

**National Workshop on Municipal Finance and Urban Planning.  
26<sup>th</sup> November 2018.  
(Ministry of Housing and Urban Affairs)**

# **Crowd Sourcing and Participatory GIS with Sensor Network for Smart Planning.**

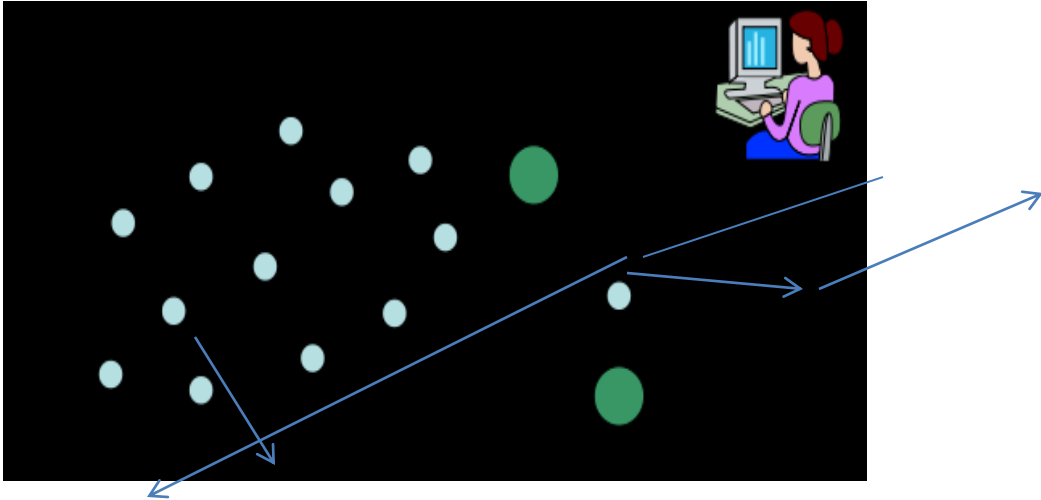
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Delhi Development Authority.  
DGM/Expert/Architect,  
Indian Railways Stations Development Authority(IRSDC)**

# What is CROWD SOURCING ?

- Despite the multiplicity of definitions for crowdsourcing, one constant has been the broadcasting of problems to the public, and an open call for contributions to help solve the problem. Members of the public submit solutions that are then owned by the entity, which originally broadcast the problem. In some cases, the contributor of the solution is compensated monetarily with prizes or with recognition. In other cases, the only rewards may be kudos or intellectual satisfaction.
- Crowdsourcing is channeling the experts' desire to solve a problem and then freely sharing the answer with everyone.

# What is Sensor Network?



**Wireless sensor network (WSN)** refers to a group of spatially dispersed and dedicated sensors for monitoring and recording the physical conditions of the environment and organizing the collected data at a central location. WSNs measure environmental conditions like temperature, sound, pollution levels, humidity, wind, and so on.

# WHAT IS GIS ???

- GIS or Geographical Information System is a computer system/program designed to capture , store, manipulate, analyze, manage and present all types of spatial geographic data.
- **Database+MAP=GIS**

**GIS** is an organized collection of computer hardware, software, geographic data, and personnel to efficiently capture, store, update, manipulate, analyse, and display all forms of geographically referenced information.



# INTRODUCTION

- ❑ Municipal GIS address the needs of Local Administration, Public Works, Planning & Engineering department, Public Health Department, Water supply, Town and Country planning Department, Public Safety, Land records, Tourism Department etc.
- ❑ It manage Municipal tasks such as Property Tax, Birth and Death Registration, Socio Economic Data management and Holding registration.
- ❑ It link the corresponding database with the geospatial view of the current municipal area.
- ❑ This database can include attributes of each individual property with information such as ownership, address, house type, built year, compliance with the regulations of the building authorities, public utilities mapping to the plot, street characteristics and amenities.

## A MUNICIPAL GIS SYSTEM INVOLVES VARIOUS OF STEPS INCLUDING:

- Computerization of land records.
- Digitization of existing spatial entities such as base maps.
- Updation of property records.
- Property Tax Assessment.
- Infrastructure database creation.
- Survey of the individual properties.
- Updation of the non-spatial database on a day to day citizen centric level.

**PRESENTLY THERE ARE FEW EXAMPLES  
AVAILABLE FOR GIS AT MICRO LEVEL,  
MESO LEVEL & MACRO LEVEL.**

- 1. The Mirzapur Municipal GIS (Micro Level)**
- 2. Kanpur Nagar Nigam Municipal GIS  
Project (Meso Level)**
- 3. Delhi State Spatial Data Infrastructure  
Project (DSSDI) {Macro Level}**

# THE MIRZAPUR MUNICIPAL GIS (MICRO LEVEL)



# PROPERTY DATABASE

Property database recorded & computerized.

Microsoft Excel - Reassessment3

File Edit View Insert Format Tools Data Window Help

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	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Pr
1	SINo	Property	OldNo	NHNo	Address	AC	P_Owner	F_H_Name	RC	KP	FB	Occ	NoF	Firs	FirC	UN	Pr
2	1	1a			1 Khandawa	3 f	Katwaru	R	P	B	Y		1 1			1	1
3	2	2 2			2 Khandawa	3 f	Staynaryar	R	M	B	Y		1 1			1	1
4	3	3 3			3 Khandawa	3 f	Ram Adhir	R	M	B	Y		1 1			1	1
5	4	4 4			4 Mallahan	3 f	Keshawa	R	K	B	Y		1 1			1	1
6	5	5 5			5 Mallahan	3 f	Mahaveer	R	P	B	Y		1 1			1	1
7	6	6 6			6 Mallahan	3 f	Satyanarye	R	P	B	Y		1 1			1	1
8	7	7 7			7 Mallahan	3 f	Gopal	R	M	B	Y		2 1-2			9	1
9	8	8.01	8		11 Mallahan	3 f	Jagannath	R	P	B	Y		2 1-2			9	1
10	9	8.02			Mallahan	3 f	Jagannath	R	P	B	N		1 1			1	2
11	10	8.03			Mallahan	3 f	Jagannath	R	P	B	N		1 1			1	3
12	11	8.04			Mallahan	3 f	Jagannath	R	P	B	N		1 1			1	4
13	12	8.05			Mallahan	3 f	Jagannath	R	P	B	N		1 1			1	5
14	13	8.06			Mallahan	3 f	Jagannath	R	P	B	N		1 1			1	6
15	14	8.07			Mallahan	3 f	Jagannath	R	P	B	N		1 1			1	7
16	15	8.08			Mallahan	3 f	Jagannath	R	P	B	N		1 1			1	8
17	16	8.09			Mallahan	3 f	Jagannath	R	P	B	N		1 1			1	9
18	17	8.1			Mallahan	3 f	Jagannath	R	P	B	N		1 1			1	10
19	18	8.11			Mallahan	3 f	Jagannath	R	P	B	N		1 1			1	11
20	19	8.12			Mallahan	3 f	Jagannath	R	P	B	N		1 1			1	12
21	20	8.13			Mallahan	3 f	Jagannath	R	P	B	N		1 1			1	13
22	21	9 9			12 Mallahan	3 f	Satyanarye	R	K	B	Y		1 1			1	1
23	22	10 10			13 Mallahan	3 f	Pyarey	R	K	B	Y		1 1			1	1
24	23	11 11			14 Mallahan	3 f	Suddhu	R	K	B	Y		1 1			1	1
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29	28	16 16			21 Mallahan	3 f	Late Abdul	R	P	B	Y		1 1			1	1
30	29	17 17			23 Mallahan	3 f	Usman	R	K	B	Y		1 1			1	1
31	30	18 18			24 Gaibi Ghat	5 f	Jangali	R	P	B	Y		1 1			1	1
32	31	19 19			25 Gaibi Ghat	5 f	Dwarika	R	P	B	Y		1 1			1	1
33	32	20 19 1			26 Gaibi Ghat	5 f	Premchan	R	K	B	Y		1 1			1	1
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Reassessment3

Ready

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# PROPERTY TAX ASSESSMENT

**A computerised tax billing system for property.**

Find View Print Help

Demand96/97  
Demand2001/02

WARD NO. 1

SI No.: 127

◀ ▶ Add Undo Save

OldNo: 118 Address: Shivpufr Main

NHNo: 127 NameTaxPayer: Agnu S/o Mangaru

Remarks:

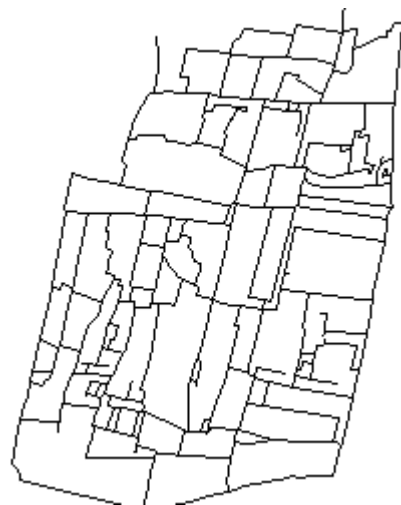
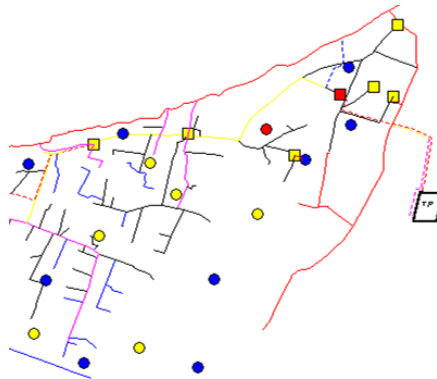
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120.00	360.00	0.00	<input checked="" type="checkbox"/>		
			Water Tax in 96/97:		
			<input checked="" type="checkbox"/>		
House Tax in 97/98:	<input checked="" type="checkbox"/>	House Tax in 98/99:	<input checked="" type="checkbox"/>	House Tax in 99/00:	<input checked="" type="checkbox"/>
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House Tax in 00/01:	<input checked="" type="checkbox"/>	House Tax in 01/02:	<input checked="" type="checkbox"/>		
Water Tax in 00/01:	<input checked="" type="checkbox"/>	WaterTax in 01/02:	<input checked="" type="checkbox"/>		

Record: 127 of 2185



# INFRASTRUCTURE SYSTEM

- Existing infrastructure records for water distribution, drainage & the street network .
- It assess the material and condition of streets & drains.



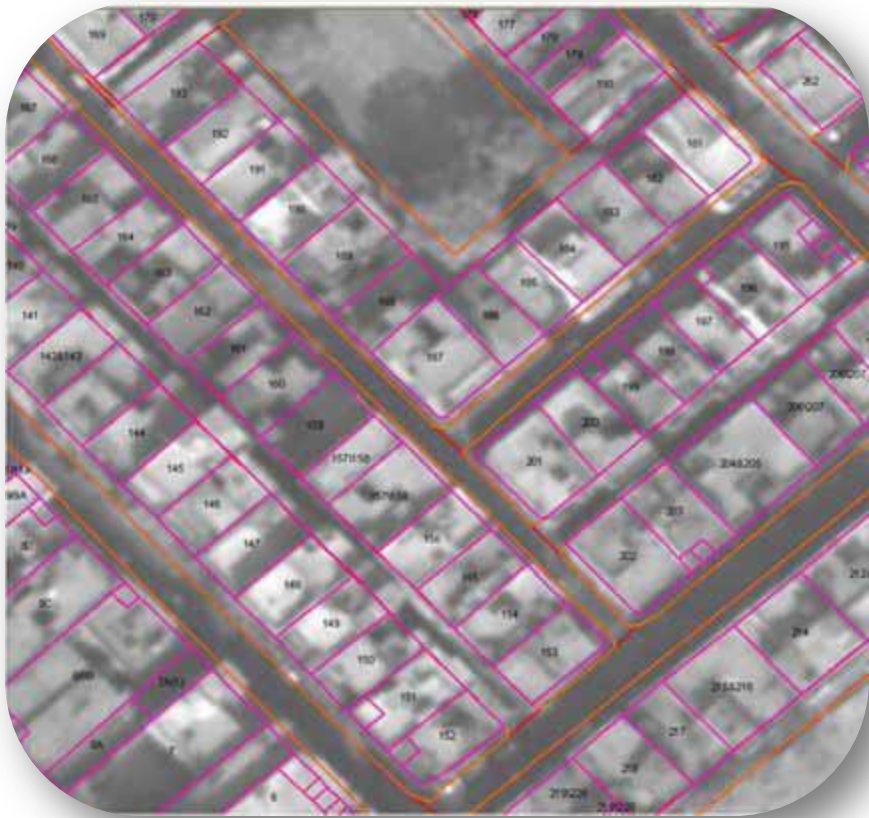
Name	WdKLane	WdPLane	WdBriLane	WdStLane	DrnSides	HdRepair
ABC Company to Pan Dariba	0	0	0	0	1	Y
ABC Company to Pan Dariba	0	0	0	0	1	Y
Side Lane St. Marks School	0	0	0	0	1	
Gosaia Tola Lane	0	0	3	0	1	Y
Makari Khoh Chauraha to Bhibhanahiya Makari Khoh	0	0	0	3	1	Y
Budhe Nath Gali	0	0	0	2	1	Y
Side Lane St. Marks School	0	0	0	0	1	
Side Lane St. Marks School	0	0	0	0	1	
Side Lane St. Marks School	0	0	0	0	1	
Lane Infront of BLJ Inter College Makari Khoh I	0	0	0	0	1	Y
Lane Infront of BLJ Inter College Makari Khoh I	0	0	0	0	1	Y
Lane Infront of BLJ Inter College Makari Khoh II	0	0	0	0	1	Y
Lane Infront of BLJ Inter College Makari Khoh I	0	0	0	0	1	Y
Lane Infront of BLJ Inter College Makari Khoh I	0	0	0	0	1	Y
Lane Infront of BLJ Inter College Makari Khoh I	0	0	0	0	1	Y
Makari Khoh Chauraha to Bhibhanahiya Makari Khoh	0	0	0	3	1	Y
Lane Infront of BLJ Inter College Makari Khoh II	0	0	0	0	1	Y
Lane Infront of BLJ Inter College Makari Khoh II	0	0	0	0	1	Y
Lane Infront of BLJ Inter College Makari Khoh I	0	0	0	0	1	Y
Lane Infront of BLJ Inter College Makari Khoh I	0	0	0	0	1	Y
Lane Infront of BLJ Inter College Makari Khoh I	0	0	0	0	1	Y
Lane Infront of BLJ Inter College Makari Khoh I	0	0	0	0	1	Y
Lane Infront of BLJ Inter College Makari Khoh I	0	0	0	0	1	Y
Lane Infront of BLJ Inter College Makari Khoh I	0	0	0	0	1	Y
Lane Infront of BLJ Inter College Makari Khoh I	0	0	0	0	1	Y

**KANPUR NAGAR NIGAM  
MUNICIPAL GIS PROJECT  
(MESO LEVEL)**



# GIS DATABASE

Geo-referencing, alignment of existing KNN GIS data with updation from satellite image.



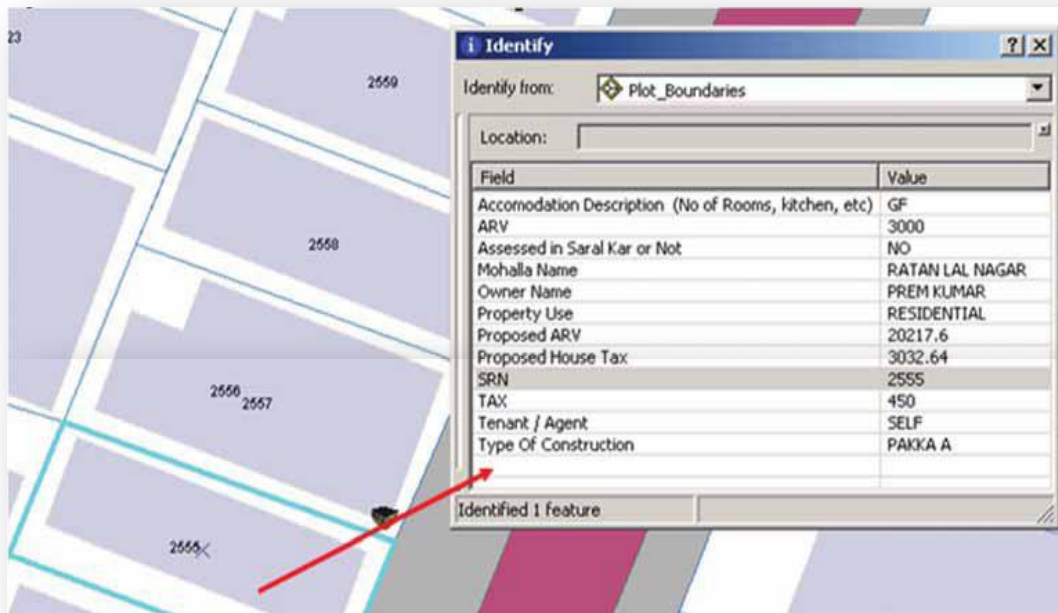
**Geo-referencing of Satellite image**



**Base Map**



**Base Map with Property Details**



**After Spatial and Non-Spatial Linking**

## 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 / Property
- 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



**DELHI STATE SPATIAL DATA  
INFRASTRUCTURE PROJECT  
(DSSDI) {MACRO LEVEL}**

# INTRODUCTION

**DSSDI is the three dimensional (3D) GIS collaborative project between Survey of India and IT Department of the Delhi Government. The key aspects are:**

- ❑ Creation of comprehensive **urban information system** .
- ❑ **3D modeling**, texturing, visualization and creation of virtual walkthroughs of the NCT of Delhi .
- ❑ **Mapping** of underground and overground utilities .
- ❑ **Land information system** (LIS) for maintenance of land records, spatial and attribute details up to the level of an individual parcel and integrating old revenue records with the current survey.

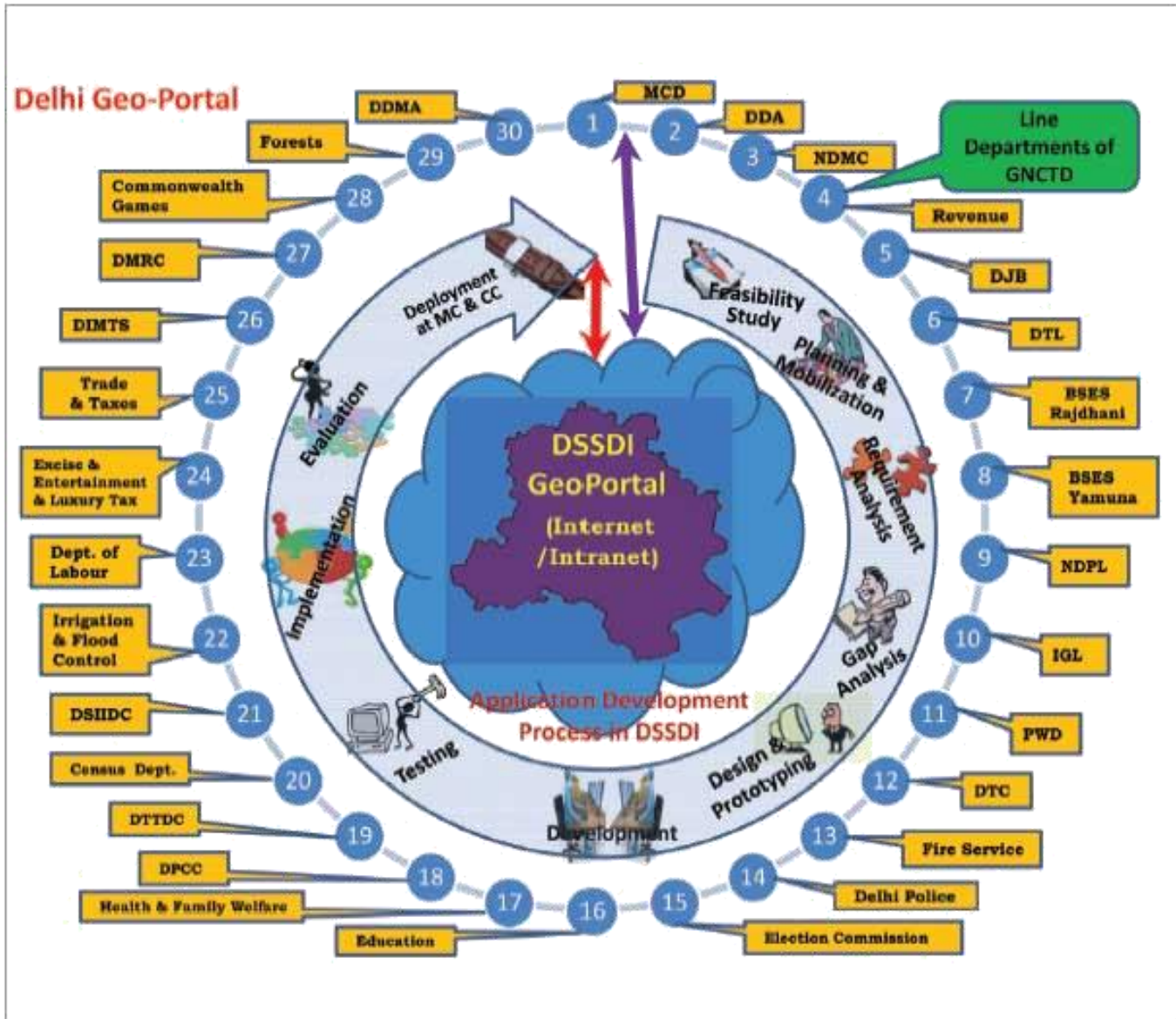
- ❑ **Property survey** involving door-to-door survey of all kinds of settlements, their usage and classification.
- ❑ **Installation of wireless IP cameras.**
- ❑ **Geo-portal** and decision support system that will function as a single window through which all the line departments will access information.

# DEPARTMENTS

The **31 line departments** of the GNCTD involved in the project.

All departments have identified at least five applications including

- Mapping and locating their existing assets/land/buildings ,
- Assessing whether they are currently fully utilized or under utilized as per the Master Plan 2021, and
- Whether buildings could be shared by various departments to achieve optimum utilization of available FAR as per the Master Plan norms.



Development process and line departments for Delhi Geo-Portal

# FEATURES

## **The 337 DSSDI features include**

- 28 in boundary,
- 98 in building,
- 59 in transportation,
- 64 in utility,
- 40 in landuse,
- 5 in cadastre,
- 16 in hydrography,
- 4 in hypsography,
- 3 in image,
- 5 in framework,
- 3 in input for updation and
- 12 in 3D GIS.

The features have been assimilated through GPS survey and levelling, aerial images, GPR survey, inputs from line departments and ground validation including field property survey and attribute collection.

# PHASING

Phase	Framework	Status
Phase A	<ul style="list-style-type: none"><li>• Digital elevation model with 50 cm accuracy,</li><li>• Ortho photo with 25 cm accuracy,</li><li>• Aero triangulation with 12.5 cm accuracy,</li><li>• GPS control with 5 cm accuracy and</li><li>• Monumentation.</li></ul>	87 % complete
Phase B	<ul style="list-style-type: none"><li>• System design and integration,</li><li>• Monitoring and control centres,</li><li>• Capacity building,</li><li>• Delhi geoportal and</li><li>• Database schema.</li></ul>	48 % complete
Phase C	<ul style="list-style-type: none"><li>• Primary data capture,</li><li>• Utility survey,</li><li>• Land information system,</li><li>• Topographical mapping and</li><li>• 3D mapping.</li></ul>	80 % complete
Phase D	<ul style="list-style-type: none"><li>• 3D GIS,</li><li>• 3D topology,</li><li>• 3D rendering and</li><li>• Texturing.</li></ul>	100 % complete

# BENEFITS

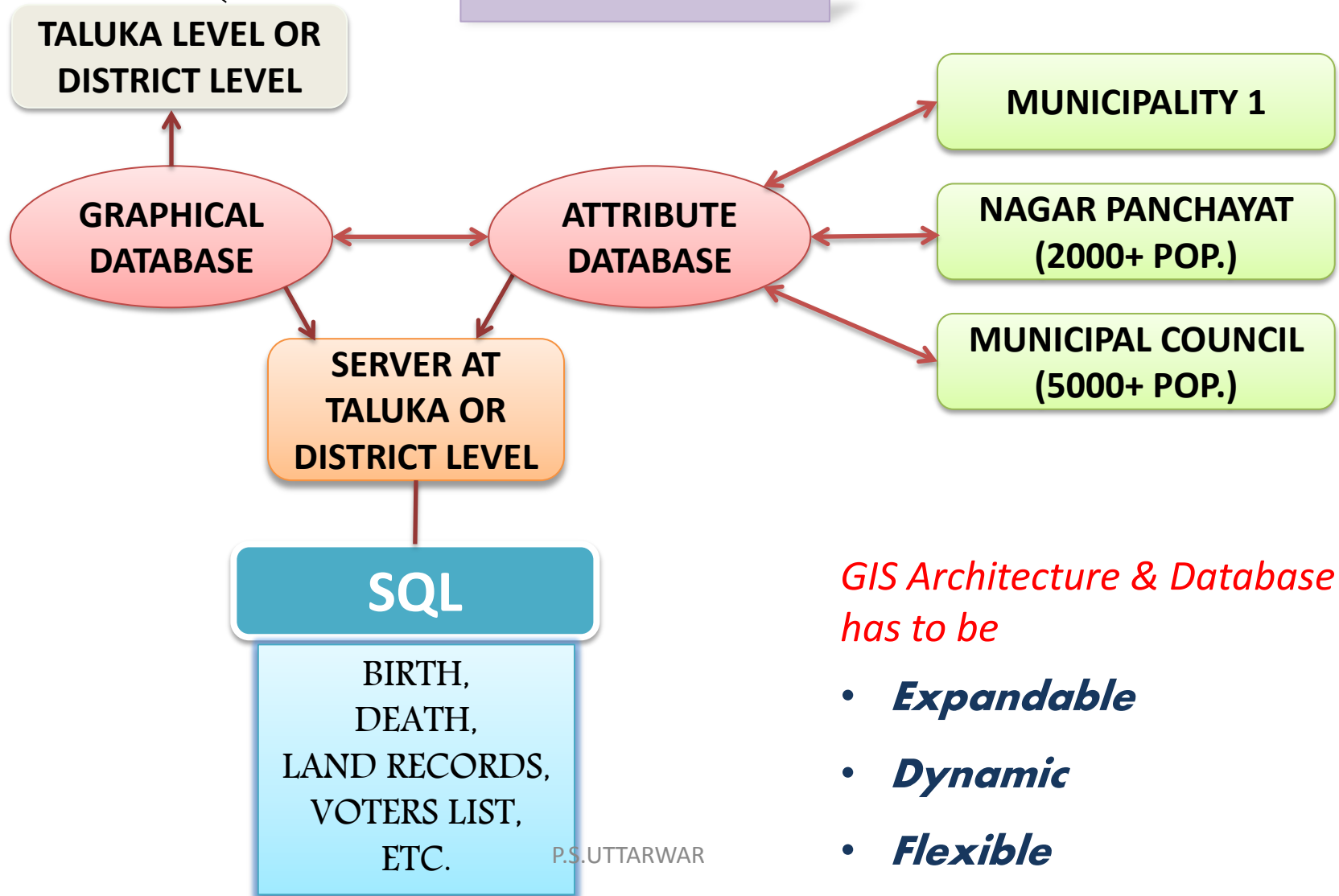
- Integrated planning and service delivery
- Enforcement of local laws and regulations
- Optimal utilization of public resources
- Disaster management
- Security cover
- Empowering citizens through the Web portal.



# CO-OPERATION BETWEEN MUNICIPALITIES & TALUKA OR DISTRICT AUTHORITIES

PANCHAYAT CAN NOT AFFORD IT

## WEB BASED GIS



*GIS Architecture & Database has to be*

- ***Expandable***
- ***Dynamic***
- ***Flexible***

# REASONS

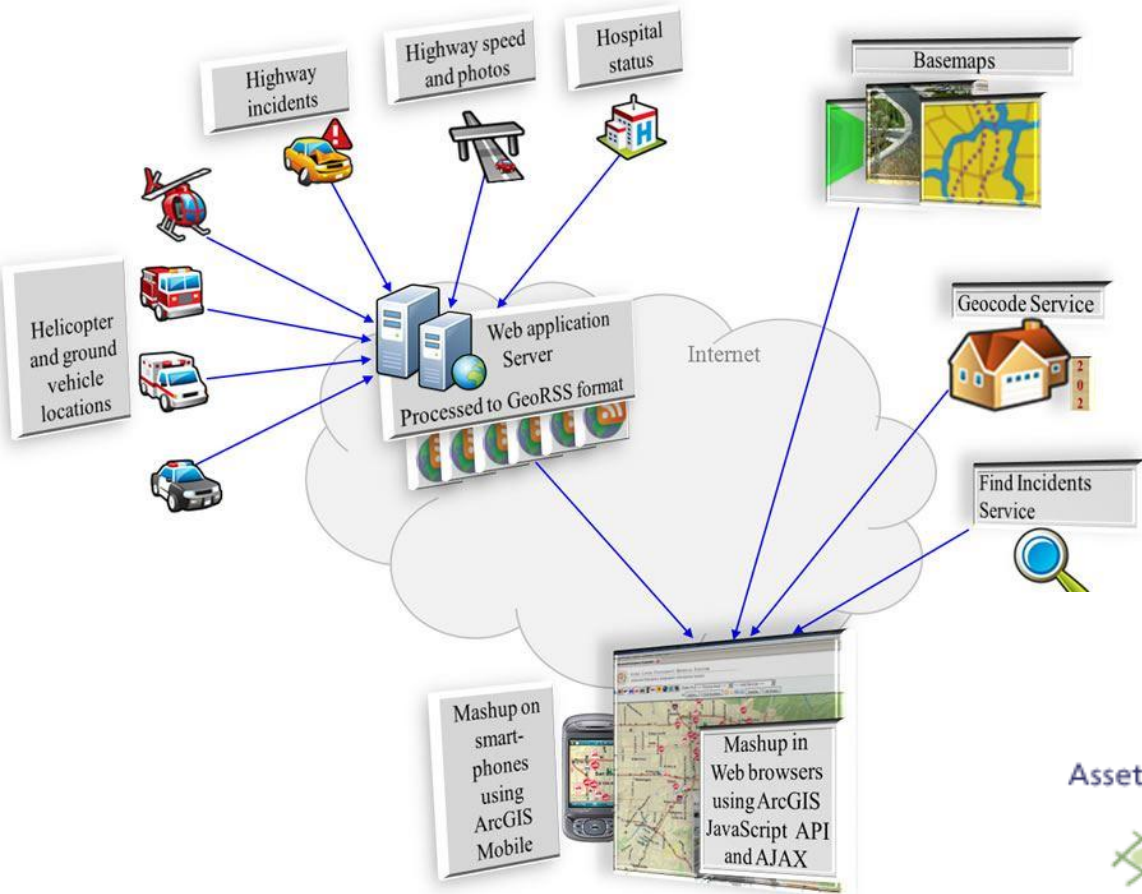
- ❑ Low **Affordability** at Municipality / Panchayat level
- ❑ Sparse availability of **Resources** (Technical support / Trained Personnel)
- ❑ **Practicability** (Political stability / Low Priority)

# DATABASE FOR MUNICIPALITY

Functions	Micro Level	Meso Level	Macro Level
• Certificates (Birth, Death, Caste, Domicile)	✓	✓	✓
• Voter List	✓	✓	✓
• Ward Boundaries / Town & city Boundary / constituencies etc.	✓	✓	✓
• Education	✓	✓	✓
• Health	✓	✓	✓
• Government Schemes (Sr. Citizen, Pension Scheme etc.)	✓	✓	
• Contacts / Feedback			✓
• Emergency Services (Fire, Ambulance etc.)			✓
• Bill Collection			✓
• Base Map		✓	✓
• Revenue Records	✓	✓	✓
• Socio Cultural		✓	✓
• Infrastructure (Water, Roads, Sewerage, Drainage, SWM, Electricity)		✓	✓
• Information (Circulars, Tenders, RTI)		✓	✓
• Taxation			✓
• Weather Bulletin (Coastal Area)	✓	✓	✓

# Integration of GIS and web

- Non-professional GIS users gain easy and fast access to location analyses data to assist in their day-to-day work.
- Professionals can easily perform spatial operations such as geocoding and route networking.
- GIS Web services allow:
  - providing users one-stop access to location – based information
  - Information available to all who need it ; researchers, administrations, businessmen, customers.
  - Time to time update and maintenance of data



# SUGGESTED INSTITUTIONAL SUPPORT

**AT METRO CITIES** – Model of DSSDI can be adopt.

- A) **AT STATE LEVEL** – There is need to have GEO SPATIAL BUDGET.
- B) **AT DISTRICT LEVEL** – There is dedicated fund for Geospatial development.
- C) **AT TALUKA LEVEL** – There is a dedicated team of Geospatial Personnel to utilize fund
- D) **AT MUNICIPALITY LEVEL**- Geospatial operations to manage, update & maintain database & system.

**Amend list of functions to Municipality to include Geo Spatial Information.**

**WE EXPECT THIS CONFERENCE TO  
MAKE SUCH RECOMMENDATION  
TO GOVERNMENT**

**THANKS**

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