Abstract:
The KMC Municipal GIS is currently in operation and has been a success story. For the first time the e-governance is GIS enabled and forms a Spatial decision support system in a local government. The system has resulted in enhancing the property based tax revenues by three times as compared to the system that existed prior to the introduction of the GIS based application. The other positive fallouts of this Endeavour have been:
- Transparency in governance
- Reduction in delays in government processing of grievances
- Online tax payment and status verification facility removes intermediary agents facilitating the same.
- Better revenues for investments into civic facilities

Introduction:
Kanpur Municipal Corporation (KMC), is one of the largest commercial and industrial Municipal Corporation in Uttar Pradesh, India extended to a total area of about 260 Sq. KM with a population of about 2.5 Million people 2001 census).

KMC is using ESRI software ArcSDE, ArcView since year2002. We had a (total station) digital map of Kanpur City and the map was integrated with other property tax related attribute data in the desktop platform.

In the year 2006 the KMC decided to update the digital maps with the help of Quick Bird imagery, updation of different ESRI software along with development of a GIS based interactive website and on-line property tax

An Over View of the Project:
As a part of the e-governance initiatives, KMC envisaged development of an online web & GIS based property tax calculation information & payment system as a pioneering effort in the country. The job
was formally tendered and the work was awarded to ESRI India on basis of best technical cum financial performance. The scope of this work covered the following are the major activities:-

- Creation of a GIS based spatial property database involving:
  - Procurement and supply of Quick bird Image (0.6m resolution) for the entire area under the KMC jurisdiction.
  - Geo-rectification of the satellite image form the GCPs collected from DGPS survey.
  - Updation of digital GIS maps of KMC with the help of geo-corrected QuickBird data and preparation of data for assessment list.
- Conduct a property level survey for every property unit
- Development of Informative and Interactive web GIS system for online property tax calculation and payment
- Development of desktop application for property database repository management and tax assessment.
- Supply and Installation of software’s, hardware and networking with server and additional peripherals
- Training of KMC Personnel
- Renumbering of properties with unique premises no. and fixing of house number plates.
- The Scope of work mentioned above could be categorized into two broad components based on requirements of the KMC project as –
  - Property Survey & GIS database Creation
  - Application Development and Website Development

**Property Survey & GIS database Creation**

QuickBird satellite data was procured and georeferenced based on the Ground survey conducted to collect the GCP’s through DGPS. Base data of 1:1000 scale was created through digitization of satellite imagery and supplemented with secondary ground survey to capture information on covered / carpet area, land use, occupant’s details, condition of structure, etc. The mapping done using the Quick bird Satellite data was used for conducting the primary contact property survey.

**Application and Website Development**

The software development effort for the Kanpur Municipal Corporation included development of KMC portal and desktop application.
1. Desktop Application
A desktop application also was developed as part of the project, providing a GIS interface to perform conditional queries on database such as ‘Tax collected by Zone’ or ‘Tax collected in a financial year for a selected ward’, etc. The database is linked to spatial layers to display results of analysis and queries on GIS maps. The application also enables the KMC staff to calculate tax based on digitized areas taking into account the Unit Area Method and generate various kinds of reports required in the day to day operations of KMC. Primary focus of the application was to provide a server based Geographical Information System with key spatial layers and links to the relevant textual / graphical information available in the database.

2. KMC GIS Based Website
An interactive GIS based website was developed for KMC to provide on-line information to citizens on:

- Property Tax Details
  a. Property Tax liabilities
  b. Existing status of paid taxes
  c. Annual taxes due to be paid,
- On-line Property tax calculation based on the Unit Area Method and On-line tax payment

A facility to access maps based on Zones, Wards, Blocks and Chaks will be provided. In case an individual or an organization wishes to buy relevant maps, the site also provides for visualization of maps and placing an on-line purchase request by the individual or organization.

Online tax payment
Some special feature of the website to provide on-line information to citizens on:

- Transaction failure redressal
- Automatic receipt generation
- Automatic data updation based on time specific scheduler

Property Numbering
Property addressing is one of the most important components in property management system; a proper addressing system is a prerequisite for efficient management of many of the public services, considering the complexity of the Indian metropolitan house pattern it will be very difficult to find out full proof numbering system. However with application of modern tools like GIS it has become easy to design a logical and consistent numbering system.
Considering the actual scenarios in Kanpur, the numbering system which is practical for Kanpur will be a administrative boundary based numbering system. In this system, the house number or premise number will be unique within the smallest administrative boundary that is Chak in the case of Kanpur.

**Structure of the property number**

The unique property number will have 6 components i.e. Zone No., Ward No., Chak No., Premise No., Floor & parts and will have 17 digits in total.

**System Architecture**

KMC application uses the three-tier architecture based on ESRI technology. An ArcSDE service conveys spatial data between Geographic Information System (GIS) applications and a database. The system architecture uses database management systems (RDBMSs) – SQL Server with ArcSDE. It will be a registered collection of ArcGIS feature classes. The application that can connect to and access spatial data from an ArcSDE service will be automatically designed in the application. The solution
component for KMC application development and deployment follows three-tiered system architecture as given below:

- **Presentation Tier or Client Tier**: where the users access the KMC application through internet browser
- **Application Tier**: where the KMC application business logic resides
- **Data Tier**: where the KMC application databases reside

**Project Implementation was a hurdle race**
As usual change is always painful till it is accepted; else till it becomes a habit. A strong management support from KMC and ESRI has been proved to be the key to win this hurdle race.

We have learnt that:

- Continuous stepwise consultation/participation with various stakeholders
- Awareness of Taxpayers
- Political/Administrative will
- Media Support

......... is very much needed for successful implementation of this Project.

**GIS Software Used: ESRI ArcGIS Suite, ArcSDE**