Integrated Land Information System

To ensure the Transparency and Availability of Information, in context of Bangladesh

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***Abstract*—Bangladesh is a one of the most populated developing country with a very limited resource of land. This rapid increase of population is creating high pressure over land-man ratio. Due to age-old land management system, Land ownership record management system is become insufficient and till now it's incomplete in Bangladesh. Also the land administration system is known as the most corrupted sector of Bangladesh. To solve these problems, an integrated land information system is required which will ensure the transparency and availability of land related information. The infrastructure can be effective by improving the land administration, land ownership record management, registration, relocation, advance mapping, tax payment, and so on. Based on the secondary information by literature review and interview, this paper is aimed to propose few feasible strategies of LIS for an efficient and effective land information system. This paper will also focus on the present challenges of current system that are needed to be resolved.**

Keywords— Land Information System; Digital Bangladesh; GIS; Ownership change; Integrated System; Transparency

I. INTRODUCTION

Bangladesh is a South-Asian developing country and it is struggling with a large amount of population and corruption. Bangladesh is the 12 most populated country based on the population density[1]. The rapid increase of population is continuously reducing the land-man ratio of this country. (Growth rate is 1.37 [2])

Corruption has been recognized as one of the major problems. In Bangladesh, corruption has engulfed the administrative, commercial, political and also social sectors; the Land Administration System is one of them. A World Bank survey reveals that most crimes and corruption in Bangladesh take place in land-related services. The main reasons behind those corruptions are miss management of Data, lack of integration, slowness of query, Manual data management and unavailability of reliable information.

The rate of land transfer and relocation is also very high in Bangladesh. However, the unadventurous land administration system is not capable to handle this growing demand. An inadequate and improper land record is the result of years old manual system, which is enough for helping the corruption. Here the Inappropriate land administration and management system works as the catalyst. According to this manual process it may takes more than 10 years to complete a survey, which is one of the major drawback of this present system [2]. Another interesting fact is, according to the present system it may take up to 2 years to update an ownership change record from sub-register office to central data base [3].

That is why; it becomes an obligation to introduce an advance land administration and management system to conquer from this situation. Land Information System (LIS) is the most feasible systematic approach for developing an efficient land administration and management system. This paper focuses on few issues that are needed to be introduced for an efficient and effective land information system for a developing country like Bangladesh.

II. AN OVERVIEW OF PRESENT LAND ADMINISTRATION SYSTEM OF BANGLADESH

It is very difficult to manage and make rational and scientific land policy because the data are collected through many steps in conventional-manual method. Government is responsible to collect and analyze the data related to land, and develop various land policy based on them.

Government has already introduced many information technologies including GIS. The Land Management Information Systems (LMIS) Development Project had been launched in 1998 by the government to solve these problems and to improve land management system.

This projects includes of Land Survey, Preparation and Preservation of Records under Digital System (1st Phase) and 'Computerization of existing Mouza Maps and Khatians are undergoing [4].

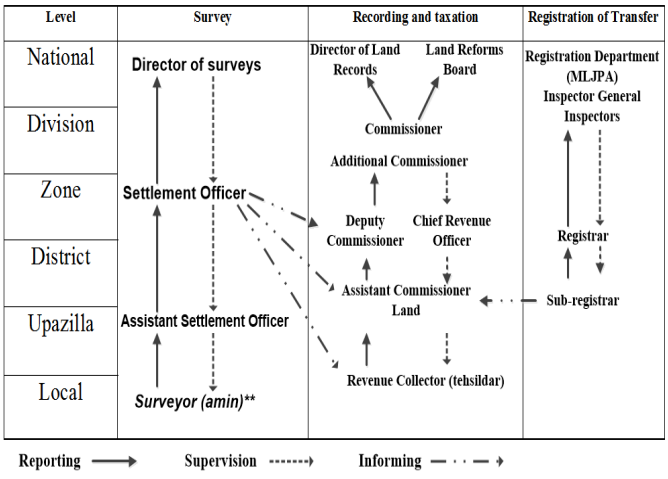

Fig. 1. Land management system of Bangladesh [3]

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To collect and maintain those information total administration are being divided into various levels.

According to the existing Administration, the ministry of land is responsible manage total system with the assistance of different agencies. There are few others agencies with more minor roles include: the Ministries of Forests and Fisheries; the Directorate of Housing and Settlement; and the Department of Roads and Railways and so on [5].

The land survey process is referred to as land settlement and is administered by the Directorate of Land Records and Surveys (DLRS). It may take more than 10 years to complete the total survey! Here the settlement is seen as a temporary process where only certain parts of the country are covered at particular points of time.

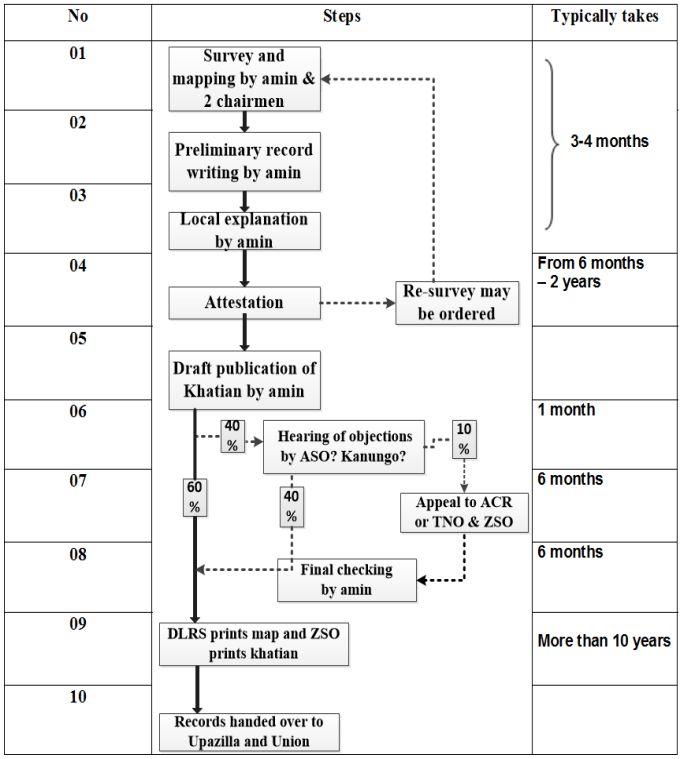

Fig. 2. The land survey process

Elsewhere nature of the survey process in individual locations is summarized in Figure 2.

The present manual procedure of ownership change and updating can be proved as problematic. Land records could be updated:

- As a result of surveys;
- Via the sub-registrar; and
- Through inheritance.

Figure 3 shows the ownership change process via sell. But the reality differs from this scenario. Some transfers occur on an entirely unofficial basis, perhaps when land is mortgaged.

Some buyers do not try to check the AC records first and even if they do, these records may not be up to date. The AC (Land) generally does not update the record unless first paid a bribe to do so.

The deed writers and Sub-Registrar collude to ensure that this step only proceeds if a bribe is paid first, whilst the buyer and seller may also collude to reduce the amount of Immovable Property Transfer Tax (IPTT), which is levied at 10% of the sale value [6].

There is no requirement to check the legality of the transaction and it is not uncommon for the same plot to be "sold" to several different buyers, although this is much more frequent in urban areas [6].

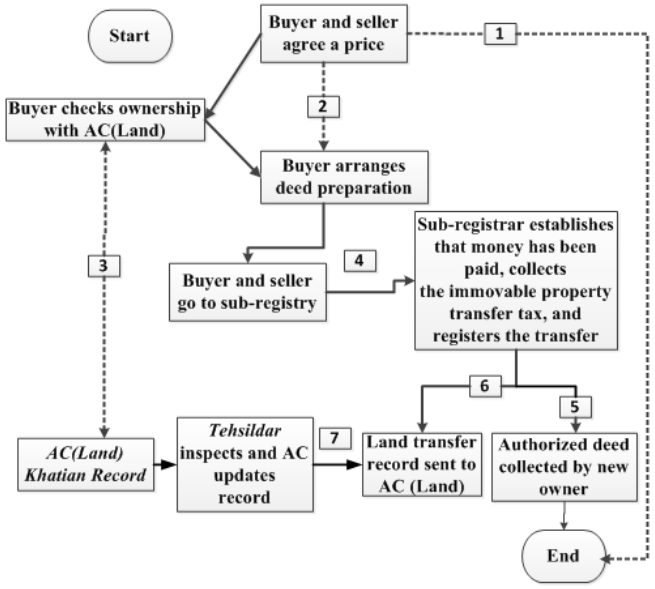

Fig. 3. Land transfer procedure through sale

III. INTEGRATED LAND INFORMATION SYSTEM

Land administration and management, planning of utility services and other services could be improved by this integrated land information system (LIS). This system include GIS that is a vital concept, which is related to positioning of land, land size and orientation, land ownership, land use etc.

This is a large and complicated system to serve general people, public and private organizations those are related with land administration and management, land development and other land related services.

Government of Bangladesh has already initiates about the Land Information System. But there are few more scopes to improve the overall system [5].

A. Advance Mapping

The earlier mentioned system depend a manually designed cadastral map, where each and every data is precisely described.

Satellite navigation systems or Global Positioning system (GPS) could be used for field data collection. For this, the surveyors use portable backpack or hand-held devices. They use signals from GPS satellites to work out this exact location on the earth's surface in the terms of (x, y, z) co-ordinates using trigonometry at the push of a button of the GPS receiver. Most GPS receivers store collected co-ordinates and associated attribute information in their internal memory, so they can be downloaded directly into a GIS database (Heywood, et. al. 2002).

This GIS is a method of digital (i.e., computerized) mapping that can help you where particular people, events, or conditions are located, and other information about them as well as it also links data to its geographic location. In order to ensure the proper functionality the GIS systems have some basic needs:

- Hardware with GIS software
- Accurate data, in a form that can be fed into the software program
- Trained people to use the GIS system

1. *Cadastral Data*

Cadastral data are the spatial information that represents details information about each plot containing area, usage, plot number, owner, together with location expressed in terms of mauza, upazila and district. All cadastral parcels have a unique Demarcation Number for each of them.

At present the ministry of land take several project like "Computerization of Existing Mouza Maps and Khatian Project" as the part of their Digital Land Management System' (DLMS). It will take two more years to complete by inserting 4.58 core khatian's information on the digital land information system (DLIS) [5] [7].

2. *Attribute Data*

Attribute data are additional information about geographic map, cadastral information, and other mapped features. Owner's identification, geographical characteristics, leases against the plot and many others along with Demarcation Number (identification number) are part of attributed data [5]. Attribute data are stored in a database.

Fig. 4. Map that demonsatrate the use of land

Figure 4 describes the concept of Advance mapping for land information system, where different agencies could make a series of overlapping maps or other media of information based on common identifiers.

The following parts of the paper attempts to provide some recommendations for preparing and maintaining the integrated LIS.

An advance multipurpose GIS based integrated map can provide you the scenario of lives of the people who live there, the geology or soil chemistry of the area, or the socio-economic development. By using different colors or patterns, just as they often do to distinguish between states or countries, this map may also provide different sets of information:

- Parcels map
- Geographical type of Land
- Land Owner's identification (With previous record)
- Population density
- Land usage
- Land values
- Infrastructure
- Utilities connection
- Transportation
- Forest/Vegetation
- Hydrographic Feature

These are few maps that can be created using GIS software and the appropriate data. There are few more data that might be included on this map.

- Educational status
- Economical status of a zone
- Traffic accidents (can also be differentiated by whether or not injury or death occurred)
- Incidents of violence crime (by number of incidents, and/or by type of crimes)
- Polluted groundwater
- Natural resources
- Disaster-prone areas

There are also public-domain GIS programs available free on the Internet, and smaller software manufacturers whose products or support may be best for this development.

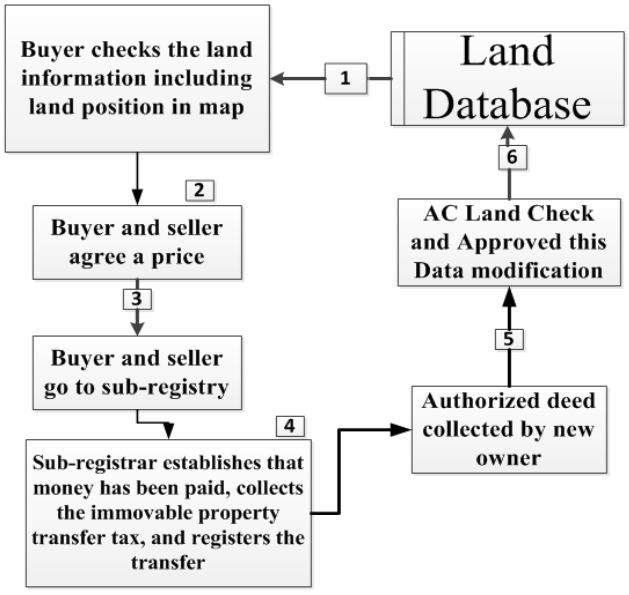

Fig. 5. Proposed ownership change process

B. *Ownership change Process*

There are various processes of ownership change. Among them sales is mostly used process. Present procedure of ownership change through sales is show in Figure 3.

Integrated Land information system will help to overcome those draw back. Figure 5 shows the proposed ownership change procedure via sales.

C. *Elimination of periodic survey*

This Integrated information system will instantly update during any changes of its records. Periodic survey will be no more require updating land information. Anyone can get updated information through advance map or simple online query.

But it will take much more time than the normal survey to collect all necessary data and to convert it into digital form, which is the primary requirement to develop this integrated land information system.

D. *Integrating Revenue Process with LIS*

Integration of LIS with National Board of Revenue (NBR) will improve the efficiency of revenue collection process. Board of revenue can easily calculate the amount of revenue of land against a national ID by utilizing the ownership record of Land. This will also include a new workflow to automate mutation process; this workflow will create a legal framework for land record updating and auditing records [8].

IV. PHASE OF IMPLEMENTATION

A. *Digitalization of data*

The first phase of this land informations system is updating all land related information through present architecture and converts all of them into digital form. Then those data could be used in this information system.

B. *System analysis and Design*

The system has to be redesigned to fulfill the goal of LIS based on the available information and administrative architecture. In this integrated system many internal and external agencies are connected through this platform. So how they will cooperate with each other and how the data will be served to the end user that should be finalize in this phase.

C. *Infratructure development*

This large and complicated information system requires proper networking all over the country, Hardware with special software. These are the primary requirement to initiate this project.

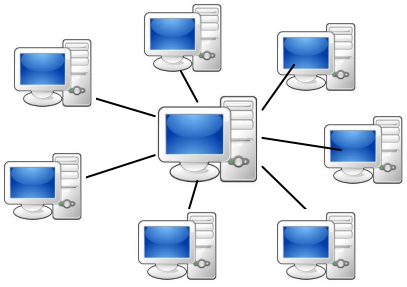

Fig. 6. Distributed Divisonal Data base

D. *Distributed data base*

This System has to satisfy thousands of queries in every second. Distributed server is the solution that will make the process faster and distribute the load of main server. The country is divided into seven Administrative Divisions: Dhaka, Chittagong, Khulna, Rajshahi, Barisal, Sylhet and Rangpur. There will be seven Divisional databases in seven Divisions and a Central database (shown in Figure 6). Local query will be satisfied from the divisional data base and each and every update will be synchronized with the central data base periodically.

E. *Open system architecture*

Governments have very diverse computer platform and they also have various usages of GIS S/W's or data. Open system architecture could provide interoperability between different computer platforms and different S/W's. It will help the government to share existing resources in this present computing environment. LIS may also provide nationwide data sharing and scaling up the governments' services [9].

V. RELATED WORKS

Most of the developed countries have already introduced LIS to maintain their land administration. Many countries in South Asia have recognized the need of the improvement for the land administration; even some of them are developing their own land administration with the help of technology.

Among them the land administration of **South Korea** had been established as early as in 1910s, during the Japanese regime adopting the title registration system. The country promulgated the Cadastral Law in 1950. Around 32 million land parcels in Korea have been computerized from 1975-1984 and 759,000 cadastral map sheets digitized between 1999 and 2003. A modern land administration system in Korea, called the Korean Land Information System (KLIS) has been developed to protect the property rights of the public by efficiently managing cadastre and registry books since late 1980s [10].

The evolution of land administration system in South Korea has coincided with the changes in the land policies from time to time, including policies on property taxation, land use planning and management, land subdivision and supply and real estate market controls and management. These changes had a direct bearing on the rapid economic development of the country, according to Prof Jiyeong Lee, University of Seoul.

Canada is the second largest country in the world, Canada has an extremely diverse and complex landmass. As a consequence, land administration in Canada is quite complex and multi-faceted and is shared between federal, provincial, municipal and aboriginal levels of government. The federal government continues to play a vital role in nation building and frontier land administration. Canada's land title and survey systems are in an evolving phase [10].

"We have recently completed a mapping project which started in 1940s. It is also focusing on land reform through First Nations lands administration renewal, integrated parcel creation processes with land use planning and land registration systems," says David Harper, Director- Geo Connections.

VI. Challenges of integrated Information System

Less developed countries have to face many manmade socio-economic obstacles than developed country. They depend on colonial system which is rudimentary and complex. This system consists of late adaption of technology, ineffective policy framework, fragmented system and mostly the Red tape. To implement this proposed system the government will face few primary obstacles and those draw backs have to overcome to ensure the efficiency and effectiveness of LIS.

A. Reorganizing the present Land Administration and flow of Information System

Land management and information system must be properly reorganized to adapt this new information technology. Land management and information system will be connected through online network. Many infrastructures, equipment, trained manpower and many others may require for supporting the new information system. The present land administration has to be reorganized to ensure the flow of information. Every updates have to be authorized by Local Land Administrator (LLA). There will be a LLA on every upozila and he will just check and approve submitted data. District Land Administrator (DLA) is responsible to change data after enquiry, if there is an appeal for it. Local Land Officer (LLO) is responsible for only data entry based on the request of land owner after processing all official steps. Many conventional processes could be eliminated through networking and data sharing.

B. Education and Training

LIS includes different types of Hardware, Software, Network, database, application, and so on. Most of them are very sensitive and require trained person to operate this. The overall success of this project depends on participation of all officials in charge of system developing, maintaining and using LIS. Proper training on various sectors will be very helpful for officials and also different educational project may also help the user to operate and get services from this LIS.

VII. Conclusion

Land administrator and management system of a country is a very complex system and time consuming. There are few challenges of implementation Integrated information and government are working on it. Land information system is a very important step that will ensure the information availability and transparency of land administration. The benefits are enormous with data sharing between different agencies, it can help in policy making decisions, prevent frauds, grow awareness of people.

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