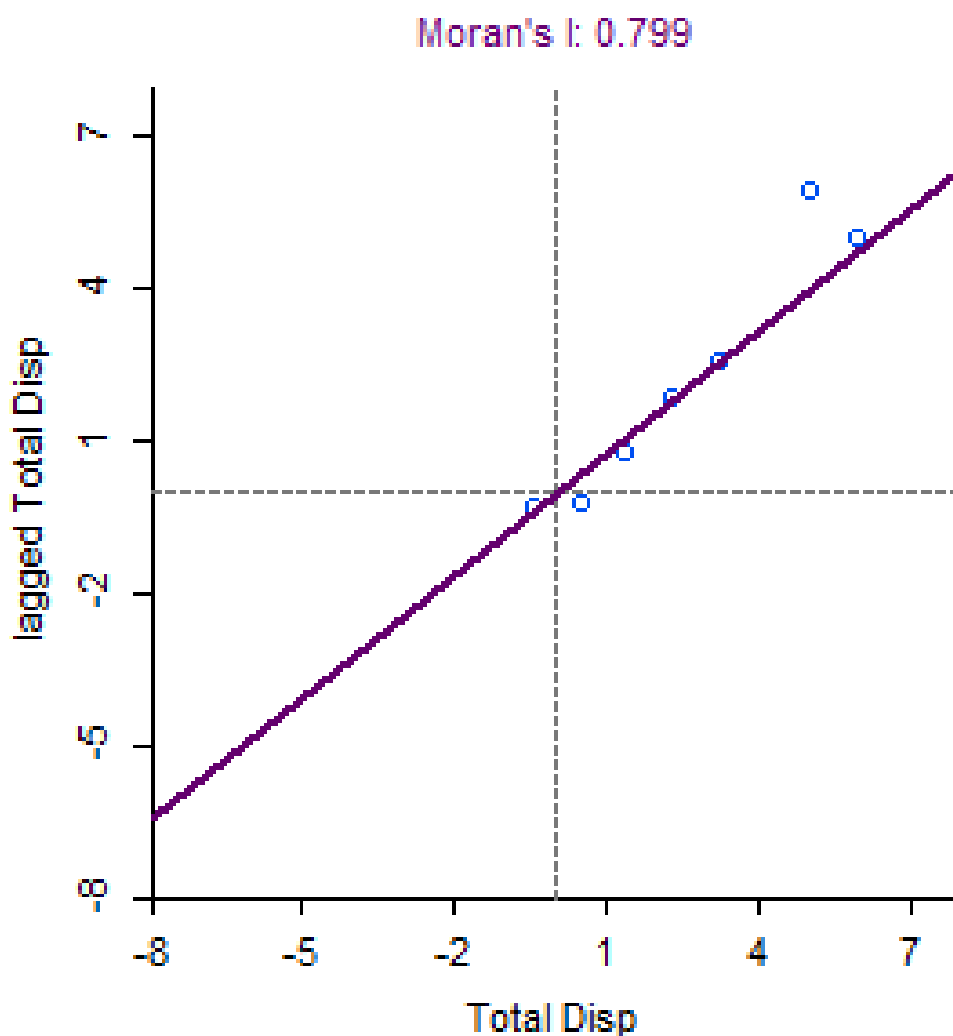


Fig. 6: Moran Scatterplot

The slope of the Moran scatterplot (**Figure 6**) indicates the linear fit across the standardized land dispute incidence numbers, and it is equal to the Moran's I value (**0.799**). The link between standard dispute incidence values and the weighted mean value of their neighbours is depicted by the Moran scatterplot. The lower-right and upper-left quadrants have negative spatial autocorrelation of a Moran scatterplot, while the lower-left quadrant and the upper-right quadrant have positive spatial autocorrelation.

The Moran's I measure the similarity between the incidences and their surrounding neighbours. The value (**0.799**) recorded indicates a positive autocorrelation. In other words, the value indicates how similar the incidences are similar to each other spatially.

The identification of significant hotspots is determined by the Moran scatterplot which is supplemented by the creation of a LISA cluster map (**Figure 7**).

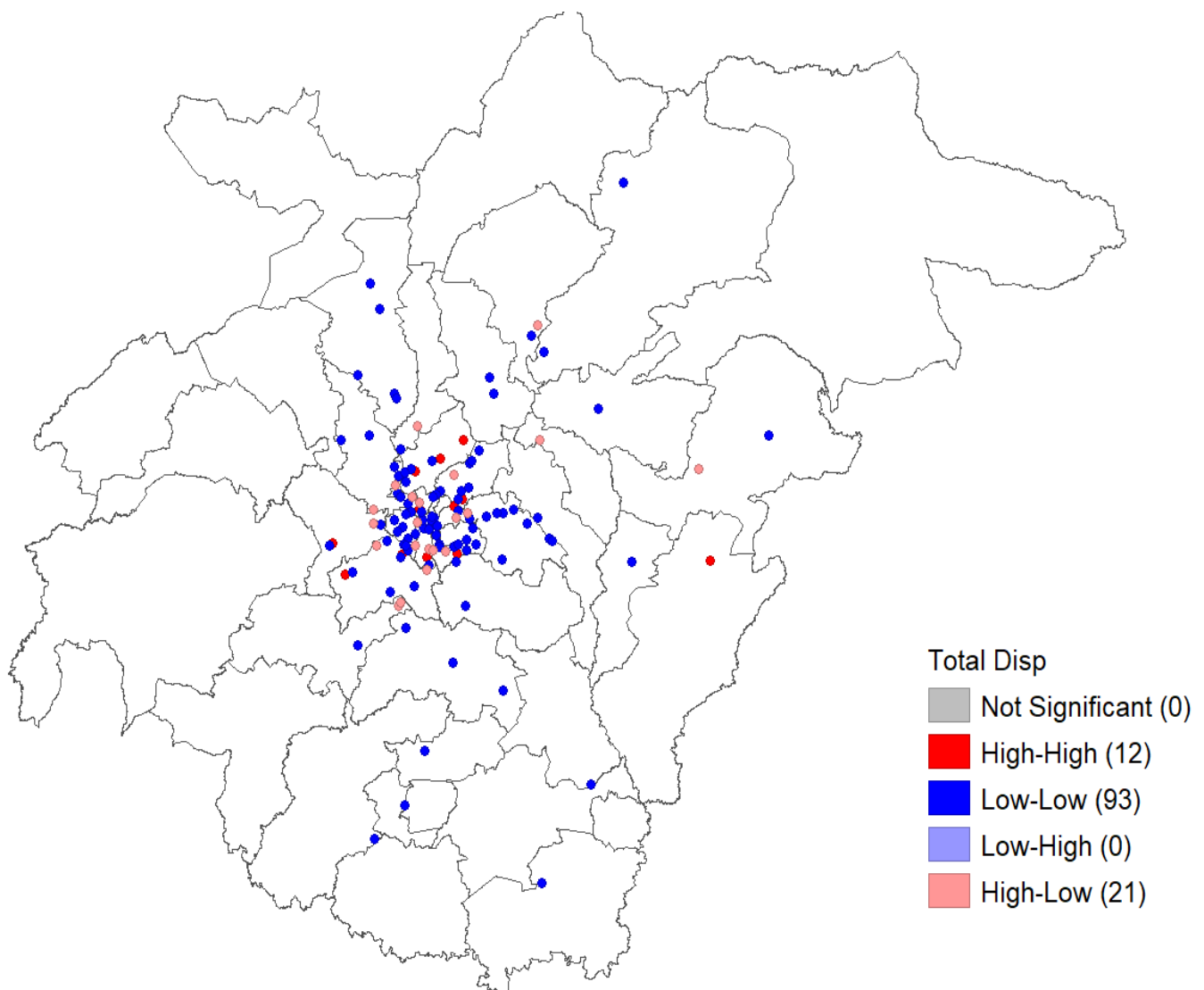


Fig 7: LISA Cluster Map

Based on the classification of Moran scatterplots, LISA cluster maps were divided into 4 categories. The land dispute cases were labelled as non-significant and shown as grey dots when their p-values were greater than 0.05. The deep red and the deep blue dots are signs of positive spatial autocorrelation. They are represented by Low-Low (LL; low dispute incidences surrounded by

similar low incidences) and High-High (HH; high dispute incidences surrounded by similar high incidences). The light red and light blue are signs of negative spatial autocorrelation. They are represented by Low-High (LH; low dispute incidence cases surround by high incidence cases) and High-Low (HL; high dispute incidence cases surround by low dispute incidence cases).

The incidences of the land dispute cases were used for the creation of a kernel density. A smooth surface map of incidents involving land disputes was shown using the kernel density map. Land dispute cases were most prevalent in the area highlighted by the red hues.

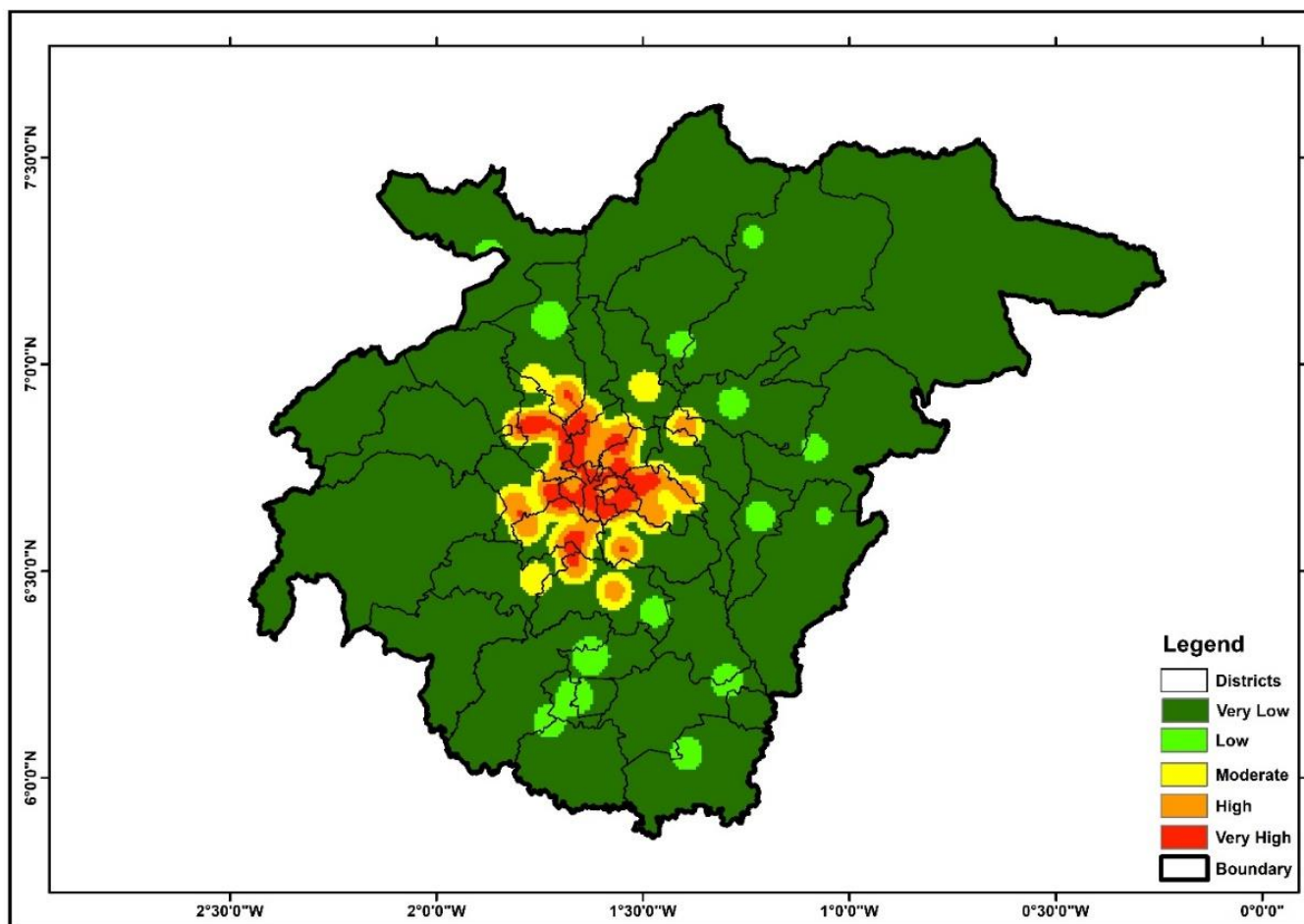


Fig. 8. Descriptive map showing region with high incidences of land disputes.

3.2.1 Analysis of Spatial Trends in Land Disputes

The central part of the research area was where the majority of the dispute incidents were recorded. Based on the 2021 population and housing census conducted, 61.6% of the Ashanti Region's population can be found in the urban areas. They also recorded a 15.8% increment in the urban population from the 2010 census. Over time, there have consistently been disputes in the central part of the study area and its surrounding localities.

The localities within a radius of 5km from the central business district recorded the most dispute cases. As the urban population continues to grow in these areas, it can be argued that the competition for space will also intensify. This will likely lead to an increase in land disputes as a result of the current environment, where the conversion of agricultural land to urban usage results in wealth flows to stakeholders. Stools are tracing their ownership back to areas that have been long occupied

by outsiders or nearby communities: this leads to more disputes as The National Land Policy noted, uncertain boundaries of customary-owned property due to unreliable maps and plans, and conflict of interest between and within land owning-groups are among the reasons of land disputes in Ghana (Ministry of Lands and Forestry,1999)

4.0 CONCLUSIONS AND RECOMMENDATIONS

The study revealed that land disputes incidences were in and around the central part of the study area. Based on the Moran Scatterplots, LISA cluster maps were used to identify hotspot zones in the study area. A total of 12 localities were identified as hotspot zones in the study area. The incidence of land disputes was mostly in the peri-urban areas with proximity to the Central Business District. These localities and towns are represented as a shade of red in the kernel density map, and they represent the hotspot zones.

Many things can lead to a land dispute or conflict, including improper or incomplete documentation, ignorance, a lack of family history knowledge, a land seller's conspiracy to defraud the buyer and the multiple sales of lands, forced encroachment, and an ineffective land administration system (Boafo-Anang et al., 2021). It is crucial to analyse spatial patterns of land disputes and identify high risk locations to help in the creation of land disputes resolution policies. To ensure better and efficient management of land disputes, the identified hotspots zones will provide a better context of the risks associated with disputes and help maximise the effectiveness or improve the resolution of disputes.

Giving the increasing trend of land disputes, future studies could delve deeper into the variables affecting a town or locality's susceptibility to land disputes.

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7.0 AUTHOR CONTRIBUTIONS

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8.0 REFERENCES

- Aasoglenang, T. (2014). Decentralized Planning for Pre-Conflict and Post-Conflict Management in the Bawku Municipal Assembly of Ghana. *Ghana Journal of Development Studies*, 9(2), 63. <https://doi.org/10.4314/gjds.v9i2.4>
- Ahmadi, M. (2003). *Crime Mapping and Spatial Analysis*. February.
- Ajayi, A., & Buhari, L. (2014). Methods of Conflict Resolution in African Traditional Society. *African Research Review*, 8(2), 138. <https://doi.org/10.4314/afrrrev.v8i2.9>
- Akrofi, E. (2013). *Assessing customary land administration systems for peri-urban land in Ghana*. 288. <http://open.uct.ac.za/handle/11427/4989>

- Amiri, A. M., Nadimi, N., Khalifeh, V., & Shams, M. (2021). GIS-based crash hotspot identification: a comparison among mapping clusters and spatial analysis techniques. *International Journal of Injury Control and Safety Promotion*, 28(3), 325–338. <https://doi.org/10.1080/17457300.2021.1925924>
- Amoasi, C. (2021). *Alternative Dispute Resolution in Ghana* (pp. 154–170). <https://doi.org/10.4018/978-1-7998-7898-8.ch009>
- Ansah, B. O., & Chigbu, U. E. (2020). The nexus between peri-urban transformation and customary land rights disputes: Effects on peri-urban development in Trede, Ghana. *Land*, 9(6), 1–28. <https://doi.org/10.3390/LAND9060187>
- Anselin, L. (1995). *Local Indicators of Spatial Association-LISA*. 27(2).
- Antwi, A., & Adams, J. (2003). Economic rationality and informal urban land transactions in Accra, Ghana. *Journal of Property Research*, 20(1), 67–90. <https://doi.org/10.1080/09599910210159398>
- Aryee, J., Frempong, A., Asante, R., & Bofo-Arthur, K. (2011). Local Power Struggles, Conflicts and Conflict Resolution in Ghana. In *Dakar: CODESRIA Research*
- Asaaga, F. A. (2021). Building on “traditional” land dispute resolution mechanisms in rural Ghana: Adaptive or anachronistic? *Land*, 10(2), 1–17. <https://doi.org/10.3390/land10020143>
- Asafo, D. M. (2020). *Peri-urban Development : Land conflict and its effect on housing development in peri-urban Accra, Ghana. December*, 322.
- Asenso-Gyambibi, D., Affam, M., Amofo, E. Y., & Acquah, S. B. (2017). Improving Land Tenure Security through Customary Boundary Demarcation- A Case Study. *Ghana Mining Journal*, 17(1), 1–8. <https://doi.org/10.4314/gm.v17i1.1>
- Berry, S. (2018). *Who owns the land ? Social relations and conflict over resources in Africa*. 7.
- Bofo-Anang, R. S. M., Akrofi, E. O., & Shitsi, F. J. (2021). *Land Disputes And Conflicting Land-Court Judgement In Ghana Perspectives of Regulatory Stakeholders*. 4(3), 2657–2664.
- Boamah, N. A. (2013). Urban Land Market in Ghana: A Study of the Wa Municipality. *Urban Forum*, 24(1), 105–118. <https://doi.org/10.1007/s12132-013-9187-z>
- Cieślak, I., & Biłozor, A. (2021). An analysis of an area’s vulnerability to the emergence of land-use conflicts. *Land*, 10(11), 1–18. <https://doi.org/10.3390/land10111173>
- Cobbinah, P. B., & Amoako, C. (2012). Urban sprawl and the loss of peri-urban land in Kumasi, Ghana. *International Journal of Social and Human Sciences*, 6(1), 388–397. http://www.researchgate.net/publication/232957200_Urban_Sprawl_and_the_Loss_of_Peri_Urban_Land_in_Kumasi_Ghana/file/d912f509af6f7c7ef5.pdf
- Conroy, S. (2014). *Land Conflicts and Lethal Violence in Nigeria: Patterns, Mapping and Evolution (2006 – 2014) Nigeria Watch Project*.
- Crook, R. C. (2005). *IDS Working Paper 241 State courts and the regulation of land disputes in Ghana : the litigants’ perspective September 2003 , when the research upon which this paper is based was*

carried out in Ghana and Côte He has a PhD in Government from the London Sc. February.

- Dadashpoor, H., & Somayeh, A. (2019). Land tenure-related conflicts in peri-urban areas: A review. *Land Use Policy*, 85(April 2018), 218–229. <https://doi.org/10.1016/j.landusepol.2019.03.051>
- Dietz, K., & Engels, B. (2020). Analysing land conflicts in times of global crises. *Geoforum*, 111(December 2019), 208–217. <https://doi.org/10.1016/j.geoforum.2020.02.019>
- Edzii, J. A. (2018). *Is Alternative Dispute Resolution a Solution To Interpersonal and Group Conflicts in West Africa? the Case of Ghana*. July. <http://ugspace.ug.edu.gh>
- FAO, Herrera, A., & Passano, M. G. da. (2006). Land tenure alternative conflict management. *FAO Land Tenure Manuals 2*.
- Gillespie, A. A. (2013). 17. Alternative Dispute Resolution. *The English Legal System*, 554–566. <https://doi.org/10.1093/he/9780199657094.003.0017>
- Gough, K. V., & Yankson, P. W. K. (2000). Land markets in African Cities: The case of peri-urban Accra, Ghana. *Urban Studies*, 37(13), 2485–2500. <https://doi.org/10.1080/00420980020080651>
- Gyamera, E. A., Duncan, E. E., Kuma, J. S. Y., & Arko-Adjei, A. (2016). Land Conflicts in Ghana , Causes , Effects and Resolution. *44th UMaT Biennial International Mining and Mineral Conference, August 3-6, 2016. UMaT Auditorium, University of Mines and Technology, Tarkwa, Ghana*, 1–26. https://www.researchgate.net/publication/316554067_LAND_CONFLICTS_IN_GHANA_CAUSE_S_EFFECTS_AND_RESOLUTION
- Herbst, J. (2000). States and Power in Africa: Comparative Lessons in Authority and Control. In *Princeton University Press*. Princeton: Princeton University Press. www.pup.princeton.edu
- Kansanga, M. M., Arku, G., & Luginaah, I. (2019). Powers of exclusion and counter-exclusion: The political ecology of ethno-territorial customary land boundary conflicts in Ghana. *Land Use Policy*, 86(December 2018), 12–22. <https://doi.org/10.1016/j.landusepol.2019.04.031>
- Kidido, K., & Bugri, J. T. (2020). Land Dispute and Resolution Process Among the Youth Under the Customary System in the Techiman Traditional Area of Ghana. *African Journal on Land Policy and Geospatial Sciences*, 3(1), 2657–2664.
- Kuusaana, E. D., & Bukari, K. N. (2015). Land conflicts between smallholders and Fulani pastoralists in Ghana: Evidence from the Asante Akim North District (AAND). *Journal of Rural Studies*, 42, 52–62. <https://doi.org/10.1016/j.jrurstud.2015.09.009>
- Kwame, O. B. (2019). *Examining Land Conflicts , Land Dispute Resolutions and Women Farmland Rights in the Dormaa Traditional Area , Ghana Examining Land Conflicts , Land Dispute Resolutions and Women Farmland Rights in the Dormaa Traditional Area , Ghana*. January.
- Ministry of Lands and Forestry. (1999). Ghana national land policy. *Government of Ghana*, June.
- Mireku, K. O., Kuusaana, E. D., & Kidido, J. K. (2016). Legal implications of allocation papers in land transactions in Ghana-A case study of the Kumasi traditional area. *Land Use Policy*, 50, 148–155. <https://doi.org/10.1016/j.landusepol.2015.09.015>
- Paaga, D. T. (2013). Customary Land Tenure and Its Implications for Land Disputes in Ghana : Cases

from Wa , Wechau And Lambussie. *International Journal of Humanities and Social Science*, 3(18), 263–270.

Panjang, N. L., & District, T. N. (2020). *Mapping and Resolution of Conflicts Pagang-Gadai Land Ulayat in Minangkabau*. 458(Icssgt 2019), 83–91.

PHC. (2021). Today, 22. *Population and Housing Census: Provisional Results, September, 1–7*. https://statsghana.gov.gh/gssmain/storage/img/infobank/2021_PHC_Provisional_Results_Press_Release.pdf

Ramírez, R. (2002). *A conceptual map of land conflict management: Organizing the parts of two puzzles*. March 2002, 1–13.

Sabogu, A., Nassè, T. B., & Osumanu, I. K. (2020). Land Conflicts and Food Security in Africa: an Evidence From Dorimon in Ghana. *International Journal of Management & Entrepreneurship Research*, 2(2), 74–96. <https://doi.org/10.51594/ijmer.v2i2.126>

Sarfo, K., & Anokye, P. A. (2021). Towards elimination of corruption in the land sector. *African Journal on Land Policy and Geospatial Sciences ISSN:2657-2664, Vol.4 Issue 3 (May 2021)* 365, 4(3), 2657–2664.

Tripathy, B. R., Liu, X., Songer, M., & Kumar, L. (2021). *Descriptive Spatial Analysis of Human-Elephant Conflict (HEC) Distribution and Mapping HEC Hotspots in Keonjhar Forest Division ,.* 9(June), 1–17. <https://doi.org/10.3389/fevo.2021.640624>

Ubink, J. M., & Amanor, K. S. (2008). Contesting Land and Custom in Ghana : State, Chief and the Citizen. In *Contesting Land and Custom in Ghana : State, Chief and the Citizen* (Issue August). <https://doi.org/10.5117/9789087280475>

Wang, H., Riedinger, J., & Jin, S. (2015). Land documents, tenure security and land rental development: Panel evidence from China. *China Economic Review*, 36, 220–235. <https://doi.org/10.1016/j.chieco.2015.09.005>

Wehrmann, B. (2008a). Land Conflict: A practical guide to dealing with land disputes. In *Land Conflicts*. <https://www.giz.de/fachexpertise/downloads/.../giz2008-en-land-conflicts.pdf>

Wehrmann, B. (2017). *Understanding, preventing and solving land conflicts*. 1–156. <http://www.foncier-developpement.fr/wp-content/uploads/LandConflictsGuide-web-20170413.pdf>

Wianti, K. F. (2014). Land Tenure Conflict in the Middle of Africa van Java (Baluran National Park). *Procedia Environmental Sciences*, 20, 459–467. <https://doi.org/10.1016/j.proenv.2014.03.058>

Yamano, T., & Deininger, K. (2005). Land Conflicts in Kenya: Causes, Impacts, and Resolutions. *FASID Discussion Paper*, 27.

9.0 KEY TERMS AND DEFINITIONS

Land Disputes or Conflicts: These names were used interchangeably to refer to a disputed claim or dispute regarding a parcel of land, including disputes around land use, ownership, or boundaries.

Spatial Autocorrelation: The occurrence of systematic spatial variation in a mapped variable is referred to as spatial autocorrelation. When nearby observations share comparable data values, the map displays positive spatial autocorrelation.

Local Indicator of Spatial Autocorrelation: LISA utilizes the Moran scatterplot, which is based on the Moran scatterplot and generated using Local Moran's I. Any statistic that meets the following two requirements is a LISA, according to Anselin (1995):

1. The LISA for each observation reveals the degree to which the observation is significantly spatially clustered with other observations with similar values;
2. LISAs for all observations are proportional to a global indicator of spatial connection.