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## Land information system in a sample ward of Kumbakonam town using GIS for decision making

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**Abstract**

LIS (Land Information System) implies that the spatially referenced land data stored in the database should be related to its ground location. In the Indian context of information system for sustainable development, the obvious choice of geographical location is the land parcel available in cadastral records. It is both easily locatable on a map and described in legal records. Such a land information system generated from the cadastral surveys will provide the information base for village level or micro level planning. The LIS will comprise of graphic elements derived from cadastral maps and non-graphic attribute data obtained from cadastral records suitably supplemented with additional information useful for planning purposes. In India, rapid urbanization is resulted due to the unprecedented population growth coupled with unplanned developmental activities. In this study, an integrated remote sensing and GIS based methodology is developed and successfully tested by generating an up to date digital database. In the present study a sample ward in Kumbakonam town has been taken with two objects of the study: To design a LIS with the details of the administrative infrastructure and attach the data base using ArcGIS module, secondly to convert the layout into different GIS layers and attach the secondary information such collected that will be used for decision making purpose. In this study ArcGIS 9.2 platform has been used to link the map and data base.

**Keywords:** ArcGIS platform, land information system, remote sensing and GIS, cadastral survey, data base

**Introduction**

LIS (Land Information System) implies that the spatially referenced land data stored in the database should be related to its ground location. In the Indian context of information system for sustainable development, the obvious choice of geographical location is the land parcel available in cadastral records. It is both easily locatable on a map and described in legal records. Such a land information system generated from the cadastral surveys will provide the information base for village level or micro level planning. The LIS will comprise of graphic elements derived from cadastral maps and non-graphic attribute data obtained from cadastral records suitably supplemented with additional information useful for planning purposes. In India, rapid urbanization is resulted due to the unprecedented population growth coupled with unplanned developmental activities. In this study, an integrated remote sensing and GIS based methodology is developed and successfully tested by generating an up to date digital database.

The data elements (Landuse/ landcover, infrastructure, drainage etc.) have both static and dynamic components; pose a formidable challenge for proper maintenance and operations in different sectors concerns. Due to development of automation in technological processes applied to data gathering, integration and processing of topographic details and their customized presentation, analysis and interpretation the challenges can be met with the help Desktop GIS system. While Geographical Information System (GIS) involves in integration of spatially referenced data in a problem-solving environment, GIS-based Land Information System (LIS) is an interactive computer-based systems that help decision makers utilize data and models to solve unstructured problems. Combining both the ideas, in the present times such powerful software technology has been developed that allows.

Amarsaikhan (1995) [1] has applied a knowledge-based approach for Land Evaluation in Mongolia, using Remote Sensing and GIS Techniques in the earth sciences is of great interest nowadays. The main aim of the research was to build a prototype geo expert system

(GES), which can be used in decision-making on the basis of the knowledge base gathered from RS and GIS experts within GIS environment. For this purpose, land evaluation for wheat suitability was performed. In the selected area, the basic object consists of the surface elements characterized by attributes some of which are unknown. They were determined by the use of RS and GIS techniques cooperating with the experts from this field.

Ly Sophea (2006) [2] has carried out the Land issues in Cambodia have been controversially confronted and held back many activities of development for a long time. To accelerate and foster the land issues more manageably and effectively with public land information display, the systems of land information will be initially needed in Cambodia. Digitally technical access to LIS with all kinds of land attributes the combinations of ArcGIS and other programs will be applicable to produce geographical information for public requirements. ArcGIS can generate the geographical information with highly accurate data and Ms Excel, Access or other programs in a set of database can produce and store text data. Technical linkages of all data can be more dynamics due to latest updateable and most flexible situation. It will be crucial and technical way of information display and dissemination in Cambodia.

Chandrasekhar Nori (2000) [3] has suggested that the present system of land records be replaced by a more comprehensive, computer based Land Information System (LIS) in Hyderabad, which will contain agricultural, soil, irrigation, demographic, climatic, and meteorological and elevation information, in addition to the graphical sketches depicting land holding, ownership related information and village maps. An LIS may be briefly defined as an on-line repository of information that enables the most efficient use of land and a system that relates macro level development programs and land use practices to the individual landholdings and their owners. It is also suggested that a single and uniform national level LIS should be evolved, so that standardization of cadastral survey methodology and maintenance and operating procedures are achieved across all States and Union Territories in the country. Such a uniform national LIS provides several additional benefits, besides serving the needs of the landowners and the Revenue Departments. Some of the major benefits like micro watershed development, agricultural monitoring and rural development are discussed in detail.

**Study Area Description**

Kumbakonam is location in Thanjavur District. It is situated 10°57" north latitudinal and 79°28" East longitudinal Extension. It has total geographical area of 12.58 sq km. It is located about 313km away from Chennai; on the south 90 kms from Tiruchirapalli District and on the east 40 kms from Thanjavur District on the North East. In 1886 a town committee was formed to administrative the Kumbakonam town, and it has celebrate its century in the year 1966. The area extent of a town was only 7.68 sq. km. in the year 1860 and the population was upgrades in to a selection grade municipality. Now Kumbakonam have been divided in to survey 45 wards and for administrative purposes.

**Problem Statement**

Creation of Geographic Information Base files of the underlying population in a town or at village level would be useful for a better administrative and distribution purpose of

a good governance. The US, UK and the Western European countries and to some extent the Gulf countries have been successful in the creation of base files and some of the countries are converting the land records into digital formats. The latest technological advancements in digital revolution have demonstrated the conversion of land details in the form of GIS with attached data files. This is useful in locating a house and knowing the details of the household, number of persons living with the head of the family, the age groups, and community, income categories and so on. This will be used for administrative purposes; for example by using such details in a particular spatial unit the eligible voters can be identified. Similarly based on the income categories, the public distribution system requirements can be determined. This type of system will be more useful in the disaster prone areas and to plan the post disaster and mitigation processes this GIS database can be of immense help for the administrators for relief distribution. The present study is a sample work, taking one ward in Kumbakonam town, WARD NO. 24 and this will demonstrate how effectively this could be used for other wards in the town.

**Objectives**

To fulfill the above problem the following two objectives have been formulated and they are:

a.	To design a Land Information System selecting one ward and map the details required for the administrative purpose along with the attached data base using ArcGIS module,
b.	To convert the layout into different GIS layers and attach the collected secondary information about the character of population which will be used for decision-making.

**Data Used**

There are three different datasets are used in LIS. They are: a. Satellite data in digital b. Analog data in the form of maps and c. Field data collected from various sources. To support image classification and thematic information collection, several field trips have been realized to the study area and the information on land cover and using a video recorder and GPS camera has collected land use. The GPS camera with a built-in GPS chip provides information such as date and time, geographical co-ordinates and bearing captured on the film media together with image. This information combination represents an excellent tool for accurate data registration and enhances the efficiency of the in-house work.

**Methods of Analysis**

To assess the Land Information System in Kumbakonam (24th Ward) details a base map collected from municipal office, and it is converted into digital data by scanning with the help of Hp scan jet scanner. Scanned layout ward map are then Geo referenced using the GPS and software tool Arc GIS 9.0. Spatial features needed for the study are digitized in the Geo referenced topographical maps using Arc map and it is converted into shape files. Digitized spatial features layers such as ward boundary, canal, pond, municipal drainage, park, playground, religious, shop, house, vacant site, etc., are stored in shape files (\*.shp) and the files are maintained in Arc Catalog. Ownership related details collected from the direct fieldwork. Collected details about the type of house infrastructure, survey numbers Land value details collected from the Taluk administrative office

of Kumbakonam using GPS (Global Positioning System) instrument – GS 20. To prepare the land use and land cover map the spatial and temporary changes in growth patterns are recognized in the digital data. Plot wise urban map to prepared and attribute designed for every plot with full Ownership, Door number, and Name of the family head with age, Resident type and Street name in the study area. A Geographic Information System has been created to acquire information regarding every plot with its all attributes. The entire database is to provided a query facilities for immediate a ready extraction of Information in all the maps.

**Land Information System**

Kumbakonam ward # 24 (study area map) was obtained from Taluk Administrative office. The ward map was scanned and then digitized using Arc GIS convert then in the form of digital maps. The map was converted into digital format by tracing all the minute details, which is required for the land information system.

Figure-1 shows the ward # 24, along with the land information related features of Pond, Channel, Drainage, Roadways, Railway, Park, Playground, Temple, Church, Mosque, Shops, Houses and vacant site. These features have been traced using Arc GIS 9.0. This was Geo referenced using GPS. The neighboring wards of the study area. The distribution of Land with Survey numbers in ward no. 24 in Kumbakonam town. In the center of the ward area most of the land is kept vacant. The survey numbers 2212, 2213, 2214, 2262, 2264, 2265, 2271, and 2273 represented the vacant lands and open places. And the remaining areas are occupied by houses and shops. the details about distribution of building structure and types. The infrastructure facilities

are growing in the ward with gradual expansion. These maps shows the available infrastructure facilities found in the 24<sup>th</sup> ward. The infrastructure facilities are highly developed in east, southwest and northwestern part of the ward. This part represents the areas Gandhi Nagar, Srinagar colony and Ponnusamy Nagar. In these area most of the house structures are multistory buildings. In the south (Sekkanganni road) and north western (Sivagurunathan street) part of the ward, most of the house structures were tiled and thatched.

Figure – 2 displays the ownership details of the 24<sup>th</sup> ward. In this ward, maximum number of family living in own house and few families are living in rented house. Figure – 3 shows the estimated land values in Rupees /sq.ft. These values have been grouped according to the very high, high, moderate, low, very low amount of land value categories. The highest category of land value is above 400 Rs/sq. ft. The moderate category of land value is between 350 and 400 Rs/sq. ft. The lowest category of land value is below 350 Rs /sq. ft. In the South (Sekkanganni road) and south east (Srinagar colony) part of this ward has low land values. Northeast part of (Senthilnathan Nagar), the centre part (Srinagar colony), and the North West part (Ponnusamy Nagar) of this ward have moderate land values. Western part (Arokiasamy Nagar), southwestern part (Gandhi Nagar) and northwestern part (Mayiladuthurai road and Dr. Moorthy road) of 24<sup>th</sup> ward have high land values. Figure - 4 shows the GIS database for SQL map in 24<sup>th</sup> ward of Kumbakonam Town. The SQL map is prepared by entering all the collected data into the GIS attribute table. SQL queries are directly passed to the underlying database system. It facilitate for single click it displays particular information.

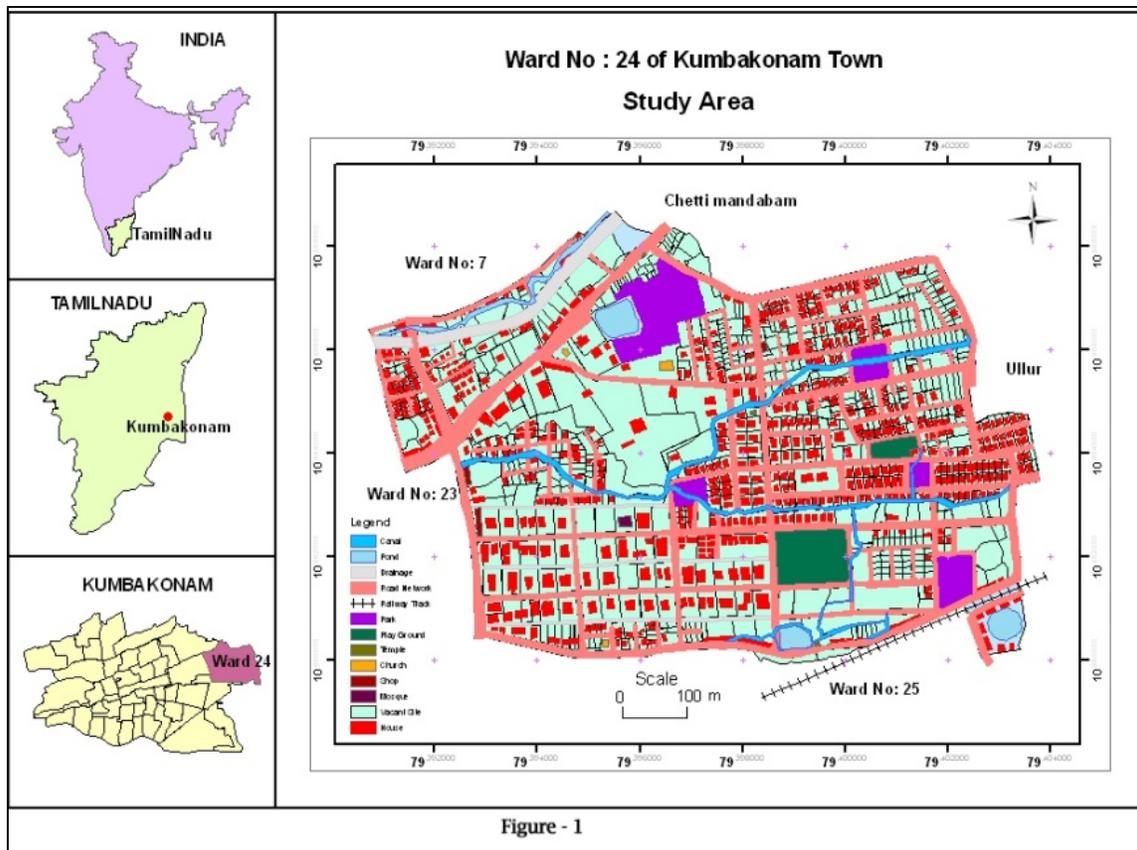
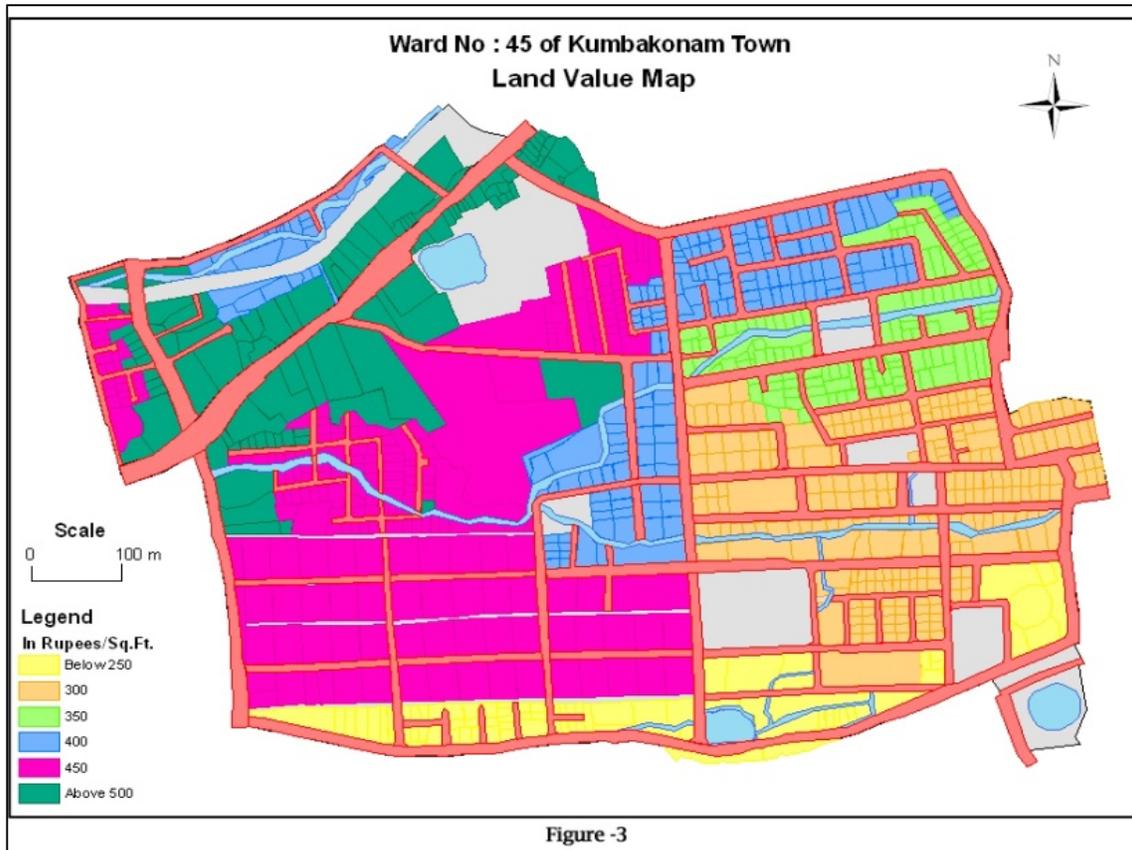
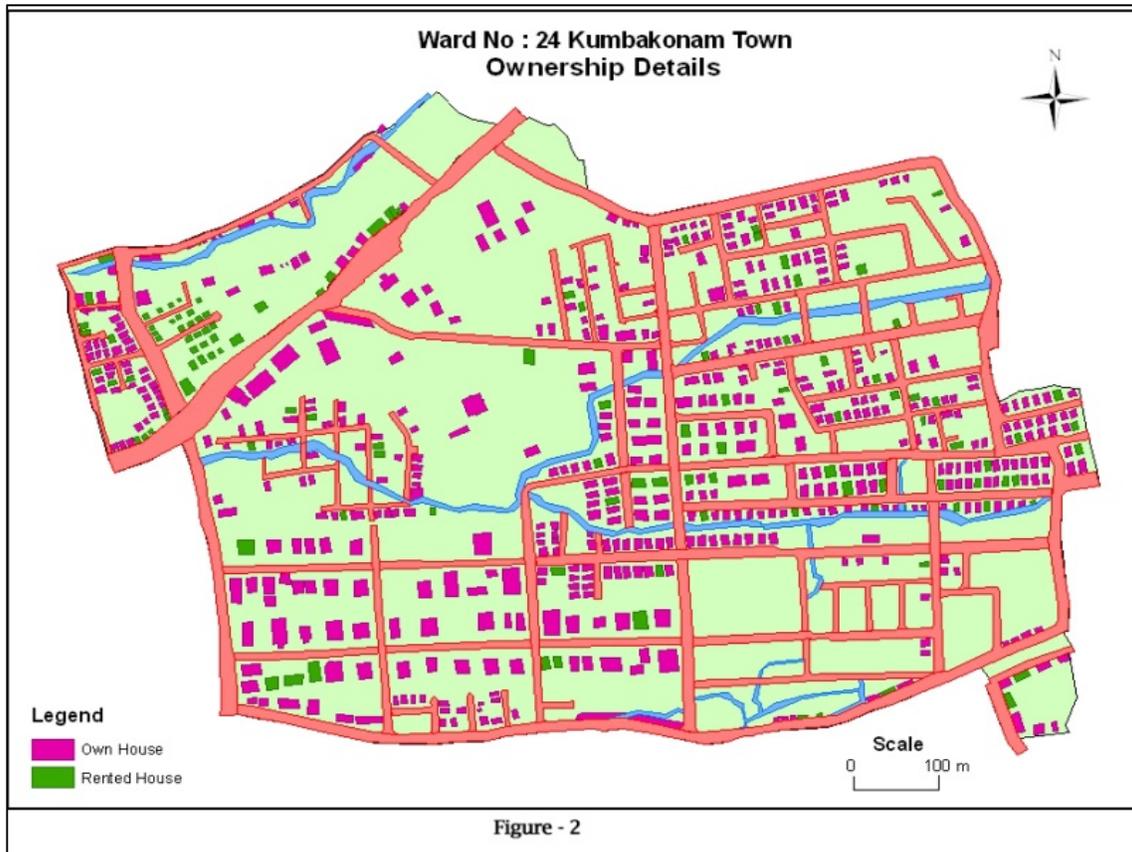
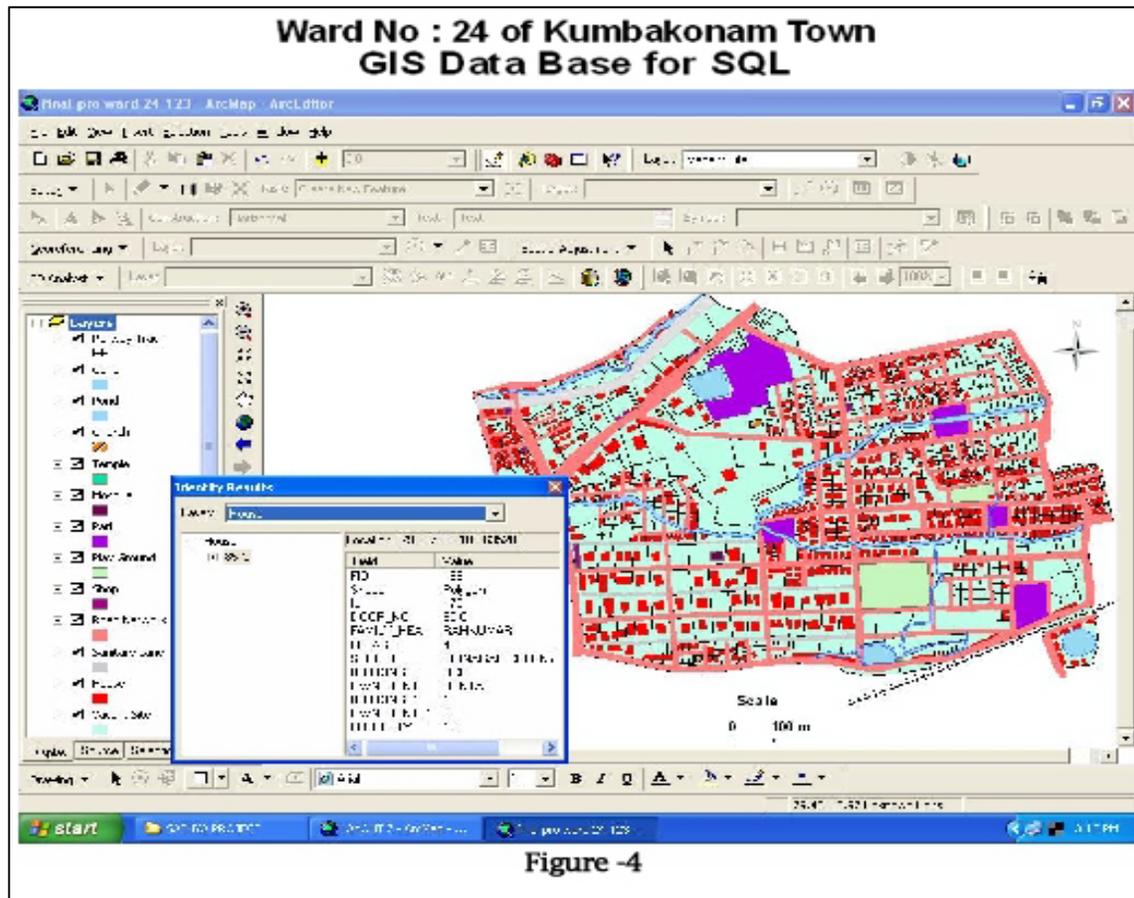


Figure - 1





### Conclusion

Creation of Spatial Data base using mapping softwares like the ArcGIS along with the attached database can provide useful information for the users in this information age. In India this system is slowly developing and will get a shape in the near future. Geo-spatial database can provide a full-proof system and easy to monitor and manage during public distribution to the disaster preparedness and for rehabilitation processes. From this study from individual household to streetwise details can be queried according to the user community. This database can be used to find out and locate the eligible voters in this ward as well as land revenue/ house tax collection for the administrators.

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