KMC PROPERTY TAX MANAGEMENT SYSTEM USING GEOSPATIAL TECHNOLOGY

Use of GIS and ICT Tools

**An age old practice**

We have read stories of treasure hunts. The TOOLS needed for hunt were:
- a PROBABLE target place of treasure,
- strategic INFORMATION to reach the target either in the form of some script / geographical map or some verbal tip.
- The treasure hunter had to encounter spider net.
   - This net used to give him hope; that he is very near to the hidden treasure.

**What we have achieved**

- Up gradation of MAP
- Online tax payment
- Others Municipal forms & format required to the citizens are available on the web.

**The success of the this project is because of**

- Continuous stepwise consultation with various stakeholders
- Taxpayers Ward wise
- Political leaders
- Corporation Board
- Ward members
- Revenue Inspectors and municipal officers
- State Government
- Hon, Courts

**Major Components of the Project**

- Desk Top Application
- GIS based Property Survey
- ArcGIS 9
- Website
- GIS dataset

**An integrated concept**

- Procurement of satellite images
- Ground survey based Geo-rectification of the satellite image
- Updating and migration of existing GIS data set using QB image
- Contact survey to collect details for every property unit
- Spatial ground survey
- Spatial and non-spatial data link to create spatial property database
- Development of web GIS system for online property tax calculation and payment
- Development of desktop application for property database repository management and tax assessment
- Training KMC Personnel
- Renumbering of properties with unique premises no. as prescribed in Modern Municipal law and fixing of house number plates at the cost of owner/occupier

**Public Awareness Campaign to Educate the Tax payer**
1. DOOR TO DOOR PROPERTY SURVEY

- Procedure
  - House Number in the field is verified against the data on the map and in the Billing Database Sheet.
  - The House Number is marked on the map and identified / marked in the Billing Database Sheet.
  - For multi storyed buildings, the records are marked as a group in the Billing Database Sheet.
  - Any corrections to the property shape is marked on the map.

Preparation of New Assessment List

- Door – to – Door Contact Survey for updation of assessment list
- More than 53 attributes layers collected from field
- Property data sets classified into 46 category
### Properties Added in Tax net After GIS Survey

<table>
<thead>
<tr>
<th>Zone</th>
<th>No. of Assesses before GIS survey (Year 2007-08)</th>
<th>No. of Property Assesses after GIS Survey till 31/03/2012</th>
<th>No. of Assesses added after GIS survey</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Zone-1</td>
<td>22,313</td>
<td>29,523</td>
<td>52,875</td>
<td>7,210</td>
</tr>
<tr>
<td>Zone-2</td>
<td>1,04,889</td>
<td>1,16,797</td>
<td>1,32,173</td>
<td>11,908</td>
</tr>
<tr>
<td>Zone-3</td>
<td>22,710</td>
<td>59,709</td>
<td>71,480</td>
<td>36,999</td>
</tr>
<tr>
<td>Zone-4</td>
<td>11,609</td>
<td>28,638</td>
<td>39,650</td>
<td>17,029</td>
</tr>
<tr>
<td>Zone-5</td>
<td>70,822</td>
<td>68,387</td>
<td>83,970</td>
<td>-2,135</td>
</tr>
<tr>
<td>Zone-6</td>
<td>42,162</td>
<td>88,976</td>
<td>96,105</td>
<td>46,814</td>
</tr>
<tr>
<td>Total</td>
<td>2,74,205</td>
<td>3,92,032</td>
<td>4,76,283</td>
<td>117,827</td>
</tr>
</tbody>
</table>

### ADDITIONAL REVENUE GENERATION

**Property Tax Demand Enhancement After GIS**

<table>
<thead>
<tr>
<th>Zone</th>
<th>Annual Tax Demand Before GIS Survey (in Lacs) 2007-2008</th>
<th>Revised Annual Tax Demand After GIS Survey (in Lacs)</th>
<th>Difference Tax (in Lacs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone-1</td>
<td>587.471</td>
<td>1,682.817</td>
<td>1,255.446</td>
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<td>Zone-2</td>
<td>407.648</td>
<td>1,740.381</td>
<td>1,332.733</td>
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<td>Zone-3</td>
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</tr>
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<td>1,950.576</td>
<td>1,058.100</td>
</tr>
<tr>
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<td>1,818.186</td>
<td>1,344.022</td>
</tr>
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<td>3,349.593</td>
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### Annual Tax Demand Increasing rate after GIS Survey

**Property Tax Demand Enhancement After GIS Survey**

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### Kanpur Nagar Nigam Collection Efficiency Graph

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</tr>
</thead>
<tbody>
<tr>
<td>Demand</td>
<td>50%</td>
<td>60%</td>
<td>70%</td>
<td>80%</td>
<td>90%</td>
<td>100%</td>
<td>110%</td>
</tr>
<tr>
<td>Balance</td>
<td>10%</td>
<td>9%</td>
<td>8%</td>
<td>7%</td>
<td>6%</td>
<td>5%</td>
<td>4%</td>
</tr>
</tbody>
</table>

### % of Collection

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</tr>
</thead>
<tbody>
<tr>
<td>Revenue</td>
<td>96.80</td>
<td>94.87</td>
<td>98.33</td>
<td>79.87</td>
<td>99.89</td>
<td>99.87</td>
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</tr>
</tbody>
</table>
2. DEVELOPMENT OF SERVER BASED PROPERTY TAX APPLICATION SYSTEM

**Desktop Application**

**Objective**
- Development of desktop application for property database repository management, update and tax assessment
- Migration of existing MS Access based property tax application to MS-SQL based application

**Major Functionalities**
- User friendly interface for data addition and update
- GIS interface to perform spatial queries on database
- Generate various kinds of reports required in the day to day operations
- Tax calculation module
- Keeping a complete track of a property in terms of the dues, payments and ownership changes etc.

**Technology Used**
- VisiLAN & MS-SQL 2003

**Glance of Desktop Application**

- Some Sample Reports
  - Detailed Individual Property Information report
  - Zone-wise collection report
  - Year-wise collection chart

- Main Interface

- Property Tax Collection Interface

- More than 60 different types of reports

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**2. DEVELOPMENT OF GIS BASED INTRACTIVE & ATTRACTIVE WEBSITE**

http://kmc.up.nic.in
Special features of KMC Website

**Objective**
- Development of a web application for self-assessment and payment of property tax, with additional functionalities

**Major Functionalities**
- Online self property tax calculation
- Online property tax payment facilities
- A facility to access maps at different administrative hierarchy eg. Wards, Properties
- GIS based spatial searching and identification of properties
- Online Birth/Death registration
- Online Grievance Redressal module
- Library of different forms for downloading
- Citizen forum for interactive discussion

**Technology Used**
- Microsoft Windows
- ASP.Net (VB.Net)
- JavaScript and HTML
- .NET Framework 2.0
- SQL Server 2005
- A+LIMS 9.2
- A+RDE 9.2

Information Availability
- An overview of the City
- On-line property tax calculation
- Hassle free online property tax payment facilities
- A facility to access different maps based on Zones, Wards and Property
- GIS based spatial searching and identification of properties
- Monthly per sq. feet rates used for calculation of property tax
- Circle rates of property used for the calculation of property tax for non-residential properties
- Ward wise/Property wise maps with civic infrastructure details like roads, lanes, by lanes, parks, electric poles, telephone poles, railway lines, hotels, hospitals, police stations, schools, cinema hall etc.

On-Line Tax Calculation System

View Stepwise On-Line Tax Calculation System

On-Line GIS based spatial searching and identification of properties

Ward-wise rates for Residential/Non-Residential Properties
4. GIS BASED PROPERTY MAPPING/TRACKING PROCESS

1. Procurement of Satellite imagery
2. Ground Survey/field Verification
3. Digitization
4. Creation of different Layers
5. Data Linking with Property Tax Data
6. Data based thematic generation
7. Full view of Map
GIS MAPPING & LINKING

- Satellite Image Based Mapping
- DGPS Survey for Sub-Meter Positional Accuracy
- More than 53 feature included
- Detailed ground survey for ground truth mapping
- Spatial and Non-Spatial data linking

ABOUT GIS DATA SET

Details of Layers

Commercial
- Name
- Address
- Company
- Contact

Public facility
- Name
- Address
- Contact

Recreational
- Name
- Address
- Contact

Property
- Name
- Address
- Contact

Educational
- Name
- Address
- Contact

Transportation
- Name
- Address
- Contact

Utility
- Name
- Address
- Contact

Religious
- Name
- Address
- Contact

Landscape
- Name
- Address
- Contact

Linked data after the integration of both Spatial and Non-spatial data on the basis of unique Building ID for property

Process and Technology used

Non-Spatial data collected from the door to door contact field survey of all 110 wards

Spatial data with all features captured from field survey and digitization of images

ArcGIS 9

Collection of GIS DCPM Points

Spatial Adjustment of Survey data (Legacy database DCPM) with georeferenced image

Digitization of satellite images for features like Roads, Water bodies, Open Data, Half map etc

Base Map

With Property Details

Roads

Non-Spatial Linking

Building cover

DIGITIZATION OF MAP'S BASED ON LATEST QUICK BIRD IMAGINARY
Achievements:

- Project has been published as one of the best practice by: PEARL (An initiative under JNNURM) volume -2.
- Project has been published as one of the best practice by ASCI, Hyderabad.
- Project has been published as one of the best practice by Computer Society of India, 2011.
- A paper based on this project has been published in the Arc India News magazine January-March 2009 edition volume-3.

Recognition of the work-awards

- **Indian Geospatial Award-2009** for utilizing geo-spatial technologies as part of e-governance initiative in 2010 by Sri T. Ramaswamy, Secretary Information & Technology, Govt. of India, at New Delhi.
- Selected under **The Top-100 ICT Projects in INDIA during 2011 & Awarded certificate of Merit for Unique Property Numbering System dated 1st Sept., 2011** by Sri Montek Singh Ahluwaliya, Vice-Chairman, Planning Commission, Govt. of India, at SKOCH ICT India Award 2011, New Delhi.
- Project has been awarded **CSI-Nihilent Award-2011** in the project category G2C by Computer Society of India dated 02.12.2011 at Ahmedabad.
- Project has been awarded **U.P. State e-Governance Awards-2009** in the project category “Government Process Re-engineering” by Sri Anoop Mishra, Chief Secretary Govt. of Uttar Pradesh dated 07.12.2011 at Lucknow.
- Project has been awarded **Special Achievement in GIS in India (SAG Award) Award** by Sri Sailesh Nayar, Secretary Science & Earth, Govt. of India dated 08.12.2011 at 12th ESRI India User’s Conference, New Delhi.
Technical Description:

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 is 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

Time Frame:
Initially it was one year but it was extended twice i.e. it took 3 years to complete.

Principal Involved in the Innovation:

1. To make e-governance GIS enabled and use it as decision support system.

2. The system has resulted in enhancing the coverage by more than 50% & property based tax revenue by more than two times as compared to the system that existed prior to the introduction of the GIS based application.

Originality/Novelty of the innovation:

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:

1. Transparency in governance
2. Reduction in delays in government processing of grievances
3. Online tax payment and status verification facility removes intermediary agents facilitating the same.
4. Better revenues for investments into civic facilities
Advantages over known alternatives:

Previous Situation

One of the main problems of the Kanpur Nagar Nigam (City Corporation) and Kanpur Jal Sansthan (Kanpur Water Company) has been the extremely low tax revenues. Kanpur Municipal Corporation (KMC) used to do survey in the gap of every five years and additional properties were marked upon to collect property tax. Due to Annual Rental Value (ARV) method, citizens had to face lot of problems on the assessment basis and rates of payment.

The ARV method was quite subjective and depending upon the understanding of laws by the municipal staff, citizens had to face the non-conformity of the standard rate. Database of the houses were not adequate to take all the properties under tax net. Due to rise in the number of the properties, the demand for services were also increasing which had created too much of animosity between the citizen and administrative wings of KMC.

There were differential rates of property tax for both the industrial and non-industrial buildings though located in the same location. This used to be the bone of contention between citizens and Kanpur Municipal Corporation. Though, citizens used to pay taxes but they were not very regular in payment and thus it finally resulted in to litigation cases.

Property tax reforms in KMC established the system of scientific, transparent and self assessed system of tax collection, based on rational parameters which are now acceptable by the citizens. This reform has worked in way that the whole system became responsive to citizens as well as to the service provider.

Outcome of the Project

The outcome of the reform was very productive as the number of properties covered under the tax net increased manifold and added to the revenues of the KMC. The increased revenue was used for infrastructural development.

1. Information Availability

- An overview of the City
- On-line property tax calculation
- Hassle free online property tax payment facilities
- A facility to access different maps based on Zones, Wards and Property
- GIS based spatial searching and identification of properties
- Monthly per sq. feet rates used for calculation of property tax.
- Circle rates of property used for the calculation of property tax for non-residential properties.
- Ward wise/Property wise maps with civic infrastructure details like roads, lanes, by lanes, parks, electric poles, telephone poles, railway lines, hotels, hospitals, police stations, schools, cinema hall etc.

2. Process Re-Engineering
Information Collection system changes as follows:-

- Kanpur City Level information collection system:
  Kanpur City level information specially the basics of the city and landmark are available on-line.

- Digital Maps of the City is available
  The city map which was previously on tracing paper and ammonia print is available in 1:1000 scale in digital format with details up to the property level.

- Property Tax Data :
  Property tax data which was available on paper only, now it is globally available through website.
  - Property Tax liabilities
  - Existing status of paid taxes
  - Annual taxes due to be paid

- Tax Calculation System:
  - Previously it was manually calculated.
  - Now software based calculation on the Unit Area Method and On-line tax payment is available on-line through KMC web-site.
  - One can calculate and view stepwise calculation with all relevant details.

- On-Line Birth & Death registration:
  Birth & Death registration is available On-Line previously it was on paper.

- Different type of reports based on above mentioned facilities is always available on server or on-line.

3. Citizen Centricity & User Convenience:-

The functionalities in the web-site provide following services/conveniences to stakeholders (citizen/Government Departments):-

- On-line property tax calculation and view steps of calculation
- Online property tax payment facilities
- A facility to access different maps based on Zones, Wards and Property (Restricted to Govt. use)
- GIS based spatial searching and identification of properties
- Ward wise/Property wise maps with civic infrastructure details like roads, lanes, by lanes, parks, electric poles, telephone poles, railway lines, hotels, hospitals, police stations, schools, cinema hall etc.
- The information is being used for R&D, planning of infrastructure and other projects.

4. Transparency in Government Process:

- Almost 100% property tax coverage in the KMC area.
- Transparency & Speed in working.
- Online tax payment and status verification facility removes intermediary agents
- Better revenues for investments into civic facilities
- Property details (attribute data) and GIS database (spatial data) available at the click of mouse.
5. Time Saving/ Efficiency improvement initiatives

- Reduction of time in surveying the area and mapping.
- Time saving in tax calculation.
- Better understanding of property tax calculation.
- User friendly application for day to day tax management
- Web application for hassle free tax calculation and payments
- Creation of GIS based spatial property database
- Map based tracking of property tax defaulters
- Revenue generation efficiency.
- Renumbering of properties with unique premises no. and fixing of house number plates.

Base data generated during this reform has been used by the KMC at different fronts which includes citizen centric initiatives to make government more responsive for development purposes.

**GIS Map used in –**

- By Kanpur Municipal Corporation (KMC) for planning and revenue generation.
- Delimitation of KMC Wards- 2006.
- BPL (Below Poverty Line) Survey - 2007
- For planning, design/implementation of water supply & sewerage projects under JNNURM.
- By Kanpur Electric supply Company (KESCO) for power distribution planning and revenue generation.
- Census -2010-11 For enumerator block boundaries
- For Development of City Mobility Plan by U.M.T.C

**Achievements/ Results**

This reform became a huge success in Kanpur to create an umbrella effect for covering large number of properties under it. The data below gives out an outlay of the assessed properties after GIS Survey:

- Increase in number of Properties

**Increase in number of property under tax net after GIS Survey**

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The table shows that, the number of properties increased from 2,74,205 to 4,48,747 which means that after the survey 1,74,542 properties were added into the tax net. Hence, the new reform is beneficial for both government and the KMC.

Costing of the project

This project cost was Rs 130 lakhs, Rs 70 lakhs were of URIF funding and the remaining money was raised by the KMC from its own resources.

Property Tax Records in GIS

Map linked to Municipal Records

Additional Revenue Generation

........................................END OF THE DOCUMENT........................................