

## GUEST EDITORIAL PREFACE

# Responding to the Challenge of Global Change in Africa: The Role of Geospatial Information Technologies

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Global and regional scale changes are now being recognized and felt in Africa in form of environmental, socio-economic and geopolitical alterations driven by the demographic shift. The regional environmental changes are by far among the most serious, threatening human and natural systems and intercepting development of the continent. The environmental changes are consequently influencing the development priorities in the continent bringing renewed issues such as climate change high on the agenda. One key ingredient of the changes involves the demographic shift in general but specifically Africa being the fastest urbanizing region. Africa's urbanization is occurring amidst complex and dynamic rural development intricacies. From climate change impacts, chronic poverty, declining agricultural productivity, growing but less vibrant industrial and mining sectors, inadequate public services, systemic institutional challenges and political polarization, Africa seems unready to confront the global environmental changes. Africa is considered to be the most vulnerable to the consequences of global environmental change especially climate variability and change. These relatively new challenges are additional stress-

ors to the eminent problems of land degradation, disasters and desertification that continue to constrain livelihoods, impinge poverty reduction initiatives and the capacity of the African governments to meet Millennium Development Goals (MDG) targets. Climate change has added a renewed dimension to the inherent challenges which poses a question as to whether African leadership in all spheres of political, research, corporations and development practitioners are ready to confront the issues.

There are several strategies some of which have been piloted in Africa that have focused on transforming the social and economic wellbeing on the continent. Foreign direct investments, new partnerships for economic development, promotion of trade among African countries, agricultural development programs, infrastructure programs have for long and in recent years been scaled up to respond to poverty challenges. However in addressing these challenges the need for information and knowledge regarding natural resources, human resources, infrastructure and demographics is more than apparent. The widely utilized information technology has seen the growth of geospatial technologies which are augmenting knowledge-driven growth and development in Africa. Evidence from the proceedings of Africa's premier

geospatial technologies conference in 2009 that took place in Kampala has emerged on how Africa is innovatively utilizing geospatial technologies for sustainable development. But challenges still remain in regard to how Africa can optimally harness the dynamic and evolving geo-information technologies drawing from best practices and successes to address the effects of the changes and support the readiness for appropriate response.

## **AFRICAGIS/IJAGR LINKAGE**

In this special issue put together from the Africa GIS 2009 conference, research papers are demonstrating the role of geospatial technologies in addressing the challenges faced by Africa. Silke Noack et al. point out the importance of advanced geospatial modeling techniques to analyze environmental degradation, prediction of mineral resources and assessment of forest vulnerability to pests. Providing advanced tools that are user friendly such as the Advangeo, access to information is enhanced but also the expansion of the geospatial professional community of practitioners which is accelerating knowledge production necessary for Africa's sustainable development. Spatial knowledge management is critical for sustainable development requiring being up to date but in a format easily accessible. Jean Damascene Mazimpaka illustrates how in Rwanda the move is from spatial knowledge availability to spatial knowledge management. This paper presents one of the many African case studies showing advancing management of the large quantities of spatial data in an innovative way by factoring the dynamic nature of geographic objects on which knowledge is drawn. Felicia Akinyemi further stresses the role of National Spatial Data Infrastructure (NSDI) in knowledge management focusing on Rwanda. This paper expands Jean Damascene's point of knowledge management to showcase progress in creating a framework for policies, standards, institutional arrangements that can support the acquisition, processing, storage, distribution and utilization of spatial

information. The paper addresses NSDI as a framework to facilitate discovery of spatial information through stakeholder participation by integrating the often disparate knowledge systems. The paper demonstrates progress by the online metadata search facility in Rwanda which is making data discoverable. Cees van Westen and Woldai Tsehail present a comprehensive tool for collecting, analyzing and dissemination of spatial information for hazard and vulnerability assessment. Focusing on a case study of urban areas, this generic tool developed jointly with UNU and ITC, provides ready to use technologies for knowledge production in the area of sustainable development again bringing these technologies to professionals in Africa who are in urgent need for sustainable development.

The second set of papers in this special issue on AfricaGIS, build on the preceding articles which are focused on tools, techniques and advanced simulations of complex systems to showcase the utilization of geospatial tools through specific thematic applications demonstrating how geospatial tools are supporting Africa's sustainable development at various levels. These papers provide ready to use or applied geospatial information products for decision support in various fields (UNECA, 2010). The longstanding debate on role and usefulness of geospatial information has seen Africa walk the talk in geospatial technology. As the utilization of geospatial techniques continues to surge, spatial information has become an integral part of the decision making processes at various levels in government, private businesses, local governments and international humanitarian agencies (Rogers, 2006). The fields in which geospatial information is utilized are diverse as the issues that call for response from Geospatial technologies. From natural resource management, agricultural productivity assessment, hazard assessment, health, urban development and resources assessment, the utilization of geospatial techniques has gained momentum (Tanser & Le Sueur, 2002; Barkawitz, 2008). Planning and management for sustainable development requires quality information and location-specific information

remains very critical to support decision making for sustainability in Africa (Tanser & Le Sueur, 2002).

Charles Paradzayi and Harold Annergan's article illustrates a well articulated research on applying synthetic aperture radar data as an alternative technique to estimate woody biomass. This paper focuses on larger spatial scale assessment of resources that may not resonate at micro level highlighting a key point of coupling analyzes that have to be undertaken on micro, meso and macro scale to support decision making. The paper links SAR technology to social economic processes that determine the resource use levels at community level. This paper illustrates ready to use techniques for decision support by national and regional government in respect to energy use.

Opeyemi and Akinyede's article focuses on agriculture and food security a topical issue and of high priority for Africa. Nigeria is one of the most recent countries to join the space technology race and the main goal is to monitor environment to ensure optimal utilization of natural resources. NigeriaSat 1 applications have focused on agriculture as illustrated in the paper emphasizing the rule on location-specific information for sustainable development. This paper further show cases the uptake by Nigeria's government of information products from space borne technology for decision support in agricultural sector. Partnerships have emerged with International research organizations such as International Institute for Tropical Agriculture to generate the much needed information products besides taking it further by mainstreaming such products into national development strategies. In a detailed research article by Tunrayo Alabi et al. space technology and techniques of spatial analysis is taken further in a case study on land suitability evaluation for cocoa production that indicates utilization of geospatial technologies in Africa. Many African countries are yet to accomplish land evaluation studies to analyze fitness of land for different optimal uses despite the longstanding works and support by FAO. Africa remains agricultural dependent largely

and the future points to increased reliance and expansion of agriculture. But expansion comes with costs and negative impacts on environment that evaluation of land becomes indispensable. Tunrayo's paper focuses on cocoa in Nigeria but it also provides a framework and case study applicable in many African countries. Cash crops still play an important role as emphasized in the paper but it requires careful and thorough analysis with geospatial techniques providing methodological frameworks in assessing for optimal uses. The paper further illustrates the participatory nature of land evaluation and planning for use through integrating GIS with multi-criteria decision analysis techniques. The last article by Shuaib Lwasa et al., provides a summary of conference proceedings highlighting the key issues from the interactive and intuitive discussions. The article also points to a roadmap for enhancing utilization of geospatial technologies for sustainable development in Africa.

## CONCLUSION

In conclusion, this special issue of IJAGR illustrates the usefulness of geospatial tools from advanced modeling frameworks and techniques to knowledge management and educational tools which all have contributed to capacity building in Africa. The articles also demonstrate building on existing capacity and it is the later which needs augmenting as reflected by the summary conference proceeding report. In the era of fast social and environmental changes, the quest for knowledge to support sustainable development will remain high and the role of geospatial technologies expected to increase in order to galvanize knowledge production required at various levels to support decision making.

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