

Summary of some selected 2010 postgraduate diploma projects.

Title: Geospatial analysis of surface water pollution from automobile waste in Ife central

Author: NGWA Julius Nde (Cameroon)

Supervisor: Dr. O.O. Orimogunje

Summary: The study was designed to identify water pollutant from automobile waste in Ile Central. It also mapped and model water pollution generated from automobile engineering waste in the study area using DTM. This was with a view to propose land suitability model for Automobile Engineering Workshops and waste disposal site for Ife Central Local Government area. The study made use of both primary and secondary data in order to achieve the stated objectives for the study. Questionnaires were randomly administered in a face to face situation at different locations by the researcher. In all, forty-one people were interviewed. The data gathered has a specific focus on gathering information about Automobile Engineering Workshops, waste production, treatment and disposal in the environment and impact to human health. Water and waste samples were also randomly collected for laboratory analysis. The datasets were analyzed using ERDAS Imagine, ArcGIS, AutoCAD Map 3D and MS Office. The observed changes were mapped and the results of the classification were prepared in different themes in GIS mode using ArcGIS. SPSS techniques were used to analyze the data generated in order to produce tables and figures. The results show that the rivers close to automobile workshops in the study area are highly polluted. The temperature, pH and Electrical Conductivity were found in a range of 25.22 – 25.3, 6.13-6.92 and 207-410 respectively for water samples only. Pb, Cu and Mn concentrations for all samples analyzed using Atomic Absorption Spectrophotometer also varies and range from 0 - 0.055mg/L. The results also shows that Scraps, Black oil, Antifreeze and Lead acid battery are the main waste produced in the area with 31.71%, 29.27%, 9.76% and 9.76% respectively. The study concluded that there is need to bring in GIS to mitigate this spatial problem while the authorities should create a suitability automobile workshop and waste disposal site base on the results of this study.

Title: Crime Mapping Analysis in Abuja Using Geospatial Technology

Author: APENA Femi. A (Nigeria)

Supervisor: Prof. A.S. Aguda

Summary: Technology and its use are often responsible for social change, regardless of whether the change is expected or not. The impact of geographic technologies on crime analysis has bigger implications. Advancements in geospatial technologies have led to large changes in law enforcement strategies. As a result of these technological developments, there has been a recent shift toward more geographically focused policing practices. Hot spots policing is one geographically focused policing strategy that is being adopted in the law enforcement community globally. This study examines the use of GIS technology in crime mapping as a database for crime control and management using Abuja City metropolis as a case study. Considering the wide phase of Abuja, the research is therefore limited to phase one of Abuja City which comprises of Asokoro, Garki, Wuse, Central Area, Maitama and part of Utako Districts for ease of reference and coordination. Literatures and concepts pertaining to the subject matter was reviewed and it was concluded that acute crime fighting

effort should be made to involve the public while integrating the modern techniques (GIS) in the daily method of policing. The methods, materials and the concept of data base design and creation used were the hard and software, questionnaires, GPS receiver and consultation with relevant documents. Software enlisted is Ilwis 3.3, ArcMap, ArcCatalog and ArcView 3.2 GIS software, Microsoft suite Visio, Ms Word, Power point, Excel, Paint and adobe Photoshop. The result obtained from the research showed that robbery and kidnapping are the major crime recently observed to be on the increase in the city closely followed by burglary, stealing, murder and other crimes. The benefits derived from using GIS technique in combating crime is considered enormous and is recommended to the Nigeria Police Force to adopt GIS Technology without further delay. The proximity/nearness to crime is considered; the road network analysis revealed that although some Police stations may be closer to a crime hotspot, but the length of the road to such hot spots might be longer time a hindrance to burst a crime. And, that some major roads have spatial influence on the neighbourhood in terms of accessibility hence the service area analysis helps to track crime.

Title: An assessment of urban growth using geo-spatial techniques: A case study of Arua-municipal council-Uganda

Author: FINDRU Alo Moses (Uganda)

Supervisor: Prof. A.S. Aguda

Summary: The World over, cities are experiencing change in terms of their size, activities and their functionality in the worlds' economy and political systems. If globalization is an inescapable tide sweeping over all nations and cities, which policy response can be the best form of adaptation in towns in Uganda in general and Arua Municipal Council specifically? What challenges do changes in urban areas create for planning authorities? Have new forms of spatial development emerged, or old ones died out in Uganda? This paper focuses on the local urbanization trends in Arua Municipal Council, Uganda detailing the geo-spatial temporal characteristics of the processes of change. The objective of the study is to critically assess the urban growth of Arua Municipality using Geo-spatial techniques to achieve sustainable development. The problems that this objective are expected to address are: uncontrolled expansion (urban sprawl) accompanied by the growth of informal settlements, stagnating and declining urban economies, diminishing employment opportunities, a deterioration in the quality of basic services hence quality of life, and a decline in the quality of the urban environment,(both built and natural), poor provision of services and infrastructure and frequent outbreak of disease epidemics such as cholera, malaria, among others. Methodology used in this study include: data generation and importation, procession, interpretation and analysis and presentation of the findings in maps, tables graphs and texts. Findings show that 37.5% of the total developed area of the Municipality is of informal nature which likely exacerbates the problems being experienced and recommendations are presented for policy makers to have appropriate policies and researchers for further research.

Title: Analysis of solid waste collection practices and the distribution of waste collection facilities in Obafemi Awolowo University campus.

Author: KITOTO Victoria Atieno (Kenya)

Supervisor: Dr. Babatimehin

Summary: The study was carried out to assess the spatial distribution of waste collection sites, the flow of waste from point of generation to disposal and proximity of the final dumpsite to the various households, the accessibility of central waste collection sites by the O.A.U. residents and the waste collection vehicles and to suggest a framework for a more effective waste management system in O.A.U. citing where more appropriately a dumpsite can be located. High resolution Ikonos imagery of 2007 and a topographic map of Obafemi Awolowo University were used to identify the land use pattern of the study area and feature identification of the same. A global positioning system (GPS) facility was used to identify the geographical position of the various waste collection sites after which the data collected were integrated in a GIS environment. Questionnaires were also used for this study to assess the waste management strategies by the O.A.U. population from point of generation to point of waste disposal. This research demonstrates the usefulness of integration of remote sensing techniques and GIS to identify appropriate areas suitable for waste disposal and hence provides a selection of environmentally friendly disposal sites and thus supplying reasonable, convenient and administratively transparent solution to the waste disposal system.

Title: An assessment of potential tourist sites in Ile-Ife, Osun

Author: ALINAITWE Prossy (Uganda)

Supervisor: Dr. O. Ajala

Summary: The success of tourism in any country depends on the ability of that country to sufficiently develop, manage and market the tourism facilities and activities in that country. Most developing countries depend mainly on tourism for economic growth and diversity. Nigeria, a developing country in West Africa, is one such country. In Nigeria, oil is the largest foreign currency earners. But uncertainties in prices of oil products in the international market make tourism alternative and reliable source of investments and foreign currency. Geographical Information System (GIS) technologies provide us with the possibilities of showcasing the tourism potential in any community for better management. In this study, GIS design and network analysis were carried out by taking advantages of GIS possibilities for tourism development in Ile-Ife, Osun state, Nigeria. An analysis of the potentials of tourism in the area was conducted using GIS. The project examined the applications of RS and GIS to tourism development in Ile-Ife, Osun State, Nigeria. It identified potentials of tourism and the hiccups derailing tourism development in Ile-Ife. Data analysis showed that the tourist facilities are spatially located far from the tourist sites. Identified tourist facilities, include Hotels, Hospitals, restaurants and car stations. To enhance development and sustainable growth of the sector in Ile-Ife, the use of GIS and Remote Sensing technology is highly recommended to facilitate capturing, retrieval and analyzing geo-referenced data.

Title: An analysis of the spatial pattern of sawmills using remote sensing and GIS in Ile-Ife, Nigeria

Author: NGAUNKAM, Precilia Shokoleu (Cameroon)

Supervisor: Prof. F.A. Adesina.

Summary: Remote sensing and GIS are useful tools in analyzing spatial data for proper decision making. The objectives of this study is to identify sawmill distribution in Ile-Ife; create a data base of all the timber transportation industry; determine the sawmill industries that are compliant and use GIS and remote sensing for this spatial distribution. The result showed that sawmills are concentrated only in Ife-East most especially along Ondo road area. No sawmill fall within the required standard, 12 sawmills were found to be 150 m closed to the swamp. 7 sawmills were found around schools at 150 m buffer. For point distance analysis, only one sawmill is separated from all the other sawmill at 200 m, showing that the sawmills are in clustered with each other. For highway road buffering, 14 sawmills falls within a distance of 50 m. sawmills buffer to building, result to 59 sawmill within the distance of 20 m. The study concludes that, there is no spatial standard for the location of sawmill in Ile-Ife. Therefore, there is a need for decision maker to take full control of the location of sawmills in towns.

Title: Monitoring urban growth in Ile -Ife, using multi-temporal satellite imageries

Author: NKALUBO Noawe Florence (Uganda)

Supervisor: Dr. O.A. Ajala

Summary: This project examines the use of GIS and Remote Sensing in monitoring urban growth. Ife region was used to study the phenomena over a period of 21 years using multi temporal satellite images between 1986 and 2007. The objectives of the study are to detect the urban changes that have taken place in the region between these periods, map land use or land cover change in land uses of the study area over a period of 21 years and subsequently, make a projection of the observed urban growth and population in the next 15 years. Data were extracted from Remote sensing Imagery of Landsat TM 1986, Landsat ETM 2002 and ALOS 2007 to measure the extent of growth and to show the effects of this growth on other Land use/Land cover types. The approach of the study is multi-temporal as methodologies were used to detect the changes over the three imageries of the same scene but recorded on different time frames. Results of individual techniques have been assessed and a conclusion has been drawn on the extent of Sprawl due to change occurring over time on the selected area over the earth's surface. From the statistics of the classified images, a pixel analysis was done where a comparison between the three multi-temporal date imageries was done. Hence, change Maps accompanied with statistics are generated that expresses the type, nature, trend and magnitude of change occurring between the slated dates. The results show the growth of urban growth of Ife and its effects on other land use classes identified. The results were discussed mainly focusing on the trend of urban growth expansion and its effect to the natural environment, farmland and food security and its contribution to climate change. Its implications to urban planning were also discussed.

Title: Analysis of road transport networks connectivity and accessibility in Ife-central local government, Osun state, Nigeria.

Author: OTUNGA Charles Onyango (Kenya)

Supervisor: Dr. O.A. Ajala

Summary: As a measure of accessibility, road connectivity is an important indicator of urbanization. Areas that are highly accessible are those with high percentage of road connectivity. However, providing respectable level of road connectivity requires considerable planning as well as large amount of financial resources. Therefore, it is critical that only adequate road networks required to guarantee continued growth is provided, nothing more. Realizing this fact, this research project is to study the relationship between the transportation (road networks) and land uses with an expectation that a generalized empirical model can easily be used as a guide in road planning. In accomplishing the modeling tasks, Remote Sensing & Geographical Information System(RS/GIS) has been identified as a tool in preparing land use datasets required to test and run the model in the process of determining the significant parameters that contribute to road connectivity and accessibility. Furthermore, GIS is also used as a graphical display tool in demonstrating the variation of existing road networks of the study Area. Mobility is the backbone of the activity system of the human race. Adequate mobility tends to broaden the perspective of an individual in particular and society in general. Road transport networks connectivity and accessibility has been an essential infrastructure facility, which need to be developed and maintained to accommodate a growing population and economy. The proliferation of road, rail, sea and airline networks in developing nations has helped to increase the range of towns and reduce the isolation of rural areas. The emergence of these networks meant unprecedented freedom of movement for the population and is closely tied to the continued growth of the economy. Providing real time information to the road users and guiding them to choose appropriate mode of transport and optimal routes is very vital in enhancing the efficiency of transport system. However problems associated with its use are also widespread, such as urban sprawl and air pollution. In planning a suitable road network, planners put into consideration factors like gradients or slope of the area, available land-use and soil type, community or national landmarks and governmental interest. These different considerations and interest make the planning process complex and as such there might be confusion of interest in the decision making. The use of RS/GIS has helped planners to achieve desired and more accurate results thereby reducing the complex nature in the planning process allowing different stakeholders to reach a general conclusion. Road Network Connectivity and Accessibility Analysis prevent the imposition of limit on the form of criteria and gives opportunity to policy makers to enter their own informed judgments. This provides a better communication among the decision makers and the entire community and as such creating a more open choice for analysis and possible changes if necessary. The aim of this Research Project is to introduce the possibility of using RS/GIS in road network connectivity and accessibility planning in Nigeria, using Ife-Central Local Government as a case study. In actualizing the aim, satellite image of the study area was obtained and later geo-referenced hence digitized for analysis purpose to derive the road network connectivity map. The research project can hence be said to have succeeded in showing the connectivity of the different locations/built-up-areas within the study area. Hence it can be concluded that it is possible to determine the

connectivity measures in Road Transport Networks Connectivity and Accessibility Analysis using Remote Sensing & GIS.

Title: Testifying ionospheric signatures anomalies analysis method on Khartoum earthquake.

Author: MAGDI Elfadil -Yousif Suliman (Sudan)

Supervisor: Dr. O.A. Koya

Summary: The ionospheric precursors to earthquake have been a significant tool for forecasting the events of earthquakes in recent research studies. The studies on these precursors had concluded to the occurrence of some ionospheric anomalies before earthquakes associated to every earthquake event of a significant magnitude took place in the globe; further these anomalies were demonstrated due to interaction between lithosphere-atmosphere-ionosphere system. The physics behind tectonic movements, as well as that behind the ionospheric layers, demonstrates this interaction for a better understanding of correlations. These ionospheric precursors have been studied in so many analytical and technical methods due to the ionospheric parameters and due other things. The statistical methods for analyzing these precursors also vary. In this study an ionospheric precursor analysis method is applied to the earthquake event of Khartoum, that took place in August 1, 1993 (LT), of magnitude ($M_S = 5.5$). The precursor was checked out via the analytical method, where a statistical method is used to find the upper bound and the lower bound from which the anomaly is checked out. In addition, on this same analytical method, a statistical method for detecting out the daily variation of the ionospheric parameter under study is used such that the percentage deviation of the ionospheric parameter is detected to increase from the upper bound and decrease from the lower bound. The resultant precursor is found to occur 8 days before the peak shock of the event of the earthquake took place in Khartoum. It is also found that the size or the magnitude of this ionospheric anomaly has a specific characteristic in that, it is much bigger than the one on the literature's similar study. It is found that the size of the anomaly is (46.3 MHz), and its corresponding value of the percentage deviation is (612.30%).

Title: The impact of geomagnetic storm on satellite electronic and navigation systems

Author: MATHANGWANE Bolo Basuti (Botswana)

Supervisor: Dr. S.A. Adeniran

Summary: Geomagnetic storms exist and they are part of space weather. The sun is the main source of geomagnetic storms. The space weather is a harsh and uneven environment that is hazardous to both celestial and terrestrial environment. All satellites operating on the space environment are likely to be affected by space weather that is not stable because of high charged particles from the sun. These charged particles move randomly producing charging magnetic field. When the charged particles interact with the earth magnetosphere sometimes geomagnetic storms are formed. Because satellite materials are made up of conducting materials, these particles can interact with spacecraft and can affect the exterior and the interior parts of the spacecraft. This can have effect on satellite systems such as the electronic and navigation

systems. All communication satellites use Global Position System (GPS) for navigation. This research investigated the impact of geomagnetic storms on six (6) satellites that had anomalies: two (2) with reports being affected by the geomagnetic storms and four (4) of which the anomalies are unknown. The selection was based on the satellites that orbit mostly within the magneto-sheath region where geomagnetic storms occur. Space weather indices (data) used was downloaded from National Aeronautical Space Administration (NASA) Space Weather Center and the European Space Agency (ESA) website. The data were analysed, discussed and the results presented in graphs. A case study on the effect of geomagnetic storm on GPS derived Total Electron Content (TEC) at low latitude Varanasi (Geomagnetic lat140, 55'N, geomagnetic long 1540 E) during the period of May 2007 to April 2008 was used in this study as a reference to show the impact of geomagnetic storm on satellite navigation system. The research has proved that geomagnetic storms have effects on satellite electronic and navigation systems, and also on other theories that researchers and space scientists have discovered about the impact of geomagnetic storms on satellite health.

Title: Effects of the sun's "DARK SIDE" on the stability and reliability of electric power systems.

Author: PHIRI, Makabaniso (Zambia)

Supervisor: Dr. O.A. Koya

Summary: Power lines are exposed to low frequency electromagnetic fields produced by geomagnetic disturbances which are the ground manifestations of a chain of events initiated by increased solar activity. The resulting geo-magnetically induced currents (GIC) affect ground-based technological systems, including the electric power system. GIC in a power network causes half-cycle transformer saturation, leading to generation of harmonics, overheating, increased audible noise and mechanical stress, resulting in decreased transformer life and/or complete damage, rendering power systems unstable and unreliable. In order to calculate or estimate the amount of GIC in a network, the geomagnetic field must be known, and used in calculating the geo-electric field, and hence, GIC. This work examines the effect of GIC in low and mid latitude power systems by use of geomagnetic data collected for periods of two weeks before and after documented blackout dates; this work also reviews some of the methods used to calculate available GIC in a network (Complex Image Method, local 1-D Model and Simple Plane Wave Method), particularly embracing the local 1-D Model, the Simple Plane Wave Method and Maxwell's equations – incorporating them into computer code that can be used to determine GIC levels in a network, at a given station using geomagnetic data. Although there was no mention of the possibility of GIC effect in each of the cases examined, the analysis carried out in this work shows the contrary. GIC may have been a factor in all but one of the cases. This work, further, established that electric power systems in low and mid latitude areas are not immune to GIC effects, especially in cases of large geomagnetic storms and sudden or prolonged geomagnetic activity.