



# Responsible Land Governance: Towards an Evidence Based Approach

ANNUAL WORLD BANK CONFERENCE ON LAND AND POVERTY  
WASHINGTON DC, MARCH 20-24, 2017



## **THE GHANA ENTERPRISE LAND INFORMATION SYSTEM (GELIS) AS A COMPONENT OF NATIONAL GEOSPATIAL POLICY**

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**Paper prepared for presentation at the  
“2017 WORLD BANK CONFERENCE ON LAND AND POVERTY”  
The World Bank - Washington DC, March 20-24, 2017**

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## **Abstract**

The Government of Ghana, through the Ministry of Lands and Natural Resources, is implementing the Land Administration Project 2 (LAP-2) which builds upon the foundations laid under LAP-1. Central to LAP-2 has been the development of a National Geospatial Policy and the implementation of GELIS, the Ghana Enterprise Land Information System. This paper attempts to summarise these activities and demonstrate how they will help Ghana to achieve its objective of developing a comprehensive land administration system leading ultimately to a National Spatial Data Infrastructure (NSDI).

In developing the National Geospatial Policy (NGP), which is currently in the adoption process through Cabinet, there was a thorough review of the current progress and problems. The NGP provides the basis for building the strategy to develop an NSDI implementation plan.

In parallel has been the initial implementation of GELIS which, eventually, will enable all users from the relevant Ministries and Agencies to carry out their day-to-day business processes efficiently in a digital environment, using common databases. Once complete, GELIS will present a One-Stop-Shop for all stakeholders, including the general public, irrespective of where they are. GELIS, therefore, forms a vital component of implementing the geospatial policy and the achievement of an NSDI.

## **Key Words:**

Geospatial, Ghana, Information System, Land Administration, Policy

## **1. INTRODUCTION**

The Government of Ghana through the Ministry of Lands and Natural Resources is implementing the Land Administration Project 2 (LAP-2) with funds provided by the International Development Association (IDA), the Department of Foreign Affairs, Trade and Development, Canada and the Government of Ghana. The Project Development Objective is to “*consolidate and strengthen land administration and management systems for efficient and transparent land service delivery*”. LAP-2 builds upon the foundations laid under LAP-1.

Central to the activities of LAP-2 has been the development of national policies for mapping and geospatial data, and, the implementation of GELIS, the Ghana Enterprise Land Information System. This paper attempts to summarise these recent activities and to demonstrate how, together, they will help Ghana to achieve its objective of developing a comprehensive land administration system including achieving a National Geospatial Policy (NGP) modelled on but extending beyond a National Spatial Data Infrastructure (NSDI).

The National Land Policy of Ghana (1999) provides for the “judicious use of the nation’s land and all its natural resources by all sections of the Ghanaian society in support of various socio-economic activities undertaken in accordance with sustainable resource management principles and in maintaining viable ecosystems”. The Land Policy envisages that a geospatial framework database or NSDI would be established to serve as a backbone to an integrated land information system that would link and network all the land related agencies in the country.

More recently, LAP-2 has identified the benefit of combining the draft NSDI policy created in 2013 with the Survey and Mapping Policy, also created in 2013, and the Geodetic Reference Network Policy created in 2014 as a consolidated National Geospatial Policy (NGP). This policy, prepared in early 2016, provides the foundation for the future development of an NSDI in Ghana that will avoid costly duplication of effort and will realise the benefits from sharing and being able to access and use up-to-date, reliable and high quality geospatial data.

## **2. BACKGROUND TO NATIONAL GEOSPATIAL POLICY FORMULATION**

The current situation in Ghana is one in which there are many aspects of geospatial policy already in place or being formed. There are a number of activities and projects that are NSDI-related with a number of organisations actively engaged but on an individual basis. It is also recognised that some stakeholders are aware of NSDI but appear to have varying degrees of understanding and commitment. This leads to a situation in which implementation is only partial, leading to the current problems of duplication and lack of data and knowledge sharing, thereby not allowing the full benefits of NSDI to be enjoyed. A high level

policy was therefore needed in order to pull all of these various strands together into a single agreed purpose; combined to bring about a shared vision and provide a solid foundation for the way forward.

In developing the National Geospatial Policy, which is currently in the adoption process through Cabinet, there was a thorough review of the current problems, including: gaps in data types, incomplete coverage, out-of-date data, poor quality data, a preliminary data audit of the main geospatial data suppliers and users and a data exchange audit of who was using what and from whom. The work also reviewed the problems of having some spatial data but without knowing exactly what exists, where they are, what quality they are, how they can be accessed and what conditions apply if they are used. The NGP, therefore, also provides the information from which to develop an NSDI strategy and implementation plan, under which it will be clear to all stakeholders who should do what and how it will be organised and governed, financed and resourced.

But, in addition, in an attempt to place geospatial data at the heart of government and the economy, a significant step was also taken to identify specific projects and applications, and other related national policies to see the important interdependencies and to strengthen the awareness of geospatial benefits. This identified a range of ongoing projects, initiatives and problems to be addressed in such diverse areas as illegal mining, flooding, use of agricultural land for residential building, deforestation, oil extraction, resilience planning, “Smart City” development, land use zoning, etc. A key consideration was also given to those organisations who could form the nucleus of the governing framework to implement the NGP.

The policy starting point was to examine all of the related previous policy work including the three main constituent elements and contributions from the Survey and Mapping Policy, the NSDI policy and the Geodetic Reference Policy that had already been carried out including the many other related projects that already had been actioned. And then to clearly identify how they were related and contributed to the National Geospatial Policy. It became clear as happens in many circumstances that much had already been achieved and many of the building blocks were already in place, but that more needed to be done to make people and organisations aware and to work together. This is shown in Figure 1.

### **3. KEY ELEMENTS OF THE NATIONAL GEOSPATIAL POLICY**

The NGP policy was designed as a stand-alone document based upon the existing NSDI policy but incorporating key elements of the S&M policy and GRN policy. By remaining “high level” the lower level policy documents can be changed from time to time, if required, without affecting the top-level policy. The structure was developed on the basis of other national policies in Ghana, the National Land Policy in particular, and was written and agreed after detailed formal and informal meetings, discussions, workshops and presentations to all sectors of the economy – public, private, academic, utilities and

professional institutions. What was clear was the in-depth understanding and technical expertise of all participants, the commitment of all to the overall objectives and indeed of the benefits to be gained. What was less apparent was how to get there and how to balance different aspirations and timescales.

The final policy addressed these concerns by setting out the key elements in a threefold document covering: a framework and objectives which provided the foundation, and top level guidance, for the establishment of an National Geospatial Policy; the guidelines or statements derived from the policy objectives which are intended to guide policy; and in pursuing the stated policy objectives, the policy actions which will be implemented by Government according to an implementation plan in the short, medium and long-term.

The policy framework was created in a manner that: would meet the demands of its users and stakeholders, including all levels of government; be founded on principles defined by the United Nations Economic Commission for Africa (UNECA); reflect developing international standards and best practice with the intention of promoting gender equality and empowering women; and ensure the many advantages of data sharing (collected at taxpayers' expense) were clearly recognised and enshrined in the policy.

The guidelines (i.e. the policy statements) that emerged from these objectives were set out in eight different major components which described those essential policies and commitments to be implemented and actioned. These eight components, set out with descriptive sub-clauses and definitions, covered: governance, geospatial data, access to geospatial data, interoperability, finance, legal issues, human capacity needs and communication and awareness. To commence the whole process it was recognised that the first of these, Governance, including the organisation and administrative structure, was the most important one.

In any new environment or situation where policy implementation is crucial it is important to ensure that those responsible operate at the top level, are independent of vested interests, have the necessary authority recognised by all stakeholders and can ensure and encourage the participation of all towards the ultimate objective. An organisational and administrative structure for the NSDI to be established under the overall responsibility of the Office of the President was agreed and is shown below at Figure 2. The importance of involving a wide cross section of the geospatial community is also apparent in order to provide the necessary overall management, technical and advisory roles. It includes:

- a. An executive role – to steer and guide the development of NSDI (NSDI Committee);
- b. A management role – to co-ordinate the project management of NSDI implementation across the range of stakeholders involved (NSDI Implementation Managers);

- c. An operational role – to perform day-to-day administration and technical implementation of the NSDI (The NSDI Secretariat in the Office of the President and an NSDI Technical Team); and
- d. An advisory role - teams of experts in specialist fields to provide analysis and recommendations (NSDI Work Groups).

#### 4. **POLICY IMPLEMENTATION PLAN**

The policy development was not an academic exercise but a practical and operational solution to well-known and acknowledged sets of problems designed to ensure greater efficiency across many sectors. It was to build upon existing experience and significant technical skills and indeed on previous and current “mini” NSDI’s operated by some organisations. Therefore the actions arguably formed the most important part of the policy document. This third component of the policy comprised the Action and Implementation Plan with great emphasis placed on the identification of a series of “quick wins”, short, medium and long term strategies all of which were debated and described at length.

This action plan covered each of the eight main components of the guiding principles noted above and was delivered at two levels - at a high level and by a more detailed table of actions to be carried out and implemented with assigned responsibilities for each item in the plan. Some examples where this greater detail is required are on the definition of core or fundamental datasets, staffing of the management unit, pricing and licensing policies, etc.

As noted above the first of these guiding principles is the governance of a clear institutional framework for the development of an SDI with leadership a key factor for that crucial first step of getting things moving and in a collaborative spirit. It was recommended that the potential key leaders operating under the auspices of the Office of the President should be:

National Information Technology Agency – because the ICT infrastructure, standards and geospatial delivery is reliant on this organisation;

Survey and Mapping Division (of Lands Commission) – because it is the main geospatial data provider and has already seen its operational guiding principles defined under a Survey and Mapping Policy As the national mapping agency it is central to the development, improvement and accessibility of geospatial data;

National Development Planning Commission – because it has a high level, cross-government responsibility to plan, manage, budget, implement and monitor;

Environmental Protection Agency – because it has taken the initiative to create an environmental SDI, complete with interoperable data and a data sharing agreement – in many ways a first NSDI, from which many lessons have been learnt

Ghana Statistical Service – because the organisation has a long history of using GIS to create national datasets (e.g. Districts / Enumeration Areas).

The second major area for action was the availability and knowledge about what geospatial data exists, especially through the provision of metadata. For example the lack of metadata makes it impossible or difficult for potential users to know if data exist or not. Even if the data exists it is difficult to evaluate its fitness for use, due to a lack of a proper metadata description and standard. A metadata policy had already been created for Ghana however, so this was an area in which a “quick win” was possible. A related task was to overcome the lack of a proper access mechanism to see the existing geospatial data. Adopting a standardised web-based service architecture and publishing metadata and data are the keys to overcoming this obstacle. Here again work had been carried out to assess what metadata was held by stakeholders, using which standard and a pilot metadata service had been created. The NGP policy on metadata was therefore to state that:

- a) Metadata and metadata registries will be created and maintained according to the ISO19115 Ghana Modified Metadata Standard;
- b) Metadata will be created and published for all geospatial datasets included in the NSDI according to the ISO19115 Ghana Modified Metadata Standard, and provided [and made available free of charge] to the clearinghouse by data and service providers for certification and inclusion; and,
- c) Metadata will be updated when the geospatial data is updated and will be provided to users with each supply of the relevant data

Further emphasis is given by the inclusion of a policy statement that organisations needing to access and use geospatial data for their own purposes should determine which datasets exist (through the NSDI metadata search service) and always use such data rather than creating new/duplicate data.

“Quick wins” are those that can be implemented quickly! And along with these and the identified short term actions, they can be used to overcome the tendency to see the ultimate goal as too far in the future and too complicated to insert into current business plans. And so a third area for action and a “quick win” is the adoption of a simple Data Sharing agreement between stakeholders which could be a simple Memorandum of Understanding and would be very straightforward to draft. This could quickly overcome the tendency in many countries where poor partnerships and cooperation are considered to be the biggest problem – the “silo mentality” – where many organisations fear that they will lose their autonomy when

participating in an NSDI. There is then often limited cooperation between the different organisations. Such action would also be enabled by the appointment of a senior staff member of organisations to assume responsibility for their involvement to the NGP.

Linked to this is where it is clearly recognised that there is a consistent need for geospatial data to be shared and used by different organisations. There is then an argument for a “marketing exercise” to determine what these needs are and to what timescale. An example which was examined was the case of Survey and Mapping Division (SMD), the National Mapping Agency, whose products were in great demand by other organisations. Such a “marketing exercise” can be used to develop a more detailed plan which can be used to develop the simple Data Sharing agreement referred to above.

Additionally, at this interim stage a one-off project related co-operative agreement could be put in place that would begin to increase the quality and quantity of the national geospatial data. For example, a proposed SMD / Ghana Statistical Service collaboration is a superb example of how agencies, working together towards a common goal in a positive way, can make a big impact. National, up to date and maintained administrative boundaries are important for census and local authority service provision but the information is not widely available and perhaps ownership and responsibility for management and updating is unclear. It could be made available with appropriate collaboration and become a valuable dataset for many applications. A relatively small procedural change, and collaboration, has then the possibility to have a big impact and should be applauded. There may be other examples, and the possibilities should be explored rather than waiting for a formal instruction via a new law.

Finally perhaps, the component which would give authority and impact to the adoption, (or even before adoption) of policy is the legal instrument. The drafting of the appropriate Legal Instrument does not need detailed decisions to be made but can largely be based upon the high level statements contained with the Policy.

The debate on implemented actions clearly showed that, whilst the development of a full national geospatial policy could take a number of years, a step by step approach would yield recognizable incremental benefits which would boost support for continuing action towards the ultimate goal.

## **5. IMPLEMENTATION UPDATE**

Following the preparation of the National Geospatial Policy document, a Cabinet memorandum was submitted to the previous government for approval for its implementation. However, the previous Cabinet could not fully consider the Policy document for approval before the recent change in government (in December 2016). Once the new Cabinet is constituted, the Cabinet memorandum will be resubmitted for consideration and approval.

Given the wide ranging impacts of this Policy, upon Cabinet's policy approval, a number of high intensity activities are going to be undertaken including:

- a) The Key Stakeholders identified by the NGP will sign a declaration of commitment which will be a public statement of stakeholders' commitment to put resources and energies into the NSDI. To this end, a Key Stakeholders Workshop will be organised to allow all those involved to be present and to discuss the declaration. In addition, the NSDI implementation team would be decided and agreed;
- b) Undertaking training engagements with a range of stakeholders across the country on the content of the Policy and how it will impact on the provisions of geospatial information for effective land administration and governance. These include Ministries, Departments and Agencies, Metropolitan, Municipal & District Assemblies and especially those involved directly in land administration, mining, forestry, infrastructure development and the utilities;
- c) In the short term a detailed Strategy and Implementation Plan for the NSDI will be drawn up. This will provide the detailed activities and specific funding costs required for the NSDI. It will give clarity over who does what, the human resources required, the timescales involved and the inter-dependencies between activities. Individual organisations involved in NSDI implementation will incorporate the requirements into their annual work plans and budgets;
- d) The governance structure described in the policy will be established and the Office of the President shall co-ordinate the Secretariat. Detailed roles and responsibilities for all components of the governance and administration structure will be drafted and appropriate terms of reference developed;
- e) The Secretariat will present a detailed analysis of required costs to the Presidency and approval sought for a ring fenced funding of NSDI implementation for an initial 5-year period. In that period further studies will identify subsequent costs and measures aimed at ensuring long-term sustainability and
- f) A National Geospatial Act will be introduced to provide legal backing for the actions described in this Policy.

Recognising that the National Geospatial Policy is the first, but crucial step in developing a NSDI in Ghana and gaining the benefits of more accessible, up to date, high quality geospatial data, it is encouraging to observe that the current government has given some indication that it is poised to see to the implementation of some of the policy statements in the NGP. Even before the Draft Policy document is approved for implementation, portions of it are being implemented. For example, in order to pursue the

government's agenda of providing a digital address database for the country, the office of the Vice President has convened a meeting of key stakeholders, most of whom have been identified in the draft NGP, to deliberate on the technical and legal issues in harnessing the power of modern geo-spatial technology to be used as alternatives to current practices. As a result of the meeting, a Technical Committee, to work directly under the office of the Vice President, has been formed and tasked with the responsibility of outlining a realistic action plan for the realisation of the vision of the government on addressing.

As further evidence of sustained commitment, when the Policy is approved, the Ministry of Lands & Natural Resources will roll out a comprehensive communication strategy, which provides for all round communication to both internal and external stakeholders. Upon approval, copies of the Policy will be distributed to all stakeholders and followed by a series of stakeholder workshops to disseminate and explain the contents of the National Geospatial Policy. The messages will be disseminated in a comprehensive manner including the use of local languages to facilitate understanding and cooperation of stakeholders. This strategy will be coordinated by the Public Relations Unit of the Ministry of Lands & Natural Resources and senior officers of the Ministry shall be deployed. To give extra impetus and commitment the stakeholders to be involved will be extended to include Traditional Authorities, The Judiciary, Civil Society and Non-Governmental Organisations and the Media.

## **6. GELIS BACKGROUND AND OBJECTIVES**

In addition to further strengthening the policy framework for Land Administration and geospatial information management, LAP-2 has also focused on decentralising and improving business and service delivery processes and improving maps and spatial data. The Ghana Enterprise Land Information System (GELIS) is central to this activity.

Reliable land information is essential to support effective land administration and management; however, if the system is to support efficient data analysis and decision making, equally important is the ability to access this information quickly, and, link different data sets in the information system. Providing for rapid access and ease of data retrieval is best achieved by developing a computer-based land information system containing both graphical (spatial) and linked textual (attribute) data. Under LAP-I, a Land Information System (LIS), with five sub-systems using the same database structure, was developed for the Divisions of the Lands Commission as a core system that allowed users to enter and process data that were newly generated from Systematic Land Titling (SLT) campaigns, based partly on existing manual records and maps. The LIS sub-systems were intended to allow each Land Sector Agency during day-to-day business, to process electronically its own (unique and non-redundant) data in a format acceptable to the LIS and using its unique (and separate from other Divisions) parcel number (UPN). These sub-

systems were, however, developed based on the old business processes of the previous autonomous agencies. In reality these sub-systems have not been used operationally and most of the Divisions have continued using paper folders and documents in their business processes.

In addition to the stage one LIS, there have been other information systems developed, such as the Land Use Planning and Management Information System (LUPMIS), the Urban Management Land Information System (UMLIS), a customised software for Rating Valuation and an intelligent scanning and records management system (based on the LaserFiche software). Also, some of the regional offices of the divisions of the LC have initiated computerisation of some aspects of their processes (especially to facilitate the tracking of transactions). Under LAP-1 some records held at the Lands Commission had been scanned and stored in a digital format. The LC, with assistance from FAO, also completed the development of prototype Open Source software for land administration (SOLA). Under LAP-2, however, it was recognised that the development of a comprehensive integrated Ghana Enterprise LIS (GELIS) would be a priority, with functionality based on a comprehensive analysis of the business processes and data flows of the agencies. It was also imperative that a number of LC technical developments and service innovations were taken account of and factored into the solution.

The Terms of Reference (TOR) for the provision of the required system elements of GELIS, including hardware, networking and data conversion, loading, migration and ingestion, as well as the training and capacity building essential to achieving full operationalisation were issued by LAP-2, and, following completion of the tendering process, the build of GELIS commenced in the first half of 2016. Unfortunately as a result of budget limitations at that time, the scope of the initial GELIS build and associated data capture had to be reduced to certain priority items. However the design is such that the foundations for a more comprehensive information management system have been laid down and the full scope of GELIS can be built in the future.

## **7. KEY ELEMENTS OF GELIS**

GELIS is a major project which will have significant impact upon the future operation of the Lands Commission and stakeholders in the Land Sector Agencies. As such, comprehensive and detailed specifications were produced by LAP-2 which set out the requirements of the main component parts of the GELIS implementation project, which are:

- a. Development, testing and deployment of the GELIS software system;
- b. Procurement, installation and commissioning of hardware at the central National Land Information Centre in Accra;

- c. Data conversion and loading of data to permit effective functioning at the selected regional/district offices, and, roll-out of the software to these selected offices;
- d. Knowledge Transfer and Capacity Building to ensure long-term sustainability of GELIS within Ghana's land sector.

The specifications clearly described the context and technical environment within which the development and implementation of the software is expected to take place. They make clear the requirements in relation to the principles of Modularity, Flexibility, Scalability, Interoperability, Security, Web technology, Open International Standards, and Open Source software principles which will ensure the successful initial development of a software suite. However, these principles are also vital to the long-term sustainability of GELIS as they ensure that the system put in place has a solid framework that can be extended in capacity and functionality as demand develops.

GELIS is also designed in such a way that enables LC staff to be fully involved in these future developments by developing their knowledge and skills through working alongside the development team. However, as indicated below, the initial capacity of GELIS has been somewhat curtailed by budget restrictions and time constraints and so the current activities do not fully meet all the initial objectives of GELIS. Whilst this is, of course, disappointing all parties are working to ensure that these initial steps are carried out within the requirements of the 'philosophy of GELIS' so that these first components fully meet the design goals and expectations of the fully developed GELIS in the future; and, of course, the first components will also pave the way for the eventual roll-out of GELIS to cover the whole of Ghana.

In terms of hardware the requirement is also reduced in this first phase of GELIS with LC taking back the direct responsibility for procuring some elements as part of the development of the new National Land Information Centre (NLIC). However, the comprehensive overall design is being adhered to so that those elements now being procured as part of the contract will fully meet the central requirements of the NLIC, when completed.

Similarly the requirements for data capture and conversion as part of the GELIS project are, at first assessment, fairly straightforward but the actual data volumes, contents, conditions, formats and data types are inevitably difficult to quantify and describe fully. This is due to the disparate nature of the data, multiple locations and separate offices together with an unknown relationship between data types and the ID's associated with unique items of data managed by the different agencies within LC. This complexity is illustrated in Figure 3.

This diagram illustrates the types of document typical of the various Divisions of the Lands Commission, including Job Survey Forms (JSF) of the Survey and Mapping Division (SMD) and documents from the Land Registration Division (LRD) and Valuation Division (LVD). The primary tools have been digital scanning for documents with production lines set up at various offices; vector data capture using GIS tools; and, indexing/data capture using software called SmartGED.

Within the current GELIS activity many of these elements have become better understood and it has been possible to refine the methodologies of capture for most document types. However, again as a result of budget restrictions, the current level of data capture is very much below that originally envisaged for this stage in the development of GELIS; the focus has therefore been on understanding what is available, the development of procedures and planning for the future. In this phase of the development of GELIS around 920,000 pages have been scanned and information on some 40,000 parcels is due to be delivered in the next month or so.

For the full development of GELIS, the data capture and conversion component will form a very sizeable part of the project and should not be underestimated. The work currently being carried out will enable the extent of the remaining tasks to be assessed accurately so that detailed and realistic plans can be developed for the future. This will ensure the most efficient means of data capture are employed for different data sources and ensure the maximum benefit from future budgets for completing the data capture tasks.

As already indicated one of the most important elements in the current GELIS activities is the knowledge transfer and capacity building; it is this element that will ensure the long term future for the GELIS developments and its role as a major component of Ghana's spatial data infrastructure. This involves all aspects from software development, through the hardware build and maintenance to the successful capture and conversion of all relevant data types within the LC, and its component parts. For example, part of the current activity has been to involve LC staff in the document scanning, digitising and data capture processes, alongside the local GELIS project technicians so that they gain experience of these tasks which can be passed on to other LC staff as part of the GELIS roll-out process.

## **8. GELIS PROGRESS**

As indicated earlier, the current activity on GELIS is reduced from the original scope and requirements in order to fit in with the budget and time restrictions applicable at the end of the LAP-2 project cycle. This has meant that the current activity has had to focus on specific functional elements of the software and shortened programme of data capture and conversion; the data capture and to some extent the software

development are therefore more of a pilot implementation than originally envisaged for GELIS at this stage in its development. The main elements of the GELIS software functionality and those not included in the current GELIS project are indicated in Table 1.

The result of budget constraints is that only about 60 per cent of the originally envisaged software functionality is currently included within the active GELIS programme. The excluded elements such as, for example, the Valuation Register sub-system and the Rent Collection and Management Sub-system (as indicated in the table) are both vital components for a fully-developed GELIS but have, for the moment, been left out of the development process. It is envisaged that they will be developed in the future and an important aspect of the current development is that it must ensure that no constraints to the future requirements are introduced under the current GELIS build.

The development of these essential components began in the middle of 2016. There have inevitably been some delays in capture of the detailed requirements and preparation of the required hardware infrastructure, for such a complex information management system. The go-live of GELIS is now anticipated for mid-2017, followed by user training with initial roll-out to selected regions (as listed below under data capture) to be completed in the following two months.

The data capture and conversion element of the current project has been reduced to around 10 per cent of that originally planned, and is primarily focused on parts of Greater Accra. It is also essential that there is some visibility of the aims and objectives of GELIS outside Accra and so there is some data capture underway for Koforidua (Eastern Region), Sekondi-Takoradi (Western Region), Tamale (Northern Region), Bolgatanga (Upper East Region), Savelugu (Northern Region) and Tema (Greater Accra Region). At this level, the activity is most accurately described as a pilot; however the value of such a pilot is developing the methodologies and identifying the important issues including training and knowledge transfer elements, so that once full production can be initiated the problems likely to be encountered are much better understood and much more accurate future schedules can be achieved.

Within the curtailed programme the time constraint has become much more significant, as in a two-year programme (as originally planned) there is usually scope for recovering from setbacks and unplanned events such as power outages or unexpected issues in the data capture process. The current GELIS schedule leaves very little room for manoeuvre whilst trying to maintain the project timelines; whether it is related to the contractor adapting to setbacks or whether it is the stakeholders adapting to and absorbing the impacts of change and knowledge transfer. In such circumstances it is essential for all parties to be flexible in their approach so that the maximum can be achieved in the time available. This is, for example, apparent with LC's development of the Client Service and Access Units (CSAU) software which

progressed significantly in the period before GELIS got underway; GELIS is therefore adapted to leverage benefits from integrating with the CSAU application.

## **9. GELIS AS A COMPONENT OF NSDI**

The ultimate goal is that GELIS will eventually present a complete, self-updating, efficient, transparent and accessible One-Stop Shop for all stakeholders including the general public, irrespective of where they are and what language or alphabet system they use. The design concept is the GELIS will form a vital part of the Ghana's National Spatial Data Infrastructure. The project has already made significant progress in this regard.

As international consultants with experience of several different developments, it is our (Airbus) understanding that in many countries there is usually a reluctance to share data, to part with information and data that is seen as the property of the "owner" organisation, even though the "owner" is in fact the government and, ultimately therefore, the citizens themselves. The requirements of GELIS necessitate the loading and access of data sets across multiple stakeholders and these include those vital to the successful operation of the One-Stop Shop principle.

An important dataset in his regard is, for example, the data held by Town and Country Planning Department managed and accessed through LUPMIS. Together with the other datasets which will be held and managed within GELIS, it is our view that the concept of an NSDI for Ghana can, with careful development, management, discussion and agreements on data sharing, and, not forgetting the political aspects, become a reality accepted by the broad base of geospatial stakeholders in Ghana.

## **10. THE WAY FORWARD**

The National Geospatial Policy is moving towards implementation and setting the scene for a much wider use of digital technology across a range of Ministries, Departments and Agencies and the build-up of a spatial data infrastructure based on accurate, tested and, hopefully, widely available datasets. It will be the conduit for linking together many of the projects developed under LAP-2 and also, as already stated, many of the future initiatives and projects being planned. However there is also a clear need to demonstrate as quickly as possible a successful application, that sharing data leads to greater efficiency. GELIS, despite its currently restricted scope can provide that successful application. It is being built in such a way as to be not only a pilot of the means of implementing a system for managing land administration data, it is also conceived, designed and implemented in such a way as to be fully in tune with the national policy and the ultimate goals of achieving an NSDI. Reference has already been made to the development towards an NSDI in the first part of this paper and the support from the office of the

Vice President to encourage cooperation and data sharing. Therefore the signs are there that significant progress is being made.

## **11. CONCLUSIONS**

The development of the National Geospatial Policy, within LAP-2, has the potential for a very positive impact upon the implementation and uptake of GELIS as it has put the use of the technology at the forefront of discussions about how to use digital data and how to share its benefits across a wide range of stakeholders through potential applications and improvements to business-as-usual activities. Although the implementation of GELIS is still at a very early stage, and has occurred much later in LAP-2 than originally planned, it will serve as the pilot for more detailed development and expansion as further resources become available and the main LC stakeholders demonstrate that it has benefits for managing the land and access to land and markets, and, consequently brings significant benefits to all citizens of Ghana. At this time the adoption of the policy and the fledgling implementation of GELIS will impact upon other initiatives and therefore act as a “beacon and way forward” for future strategies.

Application level	Brief description	Remarks
User Management	The User Management sub-system will manage and control all users and roles in GELIS, ensuring only applicable functionality to authorised roles and managing roles for users. In tandem with the security sub-system there will be a Single Sign On (SSO) facility so that users can use all relevant modules without having to log-on several times in a session.	This sub-system is <b><u>essential</u></b> and is being implemented fully, as specified in the Bidding Document
Case Management	The Case Management sub-system will manage and control all cases in GELIS with respect to workflow management, definition of processes in the workflow, and allocation of persons in order to accomplish the case.	The Case Management Sub-system will <b><u>not</u></b> be implemented fully. The existing CSAU software tracks/manages cases at the “front office”, and limited “back office”, which can be integrated / linked to GELIS.
Register of Spatial Objects	The Register of Spatial Objects is a sub-system that administers the data on geographical objects, cadastre and background maps, in an interoperable way with the other sub-systems/modules using WMS/WFS. The sub-system will manage the geographical, technical and topological information about GELIS cadastral objects, and, will use services to access related information managed by other sub-systems, such as Case, Address, Party (Transactor) and Document. The loading and updating of background maps will also be managed by this sub-system.	This sub-system is <b><u>essential</u></b> and is being implemented fully, as specified in the Bidding Document
Register of Parties	The Register of Parties sub-system will manage data of actual and legal bodies, clients and holders of various rights recorded in the Legal Register of Rights. In order to update persons’ data the GELIS system may in future access external registers, such as the planned ID card system in Ghana and the TIN register.	This is implemented in part in the CSAU software that will be leveraged in the development of GELIS. Current task is to check its completeness and apportion responsibility for integration and maintenance

Application level	Brief description	Remarks
Document Management	The Document Management sub-system will be used for searching, retrieving, viewing and printing documents, as well as providing the possibility of editing metadata and properties of the actual documents. All registered and supporting documents must be searchable from the document archive by specifying metadata elements or by document ID linked to cases, parties or parcels, etc. Searching for documents shall also be possible from all systems by search in documents metadata, and from the search list, selection of actual documents.	The current CSAU software lacks this subcomponent and therefore it is <b>essential</b> and is being implemented fully, as specified in the Bidding Document
Legal Register of Rights	The Legal Register of Rights sub-system shall store and manage the data on property rights, encumbrances, responsibilities and restrictions, etc., and shall be able to communicate with the other sub-systems using web-services to access related data, for example: Case management; Document; Party; and Address	This sub-system is <b>essential</b> and is being implemented fully, as specified in the Bidding Document
Valuation Register	The Valuation Register sub-system manages all information about values and taxes of the properties and real estate objects. In addition to the data managed in GELIS, a database of calculation parameters must be included in GELIS.	Even though data for the Valuation sub-system will be captured, this subsystem will <b>not</b> be operationalised under the current development
Rent Collection and Management	The Rent Collection and Management Sub-system manages tasks regarding collection of rent on leases (or sub-leases, known as assignments) of Government and stool lands.	Even though data for the Rent collection and Management sub-system will be captured in the GELIS, the subsystem will <b>not</b> be fully operationalised under the current development.
Web portal	<p>The Web portal - is a website consisting of two parts; Intranet for internal use by LC staff and Internet for external users such as police, attorneys and banks, as well as citizens of Ghana.</p> <p>The Web portal shall serve the possibility of printing cadastral certificates and other cadastral information based on user role.</p> <p>Digital notifications to property owners and others</p>	<p>This is an important element of GELIS as it involves the public and inter-use of data from different offices.</p> <p>However, the complexity of this component may be significantly reduced as it is not essential for operation of current main activities.</p>

Application level	Brief description	Remarks
	affected by cadastral cases will, in the future, be notified via electronic services such as e-mail, SMS or by the web portal.	It will be built on in later phases.
Address Register	<p>The Address Register sub-system will manage administrative units, street lines, address points and data for addresses. The capture of national street names and property numbers is ongoing with the SNPA.</p> <p>GELIS will include an Address Management Module to permit imports, updates and searches by Address, as well as maintenance of their own customer's addresses.</p>	<p>This subsystem will be external to the GELIS.</p> <p>The LUPMIS has a full subsystem, which will eventually be integrated into the GELIS</p>
Supporting level	Brief description	
Security	The Security sub-system shall provide functionality for single sign on, users' rights, password registry, etc., for all users of GELIS. The sub-system must also be available for all other sub-systems to check for authorisation roles and rights in the system.	This sub-system is <b><u>essential</u></b> and is being implemented fully, as specified in the Bidding Document
Reports/Statistics	<p>The Reports/Statistics sub-system/module will monitor and generate reports on the status of case handling procedures.</p> <p>Statistics must include, for example:</p> <ul style="list-style-type: none"> <li>- Cases within deadline or out of deadline</li> <li>- Trends in time scale, in regional/district offices</li> <li>- Entered applications according to case types;</li> <li>- Number of applications compared with the number of staff in each regional office;</li> <li>- Number of different services subject to fee; number of services free of charge, etc.</li> </ul>	Since not all reports and statistics are essential for operation of the system, the list of specific reports and choose will be prioritised according to those needed now with others left for development/integration in the future
Classifiers	The Classifiers sub-system is a system-wide code dictionary that will provide convenient services to access/insert/deactivate codes in the GELIS dictionary. It will manage the history of the classifiers as well; providing access to current and previously used classifiers and codes. Most of code-lists which are used	This sub-system is <b><u>essential</u></b> and is being implemented fully, as specified in the Bidding Document

Application level	Brief description	Remarks
	in the other sub-systems will be managed by the Classifiers sub-system, accessible by web services.	
Operation level	Brief description	
Enterprise Service Bus (ESB)	The ESB is a software architecture model used for designing and implementing the interaction and communication between mutually interacting software applications in service-oriented architecture. A light-weight ESB must be implemented as part of the system to ensure future linkages and easier incorporation of new services.	The full “Enterprise Service Bus” need not be implemented, but there are some “service oriented architecture” requirements, which should remain.

Table 2: Priorities for GELIS development  
(Source: LAP-2 Project Management Unit, 2016)

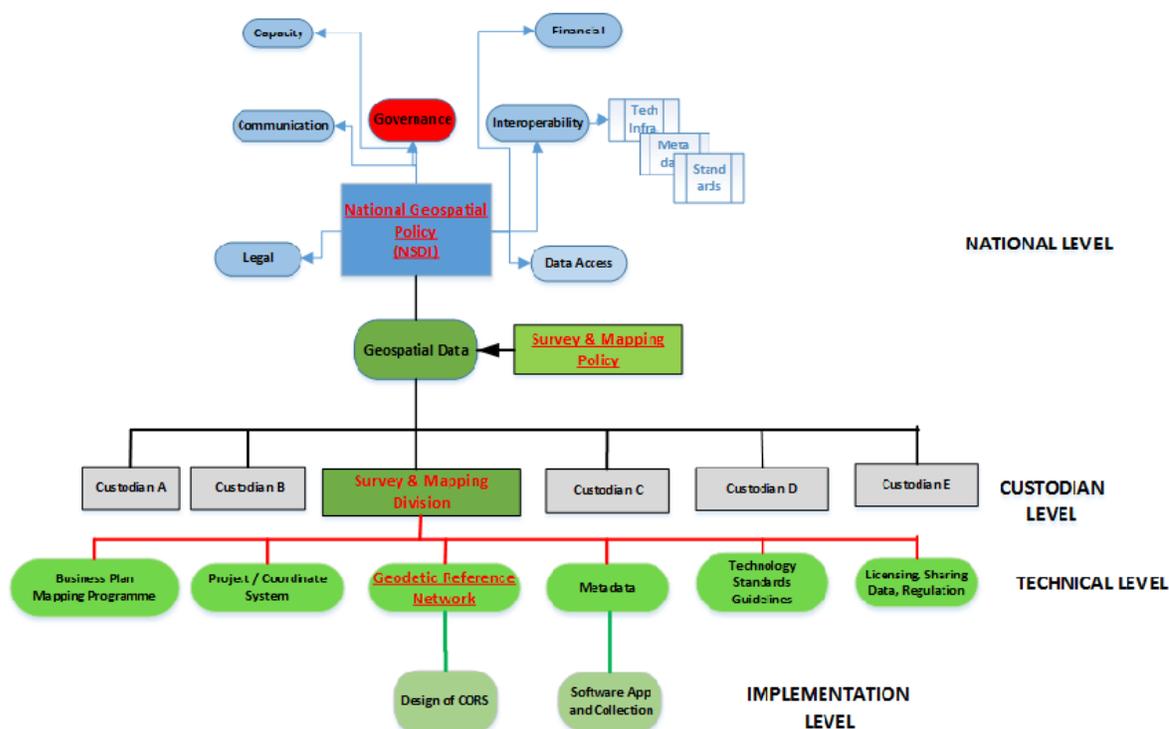


Figure 1 The hierarchy of policies and implemented projects  
(Source: Consultancy Service for the Development of National Geospatial Policy, Final Report, Airbus, 2016)

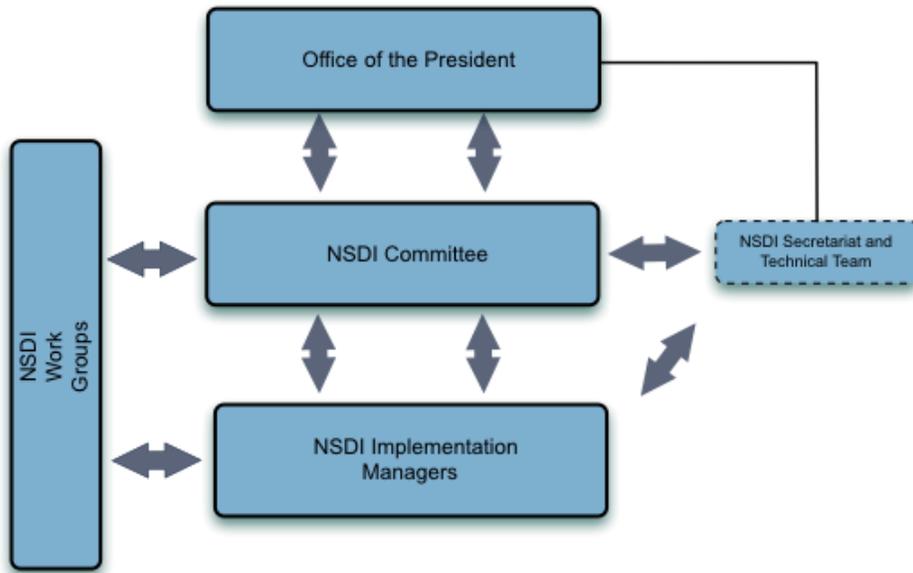


Figure 2 Proposed organisational and administrative structure  
 (Source: Consultancy Service for the Development of National Geospatial Policy,  
 Final Report, Airbus, 2016)

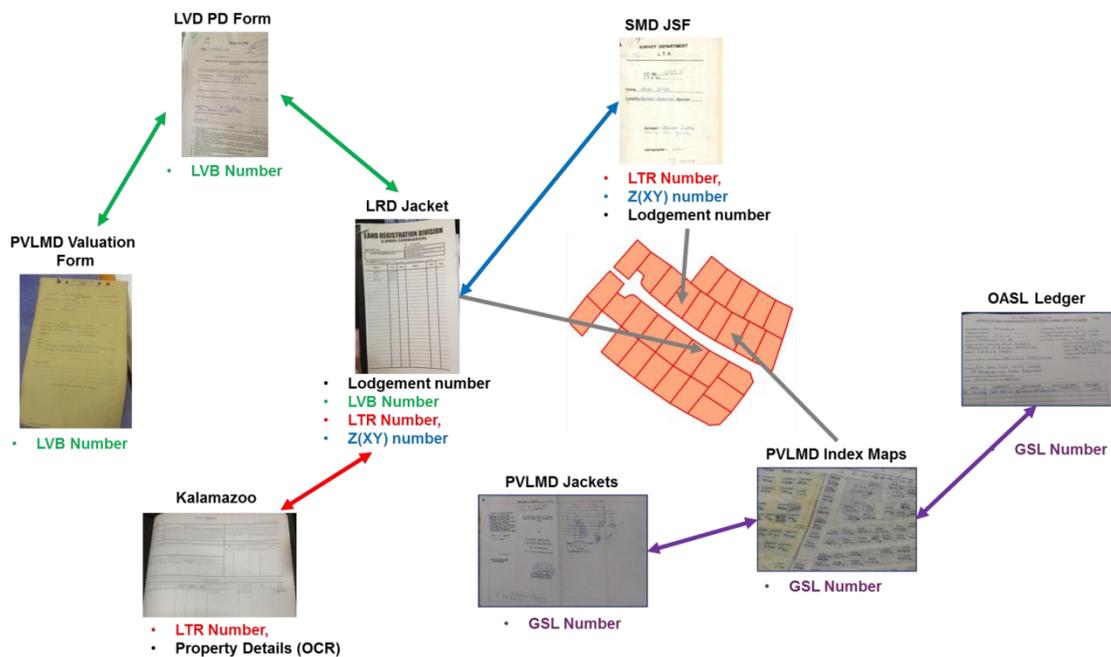


Figure 3 Documents for data capture  
 (Source: GELIS Development working document, Airbus, 2016)