



# **CRP 514: Introduction to GIS**

## **COURSE TERM PAPER**

### **Using GIS Applications in Election Process**

#### **(Case Studies)**

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## INTRODUCTION

The delivery and management of regular free and fair elections is very important. Effective geographic information system (GIS) is a critical spoke in the election wheel. GIS technology is the most suitable technology to set the limits of voting districts and reference voters geographically. The main uses of GIS in the election process are:

- Tool for research
- Distribution of data and information on electoral processes.

## OBJECTIVES

The objective of the term paper is to browse some case studies about using GIS Applications in Election Process.

## CASE STUDY 1

The case study from Kenya by (IED) The Institute for Education in Democracy is a Non-Governmental Organization providing started in 1999. IED offering services:

- Implementation of a computer based mapping system
- Production of Computer-generated voting population maps showing the location of all polling stations



- Utilized GPS equipment's to undertake field GPS activities to map out polling stations and other physical features
- Producing voting population maps useful for planning, direction during election

In 2004 IED purchased ArcView single user. Later, they upgraded it to ArcEditor concurrent use. In 2009, IED was able to come up with a geo-database which is a powerful tool to model GIS behavior, maintain data integrity, and work with an important set of spatial relationships.

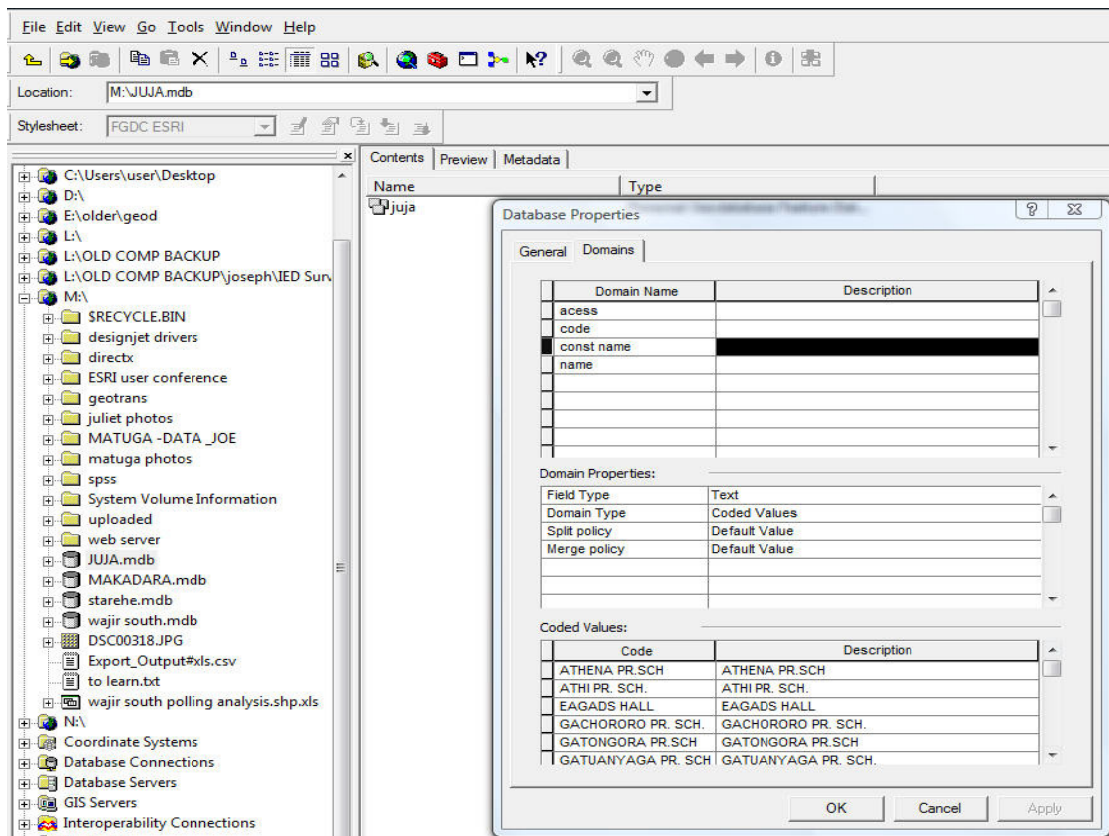
Registered_voters_2004	Registered_voters_2005	Registered_voters_2006	Registered_voters_2007	Registered_voters_2010	percent_registered_2010_vs_2007	did_not_vote_ref
40160	41401	43957	51083	41728	81.70%	
44743	45118	47209	53543	49962	93.30%	
38639	37503	39575	46527	43104	92.60%	
24494	25065	26367	29403	24001	81.60%	
57840	60031	64519	70687	60281	85.30%	
46513	48438	55876	63820	89043	140.00%	
32484	33267	34720	39239	34308	87.40%	
71853	73574	78004	57530	50835	88.40%	
95878	98091	109923	126960	105904	83.40%	
33021	33497	34902	37949	33685	88.80%	
106796	110116	125999	143723	137216	95.50%	
61422	63776	76258	87573	79377	90.60%	
82275	86544	93292	102923	83993	81.60%	
26519	27427	29524	33120	29536	89.20%	
49904	50721	53304	57862	54412	94.00%	
65784	68463	71604	66971	61274	91.50%	
39424	41047	43927	48704	41985	86.20%	
59292	62387	69894	79270	69107	87.20%	
61697	63903	76388	88328	84302	95.40%	
47203	48615	53334	60542	56684	93.60%	
98299	102518	112298	82912	76405	92.20%	
67062	68961	72855	58744	50899	86.60%	
37592	38944	41213	49059	40434	82.40%	
22097	22991	23676	26385	24293	92.10%	
47687	48790	52472	79835	73785	92.40%	
68559	70162	72379	81962	64013	78.10%	
49619	50726	57465	65580	57164	87.20%	
43408	44934	46764	78243	64299	82.20%	
63010	63943	65830	72641	68120	93.80%	
38543	40042	42142	46481	39289	84.50%	
60410	62325	70544	59667	53243	89.20%	
66075	66481	68955	77134	61444	79.70%	
51309	51920	54891	62351	50440	80.90%	
36151	38823	42275	47132	39595	84.00%	
60906	64135	70804	80172	74608	93.10%	
66975	71709	79629	90456	82153	90.80%	
52361	54167	57786	81981	72370	88.30%	
42849	44248	49395	60442	58481	96.80%	
66899	70327	74851	84684	78476	92.70%	
47875	48009	49749	56994	46846	82.20%	
70692	71477	82786	97849	91963	94.00%	

Finger 1: ArcEditor snapshot



## Data Collection

IED get 3 (Juno SB) (handheld GPS equipment) from ESRI EA. These have been very helpful in gathering data from the fields. The collection of this data starts in the office when creating the data dictionary in Arc Catalog. The layers are then loaded into the handheld GPS equipment for editing in the field. From the field data is checked in for analysis and map creation.



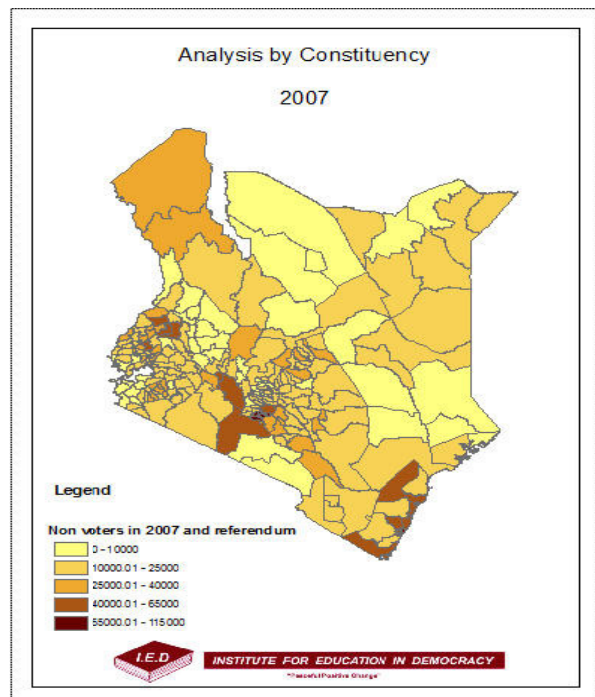
Finger 2: Geo-Database Snapshot

## Map Development

IED generates voter's maps showing the physical locations of polling stations, administrative boundaries, physical features, major towns, centers and roads. The maps have been useful to the Election Management Body, Government and security personnel, domestic.

## ANALYSIS

Analysis provides critical baselines that can guide decision making and necessary interventions for proper and effective management. Analysis aids in making rapid interventions during observation, distribution of data and information on the voting processes



including outcome of elections. It helps the security personnel to map out the location of polling stations and plan properly. It helps the Election management Body to analyze the distance between polling stations. It helps to be able to reduce the locations of polling stations and centers.

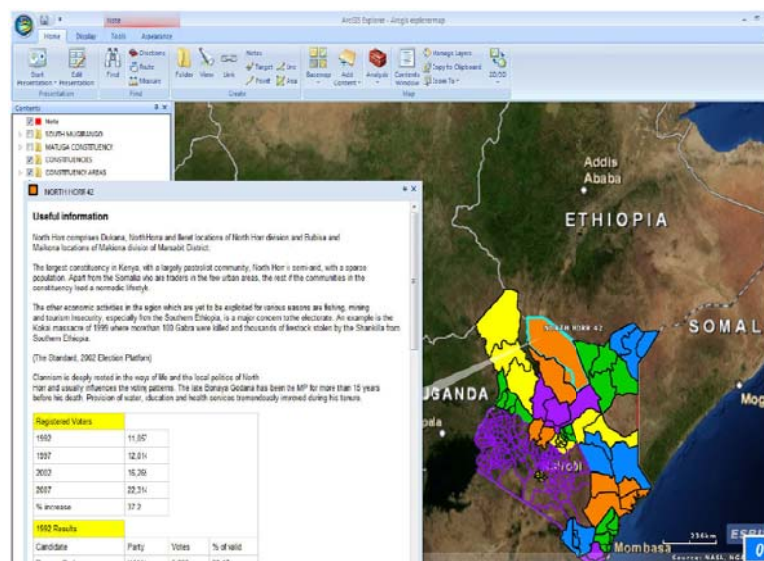


## WEB BASED MAPS

IED use the Google map platform as the base map Web Based Maps. The maps were developed using KML files (Google Earth files) generated from shape files using Arc GIS. An html page was created which has buttons linking to specific voters.

## INTERACTIVE MAPS

IED has also utilized ArcGIS explorer software to develop a map showing all the voters in Kenya. By a click of the mouse over the map the information is made available to the user. The information contained includes the parliamentary results of all the voters. IED is utilizing online version of ArcGIS Explorer in publishing interactive maps.



Finger 3: GIS Explorer Snapshot

## CASE STUDY 2

The case study from South Africa by AfriGIS and (IEC) Independent Electoral Commission, started since 1998. Using the GIS the national common voters' roll is supported through accurate mapping and distribution of bar-coded Voting District (VD) maps within very limited time frames.



Fig. 1a: Consider the map above indicating only a voting district and voting station.



Fig. 1b: The addition of place name and railway layers enhances the map. While interesting, these layers are not sufficient to accurately identify the area as yet.



Fig. 1c: This map indicates the addition of cadastre (i.e. erven) and street centre lines. Though the area on the map is not yet definitive, the reference of the map clearly improves with the addition of each layer.



Fig. 1d: In the final map roads, places of interest and aerial photography are added. The map is now spatially referenced and fit for purpose.

### Finger 4: Voting District (VD) maps

The GIS team builds and maintains the VD and registration/voting stations layers. AfriGIS forms part of a panel of GIS service providers selected through a tender process.

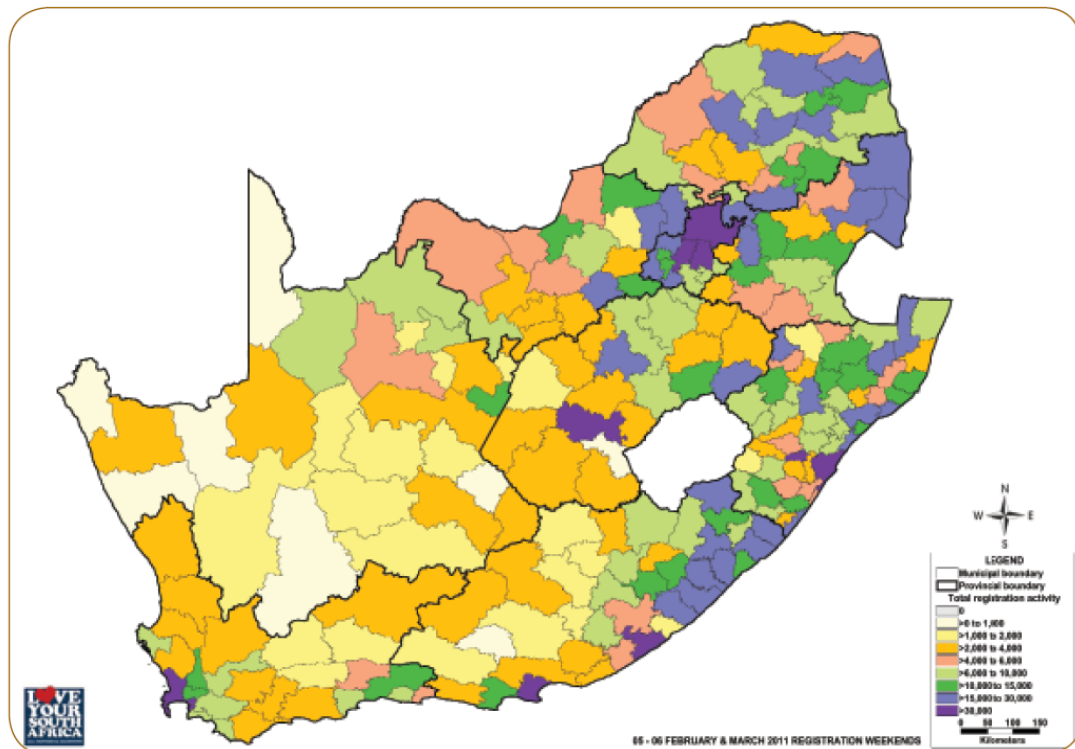


Fig. 4: Total registration activity by municipality.

## Finger 5: Voting registration stations layers

## CONCLUSION

In conclusion, using GIS in management of regular fair and free elections is important. The automated GIS Election Mapping System that will be useful in strengthening the conduct and management of elections and supporting integrity, credibility and transparency in elections. It will also enhance geographic visualization of electoral dynamics and elections outcome. The Effective geographic information system (GIS) is a critical point in the election wheel. GIS technology is the most suitable technology to set the limits of voting districts and reference voters geographically. Collaboration between the Supervisor of





Elections and the County GIS Division may save tax-payer dollars through more efficient use of time and resources, produced more accurate data for all local and state offices involved, and provided a more user-friendly experience for citizens to learn about their voting districts.

## REFERENCES

- CRP514 Course Handouts
- GIS applications in electoral process by joseph irura muhoro, kenya
- Using gis in elections by chad lupkes, roger crew and fred morris
- Lake County GIS assists the Supervisor of Elections, *A Case Study*
- Annual technical report from afrigis support for local government elections