The Challenges of Using Spatial and Demographic Data for Development in Nigeria

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Abstract

Nigeria is suffering from high unemployment, increasing poverty and an over-dependence on oil. Increased foreign and domestic investment in strategic industries would diversify the economy, and encourage growth and employment. Traditionally, it has been difficult for investors to access critical for strategic commercial decisions. This is the case for a number of reasons including minimal existing data, a lack of infrastructure and standards to allow this data to be shared, and a lack of capacity in both the State and the private sector to analyse the data. In order to overcome these issues, the Growth and Employment in States 3 programme (GEMS3) has developed a fit-for-purpose land registration system which allows the collation of large amounts of data, spatial and socio-economic. GEMS3 is looking at ways to ‘package’ this data in order to allow investors and the State to easily interpret and then utilise it in a meaningful way. The programme has also recommended the development of spatial data infrastructure to ensure that this data and data from various Ministries, Departments and Agencies (MDAs) and private sector actors can be shared and accessed freely.

Key Words:

Spatial Data Infrastructure, Systematic Land Title Registration; Investment; Planning; Nigeria
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Acronyms

African Development Bank  AfDB
Central Bank Of Nigeria  CBN
Certificates Of Occupancy  CoF0
Commercial Agriculture Credit Scheme  CACS
Corporate Social Responsibility  CSR
Geographic Information Systems  GIS
Growth And Employment In States 3 Programme  GEMS3
Information Communication Technology  ICT
Kaduna Geographic Information System  KADGIS
Kano Geographic Information System Agency  KANGIS
Kano Investment Promotion Agency  KANINVEST
Kano State Urban Planning And Development Authority  KNUPDA
Kenya National Spatial Data Infrastructure  KNSDI
Lagos Chamber Of Commerce And Industry  LCCI
Land Administration And Valuation Information Management System  LAVIMS
Land Information System  LIS
Land Use Charge  LUC
Local Government Area  LGA
Ministries, Departments And Agencies  MDA
National Agency For Food And Drugs Administration Control  NAFDAC
National Bureau Of Statistics  NBS
National Geospatial Data Framework  NGDF
Non-Governmental Organisations  NGO
Spatial Data Infrastructure  SDI
Standards Organisation Of Nigeria  SON
Systematic Land Title Registration  SLTR
UK Department For International Development  DFID
Introduction
Over the last two decades there has been a growing recognition of the importance of data in achieving sustainable development. This information now encompasses a huge range of different data sets which have the potential to impact all areas of social and economic development. Without “accurate, reliable and interdisciplinary data from a variety of sources (Committee on the Geographic Foundation for Agenda 21 et al, 2002)” analysing the needs of a State and assessing the best measures to ensure sustainable development will be extremely challenging. Population growth, high unemployment rates and diminishing land availability necessitate increasingly sophisticated mechanisms for analysing demographic conditions. Better methods for collecting and sharing data on land to aid in social and economic planning for development and informing decision making will increase opportunities for sustainable growth and job creation (Yusof).

Furthermore, the collation of social and economic data is vital for the creation of land policies to help govern distribution and use of land, and planning for sustainable land utilisation in the context of climate change and rapid urbanisation. As Klaus Deininger notes, there is a recognition that there is “enormous demand for a more evidence-based and output-driven approach to land” (Data and Analysis for More Secure Land Rights, Better Land Use, and Shared Prosperity, 2015, accessed 30 October 2016). Across the developing world, decision makers are discovering the need for spatial and demographic data and the tools required to use this data. There has been a “rapid adoption and proliferation” of geographic information systems (GIS) which are systems “designed to capture, store, manipulate, analyse, manage, and present all types of geographical data” (Mapping and Geographic Information Systems (GIS): What is GIS?). These systems have the potential to “influence and shape the way in which society views, values and uses spatial information” (Williams, Marcello, & Klopp, 2014). According to EIS Africa, building infrastructure to house geographic information is becoming as essential in the African context as the provision of physical infrastructure (Committee on the Geographic Foundation for Agenda 21 et al, 2002): Indeed, according to Farah and Ottichilo, “it is increasingly being realized that easy access to spatial information by policy makers and administrators, is important for the sustainable socio-economic development of a nation. (Farah & Ottichilo)"
There is a plethora of private contractors now offering to provide GIS services throughout the continent and donors continue to push the importance of data. As a development tool, data can be used to increase investment by identifying business clusters; identifying business owners in order to encourage fairer taxation; providing security of tenure; and generating information on land use to inform town planning. It can also be used to increase local planning capacity by allowing towns to make informed decisions regarding infrastructure which address specific community concerns, i.e. demographic and spatial data allow for more effective transport planning; industrial efficiency can be maximised by improving supply of infrastructure to business areas; and the mapping of brown field sites available for development reduces the impact of urbanisation on agricultural land. For urban areas this is in essence the concept of a ‘smart city’, a way of improving urban environments not only through an “endowment of hard infrastructure, but also, and increasingly so, on the availability and quality of knowledge communication and social infrastructure” (Spatial Data Infrastructure for Smart Cities, 2016).

Despite these trends in urban development best practice, and despite the many benefits from increasing the amount of data available for decision making, there are a number of issues preventing its effective usage. These issues are interlinked and reinforce each other. They can largely be categorised in the following way:

1. Low capacity of federal and state Ministries, Departments and Agencies (MDAs) to collect and manage data effectively and lack of awareness by decision makers as to the value of data and the role it can play in increasing state capacity through e-governance and unlocking potential investment and other sources of internally generated revenue. As Lance notes, “geographic data holdings should be regarded as national assets and not just as costly expenditures.” (Lance)

2. The private sector is also facing a learning curve in terms of understanding the interpretation and application of spatial data. The private sector lacks the skills to analyse the data itself so a method needs to be created to make accessing and utilising this data simple and cost effective.

3. Difficulty with access and exchange mechanisms among datasets continues to block effective use of data (Lance). A lack of spatial data infrastructure (SDI) policy means that even when data is collected, and willingness to share exists, there is no mandate to do so and no data standards or platform for sharing this data. This can lead to duplication of collection by non-governmental
4. organisations (NGOs), the State and the private sector, fatigue on the part of the surveyed communities, and a waste of public funding by donor agencies often sponsoring these projects.

5. Finally, “data is often seen as a commodity or source of power by those who control it” (Williams, Marcello, & Klopp, 2014); GIS has become a huge industry in Africa and data has similarly become heavily commoditised. The provision of GIS services is hugely profitable; in Nigeria, a number of states have invested considerably in expensive GIS software; many of these lie underutilised or completely unutilised.

<table>
<thead>
<tr>
<th>Country</th>
<th>Recent SDI activities in selected countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Botswana</td>
<td>Digital information policy approved by the Cabinet in March 2015</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>Received technical assistance from Namibia in 2015 in preparation for census mapping</td>
</tr>
<tr>
<td>Ghana</td>
<td>The 20-year NSDF (2015-2035) was approved in 2015</td>
</tr>
<tr>
<td>Kenya</td>
<td>Construction of the Kenya Geospatial Data Centre was completed in 2015</td>
</tr>
<tr>
<td>Malawi</td>
<td>Three-day workshop held in 2015 to present the atlas and GIS database</td>
</tr>
<tr>
<td>Nigeria</td>
<td>A large-scale SDI for the Nasarawa state was completed in 2015</td>
</tr>
<tr>
<td>Rwanda</td>
<td>Rwanda launched its national SDI geoportal in July 2015</td>
</tr>
<tr>
<td>Senegal</td>
<td>An Open Data workshop on access to Geospatial Data was held in September 2015</td>
</tr>
<tr>
<td>South Africa</td>
<td>Pricing and dataset custodianship policies were ratified in March 2015</td>
</tr>
<tr>
<td>Tanzania</td>
<td>In 2012, Tanzania initiated a project to develop an Integrated Land Information System</td>
</tr>
<tr>
<td>Zambia</td>
<td>NSDI Committee appointed by the Secretary to the Cabinet in June 2015</td>
</tr>
<tr>
<td>Zimbabwe</td>
<td>In 2015, the Zim-Geospatial tool was created to pool geospatial data from multiple sources</td>
</tr>
</tbody>
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Table 1: Extracted from Collins, Mulaku and Siriba, 2016

This paper examines the way in which demographic and spatial data can be used for development in the context of Nigeria, with a particular focus on Kano State. It will explore how this data can be used to aid social and economic planning; to promote and encourage investment; and to increase internally generated revenue through more transparent and equitable property taxation mechanisms. It will also look into the challenges with utilising this data effectively and the difficulties of ensuring it can be shared effectively. Finally, it will review potential solutions to these issues, including the introduction of spatial data infrastructure policy to increase data sharing and the ‘packaging’ of data to make effective utilisation by end users simpler.

**Approaches to data in other African countries**

According to Collins, Mulaku and Siriba, spatial data infrastructure is now the gold standard for Africa in terms of managing and providing information for sustainable development (Collins, Galcano, & Siriba, 2016). They note that “so important is SDI in today’s transforming world that nations which possess an advanced and progressive SDI would lead and chart ways in their national and international arena far
ahead of those that still use traditional forms of spatial information management” (Collins, Galcano, & Siriba, 2016).

Spatial Data Infrastructure can be defined as the “matrix of technologies, policies and institutional arrangements that will facilitate the availability of and access to spatial data for all level of government, the commercial sector, the non-profit sector, academia and citizens in general” (Nwilo & Osanwuta, 2004). According to INSPIRE\(^1\), the goals of SDI include (Tonchovska, Stanley, V, & De Martino, S, 2012):

- reducing duplication of efforts;
- lowering costs related to geographic information;
- making geographic data more accessible;
- increasing the benefits of using available spatial data; and
- establishing key partnerships between states, counties, cities, academia, and the private sector.

In essence, an SDI links together disparate GIS and allows data from various sources to be integrated and shared by a large number of users. In Collins, Mulaku and Siriba’s 2016 review of SDI implementation in Africa, South Africa is one of the only countries to have consistently invested in SDI (Collins, Galcano, & Siriba, 2016). However, in recent years, many other countries have been making great strides towards implementing these structures. In Kenya for instance, the building of a geospatial data centre was completed in 2015 and a Kenya National Spatial Data Infrastructure (KNSDI) secretariat was established (Kenya: New Geo-Spatial Data Centre to house National Spatial Data Infrastructure Secretariat, 2016). In Ghana a 20 year national spatial data facility was approved in 2015 and in Zimbabwe, a geospatial tool has been developed as a data sharing platform (Collins, Galcano, & Siriba, 2016). In Mauritius, the Land Administration and Valuation Information Management System (LAVIMS) was developed to form the basis of an SDI and has greatly increased opportunities for development in the country (Deane, Pattinson, & Lunchoo, 2016). In Nigeria, various GIS projects have been implemented, though moves towards a coordinated SDI policy remain less developed; GIS will only achieve optimal impact if a co-ordinated SDI policy is developed and enforced. If national policy is impossible then subnational or sector specific policies may be adequate as a starting point. In Benin for example, while no national SDI exists, the

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\(^1\) An EU directive to all EU members to develop SDI
Système National d’Information sur l’Eau (the National Water Information System) has been developed to specifically serve the water sector (van der Kwast, 2015).

**The Nigerian Context: the need for data**

Nigeria is home to 182.2 million people (Countries: Nigeria, 2017). It is split into 36 states under a federal system. Divided across religious and tribal lines, it is hugely multicultural, with hundreds of languages spoken across the country. Nigeria is also environmentally diverse, with savannah, desert and wetlands found across the various regions. Despite being an oil rich nation; “Nigeria has revenues of over $80 billion from oil reserves alone” (Oyefeso, 2015); wealth inequality remains one of the worst in the world; and absolute poverty remains endemic in many parts of the country, rising from 55% in 2004 to 61% in 2014 (Oyefeso, 2015). Foreign direct investment has been slowly declining and in recent years the country has experienced a worsening balance of trade, which is often blamed on the country’s overdependence on oil (Foreign Direct Investment).

It is within this context that Nigeria is currently experiencing an economic crisis. Inflation as of October 2016 was at 18.3%, the highest it has been since 2005 (Nigeria Inflation Rate). The official unemployment rate is at 13.9% (Unemployment Rate), but does not reflect the huge unpaid wage bill of many public sector workers. Fiscal mismanagement has further generated huge deficits of public funds for the provision of social services. Oil prices have fallen dramatically and for many states, the federal allocation of oil funds was reduced in 2016, so that some states can barely cover the cost of civil servants’ salaries. The urgent need for non-oil sector investment continues to grow.

The solution to reduced states funds solution will need to take into account the requirements of the commercial sector if it is to encourage significant levels of private sector investment. Investing in Nigeria, for national or international actors, is often challenging however, with opaque processes and an absence of market information. Information regarding land ownership and occupancy has traditionally been a stumbling block to successful agricultural investment in Nigeria, with limited data resulting in failed ventures and accusations of land grabbing (Wilmar Under Scrutiny for Land Grab in Nigeria, 2015). These same stumbling blocks exist in urban areas where a lack of clear occupancy rights make

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2 In Nigeria, the Land Use Act (1979) specifies that “all land comprised in the territory of each State in the Federation are hereby vested in the Governor of that State” (Nigeria Land Use Act, 1979). The majority of all land administration services are therefore managed at the State and not the Federal level.
large scale investors vulnerable to accusations of misappropriation of land where their activities are perceived to conflict with community rights.

Many of the issues limiting investment opportunities in Nigeria could be resolved by the collation, sharing and utilisation of spatial and demographic data. Furthermore, to ensure that these investments are ethical and sustainable improved planning capacity and ‘shareability’ of environmental, demographic and physical data will also be essential. SDI, in this regard, is key.

**Issues surrounding multiple GIS platforms**

Open source software and cheaper hardware is allowing a proliferation of disparate approaches to data gathering and recording at state and local level. However, in the absence of defined SDI guidelines or development policy, the potential impact achievable by sharing information is reduced. This is regrettable for a number of reasons.

Without Spatial Data Infrastructure (SDI) policies and no platforms to share this data, duplication invariably arises. Looking specifically at northern Nigeria, the collection of data to facilitate social and economic development has been ongoing for several years in Kano under the UK Department for International Development (DFID)-funded Growth and Employment in States 3 (GEMS3) project, in partnership with the Kano Geographic Information System Agency (KANGIS). Demographic and social data have been collected in tandem with the systematic recordation of ownership and the mapping of residential, commercial and public plots. This data is collected and stored in an open source Land Information System (LIS). There are, however, several other NGOs and projects collecting similar data. eHealth Africa, an organisation working on health infrastructure in northern Nigeria, also collects data and maps water sources, schools, hospitals and other public services in Kano and Jigawa. While both systems are open source, collaboration between these organisations is limited and the data is shared with various public organisations without coordination.

Similarly, in Kano State, 5,000 plots of land were recorded by the Gates Foundation through the STARS project, but this data was not fed into the State LIS. These 5,000 plots, if shared with KANGIS, could have resulted in Certificates of Occupancy (CofOs) for all participating land owners. With banks such as Central Bank of Nigeria (CBN) willing to lend (CBN approves N75billion loan for agricultural lending in states), access to finance could have been sought based on a cooperative model secured with evidence of
tenure (Guidelines For Commercial Agriculture Credit Scheme (CACS), 2014). Indeed this is the model currently being advocated for in States such as Jigawa where GEMS3 is working with the Government on a cluster farm registration project. Farmers, using their certificate of occupancy to secure credit with the bank, would invest funds in inputs, thereby securing increased yields. The lack of sharing and effective data utilisation in Kano has resulted in a missed opportunity to sell NGN50 million worth of CofOs and improve rural livelihoods.

This is only a handful of examples of the lack of coordination between organisations collecting data; similar experiences pervade the Nigerian landscape. Not only are these overlaps wasteful in terms of funding and resources, but if data is not shared effectively in the context of rapidly developing countries, this could result in an inability to plan for greater agricultural outputs; identify urgent social needs; ensure fair and inclusive urban planning; and, importantly, increase urgently needed private sector investment in these states.

**Reasons for limited coordination**

*A lack of standardisation*

This limited coordination is to an extent a product of the way in which development is ‘projectised’; data is often seen as “project specific” (Williams, Marcello, & Klopp, 2014). This is in terms of what data has been collected, how it is classified and aggregated, and how it is presented, with formats sometimes being incompatible (Nakweya, 2014). Data is collected through a variety of means including “censuses, surveys and administrative data” (Akinyemi & Beltrame, 2013). All of these forms of data can suffer from “definitional inconsistencies, fragmentation, and lack of a well-structured template for data sharing amongst stakeholders” (Akinyemi & Beltrame, 2013). Interoperability for data sets in Nigeria is hampered by the fact that there are currently no standards or guidelines for data management. Indeed, where open data sources do exist, such as the website for Nigerian Open Data Access (Data), there are no measures to record the meta-data which has a serious impact on data integrity as even the origin of the data is not shared. For spatial data to be utilised effectively, there should be standards for metadata and standards for spatial datasets transfer (Aalders & Moellering, 2001). This has been historically difficult within developing countries trying to introduce data sharing. As Alter and Vardigan note, “many projects in low- and middle-income countries have difficulty managing and documenting the data that they collect.
Data management and documentation are actually universal challenges, and support for these activities has traditionally been difficult to secure” (Alter & Vardigan, 2015).

**Private contractors**

Furthermore, competition between private contractors who can make significant profits from providing GIS services means that the free sharing of whatever data is collected could be seen as commercially imprudent; in Kaduna for example, the value of the contract awarded to a private contractor to establish and run the Kaduna Geographic Information System (KADGIS) was NGN4.4 billion. In Kano, the same company proposed a budget of NGN3.6 billion to set up a similar system. This is the same across Nigeria with a GIS contracts in States such as Oyo and Lagos valued similarly. In many cases however, the actual amount of data collected is limited as much of the funding is allocated to front end costs including the procurement of equipment.

**Capacity of the State: Low quality and lack of availability of data**

However, poor data sharing is also a product of the fact that communication between different state MDAs is either low with agencies working in silos, or competitive3. In both cases, this often leads to duplication of efforts. In addition, the requirement for MDAs to raise additional revenue in the context of falling oil prices and recession means that the housing of data has become a competitive commodity even between ministries within the same state. In many cases however, data sharing is primarily impacted by the fact that data does not exist. According to the African Development Bank (AfDB) Strategy Paper for Nigeria for example, one constraint preventing the achievement of the State’s development goals is the “low quality of and lack of availability and low quality of statistical data and weak institutional capacity of National Bureau of Statistics (NBS) and Government MDAs with a view to producing these data” (Nigeria Country Strategy Paper, 2013). From a land perspective, the collection of land data is limited to that collected through sporadic registration and recertification which. However, the sporadic system registration is slow and recertification only allows the digitisation of pre-existing land data to be entered into the database, meaning that most of the data in existence is obsolete.

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3 A study carried out by the Lagos Chamber of Commerce and Industry (LCCI) reported a rivalry between Standards Organisation of Nigeria (SON) and National Agency for Food and Drugs Administration Control (NAFDAC). Issues created by this rivalry included “arbitrary charges, fees and fines…[and] overlapping of functions”, including inspections (Aniemeka, 2015).
Williams et al note that the challenges in establishing effective SDIs in low income countries are often more prominent than in more wealthy countries (Williams, Marcello, & Klopp, 2014). A key challenge for these developing countries trying to use geospatial data effectively is related to the high cost of collecting it and then implementing the technology required to develop an open SDI. Indeed, while many states have invested in expensive GIS systems, this is often without having a full understanding of the investment in time and resources required to collect and analyse the data needed to make this software useful. In a number of states, this equipment lies unutilised. In one Nigerian state, a new GIS system was commissioned in 2010 with the assumption that it would serve as the hub of all geographic and spatially collated data in the State. A contract was awarded to a private contractor to run the system at a cost of NGN80 million. While the initial system was used to capture some data this stopped as soon as the contractors left, leaving a Microsoft Access database of redundant data and nobody with knowledge of what it contained or what could be done with it. The entire system is now defunct and the equipment purchased with the contract has been either vandalised or removed. In 2014, a new company secured a NGN300 million contract to continue the work. NGN90 million was released for mobilisation. The consultants acquired a server and some equipment, including furniture. However, the software suite was neither developed nor deployed. Since then, the hardware has remained untouched, with no fresh data collected and no historical data available for analysis (LIS Expert, 2017).

Even with low-cost, open source software the cost of data collection is significant, as is the cost of storing and preserving data and the complexity in ensuring its management. The technological complexity of creating a workable platform for sharing this data is beyond the capacity of most MDAs staffed by civil servants with little Information Communication Technology (ICT) training.

**Donor support for the collection of spatial and socio-economic data**

Given the prohibitive costs of data collection, both the private sector and donor funded development projects have in many instances provided this initial funding and setup for such systems. For example, in order to address this in Kano, the GEMS3 project has provided support to KANGIS by creating a low-cost system of land registration to be used as a “tool of economic and social development” (Smith & Kolbe-Booyzen, 2015), with the explicit aim of improving the livelihoods of the poor. The low cost registration system, known as systematic land title registration (SLTR), delivers affordable CofOs

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4 Source is anonymous to protect the identity of the informant
through an efficient and transparent process and offers the most expedient means of delivering data to improve governance; it is anticipated that the ability to generate valid, live data at Local Government Area (LGA) level will support investment and lead to increased job opportunities. Furthermore, it is expected that through the SLTR process, the business environment, within which land acquisition and management is critical, will improve. This process will help to institutionalise transparency and increase efficiency within the MDAs responsible for land (Smith & Kolbe-Booysen, 2015).

The Genesis of Systematic Land Title Registration

The SLTR process was designed to overcome challenges surrounding formal titling of property in Nigeria. Until the SLTR process was implemented, title could only be gained sporadic registration. This form of registration is based on “client-initiated applications for registration of specific parcels of land” (Smith & Kolbe-Booysen, 2015). Sporadic registration (first title and subsequent transactions), however, lacks transparency and is often a drawn out and expensive process. Corrupt practices in land administration have benefited from the opacity of the process (a lack of clear codified instructions), and anecdotal reports of “undocumented fees being levied onto landowners” are not uncommon (Smith & Kolbe-Booysen, 2015). Importantly, from an investment perspective, formal transactions are also currently not able to prevent fraud in the property market. A comprehensive, searchable and regularly updated land registry is required to verify ownership. For these reasons, most land transactions in Nigeria are executed informally.

This means, however, that “the ability of state level MDAs to benefit from land related revenue is limited by the absence of legitimate land data on ownership, use and extent” (Smith & Kolbe-Booysen, 2015). In addition, the informality of transactions limits the amount of accurate data available on land use, extent and ownership. The ability of the State to use data for social and economic planning is therefore inhibited, and opportunities to encourage investment and collect property tax, both of which could contribute to the State’s internally generated revenue are lost (Smith & Kolbe-Booysen, 2015).

Systematic Land Title Registration Today

The SLTR programme in Kano currently employs a team of 400 registration staff and this team has been able to collect data for nearly 38,000 people and has registered and recorded over 120,000 parcels of
land. Under this system, the current cost of registering a parcel and collecting the social data for the household is £6.07 per parcel. This process is expected to support spatial economic development, with significant investment expected to follow from this data; initial economic studies project 16.1% internal rate of return to LGAs post SLTR (Tsauni, 2016). This is calculated to include efficiencies gained in enabling transparent and fair property taxation through identification of ownership, as well as the low cost of the CofO (at N5,000 for a residential property; N10,000 for a commercial property). It also takes into account overhead costs of running the project such as salaries and consumables e.g. paper and printer ink.

Despite the longer term economic growth potential of this approach the initial setup costs are significant. While Kano State has provided funding for the project (Kano state has released NGN76 million to date), these upfront costs may be challenging to any state trying to collect and process this data. Additional costs of training, buying hardware such as computers and purchasing vehicles to transport the field staff can be prohibitive. Furthermore, building the capacity to use the system; analyse the data effectively; and ensure the technical upkeep of the system, as well as ensuring the integrity and continued relevance of the data requires the commitment of huge resources. Once collected, social data will need to be refreshed through census every two years to ensure its continued applicability. Strong links and coordinated actions between the Ministry of Land, KANGIS, the Ministry of Budget and Planning, the Bureau of Statistics and the Kano Investment Promotion Agency (KANINVEST) will be essential to ensure that this data is kept up to date, accurate and accessible and useful. While land ownership data and land use data are likely to be easier to track through land information systems which record land transactions, this will only apply where transactions are undertaken in the formal sphere. While low cost registration systems such as SLTR encourage entrance into the formal market, if the cost of transacting land remains high and the process complex following first registration, informal transactions will continue to take place. These may not be recorded.

In order to ensure the sustainability of the systems and to encourage sharing of this data requires a demonstration of the long term value of the data collection. This will require influence being brought to bear on decision-makers by demonstrating its commercial significance and value. Given that decisions in Government are most easily swayed by the promise of improved revenue that influence is best drawn from the private sector. The initial step must be to help the private sector to understand how they can use data for investment. In order to interest the private sector and potential investors, however, the State will have to take a proactive role, supported by GEMS3, in marketing the data and highlighting the benefits
and opportunities this presents to an investor. The ability and willingness of the State to do this will determine the likelihood of returns from the initial investment.

**Encouraging utilisation of shared data for spatial economic development**

In many states in Nigeria there is a lack of detailed knowledge of the land, human resources and the commercial landscape. This has resulted in an inability to identify opportunities based on existing resources. Property parcel information, along with the satellite imagery and additional open source data, can be used in various ways by MDAs and private sector stakeholders to attract capital investments. However, simply collecting data will not be enough to assist in the sustainable development of the State. Looking specifically at Kano State in northern Nigeria, there are several ways in which data can be made useful to the private sector in order to encourage sustainable investment in the state.

*Searchable database of land records*

Records of land ownership and occupancy found in a searchable database will allow investors to more easily see where vacant land might be available for purchase or leasing. It also allows them to seek the purchase of land from current owners in a transparent process. This includes records of commercial and residential properties. In isolation, and in a country used to informality that has developed many mechanisms to circumvent good practice, property data alone adds little value to the argument in favour of SDI.

*Linking land and socio-economic data*

However, linking the cadastral data on land occupation with the data identified below and layering this data on a map increases the value of this data:

Potential vector layers:

- social data (which identifies occupation, age and education);
- data on the location of important infrastructure such as water and electricity sources;
- data on the location of hospitals, police stations, markets etc.
For the investor

With this information, investors can make strategic commercial decisions about where to locate their businesses and will allow them to understand both their potential market and workforce. For companies looking to sell their products for example, knowledge of your consumer base is essential, particularly socio-economic status, but also the ages and sexes of their consumers. Giving this data a spatial basis makes this data even more useful when considering the location of shops or factories and how they might distribute products. Investors looking at investing in schools or hospitals would be able to ensure that their sites were in areas with access to power or water and built near to those most likely to use their services.

For rural areas, information about occupation of land is also vital for protecting against the purchase of already occupied land, leading to conflict with communities and accusations of land grabbing. It also protects from improper government acquisition of land. In Jigawa, for example, GEMS3 is developing a pilot on community registration protocols to secure land tenure in areas liable to be affected by large scale agricultural investment. However in addition to this, the programme proposes to support MDAs and investors in developing and deploying socio-economic surveys, to be administered to agreed samples across the affected communities by the SLTR teams during the community registration process. GEMS3 aims to support the Investor and MDAs to analyse the data collected and work with both to draft the identities of potential out-grower cooperatives comprised of individual land owners, based on a detailed understanding of land occupancy and existing activities; prioritise lists of potential corporate social responsibility (CSR) investments that would enhance the lives of affected communities; and create land buffer zones that protect communities for the length of the leases being offered to the investor.

For the State

For the State, this demographic and spatial data can guide investment in social infrastructure (health, education, security and sanitation), as well as in infrastructure and planning. This data can also be used to identify properties (commercial and residential) which should be paying property taxes such as ground rent and tenement rate. Having an open data source will help to ensure that these taxes are applied in a fair and transparent way.
Furthermore, the process can also provide essential information for State-led investment promotion such as the location of business or skills clusters – both formal and informal – and the identification of brownfield sites available for development. There is currently a lack of data and reliable information to inform investment promotion activities for brownfield sites. This means that:

a) community living and business environment is potentially degraded because of derelict or contaminated sites

b) there is a lack of information on potential investment opportunities and on the status of brownfield sites.

Based on comprehensive SLTR activity in a town or city, the data collected will enable investment promotion structures to identify and promote brownfield sites (i.e. sites previously used for industrial purposes) and buildings with potential for development or use by new or existing investors. SLTR helps to map and document the economic activity of a city and, where a site or building is unused or in disrepair, it presents an opportunity for the local authority to redevelop and promote the site to new investors. Investment promotion structures can then assess data and identify opportunities for brownfield sites based on a thorough analysis of ownership, zoning, potential liens on the land and possible contamination issues. These opportunities could then be marketed to investors.

In practice this could have a huge economic impact on States such as Kano. Challawa industrial area occupies approximately 3.5 square kilometres of the city. The majority of industrial and factory units in this area are, however, underutilised (while still benefiting from good transport links and a local workforce). Effective marketing and reassignment of these sites offers opportunities for investment promotion and minimises urban growth into agricultural land, which could have an impact on food security.

**SDI in progress: Tarauni LGA**

GEMS3 was implemented on the expectation that it would improve the business environment through specific reforms in land, taxation and investment. By 2016, it had developed an approach and wished to develop a holistic solution for a pilot location. The expectation was simplified access to land title through a fit for purpose system, easier transactions, improved land market, simplified and transparent taxation and an improved business environment, and thus improved investment opportunity. The land registration
system would form the basis for this by adding socio-economic data defining markets, trades, education standards etc.

In September 2015, GEMS3 initiated registration of Tarauni LGA\(^5\) which, by August 2016, became the first LGA in Nigeria to be comprehensively registered\(^6\). This LGA became the target site for our pilot. Since August 2016, GEMS3 and the Ministry of Land and Physical Planning have worked to:

- develop a simplified, transparent property valuation and taxation system through mass appraisal;
- create a database of demographic data on household structure including trades, age, educational attainment and attendance disaggregated by sex;
- create a database of physical property in LGAs, highlighting business clusters and available sites; and
- create maps and develop brochures for investors looking to use this data.

The outcome of this is an economic development model able to improve taxation structures and business opportunities in a formal environment. By applying this model to the LGA, the expectation is that investment based on known markets will improve financial returns and sustainability. Meanwhile, ongoing social provision in terms of healthcare and education will improve as the demographic profile is known and predictable. These services could be funded through an increase in the fair and transparent collection of property taxation.

GEMS3 has been working with the State to use the SLTR database to aid in the application of a mass valuation system which would make it quicker and cheaper to value properties and then tax them accordingly. As an LGA is completed, payment of the Land Use Charge (LUC) can commence. The LUC is a consolidation or harmonisation of all land related rates and charges payable on all property within Kano State (Abdulkadir & Muhammad, 2016). These charges were previously very complex and

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\(^5\) The Kano urban area covers 137 km\(^2\) and comprises six local government areas (LGAs)- Kano Municipal, Fagge, Dala, Gwale, Tarauni and Nasarawa- GEMS3 does SLTR in Dala, Fagge and Tarauni

\(^6\) Work continues in three metropolitan LGAs with two more already completed. The project aims at creating a better business environment in the state to help attract investment, increasing employment and improving livelihoods of the poor. The project employs a fit for purpose land registration system; Systematic Land Title Registration (SLTR). While the GEMS3 project has introduced SLTR to a number of Nigerian States, including Cross River, Ondo, Kogi, Kaduna and Jigawa, it is only in Kano where the collection of social data has been piloted.
expensive to enforce, placing a considerable compliance burden on the State and property owners. This meant that the State generally had a poor record of enforcement and lost significant revenue over the years. SLTR is essential in applying the LUC as it ensures that this charge is applied equitably and transparently.

Thus, the physical database of land, supported by the demographic data, supports collaborative spatial development solutions based on societal demand countered by government need. SLTR in Tarauni now offers a stronger social compact between the people and the government by offering improved tenure security, better inheritance rights for women, and with investment, easier access to appropriate education and skills development within an environmentally sustainable setting. This improves accountability on all sides in pursuit of sustainable development,

**Benefits to the State**

Anticipated benefits to the state through the use of this data are huge. The total cost of SLTR in Tarauni was approximately NGN60 million. If all CofOs are collected at N5,000 (for a residential property), the return will be NGN150 million. If the LUC is also applied, additional revenue of NGN380 million every year can be guaranteed to the State (based on a 0.1% tax rate). As the model is applicable to all LGAs, this offers a potential revenue of NGN15 billion for the city alone (Smith & Thomson, Draft Executive Summary for Valuation Report, developed for presentation at validation workshop, 2017). Kano State has in the past found it challenging to raise its own revenue; in 2015 it was reported that the State only generated 13% of its own revenue from taxation (Kano State To Boost Internally Generated Revenue, 2015). However, in the context of the oil crisis, improving the State’s ability to collect land charges in a fair and transparent manner has become all the more essential.

**Presenting the data for the private sector**

Given the lack of private sector capacity to use the data meaningfully however, the initial best opportunity has been in presenting thematic maps to present opportunities in Tarauni rather than raw data. For this reason, GEMS3 is making maps on market potential available graphically to all stakeholders. This is the best way to educate non GIS professionals in state and private sector on the application of data. Once the
private sector gains an appreciation of the range and depth of data available, and its significance, it will increasingly influence a drive for more structured and coherent data from the state.

**Visual representations of data**

While the State, donors and particularly the private sector can derive benefits from using spatial and socio-economic data, raw data may not prove useful for those without a GIS background. By preparing and ‘packaging’ investment opportunities, using the data is made more accessible and easier to interpret. Below are some basic examples of how this data can be represented.

*Security*

In the last few years Nigeria has experienced increasing insecurity. With the threat of radical Islamic terrorism in the north and the violent vigilante violence in the east, security concerns continue to grow. Being able to map potential flash zones (high density areas with many unemployed young men for example) would enable planning by the State to ensure sufficient reach by the police. In the map below, we show different area densities and mark the areas in which police stations are based.

*Image 1:*

Map showing population density and the locations of police stations in Tarauni LGA.
**Skills and Businesses**

The next two maps show the location of people with certain skills/trades (mechanics and textiles) in the LGA. In this map we have disaggregated by male and female. This data could be used by an investor to make informed decisions about where to locate their businesses given the skills in the workforce. For the state, but more likely donor agencies and development organisations, this data could be used to introduce beneficiaries to the benefits of forming cooperatives e.g. the ability to access finance. In Jigawa, this was piloted by GEMS3 in 2014 where land mapping and social data collection identified a cluster of groundnut producing women. These smallholders, once identified, came together to form a cooperative. This allowed them to pool their finances and access further financing to purchase a groundnut oil machine which enabled them to mechanise the production process, significantly increasing their production volume. Many women in neighbouring areas also travelled to use the machine, paying the cooperative for the usage. An indirect benefit of this opportunity has been the social benefit for the women working together as the cooperative also provides a forum through which the women support each other through advice and assistance with healthcare, childcare etc.

![Map showing locations of male and female mechanics in Tarauni LGA](image2.png)
Health and Education

Investment in healthcare is badly needed in Nigeria. The map below shows the location of clinics and hospitals, as well as households with more than 10 people. This information can benefit the State and investors. For the State, areas with more densely populated areas are more at risk of the spread of disease and this information will allow it to plan for potential outbreaks in the short term and to consider town planning options which decrease the density of these areas in the long term. For investors, this information will allow them to see where health facilities are most needed as well as the areas in which utilisation is likely to be high. Additional layers could be added to the map to show the location of young children or the elderly to allow more tailored healthcare provision in these areas.
In Nigeria, education, particularly in the north, has suffered from poor capacity and a lack of resources. The paucity of education provision has opened the doors to the concept of privately funded schools. For investors in private education, information on the number and location of current schools, as well as the location and number of children not in the formal schooling system will allow them to make an informed decision about whether to invest in providing schools and where best to locate these to allow access. As show below a huge number of children aged between 4-11 years and not in school currently are based in areas a significant distance from their homes. For the State, this data is also important as a large numbers of children not receiving an education could have serious consequences for the economy, for security, health etc.

Image 4:
Map showing locations of hospitals and clinics, as well as households with >10 people in Tarauni LGA

Image 5:
Map showing locations of primary schools, as well as the locations of 4-11 years olds not in primary education in Tarauni LGA
The map below shows population density in Tarauni as well as the location of hospitals and schools in the area. From this the State can see that the most densely populated areas are the least well served by providers. This may encourage the state to increase funding for additional services or encourage private investment in these areas.

**Image 6:**
Map showing population density and the locations of schools and hospitals in Tarauni LGA

**Demonstrating the value of spatial data infrastructure**

By understanding the necessity of social and spatial information, the private sector is more likely to request better access to data prior to investment. This gives incentive to senior decision makers to encourage and provide the means for organisations and companies collecting data to share this in a central repository and to push back against the expensive and ineffective system of running several GIS systems in various MDAs within the same state. It also encourages institutions that currently lack GIS to embrace the concept of collecting and utilising data to encourage investment, while ensuring that shareability of the data is considered. In order to do this in Kano State, an SDI Policy should be written to support data sharing. In Kano spatial data is often acquired and maintained by different MDAs, resulting in problems such as datasets not being compatible with one another and data not being shared across MDAs. This leads to inefficiencies and duplications of effort. An SDI policy will help to overcome these issues and create an environment where all stakeholders can “co-operate and interact with technology to better
achieve their objectives at different political and administrative levels” (Chan, Feeney, Rajabifard, & Williamson, 2001).

The role of SDI in facilitating access, delivery and sharing of spatial data, and in particular land data, is critical as a driver for investment and for increasing the ease of doing business. Improved data sharing reduces the burden on the state and investors. Senior government stakeholders and the private sector should take an active role in the policy’s development; buy-in of all MDAs from the design phase is essential to ensure that the data will be used effectively, even while the policy mandates the sharing of data across ministries according to a codified set of protocols. While the SDI will play a much broader role in a modern economy than supporting land administration, land administration could be considered a key driver for SDI.

The ideal policy should call for the creation of a State wide ‘geolibrary’ (Committee on the Geographic Foundation for Agenda 21 et al, 2002) through which the coordinated efforts of all data providers can be channelled and stored. This will allow data from multiple GIS providers to be shared. This store should be available free of charge to all MDAs, with a nominal charge for access by private individuals/companies and NGOs. Restricted access would exist for sensitive data. By creating a platform through which to share geographic data, more inclusive, transparent, efficient and effective social and economic planning can be undertaken. Once data can be shared on this platform, the benefits of shareable data, through increased planning capacity and increased private sector investment will discourage behaviour which limits the access of data based on the premise that ‘data is power’ and ‘data is profit’.

In Kano, alongside providing support for data collection, GEMS3 has also been supporting the Kano State Government in creating a state level SDI policy which will leverage SLTR to support economic growth. In a meeting on 1st December 2016 the SLTR Technical Committee met on the creation of an SDI policy. It was agreed that an SDI Committee would be created and would be comprised of representatives of key MDAs such as Ministry of Agriculture, KANGIS and Kano State Urban Planning and Development Authority (KNUPDA). This is to encourage interagency collaboration and break down silos which mean that data standards currently vary hugely and access to data is not promoted between MDAs. This Committee will work with GEMS3 to complete the policy. This policy will outline the requirements for data standardisation which will ensure that data providers manage their data in a commonly defined way.
This will help to ensure that interpretation is possible by the data user. It will also define the need to develop a common platform through which the data can be displayed.

**Conclusion**

With high unemployment rate, growing inflation and significant poverty levels based on a dwindling oil economy, it is imperative that Nigeria attract investment from the non-oil sector. A significant disincentive to investors however is the paucity of data available to potential investment projects. Open data sharing platforms are important in enhancing the business environment by providing useful information to the private sector such as locations of markets, water sources and details of land occupation. This information is also helpful to the State for planning purposes and also prevents duplication of collection by various public and private sector stakeholders. Spatial data infrastructure is required to allow various GIS to share and display their data in a standardised format. However, the implementation of SDI is currently inhibited by a number of factors. Firstly, in many instances data simply doesn’t exist or is of extremely low quality. This is due to a lack of capacity within MDAs at the state level. Secondly, where data is collected, there is currently no standard format for the data and interoperability is not assured. Thirdly, contracts for GIS development and data collection are extremely valuable and data sharing from this perspective is commercially inadvisable. Finally, even where the private sector has access to some of this data, they do not necessarily have the skills to analyse and utilise it meaningfully.

In order to put pressure on the State to invest in and make provisions for an SDI (ignoring vested interests), the private sector has to have a keen interest in the data and what benefits can be derived from having access to it. In order to encourage this understanding, the GEMS3 programme is supporting the Kano State Government to collect significant spatial and demographic data through a fit-for-purpose, low-cost land registration project, SLTR. The data collected through this process can be used by both the state and the private sector in many ways and in order to demonstrate this clearly, the programme is working to produce simple maps which allow visualisation of the data and how it can be used. Once convinced of its value, the private sector is likely to encourage the State to provide easier access to even greater amounts of data through SDI and will be able to use this data to make strategic investments.

It should be noted that initialising implementation of an SDI is likely to require significant technical assistance. SDI is extremely technically complex to develop and may require funding and support from
donors such as the World Bank. Subcontracting the process to the private sector has to date failed to address issues of capacity, interoperability, and sharing. In the long run, private provision may become a more sustainable option so long as an SDI policy in line with the investment promotion vision for the State is fully embraced by the State and the private sector contractor. It should also ensure that measures are taken to ensure confidentiality and prudent use of the data once acquired.

References


### Tables

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### Images

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