

# **Abuja Geographic Information Systems (AGIS) as a Tool for Good Governance in Nigeria**

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**Key words:** Land Administration, Good Governance

## **SUMMARY**

Abuja (FCT) covers a total land area approximately 7,315 sq. km. This makes it more than twice the area of Lagos State. According to the Aguda panel, this vast area was considered necessary in order to allow room not just for the capital city but also for a city region that will provide most of the needs of the city, including water, forestry, industrial, agricultural, open spaces, defence, air transport and other needs. As at now, the Federal Capital City (FCC) is planned to cover an area of about 250 sq. kms, while the rest of the Territory of the city region covers about 7,065 sq kms.

Land Administration in Abuja includes processes of land registration, cadastre, valuation and land inventory. Every country in the world pursues these activities in one form or another. Whatever the stage of development is, technology plays a role in executing these tasks. Developing countries particularly, Nigeria is challenged by the poor land management and administration, and aim at enhancing these services in the provision of relevant land information as support to good governance.

Traditional approaches to land administration result in design and implementation projects that take a long time. However, the introduction of innovative technology such as GIS has been playing a leading role. Land Administration includes processes of land registration, cadastre, valuation and land inventory. Every country in the world pursues these activities in one form or another. Whatever the stage of development is, modern technology plays a role in executing these tasks. The Abuja Geographic Information Systems offers a very challenging and unique opportunity to reverse the unused and untapped opportunities in Nigeria by providing the faces of modern land administration systems such as scientific which include concepts, methodology and model and operational which involve the management, governance, and operations.

This paper will look into the scientific and operational approaches adopted in the development of the Abuja Geographic Information Systems.

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## **1. INTRODUCTION**

Manual record-keeping has been in use by Land related Departments of the Ministry of the Federal Capital Territory (MFCT) and the Federal Capital Development Authority (FCDA) since the inception of the Federal Capital Territory almost 30 years ago. The city and its surrounding have been expanding rapidly beyond projections. With this rapid expansion, manual record-keeping became inefficient, time-consuming and prone to abuses. Several unsuccessful attempts were made in the past to solve the problems. The attempt failed because of the gross under estimation of the gravity of the problems and the ill-defined scope of the project. The primary reason that has hindered the computerization of the Cadastral and Land Registry records in the past is lack of a strong political will on the part of the authority.

## **2. EVOLUTION OF AGIS**

The President of the Federal Republic of Nigeria shortly after assuming office in 1999, directed for the computerization of all Land Operations at the Federal Level. The decision of the Mr. President is informed by: Society's changing priorities, Globalization and Information technology revolution. Nigeria is divided into 36 States and the Federal Capital Territory. Land Operations at the Federal Level in Nigeria are being coordinated by two major Federal Ministries namely: Federal Ministry of Housing and Urban Development and Ministry of the Federal Capital Territory (MFCT).

Federal Ministry of Housing and Urban Development is responsible for the management of all land belonging to the Federal Government of Nigeria in all the 36 States of the Federation while The Ministry of the Federal Capital Territory (MFCT) is responsible for all land belonging to the Federal Government of Nigeria in the Federal Capital Territory only.

Following the President Order for the computerisation of all Federal Government Lands Records which should include and not limited to the following:

- The accurate compilation of personal data of applicants for Land
- Storage and retrieval of cadastral information on Layouts
- Security and Control of access to confidential land information management data such as Acquisitions, Assessments, Allocations Valuations, Consents, Assignments and Registration of land related matters.

Therefore, the computerisation of the Land records in the Federal Ministry of Housing and Urban Development is tagged “FELIS” that is Federal Land Information Systems while the computerisation of the Land records in The Ministry of the Federal Capital Territory (MFCT) is named “AGIS” that is Abuja Geographic Information Systems. This gave birth to Abuja Geographic Information Systems (AGIS).

### **3. COMPONENTS OF AGIS**

Land administration is about translating the relationship between humankind and land into the formal processes of administration in society. The AGIS has two components Geographic Information Systems (GIS) and Land Information Systems (LIS). The GIS is the graphic aspect, where all cadastral information such as the master plan, land use plans, detailed site development plans, engineering infrastructure and all survey information are captured and stored in digital form. The LIS constitute the land attributes such as records of allocation, (name of allottees, plot numbers, plot sizes, uses and locations). It also includes records of all transactions such as power of attorney, deed of assignment, Mortgages, Subleases, Releases, devolution, etc.

The mission of the project is to provide a comprehensive, all-inclusive, foolproof and state-of-the-art computerized geospatial data infrastructure for the Federal Capital Territory Abuja Nigeria. The Abuja Geographic Information Systems Project is the process of developing a comprehensive land policy for Nigeria in a systematic to reduce poverty and enhance economic and social growth by improving security of tenure simplifying the process of acquiring land by the public, developing land market and fostering prudent land management by establishing efficient system of and administration.

### **4. THE AGIS PROGRAMME**

Land management differs widely between countries. Within this country context, the land management activities can be described by three components in support of sustainable development.

- Land policies are part of the national policies on promoting objectives such as economic development, social justice, equity and political stability. Relates to security of tenure, efficient land markets, real property taxation, land use control, environmental management etc.
- The operational component of the land management paradigm is the range of land administration functions that ensure proper management of rights, restrictions and responsibilities.
- The land administration functions are based on and facilitated by land information infrastructures that provide complete and up-to-date information about the built and natural environment.

In Abuja, land allocation within the territory is based on the provisions of the Land Use and FCT Acts. This is carried out by the Ministry of the Federal Capital Territory on the recommendation of the Department of Land, Planning and Survey. The Ministry of the Federal Capital Territory initiated the computerization of its cadastral and land registry and established Abuja Geographical Information System (AGIS) to sanitise land administration system in the FCT. Applications for Statutory Right of Occupancy within the Territory must be made to the Abuja Geographic Information System (AGIS) prescribed application form.

In Abuja like any other city, land administration is the process of determining, recording, and disseminating of information about ownership, value and use of land when implementing land management policies. Therefore, the land administration programme includes:

- Faster updating and presentation of data (Spatial & Non-spatial)
- Planning of revenue generation.
- Land acquisition and development.
- Development of existing and planning of new structures.
- Allocation of land for different uses like residential, commercial, industrial, etc.
- Generating of reports for higher officials / management with adequate maps.
- Generating a component for NSDI.

AGIS is an integral part of planning and implementing the vision of the city of Abuja and thus has strategic value. Building corporate spatial databases results in improved decision-making, operational efficiency and reduced duplication. AGIS is committed to managing spatial information as a corporate resource that contributes directly to accomplishing the goals and objectives of the city.

The AGIS consists of three major components, namely: Data capture and maintenance, System administration and development and the customer services. The implementation of the AGIS for land administration in Abuja can be considered under the two major approaches; namely the scientific approach and the operational approach.

#### **4.1 Scientific Approach**

Due to the unique nature of incorporating GIS into the land administration processes and the lack of familiarity with GIS, it became vital to establish a format in which to follow during the development process. Therefore, the framework of developing, designing, and implementing the AGIS followed an adapted subcomponent of GIS acquisition stages. These stages include:

- concepts
- models
- methodology

#### 4.1.1 Concepts

AGIS is a system for land and property management, registration and taxation. Based on Geographical information System (GIS), AGIS is planned to register land properties, owners, land and property transactions and taxes assigned and paid. The system is being used as a tool for governments and other authorities for the purpose of increasing revenue and tax revenue planning and collection. Additional System features include data storage, information management, quick and easy data access, as well as retrieval of Statistical data and updated reports from the office and from the field. The overall goal of this project was to design a GIS to facilitate the land administration process such as:

##### **Land Valuation**

- Determining values, objectives and the legal framework in relation to management of land as a legal, economic, and physical object.
- Basis for building sound land administration infrastructures.

##### **Cadastral Systems**

- Identification of land parcels and securing land rights
- Facilitate land registration, land valuation, and land-use control
- Underpin sound Land Administration

##### **Land Administration Systems**

- Administration of land tenure, land value, land-use, and land development
- Facilitate efficient land markets and effective land-use management
- Underpin sound Land Management

##### **Land Management**

- Management of processes by which land resources are put into good effect.
- Facilitates economic, social, environmental sustainability
- Underpins and implements sound Land Policies

#### 4.1.2 Methodology

By virtue of the stated mission of AGIS, the sheer enormous size of the large volume of records which consist mainly of:

- Compilation of personal data of applicants for Land
- Storage and retrieval of cadastral information on Layouts;
- Security and control of access to confidential land information management data, such as acquisition, assessments, allocations, valuations, consents, assignments and
- Registration of land related matters.

To put these lands and survey records archival system in digital form, it is worth considering the technical requirements to convert these records and create an automated archival system that would facilitate easy retrievals of any of the records when needed, including the ability to cope with:

1. large amounts of data
2. access by many users at the same time
3. access by many different applications at the same time
4. changes imposed by the Federal Ministry Housing and Urban Development business requirements
5. use of information technology
6. the dependable storage, maintenance, control and protection of the Lands Archival Systems.

Therefore, the development of the AGIS, the basic GIS development life cycles adopted is: awareness, feasibility, design, development, and production.

### **Awareness**

The awareness process begins with research into the availability of technology in the area of hardware and software. Several people may become interested in the developments and advances in the area of GIS. A project manager is identified within the corporation that will pursue implementation of the technology. The project manager is identified out of a perceived need to automate the graphical data in order to provide better accessibility to the tabular data. The project manager is aware with and understands the conceptual as well as the technological aspects of implementing a GIS.

### **Feasibility**

The feasibility study was initiated with the AGIS mission statement. The mission statement was stated with a purpose and measurable, attainable goals. Thereafter, a detailed needs assessment was thereafter carried out. The aim of this stage is to establish current map usage and to determine user requirements for digital mapping systems and database design. This phase exposed:

- What maps are being held and for what purpose
- Frequency of access and time to locate maps
- What kind of information is shown on the maps and how they are depicted
- What changes are made to the maps and at what frequency; how, why and where copies are taken, including volume, material used and sizes; time taken to produce copies; cost of map use
- Where are maps received from and sent to, and
- What map scales are available

### **Design**

The aim of this stage was to produce a detailed and rigorous specification of system requirements and to provide sufficient detail for the logical design of the GIS system. The results of the previous phases provided the inputs to requirements specification. The design phase was the engine room of AGIS Life Cycle, because it marked the point at which the authority moved firmly from investigation and analysis to specification and design using GIS standard techniques.

## Development

This stage included the efforts such as: allocation of all tools and resources required for the successful completion of the project. The aim of this stage was to provide in detail the question of how the GIS system was to be implemented both in terms of the technical environment in which it was to be operated, and the development approach used to build it.

### 4.1.3 Models

AGIS stores information about the Abuja as a collection of thematic layers that can be linked together by geography. The basic data types in the AGIS reflects traditional data found on a map. Accordingly, AGIS technology utilizes two basic types of data.

**Spatial data** These are describes the absolute and relative location of geographic features.

**Attribute data** describes characteristics of the spatial features. These characteristics can be quantitative and/or qualitative in nature. Attribute data is often referred to as tabular data.

#### **Spatial Data Models**

The AGIS spatial data has been stored and presented in the form of a map. Three basic types of spatial data models have evolved for storing geographic data digitally are:

- Vector
- Raster
- Image

#### **Vector Data Formats**

All spatial data models are approaches for storing the spatial location of geographic features in a database. Vector storage implies the use of vectors (directional lines) to represent a geographic feature.

#### **Raster Data Formats**

Raster data models incorporate the use of a *grid-cell* data structure where the geographic area is divided into cells identified by row and column. This data structure is commonly called *raster*. While the term raster implies a regularly spaced grid other *tessellated* data structures do exist in grid based GIS systems. In particular, the quadtree data structure has found some acceptance as an alternative raster data model.

#### **Tabular Model**

The simple tabular model stores attribute data as sequential data files with fixed formats (or comma delimited for ASCII data), for the location of attribute values in a predefined record structure.

AGIS data model saves and files the land data in a convenient, quick and simple form. The land data, constructed from the survey plans, drawing and the textual data, is kept in a central database connected to the Internet which provides immediate access to data from every computer on which the system is installed, including field access using lap-top or PDA.

## 4.2 Operational Approaches

- management
- e governance
- operations

### 4.2.1 Management

GIS Management strategies are broad categories of action that are identified for the successful management the AGIS in order to accomplish the desired objectives. The list below summarizes identified GIS management strategies.

**Hardware:** Selection of open architecture system

**Software:** Selection of GIS software packages with flexibility in data entry, data processing, database management, database analysis and manipulation, and cartographic display and reporting.

**Network:** Designing an interconnected and efficient communications local network, which provides connectivity for a heterogeneous mixture of databases, hardware, and operating systems, and provides for transparent access to data regardless of format and location.

**Database:** Designing accurate personal data of shared, geographic/land database that is centralised for client server access where desired, distributed where desired, accessible from multiple hardware platforms, and managed by data stewards. Base map data standard implementation using Oracle.

**Personnel:** Provision and coordination of training on the use of AGIS.

Consequently, the AGIS is based on worldwide leading technology in client server configuration. It provides a centralised GIS service and maintains the core or corporate data for the Federal Capital Territory. The GIS database resides on an SQL server (RDBMS) which allows for multi-user access. Data capture and manipulation is executed at GIS workstations using ArcGIS 9.0 software. The system is based on a three-layer module:

1. Client
2. Application Server
3. Server database

**Client side** – The client uses a ArcGIS which combines AutoCAD MAP drawing environment, connected directly to an ORACLE database, and receives the data and presents it in the original AutoCAD files format.

**Application Server** – The system employs an ORACLE type database that contains both the alphanumeric data and the geographical data – the map. The storage of geographic data in a database proves a substantial advantage in both traffic time and quality of received data.

**Server Database** – AGIS intends to utilize the Internet for the transmission of information to allow computerized access to data from anywhere in the world. This technology would allow direct access to field data via a computer on the Internet.

#### 4.2.2 e governance

e-Governance is about change of mind set: doing things differently and effectively - and with results. The concept of the Geospatial One Stop is a major product delivery for AGIS which will require that the data adhere to certain standards with the National Spatial Data Infrastructure's (NSDI) framework. The National Spatial Data Infrastructure's standard is consistent with ISO Geographic Information – Schema for coverages geometry and functions and the Open GIS Abstract Specification for Coverage Type and its Subtypes. The standard includes a conceptual schema expressed in the Unified Modeling Language (UML) according to ISO 19109 – Rules for Application Schema. The conceptual schema conforms to the ISO 19109 normative references and documentation of all features, attributes, and relationship definitions. This standard identifies the content model elements required for digital elevation data to be used for the Geospatial One Stop. However, this area is still being carefully considered by the Space Research Development Agency as part of the National Geospatial Development Strategy.

#### 4.2.3 Operations

One of the thrust of the AGIS is to promote good governance, having identified by the Government that bad governance is one of the root causes of all evil within our societies. The concept of "governance" is not new. It is as old as human civilization. Simply put "governance" means: **the process of decision-making and the process by which decisions are implemented (or not implemented)**. Governance can be used in several contexts such as corporate governance, international governance, national governance and local governance.

Since governance is the process of decision-making and the process by which decisions are implemented, therefore, the AGIS focuses on the formal and informal actors in land administration processes which involve decision-making and implementing the decisions made and the formal and informal structures that have been set in place to arrive at and implement the decision.

Consequently, AGIS as a tool for Good governance has 8 major characteristics. It is participatory, consensus oriented, accountable, transparent, responsive, effective and efficient, equitable and inclusive and follows the rule of law. It assures that corruption is minimized, the views of minorities are taken into account and that the voices of the most vulnerable in society are heard in decision-making. It is also responsive to the present and future needs of society.

## **5. GAINS OF THE AGIS EXERCISE**

Computerization of Cadastral and Land Registry for Phase I and II of the Federal Capital Territory Completed The Computerization of Cadastral and Land Registry for Phase I and II of the Federal Capital Territory has been completed. The project was executed under a Taskforce. The Taskforce worked round the clock to capture land records and even conducted a house-to-house field verification. One of the highlights of the work was the taking of photograph of each building in Phase I. The computerization was conducted under the platform of a Geographic Information Systems (GIS). The GIS is a combination of land information and map.

That means land attributes such as location, size, and use can be spatially visualized and analyzed. The completion of the computerization has now given birth to the Abuja Geographic Information Systems (AGIS), which will be responsible for developing the geospatial information infrastructure of the FCT. The Taskforce in the course of its work has discovered widespread cases of double and multiple allocation of land as well as illegal buildings on sewer and water lines. The mission of the Federal Government of Nigeria is that Abuja City will become a world-class Africa city by 2010 and some of the strategic priorities identified are:

- Economic development and job creation
- Public safety
- Service delivery excellence, customer care,
- Good governance
- Maintenance of Abuja Master Plan

In order to achieve the strategic priorities the following tasks were embarked upon:

- Conversion of Analogue Land Data into Digital
- GIS Products and Services Delivery
- Provision of Accurate and Timely information
- Abuja Technology Village (ATV)

### **5.1 Conversion of Analogue Land Data into Digital**

Apart from the establishment of AGIS, other gains of the exercise includes the conversions of over 105,701 applications for Statutory Right of Occupancy from individuals and organizations that the Ministry had received from 1980 to date. The Ministry had granted over 21,420 Certificates of Occupancy and all are captured into the new system. Out of these over 21,420 grants, over 15,000 were processed and issued Title Deed Plans (TDPs).

All the TDPs were scanned and over 70,000 Property beacons (PB) coordinates were calculated from the Survey data and the TDPs. From the above over 11,000 plots were determined and digitised covering the Federal Capital City (FCC) Phases I & II. All the existing 87 Register books and 22 Access databases from the Land Department have been

harmonized into the new system. Detailed information from available files for approvals of Building Plans were keyed in, to cover the period from 1980 to date.

## **5.2 AGIS Products And Services Delivery**

AGIS makes spatial information available by capturing, maintaining and packaging property information in various formats according to requirements. The following datasets are maintained:

### **Datasets**

- Stand and township information
- Administrative boundaries
- Road centerlines
- Street addresses
- Zoning information
- Proposed townships
- Topographical information (e.g. rivers, contours)
- Satellite Imagery
- Points of interest (e.g. schools, clinics, shopping centers, police stations, etc.)

### **Products include:**

- Standard maps
- Customized maps
- Digital data (e.g. dxf/shape files, interactive map products, population atlas, zoning CD)
- Property information (e.g. zoning, building line restrictions, etc.)

## **5.3 Provision of Accurate and Timely information**

Data standards and revised operational processes have been implemented to ensure the flow and sharing of information between internal departments and external institutions. A standard codes and forms have been designed as field instruments for data capture and maintenance. The integration of these systems is in progress; additionally, an electronic customer database (ECD) has also been created. Therefore, the AGIS offers valuable improvements to land/property registration of the FCT and the following benefits are now being enjoyed:

1. Speed of response increased
2. Improvement in Land Security
3. Reduction in the falsification of land documents
4. Physical reorganization/repair of land documents
5. Permits more secure property registration
6. Rationalization of Land Administration processes
7. Contribution to the infrastructure improvement
8. Increased revenues
9. Ability to have substantial projected income generation and the cash flow related to land properties.
10. AGIS provides a first class tool for advanced planning and management of lands

11. In general, the implementation of AGIS, boosted the country's economy.

#### **5.4 Abuja Technology Village (ATV)**

Following the successful operations of AGIS, and in line with the National Economic Empowerment and Development Strategy (NEEDS) together with the ensuing reforms program of the Federal Government of Nigeria, the Abuja Technology Village (ATV) has been conceptualized to establish a platform for creating a sustainable knowledge-based economy in Nigeria by actively participating in the global transformation from Information revolution to the knowledge age, which is anticipated to lead to the achievement of Nigeria's Millennium Development Goals (MDGs) of economic recovery, poverty alleviation and empowerment of the citizenry.

In actualizing the ATV concept, lessons would be drawn from similar initiatives such as Silicon Valley in the US, Dubai Internet City, International Tech Park in Bangalore and Cyberjaya in Malaysia. A common characteristic of these initiatives, which the ATV would depict in nothing short of international standards, is the cluster approach depicting a beautiful and well functioning ICT based and oriented cluster of specialist local and international companies, recreational facilities, residential complexes and other amenities.

President Olusegun Obasanjo established a cabinet committee on the ATV project under the chairmanship of the FCT Minister, with Ministers of Finance, Education, Science & Technology and the Economic Adviser to the President as members. The Cabinet Committee set-up a Technical Committee that would meet more regularly to implement its objectives. Also, an Implementation Committee was established in the FCT Minister's office to steer the project; meet weekly and provide even more regular updates on the project activities. Specifically, the Implementation Committee is mandated to ensure that at least the first phase of the ATV is developed by April 2007.

### **6. AGIS SPATIAL DATA INFRASTRUCTURE**

The mission of the project is to provide a comprehensive, all-inclusive, foolproof and state-of-the-art computerized geospatial data infrastructure for the Federal Capital Territory Abuja Nigeria. The SDI concept started with a focus on national priorities and data. It is an initiative underpins the design, implementation and maintenance of mechanisms that facilitate the sharing, access and utilisation of spatial data across different communities to better achieve their objectives. With this in mind, many States and Academia in Nigeria are beginning to develop one form of GIS to better manage and utilise their spatial data. AGIS spatial data sets include:

- Cadastral Core Data
- Street Core Data

## 6.1 Cadastral Core Data

Cadastral core data is a minimum set of attributes about land parcels that is used for publication and distribution of cadastral information by cadastral data producers. The core data is intended to provide sufficient information to support integrating basic land parcel information across jurisdictional boundaries and answering fundamental questions for business processes that need cadastral information. Therefore the Cadastral Core Data defines the minimum content for the Cadastral National Spatial Data Infrastructure (NSDI). Some of the characteristics of Cadastral Core data are:

- Attributes are as important as spatial information for decision support.
- Core data must be able to be updated
- Core data must be standardized so that information can be shared across jurisdictional boundaries.
- Core Data will provide linkages to more detailed information that can be obtained from data producers.
- Core data is defined in the context of business processes, which means that the elements in the core data have been validated as meeting business process needs, such as emergency response, locating public lands, economic development, and integrating parcel data with other themes.

## 6.2 Street Address Core Data

The core set of identification data that describes a facility and the place where it exists will include general identification data and a minimum of two types of locational data (i.e., descriptive information and spatial coordinates). This subsection provides a list of descriptive and spatial data that are used to identify and locate a facility. Mandatory core data elements for a unique identifier, general identification, and spatial coordinate data are provided.

## 7. CHALLENGES

Abuja Geographic Information Systems will help to promote economic and social development in Nigeria. This is because GIS has advanced from a “nice-to-have” to a **necessity** within the Federal Capital Territory City through the increasing utilization and demand for spatial information and services. However, the challenges facing the AGIS include:

- Capture and maintenance of datasets e.g. street addresses, cadastre, informal settlements and new satellite imagery.
- AGIS Resource management.
- Spatial information awareness for strategic decision-making.
- Managing change in terms of organizational strategies, business processes and integration of systems.
- Staying informed of the external environment regarding standards, technological developments and international events.
- Cost recovery and customer orientation

- e- conveyancing
- Resistance to change of tradition
- Resistance from those who get facilitation fees for finding deeds
- Fear of Employees losing their jobs.
- Dependent on “Local GIS Expert”

## 8. RECOMMENDATIONS

The free access site provides all the basic information and mapping functionality and is available to everyone with Internet access. The subscription site contains additional datasets such as full zoning information and high-resolution aerial photography. Recent added datasets are zoning, Valuation information, Council owned land, Strategic transportation network, Economic development nodes and inner city information.

- Develop in-country self-assessment procedures to identify institutional capacity needs
- Promote adoption of comprehensive land policies and a holistic approach to land management
- Establish a clear split of duties and responsibilities between national and local government based on the principles of good governance
- Promote the understanding of land management as a highly interdisciplinary paradigm
- Promote the need for an interdisciplinary approach to surveying education
- Establish strong professional bodies

## 9. CONCLUSION

There is an increasing awareness that land administration has a wider community and even global imperative. Linked to this trend in Abuja is the growing vision for interoperable, multi-purpose cadastres. The AGIS revolution is integral to the realization of that vision. The AGIS information revolution has considerable potential to support society’s evolving humankind/land relationship by providing information for decision makers that will enable them to make decisions favourable to sustainable development in the context of land administration and management. The AGIS is a valuable tool and powerful decision support system for the Computerisation of Land records for the following reasons:

- Effective land administration
- Efficient resource allocation for land administration
- Sustainable land development and planning
- Improved physical storage facilities for land related matters
- Automation of indexes to provide quicker document retrieval
- Computerisation of title documents to provide quicker access to land information

The establishment of AGIS implies the creation of a stronger, broader, safer and more sophisticated **Land Data Archives**.

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