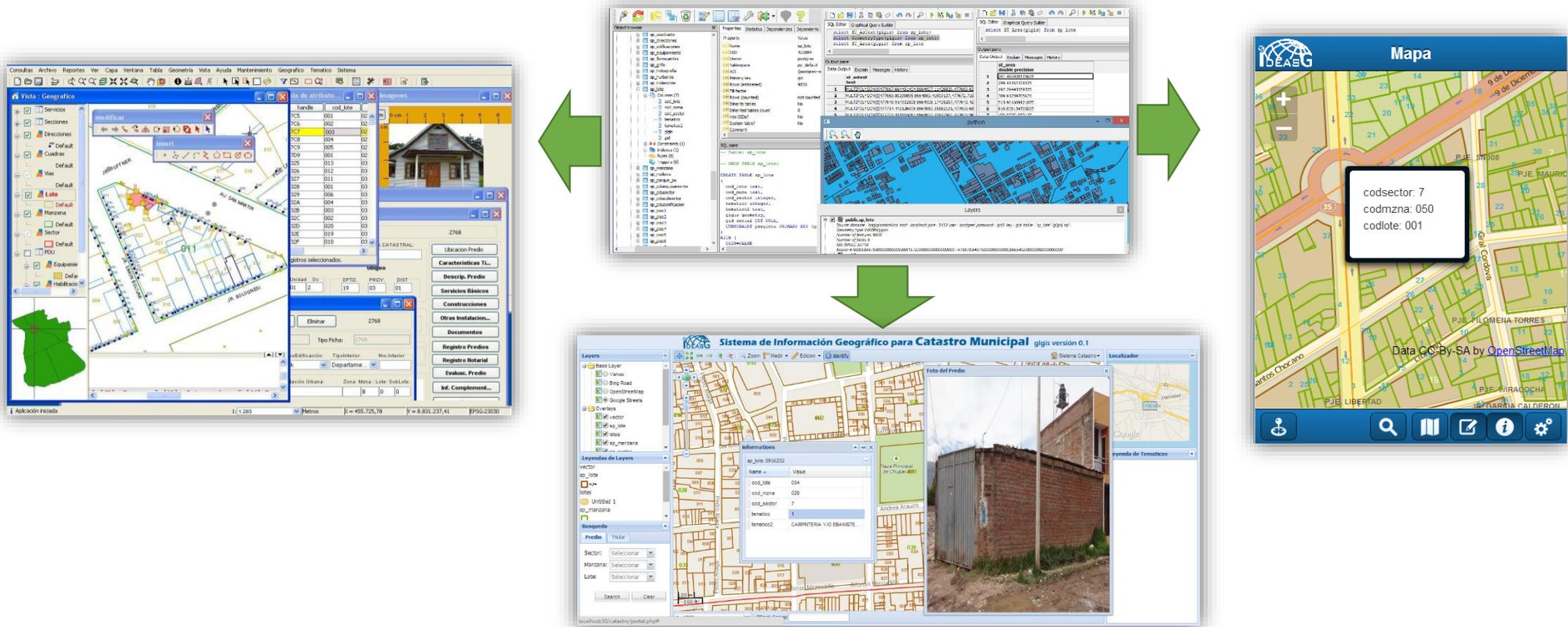


# Integration of GIS and spatial DB in management of municipal cadastre



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# 0.- Agenda

1. Goals of Implementation
2. Introduction
3. Why Based in Open Source
4. Server Environment
  1. Spatial Database
  2. Web Map Server
5. Desktop Environment
  1. Spatial Analysis
  2. Integrated Reports

6. Web Environment
  1. Search and Visualization
  2. Update the system via Web
7. Mobile environment
  1. Search and Visualization
  2. Update the system via Mobile
8. Integrate Process
9. Conclusions

# 1.- Goals of Implementation

- Validate, standardize and migrate all CAD Base and alphanumeric information to the Spatial Database
- To obtain data integrated and centrally
- Designing, Developing and Deploying Desktop application, Web application and mobile application for management of cadaster



## 2.- Introduction

This project started as an initiative to improve the automation and improved land management in municipalities.

In Peru there is the law of the National Integrated Cadastral Information Property and Tax system (SNCP) ,based on the law is being implemented this geographic information system.

It is being used open source software in all components , because the budget of the municipality is quite limited.

Before the implementation of the solution , the information and data was being handled in CAD and alphanumeric data base formats, now with the implementation process will everything of data integrated into the new system.

### 3.- Why Based in Open Source

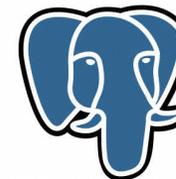
One reason to use open source software is because limited budget for the implementation of the solution

It has been evaluated the development with commercial software alternatives according to the requirements of the solution

For the purposes of local governments , requirements and scope at this stage of the solution , the open source software meets the requirements and have necessary conditions.



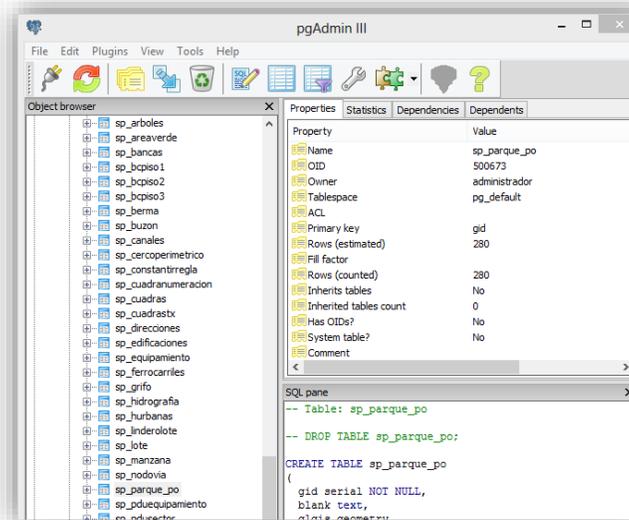
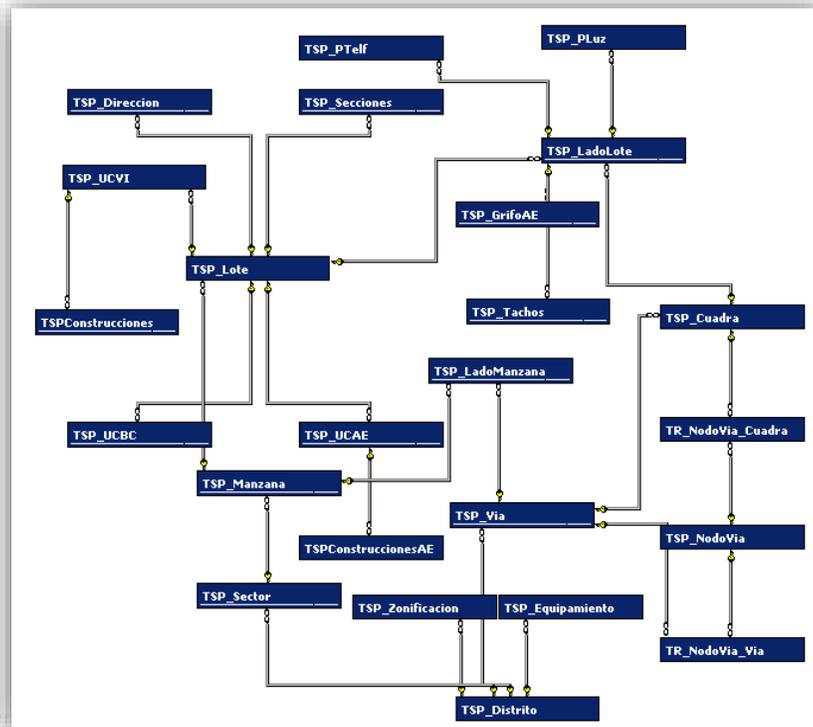
PostgreSQL



# 4.- Server Environment

The system has been designed from at least according to the data structure of National Integrated Cadastral Information Property and Tax system (SNCP)

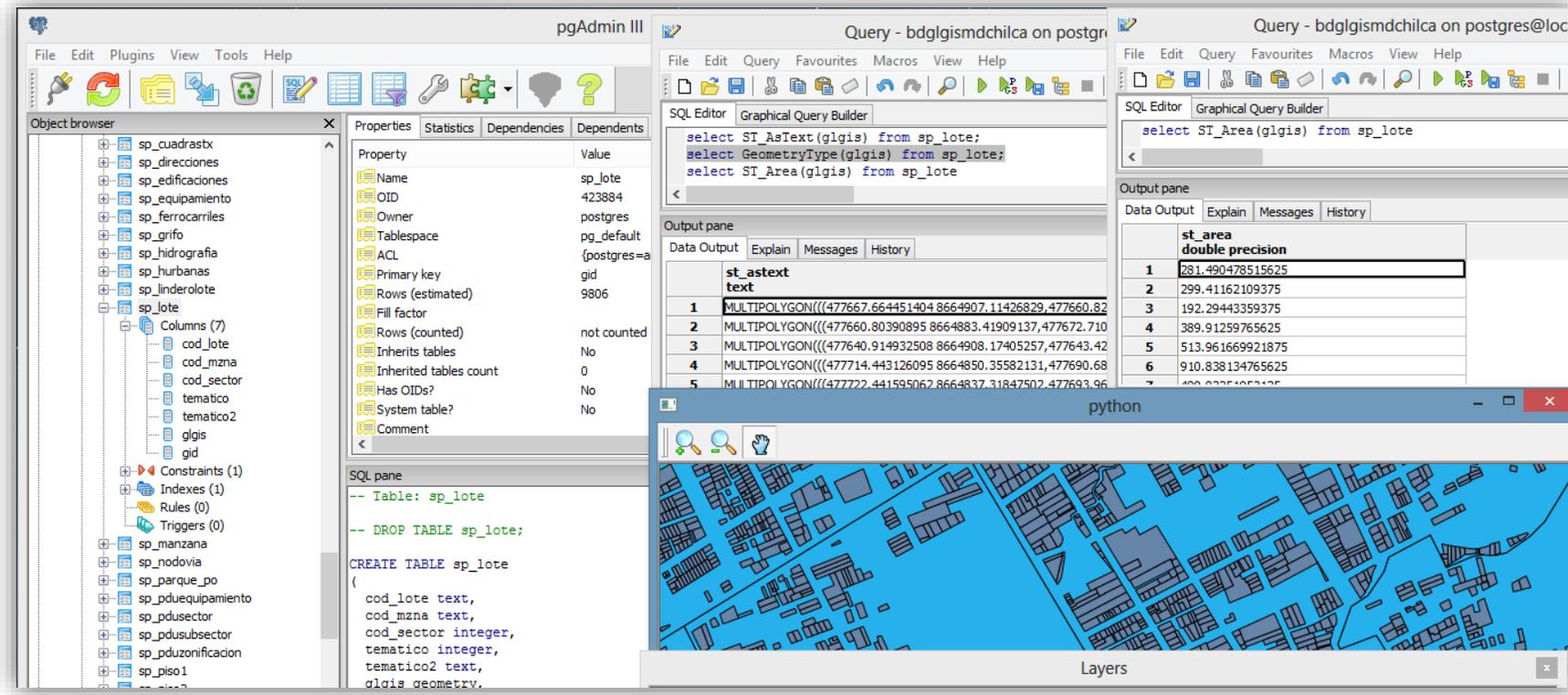
However to get to work as a system had to be added and improved the database model, because the system provides multimedia management, audit, handling security, user roles and access, statistics, reports, thematic analysis, among others that were not in the scope of the standard.



The spatial Layers is managed by geoserver as a WMS, and WFS.

# 4.1.- Spatial Database

Postgres and PostGIS Database is used as a repository for alphanumeric, spatial and multimedia data



To work with the system, we need to migrate all the information in a PostGIS spatial layers, because the base system layers are connected to spatial database, or synchronize by geojason to PostGIS

# 4.2.- Web Map Server

Tipo	Espacio de trabajo	Almacén	Nombre de la capa	Habilitada?	SRS nativo
<input type="checkbox"/>	catastro	bdglgismpchupaca	sp_lote	✓	EPSG:32718
<input type="checkbox"/>	catastro	bdglgismpchupaca	sp_manzana	✓	EPSG:32718
<input type="checkbox"/>	catastro	bdglgismpchupaca	sp_piso1		
<input type="checkbox"/>	catastro	bdglgismpchupaca	sp_piso2		
<input type="checkbox"/>	catastro	bdglgismpchupaca	sp_sector		
<input type="checkbox"/>	catastro	bdglgismpchupaca	tematico		
<input type="checkbox"/>	catastro	bdglgismpchupaca	tematico_cd		
<input type="checkbox"/>	catastro	bdglgismpchupaca	tematico_lc		
<input type="checkbox"/>	catastro	bdglgismpchupaca	tematico_lf		

The Styles of base presentation layer is configured in geoserver.

```
14 <Abstract>A sample style that draws a polygon</Abstract>
15 <!-- FeatureTypeStyles describe how to render different features -->
16 <!-- A FeatureTypeStyle for rendering polygons -->
17 <FeatureTypeStyle>
18   <Rule>
19     <Title>Con Licencia</Title>
20     <ogc:Filter>
21       <ogc:PropertyIsEqualTo>
22         <ogc:PropertyName>tematico</ogc:PropertyName>
23         <ogc:Literal>2</ogc:Literal>
24       </ogc:PropertyIsEqualTo>
25     </ogc:Filter>
26     <PolygonSymbolizer>
27       <Fill>
28         <CssParameter name="fill">#b398f3</CssParameter>
29       </Fill>
30     </PolygonSymbolizer>
31   </Rule>
32 </FeatureTypeStyle>
33 </Style>
34 <Title>Sin Licencia</Title>
35 <ogc:Filter>
36   <ogc:PropertyIsEqualTo>
37     <ogc:PropertyName>tematico</ogc:PropertyName>
38     <ogc:Literal>1</ogc:Literal>
39   </ogc:PropertyIsEqualTo>
40 </ogc:Filter>
```

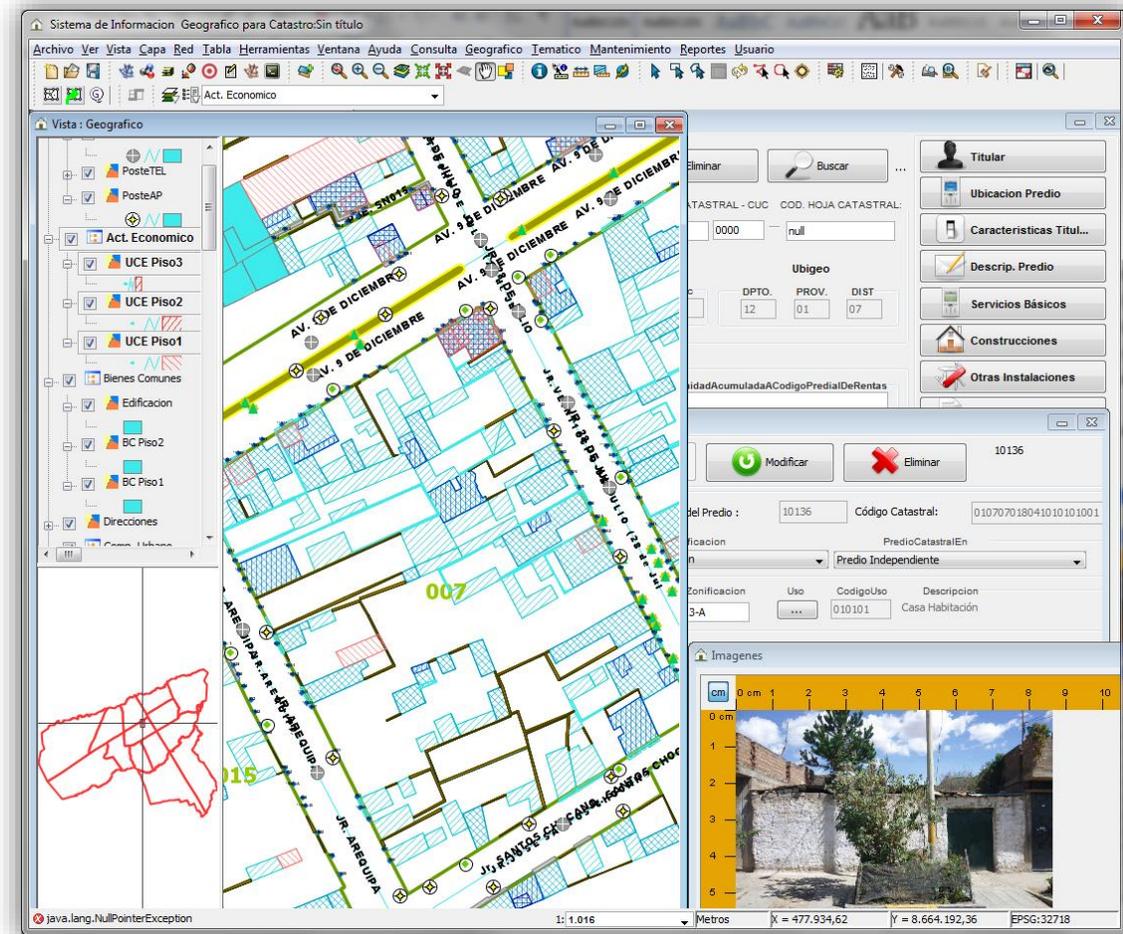
Geoserver is used as base map server , in geoserver is configured the layers of information services like WMS, WFS for web applications and mobile applications

## 5.- Desktop Environment

The desktop environment is where most advanced GIS operations, geo processes, spatial analysis and reporting is done, among others.

It has been personalized in gvSIG application so you can make the processes of cadastre.

Functionality has been added according to need, this is possible since we could run gvSIG from source code .

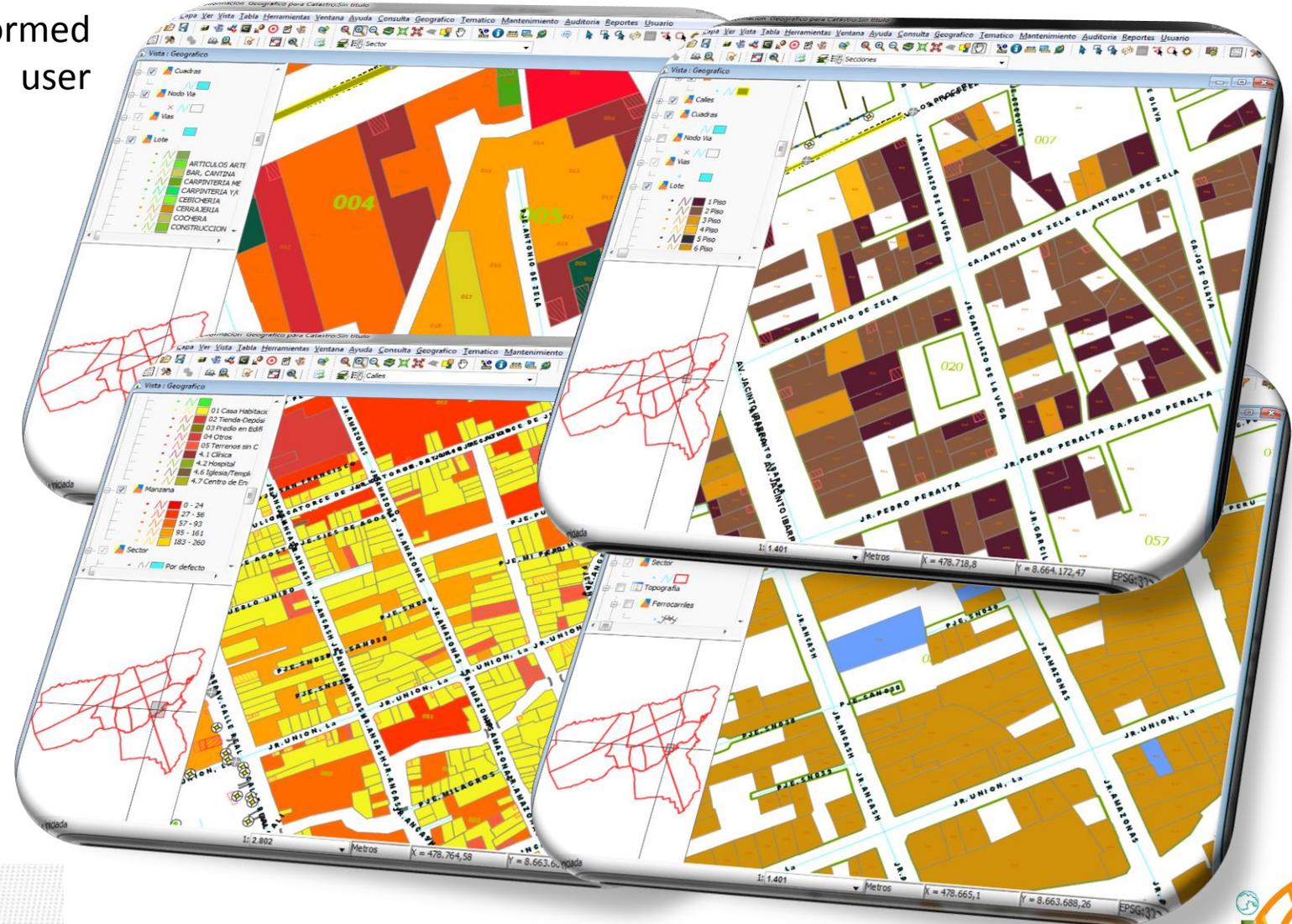


# 5.1 Spatial Analysis

Spatial analysis performed automatically, with simple user interaction

Spatial analysis processes usually performed manually by GIS software, have been programmed to run it automatically.

These automated spatial analysis is used for making day to day decisions of municipal officials



# 5.2.- Integrated Reports

The desktop environment reports are rich in design and functionality .

**PLANO DE UBICACION**

CODIGO REFERENCIA CATASTRAL

DPTO	PROV	DIST	SECTOR	MZ	LOTE	EDIFICIO	ENTRADA	PISO	UNIDAD	DC
12	01	07	024	01	02	01	01	001	3	

**ESQUEMA DE LOCALIZACION**

ESCALA : 1:500

**CUADRO NORMATIVO**

PARAMETROS	NORMATIVO	PROYECTO
USO	Catastro	
IDENTIFICACION	230250	
COMP. DE DEDICACION	4.00	
AL. VISUAL BRN	20%	
AL. TERA BRN	34.00	
TIPO	1.01.01	
REPRESENTACION	Planos	
DE DEDICACION	Comun. de Catastro	
DE DEDICACION	Comun. de Catastro	

**CUADRO DE AREAS (m<sup>2</sup>)**

DESCRIPCION	AREA (m <sup>2</sup> )	TOTAL
1	26.11	26.11
2	30.21	30.21
3	30.11	30.11
4	30.11	30.11
5	30.11	30.11
6	30.11	30.11
7	30.11	30.11
8	30.11	30.11
9	30.11	30.11
10	30.11	30.11
11	30.11	30.11
12	30.11	30.11
13	30.11	30.11
14	30.11	30.11
15	30.11	30.11
16	30.11	30.11
17	30.11	30.11
18	30.11	30.11
19	30.11	30.11
20	30.11	30.11
21	30.11	30.11
22	30.11	30.11
23	30.11	30.11
24	30.11	30.11
25	30.11	30.11
26	30.11	30.11
27	30.11	30.11
28	30.11	30.11
29	30.11	30.11
30	30.11	30.11
31	30.11	30.11
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33	30.11	30.11
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35	30.11	30.11
36	30.11	30.11
37	30.11	30.11
38	30.11	30.11
39	30.11	30.11
40	30.11	30.11
41	30.11	30.11
42	30.11	30.11
43	30.11	30.11
44	30.11	30.11
45	30.11	30.11
46	30.11	30.11
47	30.11	30.11
48	30.11	30.11
49	30.11	30.11
50	30.11	30.11

PROYECTO: DESARROLLO Y MANTENIMIENTO DEL CATASTRO DISTRITAL

**Certificado Catastral**

**CERTIFICADO CATASTRAL**

CUC : 351535120000    FECHA : 2013/12/17    HORA : 10:15:37 AM    NRO EXP. :  
 CODIGO REFERENCIA CATASTRAL

DPTO	PROV	DIST	SECTOR	MZ	LOTE	EDIFICIO	ENTRADA	PISO	UNIDAD	DC
12	01	07	06	036	009	01	01	01	001	3

**IDENTIFICACION DEL TITULAR**

PROPIETARIO (APELLIDOS Y NOMBRES) RAZON    DNI/RUC  
 VALENCIA GILBERTO PEREZ JORGE    19870208

CONDICION DE TITULAR    D: Sociedad Conjugal    PORCENTAJE (%)    00  
 DOMICILIO FISCAL DEL TITULAR    AV. NUESTRO DE DICIEMBRE 658

TIPO DE VIVIENDA    NOMBRE DE VIVIENDA    N° VIVIENDA  
 AV.    MUJER DE DICIEMBRE    658  
 AV.    MUJER DE DICIEMBRE    658

**DATOS TECNICOS DEL INMUEBLE**

DESCRIPCION	VALOR	VALOR CATASTRAL
AREA DE TERRENO DE USO PROMIO	128.00	133.48
AREA DE TERRENO DE USO COMUN	0.00	0.00
AREA TOTAL DE TERRENO	128.00	133.48
AREA TECHADA DE USO PROMIO	228.34	252.34
AREA TECHADA DE USO COMUN	0.00	0.00
AREA TOTAL TECHADA	228.34	252.34

**CONDICION PREDIO**

CLASIFICACION    USO DEL INMUEBLE  
 01 Casa Habitación    Casa Habitación

TIPO EDIFICACION    PREDIO CATASTRAL EN  
 Casa Ch. del    Predio Indefinido

**COORDENADAS**

NRO	Vertice X	Vertice Y	PROYECTO	COORDENADA X	COORDENADA Y	NEP	ECB	BCC	MC	TC	PI	PV	RV	BA	ES	AREA TECNICA	AREA TERRENO
01	1	1	Promio	01.07.064	4.88	Regular	Regular	Regular	E	F	G	F	G	G	G	114.0	126.17
02	1	1	Promio	01.07.064	4.88	Regular	Regular	Regular	E	F	G	F	G	H	G	114.0	126.17

**CONSTRUCCIONES**

**UBICACION POLITICA**  
 DISTRITO CHILCA 12-01-07

ESCALA PLANO 1/500  
 ESTRUCTURA    @    Sct'd  
 ZONIFICACION    CD

**LINDEROS**

FRONTE	12.52
DERECHA	11.68
IZQUIERDA	14.10
FONDO	8.85

**OBSERVACIONES:**

SE EXPIDE EL PRESENTE CERTIFICADO A SOLICITUD DE DONÑA/

NOTA:  
 EL PRESENTE REGISTRO CATASTRAL NO CONSTITUYE TIPO DE DOMINIO, NI OTRA FORMA DE DERECHO QUE PUEDE CONTRIBUIR A LA DEFINICION DE LOS LINDEROS DEL BIEN INMUEBLE.  
 VERIFICACION DEL CERTIFICADO EN PISES

**FIRMA Y SELLO**

PROYECTO: DESARROLLO Y MANTENIMIENTO DEL CATASTRO DISTRITAL

Pagina 1 de 1

Are integrated and shows geographic information, statistics, cadastral unit pictures and alphanumeric , which become documents of communication between municipal different areas.

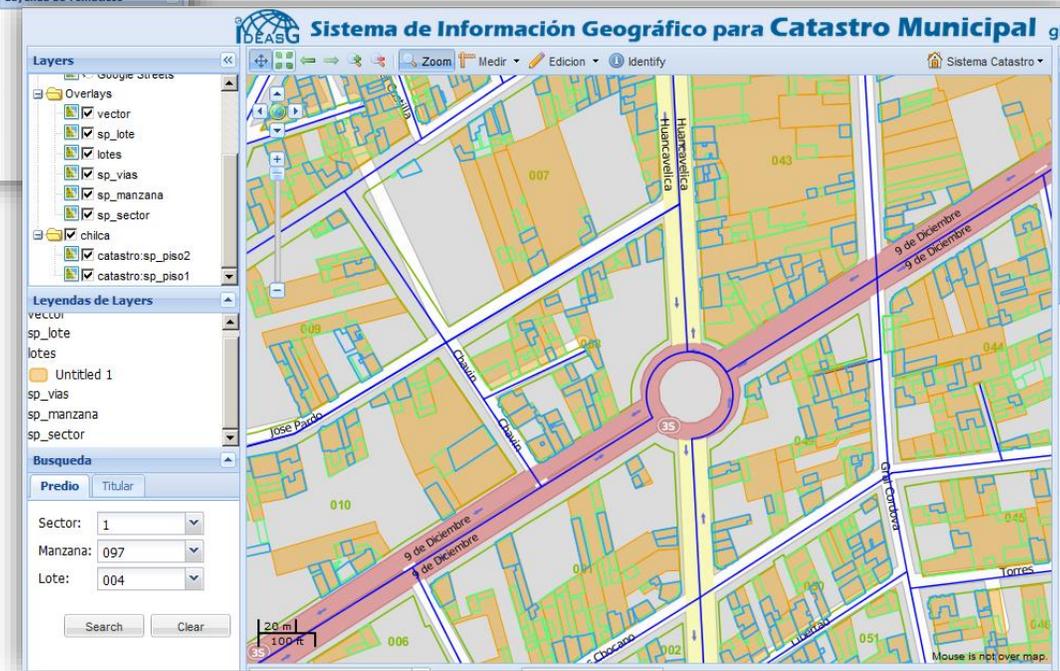
## 6.- Web Environment

In this presentation we show some results of the system

Also say that the system is still in development process



Users anywhere can do basic GIS operations as query, viewing, browsing, hide and show layers, print, measure areas and perimeters, export image, update information to the central database.



# 6.1.- Search and Visualization

In the web environment system can do searches by lots, blocks, sectors, by owner, and by cadastral code. we can also consult each parcel individually using spatial navigation

The system is capable of displaying multimedia information for each cadastral unit.

We can review some thematic maps inside web environment also.



## 6.2.- Update the System in Web Environment

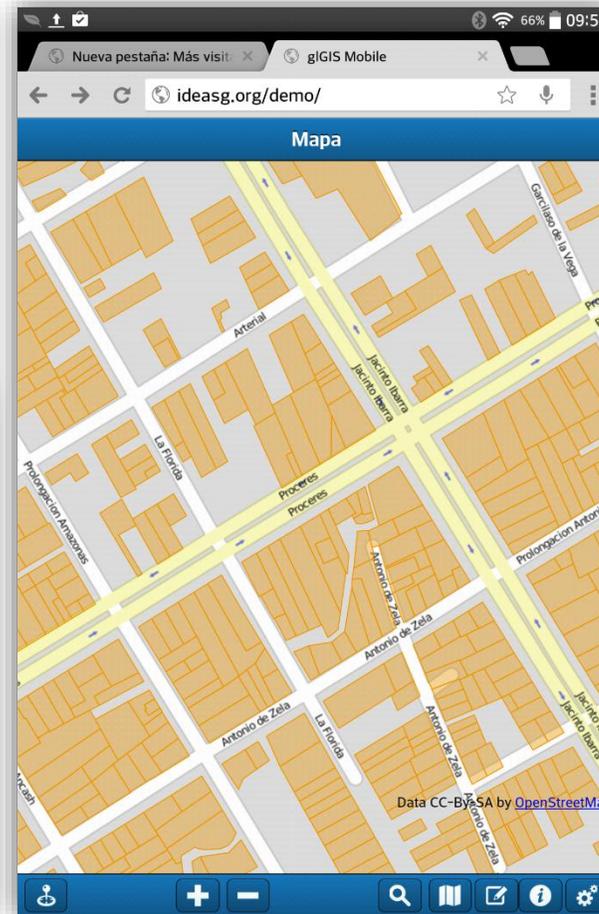
The screenshot displays the 'Sistema de Información Geográfico para Catastro Municipal' (gis versión 0.1) web interface. The main window is titled 'Ficha Económica' and contains several sections: 'Controles' with 'Nuevo', 'Modificar', and 'Eliminar' buttons; 'Ficha Catastral Urbana Actividad Económica' with fields for 'Codigo de Ficha Catastral Economica', 'Nro de Ficha', 'Codigo Unico Catastral - CUC', and 'Codigo Hoja Catastral'; and 'Codigo de Referencia Catastral' with a table for 'Ubigeo' (Dpto., Prov., Dist., Sector, Mzna., Lote, Ec.). Below these are fields for 'Nombre Comercial', 'Tipo de Empresa', 'Observaciones', and 'Digitador'. A search panel on the left allows filtering by 'Predio', 'Titular', 'Sector', 'Manzana', and 'Lote'. Three floating windows are visible: 'Autorización Municipal Funcionamiento' with 'Nuevo', 'Modificar', and 'Eliminar' buttons and fields for 'Codigo de Autorizacion', 'Codigo de Unicat', 'Nro de Expediente', and 'Nro de Licencia'; 'Actividades' with a table of activities; and 'Foto del Predio' showing a photograph of a brick building with a corrugated metal gate. The 'Actividades' table is as follows:

id_activid...	cod_actividad	Desc_Actividad
114	31404	PESCADERIAS Y AFINES
115	31405	ANIMALES PEQUEÑOS
116	31499	OTROS ANIMALES VIVOS
117	32101	PLANTAS MEDICINALES

As in the desktop environment, here you can update the information from the web, it is useful for users authenticated in other communities and do not have access to the intranet

## 7.- Mobile environment

Since mobile users can also interact with the integrated system, can view, search, geo locate, update basic information system.

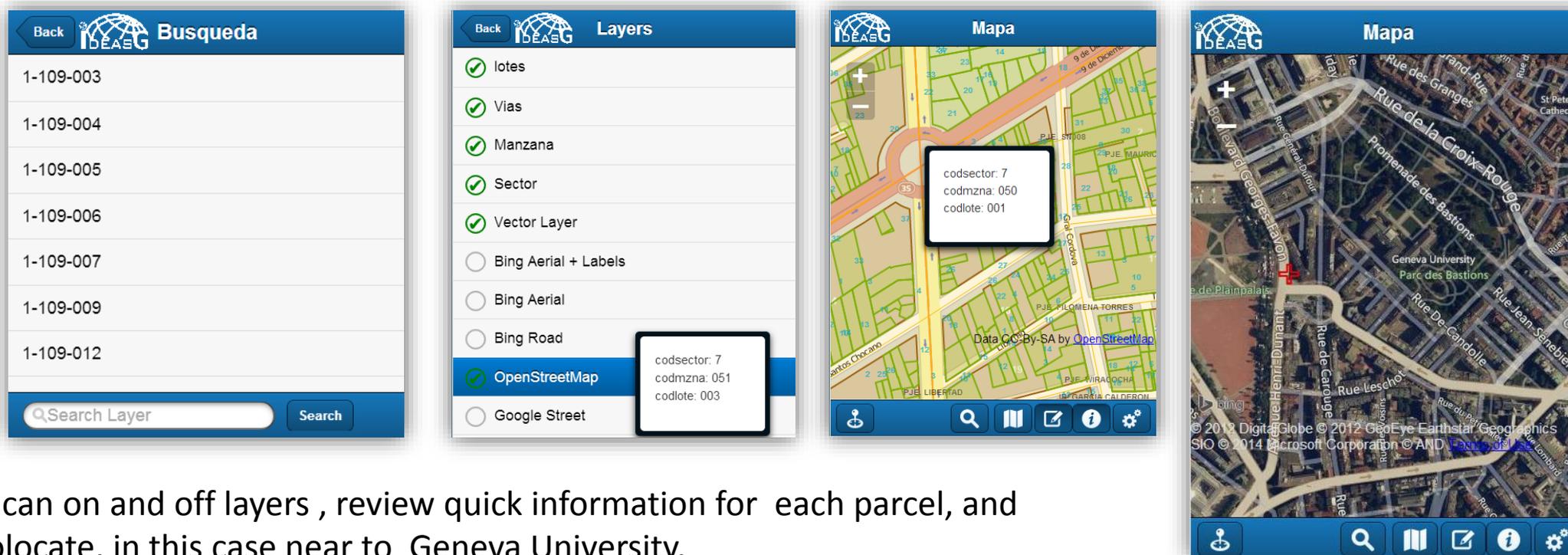


The mobile system environment is still under development, however we can display results according to project scope.

At this moment the system is in test however the functionality according to scope is fully integrated.

# 7.1.- Search and Visualization

In the mobile environment we can make the search for cadastral codes based in blocks and parcels.



We can on and off layers , review quick information for each parcel, and Geolocate, in this case near to Geneva University. Of course we can navigate using zoom+, zoom- , move.

## 7.2.- Update the System via Mobile

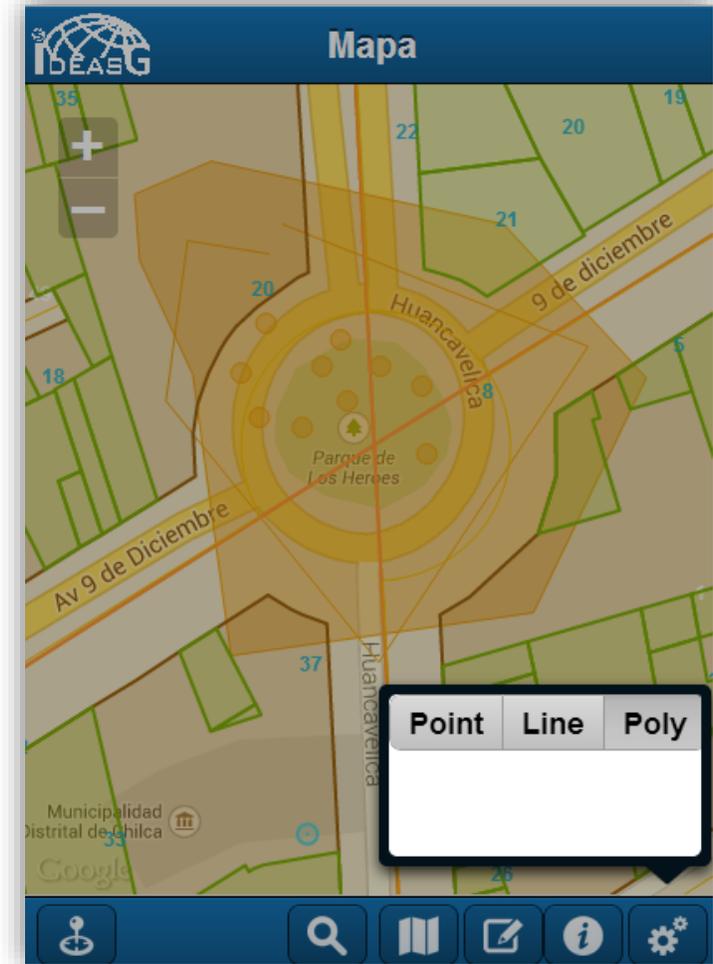
The mobile component is designed to make timely updates as the case of the municipality of inspectors in the field, in this example inspector update the municipal license and annotate some incidents to test.

Also it is possible to update spatial incidents in the city and save with basic attributes like category.

Licencia	
Nro Expediente	2014-0500-MCH
Nro Licencia	10004
Fechas	
Expediente	05/03/2014
Vencimiento	11/19/2013
Inicio Acti...	05/08

codsector: 7  
codmzna: 049  
codlote: 032

All the updates the geographic or alphanumeric is synchronized to the central database.



## 8.- Integrated Process Explain Demo

The system is integrated from the server, clients as desktop, web and mobile, we show a comprehensive process with a step by step example.

- We can import, digitize or migrate information related to the system and for local government purposes
- In the centralized database we have in this case an layer about a parcel with business with attribute as the municipal licenses status, multimedia, owner, and others.
- We can do advanced desktop changes spatially , join with each other, split into two parts and other necessary processes.
- From desktop, web or Mobile we can update alphanumeric, spatial or multimedia information.
- On the desktop and web environment we can see spatial analysis of city areas , with patterns of areas, with density , parcels with operating licenses or not and all of the spatial analysis available.
- After updating the information from any environment to the central database , can we view, query or refresh. The query or analysis have changes instantly.
- Finally we can make decisions with the integrated system

## 9.- Conclusions

- If you do not know your territory you can not manage it
- To get to know the territory we should have the city at our fingertips in one laptop , one tablet or smartphone.
- The decisions do not make the computer or the system , decisions are made by a person who knows the worldview of citizens, laws, and system reporting interpretation.



Thank You  
Merci  
Gracias

**Further information:**

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