Application of Geospatial Technology in Web Based Property Tax Information System

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Abstract: **Property tax is an essential revenue source for the state government to construct infrastructure, to improve the facilities needed for the people and to perform any city operations. The lack of updating information on newly constructed buildings, precise measurements in property boundaries and monitoring the tax payers reduces the tax revenue collection. Geographic Information System (GIS) helps to improve the property tax revenue by creating a common platform in which the property boundaries are linked to the property related data. The property boundaries digitized from the cadastral map is linked to the database containing the property related data such as name of owner, no of floors in each building, property type, nature of occupancy etc., The area for property boundary is calculated in GIS and is multiplied with the taxes implied which varies for each property depending on their dimensions. The resulting map is connected to the PostgreSQL and PostGIS and published as a static web page in a geo-server where the respective information for each property is displayed.**

*Keywords***: Parcel Mapping, Web publishing, Geospatial Technology, Property Information System.**

I.   INTRODUCTION

Government bodies build basic facilities and satisfy the citizen needs only through taxes paid by the citizens. The taxes are the most important revenue for the functioning of the Government. So it is necessary to pay the proper tax within the correct time period. There are different types of taxes – Property tax, Commercial tax, Industrial tax etc., and it is the duty for the government to monitor the changes occurred, update them periodically and identify the tax defaulters. Due to the improper and lackadaisical behavior of both citizens as well as the government, there is a decrease in the amount of tax collected and in turn it reduces the funds which cause a delay in every functioning of the system. To combat such a situation, it has become necessary to identify, develop and implement a transparent property tax information system. Property tax revenue collection is not up to the mark due to lack of property tax information system. A change in the particular property or area needs to resurvey which involves a lot of human efforts. With the advent of the Geographical Information System (GIS), tax mapping and the property tax information system can be done effectively. It helps to provide a link between real property (Spatial) and office records (Non-Spatial). Tax mapping is done to identify the property boundaries, actual land use and violations in their built-up properties. The property tax information system provides the details about the owner of the property, property type, land use type, no. of floors and the tax to be paid etc., The high-resolution satellite image or aerial photographs can be used to detect the change occurred among the properties by overlaying them with the existing data.

II.   OBJECTIVE

•   To analyze the collected cadastral map and the satellite imagery for the better visualization of edges of buildings.

•   To assess the extracted boundary with the existing cadastral map.

•   To link the related property details collected from the field survey with the extracted property boundaries.

•   To publish the map in Geoserver by connecting it through PostGIS and PostgreSQL to obtain a Property Tax Information system.

III. STUDY AREA

Chennai stretches nearly 43 Kilometers along the coast of Bay of Bengal from Uthandi the erstwhile village panchayat in the South, to Kathivakkam the erstwhile municipality in the North. It has the Bay of Bengal as Eastern boundary and remaining three sides are surrounded by Kanchipuram and Tiruvallur districts. The district administrative units include Revenue which has three major divisions, 10 taluks and 55 revenue villages, Local bodies which have Greater Chennai Corporation has 15 zones and 200 wards and Constituencies containing 3 Members of Parliament and 16 Members of Legislative Assembly. The district of Chennai has a total population of about 46,46,732 in which 23,35,844 represents male and 23,10,888 represents female according to the Census of India 2011. Chennai climate varies from humid to hot humid with 24ºC mean temperature. I have selected a Block (No.64) of Mylapore taluk as my study area which covers an area of about 0.81608 ha.
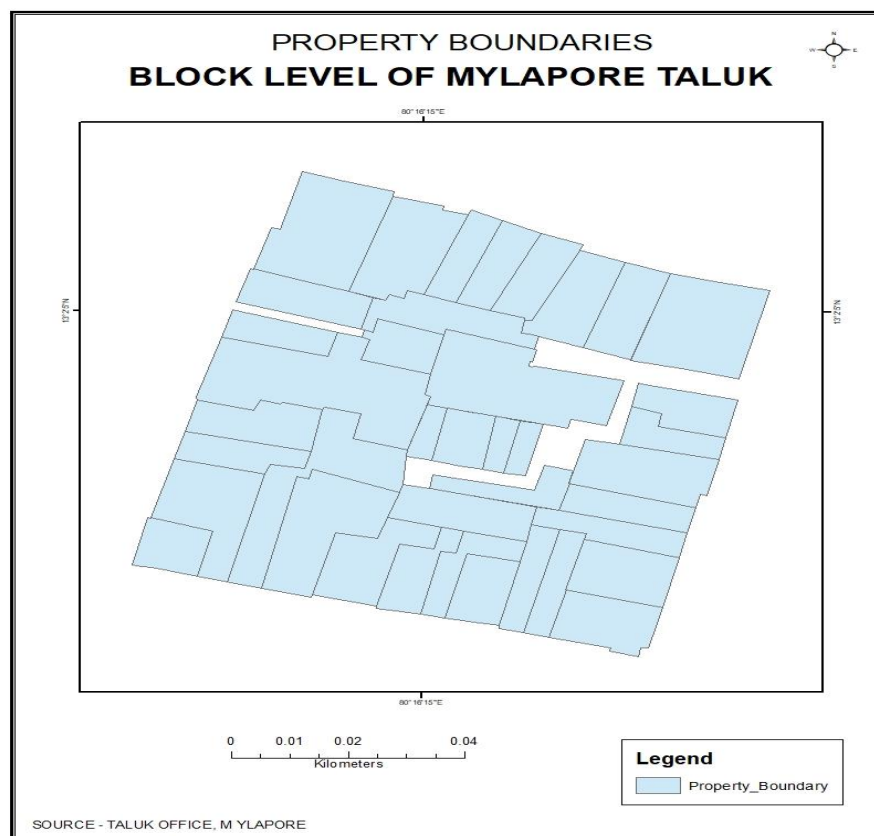

Fig 1: Study Area

VI. METHODOLOGY DESCRIPTION

The land parcel boundaries are obtained from the pan-sharpened high-resolution Ikonos (1m) satellite image through visual interpretation. They are digitized along with the plinth area of the buildings using ArcGIS 10.3. The cadastral map was georeferenced and it is verified by importing it into Google Earth. Then it is cross-validated with the extracted parcel boundary. The details such as Property Owner name, Number of floors, Land Use type, Property type, House no are collected from the field work. The extracted boundary is cross-validated with the Landuse map to detect any violation. The study area has buildings with the proposed Landuse type. So it is not mentioned. The area is calculated using Calculate Geometry and the taxes for half yearly are calculated manually and entered in the database. A database is created in PostgreSQL and the map is imported into it through PostGIS. This helps to perform any query along with the spatial data. Through Geoserver, the map is published for the visualization of property tax information for their respective properties. When tapping the particular property the rel ated information is displayed at the bottom of the map.

The property tax calculation is based on the Rental Letting Value method which is followed by the Chennai Corporation. The Basic Street Rate for the residential building is 2.1 and for the non-residential building is 5.4. The tax calculated is as follows:

Monthly Rental Value = Plinth Area in Sq.ft x Basic Street Rate

Annual Value = Monthly Rental Value x 10.92

Half Yearly Tax = Annual Value x12.40%

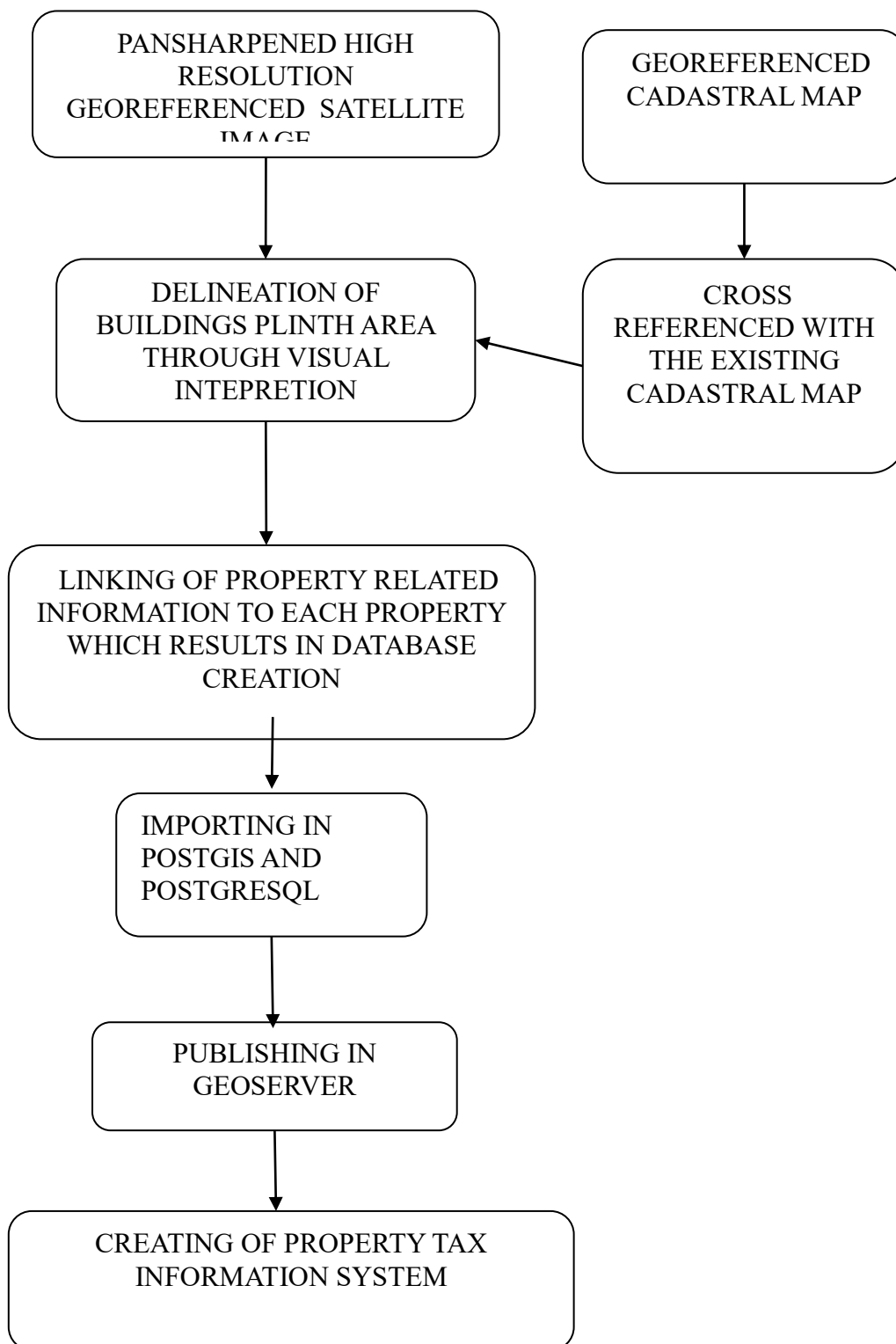The workflow used in publishing the Property tax information system is described below:

Fig 2: Methodology for web map publishing of property tax information system

FID	Shape *	Id	Owner	Property_T	LU_Type	Ownership	No_ofFloor	Areasq_m	HalfYear	Survey_No	Old_Newno
0	Polygon	0		Residential	Mixed_Residential		G	363	11111	3223/1	
1	Polygon	0	Padhmabhai	Mixed_Residential	Mixed_Residential	Self-Occupied	1	390	34893	3231/1,3231/2	99/50
2	Polygon	0		Non_Residential	Mixed_Residential	Tenant	1	181	28492	3233/2	
3	Polygon	0		Non_Residential	Mixed_Residential	Tenant	G	207	16292	3233/1	
4	Polygon	0		Non_Residential	Mixed_Residential		1	152	11963	3235	
5	Polygon	0		Non_Residential	Mixed_Residential		2	137	14976	3236	
6	Polygon	0		Non_Residential	Mixed_Residential		G	123	9681	3237	
7	Polygon	0	Sridharan	Non_Residential	Mixed_Residential	Tenant	G	296	23291	3238,3239	17/14
8	Polygon	0		Non_Residential	Mixed_Residential	Self-Occupied	2	403	95156	3240,3241,3242	
9	Polygon	0		Mixed_Residential	Mixed_Residential		G	180	14167	3243/1	
10	Polygon	0		Residential	Mixed_Residential		G	118	3612	3246/1,3246/2	
11	Polygon	0		Residential	Mixed_Residential		G	195	5969	3243/2,3229	
12	Polygon	0		Non_Residential	Mixed_Residential		G	121	9524	3244	
13	Polygon	0	Srinivasan	Residential	Mixed_Residential	Self-Occupied	1	594	36363	3247	13/45
14	Polygon	0	Parthasarathy	Residential	Mixed_Residential	Self-Occupied	1	187	11447	3248	14/36
15	Polygon	0		Residential	Mixed_Residential	Self-Occupied	1	137	8387	3249/1	43/14
16	Polygon	0		Non_Residential	Mixed_Residential	Self-Occupied	1	129	20306	3251/1,3251/2	
17	Polygon	0	Bhasumoni	Non_Residential	Mixed_Residential	Tenant	G	302	23769	3249/2	27/16
18	Polygon	0		Residential	Mixed_Residential		1	473	28955	3228	
19	Polygon	0	Munnusamy	Non_Residential	Mixed_Residential	Tenant	G	141	11098	3227	24/13
20	Polygon	0		Non_Residential	Mixed_Residential		G	390	34893	3226	12
21	Polygon	0		Residential	Mixed_Residential	Self_Occupied	2	262	24058	3225	
22	Polygon	0		Non_Residential	Mixed_Residential		G	144	8972	3224	
23	Polygon	0		Residential	Mixed_Residential		G	114	3489	3224/1	
24	Polygon	0		Residential	Mixed_Residential		G	49	1499	3223/6	
25	Polygon	0		Residential	Mixed_Residential		G	53	1622	3223/5	
26	Polygon	0		Residential	Mixed_Residential		G	110	3367	3223/4	
27	Polygon	0		Residential	Mixed_Residential		G	51	1575	3223/7	
28	Polygon	0		Non_Residential	Mixed_Residential	Tenant	1	137	21566	3218/1	
29	Polygon	0		Mixed_Residential	Mixed_Residential		2	202	28264	3217	
30	Polygon	0	Venugopal	Mixed_Residential	Mixed_Residential	Tenant	1	198	20396	3215,3216	63/1
31	Polygon	0	Ranjithkumar	Non_Residential	Mixed_Residential	Self_Occupied	1	116	18260	3218/3	8/55
32	Polygon	0	Shunmugam	Non_Residential	Mixed_Residential	Self_Occupied	1	115	18103	3218/2	53/12
33	Polygon	0	Rajendran	Non_Residential	Mixed_Residential	Self_Occupied	1	143	22510	3219/1,3219/2	52/14
34	Polygon	0	Ravichandran	Residential	Mixed_Residential	Self_occupied	2	122	11203	3220	16/51
35	Polygon	0		Non_Residential	Mixed_Residential		G	1360	10704	3221	
36	Polygon	0		Residential	Mixed_Residential	Self_Occupied	G	225	6887	3222	
37	Polygon	0		Residential	Mixed_Residential		G	199	6091	3223/2	15/43
38	Polygon	0	Siva	Non_Residential	Mixed_Residential	Tenant	2	358	84531	3223/3	No.7

Fig 3: Creation of Database

Fig 4: Importing the Database into Postgre SQL

V.   RESULTS AND DISCUSSIONS

The map showing the property boundaries along with attribute information is published in Geoserver and a Property Tax Information System is created where the user can get to know about the tax details of their property along with the type of land use where they fall under, under what sort of ownership do they currently exist which help them to raise queries with the appropriate Government authorities should there be any discrepancies. But due to restrictions in obtaining data, some values will be null. The Property Tax Information System can be made effective and efficient with the help of proper administrative officers provided there is reliable information hopefully with the cooperation of citizens.
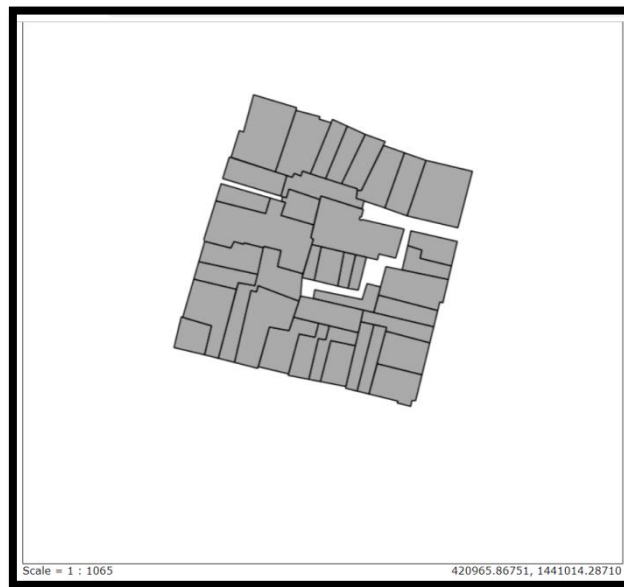
Fig 5: Map Along With Property Tax Information Is Published in GeoServer

VI.   CONCLUSIONS

The property tax information is published to ensure the transparency and to build good understanding between the citizens and administrative bodies. The citizens can calculate their property tax using the formulas and the area for their building without the help of any surveyors or administrative. With the development of advanced technology, the property boundaries along with the related information can be used to compute the taxes to be paid; identification of neighborhood boundaries can be easily obtained under the aegis of the digital world and embedding everything in a single source. Many states and countries are transforming the tax details in an interactive website for any verification or query about their property. Soon Chennai will come up with this technology as they have started the Property and Utility mapping Projects using Geographic Information System capturing the essential details through Field Survey and Drone Mapping.

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