

# Web GIS Development using Portal for ArcGIS, ArcGIS Server and Web AppBuilder for ArcGIS

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## Abstract

Sharing and organization of GIS (Geographic Information System) datasets and applications on the internet and the local network can be a challenging job as it requires specialized software. ArcGIS Enterprise is one such commercial platform. ArcGIS Enterprise is a full-featured mapping and analytics platform that includes a powerful GIS server plus dedicated web-based GIS infrastructure to organize and share your work on the cloud and also on the local infrastructure. This paper reviews a simple and easy to use methodology to create a web GIS application using various ArcGIS Enterprise tools like Portal, Server and Web AppBuilder. Web AppBuilder for ArcGIS has been used to create the GUI (Graphical user interface), ArcGIS Portal and Server acts as the middleware and PostgreSQL has been used as a backend database. The web GIS has functionalities like pan, zoom, home, info window, legend, search options, layer selection etc.

## Keywords

Web GIS, Portal for ArcGIS, ArcGIS Server, Web AppBuilder for ArcGIS, ArcMap, PostgreSQL.

## I. Introduction

Sharing and organization of GIS (geographic information system) datasets and applications on the internet and the local network can be a challenging job as it requires specialized software. ArcGIS Enterprise [1] is one such commercial platform. ArcGIS Enterprise is a full-featured mapping and analytics platform that includes a powerful GIS server plus dedicated web-based GIS infrastructure to organize and share your work on the cloud and also on the local infrastructure. This paper reviews a simple and easy to use methodology to create a web GIS application using various ArcGIS Enterprise tools like Portal, Server and Web AppBuilder. Web AppBuilder for ArcGIS has been used to create the GUI (Graphical user interface), ArcGIS Portal and Server acts as the middleware and PostgreSQL has been used as a backend database. The web GIS has functionalities like pan, zoom, home, info window, legend, search options, layer selection etc.

ArcGIS Online [2] is the cloud version of ArcGIS Enterprise. ArcGIS Online is a cloud-based mapping and analysis solution. It is used to make maps, analyze data, and to share and collaborate.

Portal for ArcGIS [3] allows users to share and secure the geospatial data and applications. It is like a content management system. ArcGIS Server [4] is the main component of the enterprise platform, it helps to create and manage the services of data. It also provides advanced analytics to the organization. Designed for interoperability, it publishes data from any major spatial data source using ESRI and also open standards e.g. Mapping, WMS (Web Map service), WFS (Web Feature service), KML (Keyhole Markup Language) etc.

Web AppBuilder for ArcGIS [5] is a module of Portal for ArcGIS. It assists to create web and mobile-friendly interactive GIS applications. It is a rapid application tool which provides

various templates and ready to use configurable widgets which adds diverse functionality in the application.

PostgreSQL is a powerful, open source object-relational database system that has bindings for many programming languages such as C, C++, Python, Java, PHP, and Ruby. It runs on all major operating systems. PostGIS adds support to store geographic objects in the PostgreSQL database.

Other important and associated software modules [6] in ArcGIS Enterprise are AppStudio for ArcGIS, Operations Dashboard for ArcGIS, Story Maps etc.

ArcGIS Server and portal has been used widely in various research studies. [7] focuses on the multi-source remote image management system based on ArcGIS Server. A pollution source management information system has been designed and implemented based on the ArcGIS Server Web ADF by [8]. [9] has designed and implemented an OpenStreetMap based application system which is aimed at creation of emergency logistics. This study uses REST (REpresentational State Transfer) service interface which the ArcGIS Server provides. [10] describes how ArcGIS platform and Multidimensional mosaic dataset (MDMD) can facilitate scientific data visualization and analytics and how the analysis results can be shared to more audience through ArcGIS Online and Portal.

## II. Objectives

The objective of this study is to create a template based web GIS application using various ArcGIS Enterprise tools like Portal, Server and Web AppBuilder. Web App Builder for ArcGIS has been used to create the GUI (Graphical user interface), ArcGIS Portal and Server acts as the middleware and PostgreSQL has been used as the backend database.

## III. Tools & Methodology

Tools Used: Portal for ArcGIS 10.6, ArcGIS Server 10.6, Web AppBuilder for ArcGIS, ArcMap 10.4, PostgreSQL 9.4. As ArcGIS Enterprise is a commercial software, software license will be required for the creation of the application.

## Methodology

### A. Installation and Configuration of the software

1. Download and Install ArcGIS Server [11].
2. Download and Install Portal for ArcGIS [12].
3. Download and Install PostgreSQL Database and configure it [13].

Change the Port number to 5433 while installation. Also download the PostGIS extension using stack builder by checking "Spatial Extension" option during the installation of PostgreSQL.

- Add PostGIS extension in the database. Open pgAdmin III, Connect to Database Server in Object Explorer, Explore Database then right click on "Extensions" and click on "New Extension", select the extension "PostGIS" from dropdown. Else, run the following command in SQL Editor:
- CREATE EXTENSION PostGIS;

4. Download and Install ArcGIS Desktop [14]. After Installation:

- Create a database server connection using the database server's IP address and login credentials in ArcGIS Catalog. This connection will be used to manage the desired layers in the database.
- Create a GIS Server connection with the ArcGIS Server using the GIS server's IP address and login credentials in ArcGIS Catalog. This connection will be used to create a service in ArcGIS Server.
- Create an Enterprise Geodatabase (to store the GIS layers) using the Arc Toolbox (Data Management Tools > Geodatabase Administration)

#### B. Publish a Service in ArcGIS Server

- Import layers in ArcMap [15] from database through ArcGIS Catalog.
- Create the map file (mxd) with the desired layers and symbology (Figure 1).
- Set the appropriate scale and the extent of layers.
- Create a service, File > Share as > Service
- Set the capabilities (Mapping, KML etc) in service editor.
- Analyze, preview and publish the service in ArcMap.

#### C. Creation of a Map in Portal for ArcGIS [16]

- Login to the Portal. Create Map > Add layer from web then Paste the REST URL.
- View the data in map viewer.
- Configure the pop ups for desired layers (Figure 2).
- Save and share the map for everyone and the enterprise for creating the web application.

#### D. Creation of the web GIS application using Web AppBuilder for ArcGIS [17]

The web GIS application will be created using the Web AppBuilder for ArcGIS. Powerful GIS applications that run on any device can be built using this tool, without any coding. Different themes and widgets can be added to the application. The widgets are configurable. The various widgets are as in (Figure 3).

Some useful widgets are:

**1. Search bar:** The Search widget enables end users to find locations or search features on the map. By default, the widget uses the geocoding service from the organization or portal and displays searchable layers configured in the map.

**2. Query:** The Query widget allows you to retrieve information from source data by executing a predefined query. Data sources can be one of the following:

- Feature layer in the current map
- Feature layer as an item in the portal
- Feature layer from an ArcGIS Server REST service

**3. Zoom button:** The Zoom widget provides the Zoom In/Out controls in the map display.

**4. Home button:** The Home Button widget set the map to the initial map extent.

**5. Previous/Next Extent:** This widget helps to view the previous and next extent of the map.

**6. Info window tool:** Info window helps to view the desired pop-up on clicking a feature in the map.

**7. Near me:** The Near Me widget allows the user to find features within a buffer of a defined address or location.

**8. Basemap gallery:** The Basemap Gallery widget presents a gallery of basemaps and allows the user to select one from the

gallery as the basemap for the application.

**9. Legend:** The Legend widget displays labels and symbols for layers in the map. The Legend widget can be set to automatically update when the visibility of a layer or sublayer changes.

**10. Layer list:** The Layer List widget provides a list of operational layers and their symbols, and allows the user to turn individual layers on and off.

**11. Splash:** The Splash widget defines the display content on the applications splash screen. It appears before users start to interact with the application.

Final view of the application after adding all the desired widgets/tools is as shown in Figure 4.

#### IV. Other Customized Web GIS application development options using ArcGIS Enterprise:

**ArcGIS Using JavaScript API [18]** - The ArcGIS API for JavaScript is designed to maximize the developers productivity for building engaging, beautiful web mapping applications. The API combines modern web technology and powerful geospatial capabilities enabling the user to create high-performing apps and smarter visualizations of the data.

**Web AppBuilder for ArcGIS (Developer Edition) [19]** - Web AppBuilder for ArcGIS is built with ArcGIS API for JavaScript and Dojo. It allows the developer to customize and extend functionalities by creating their own widgets and themes. A widget is a set of text files that you can share, move, and deploy to a Web AppBuilder application.

#### V. Conclusion

From, this study we can conclude that powerful web GIS applications can be created within a short period of time, using web App Builder. Even a person with less or no programming skills can create a web GIS application using the step by step methodology provided in this review paper. If the amount of data is less then instead of using a database like PostgreSQL, data can be used in the form of shape files, which makes the application setup even more quick and easy.

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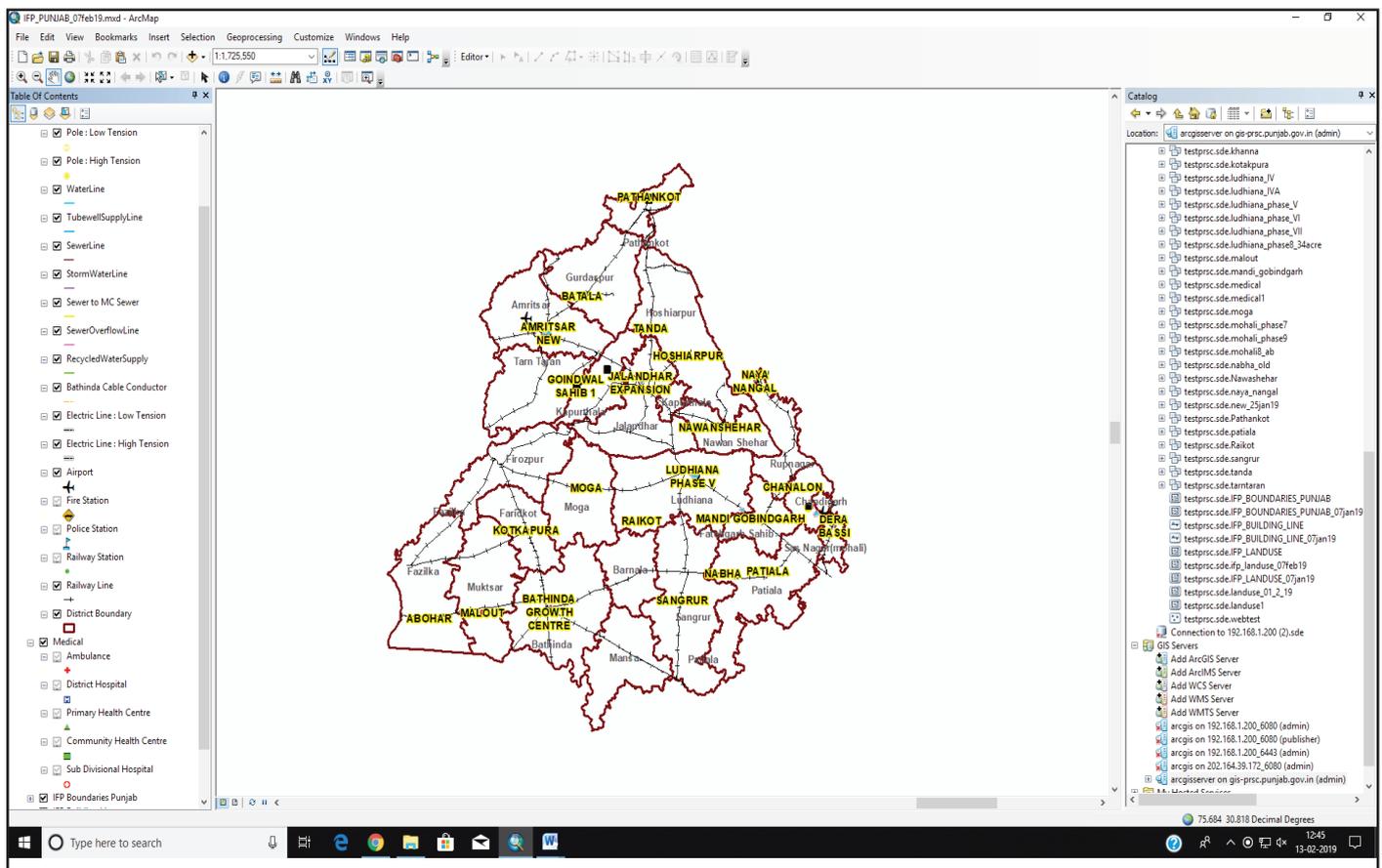


Fig. 1: View layers from PostgreSQL database in ArcMap

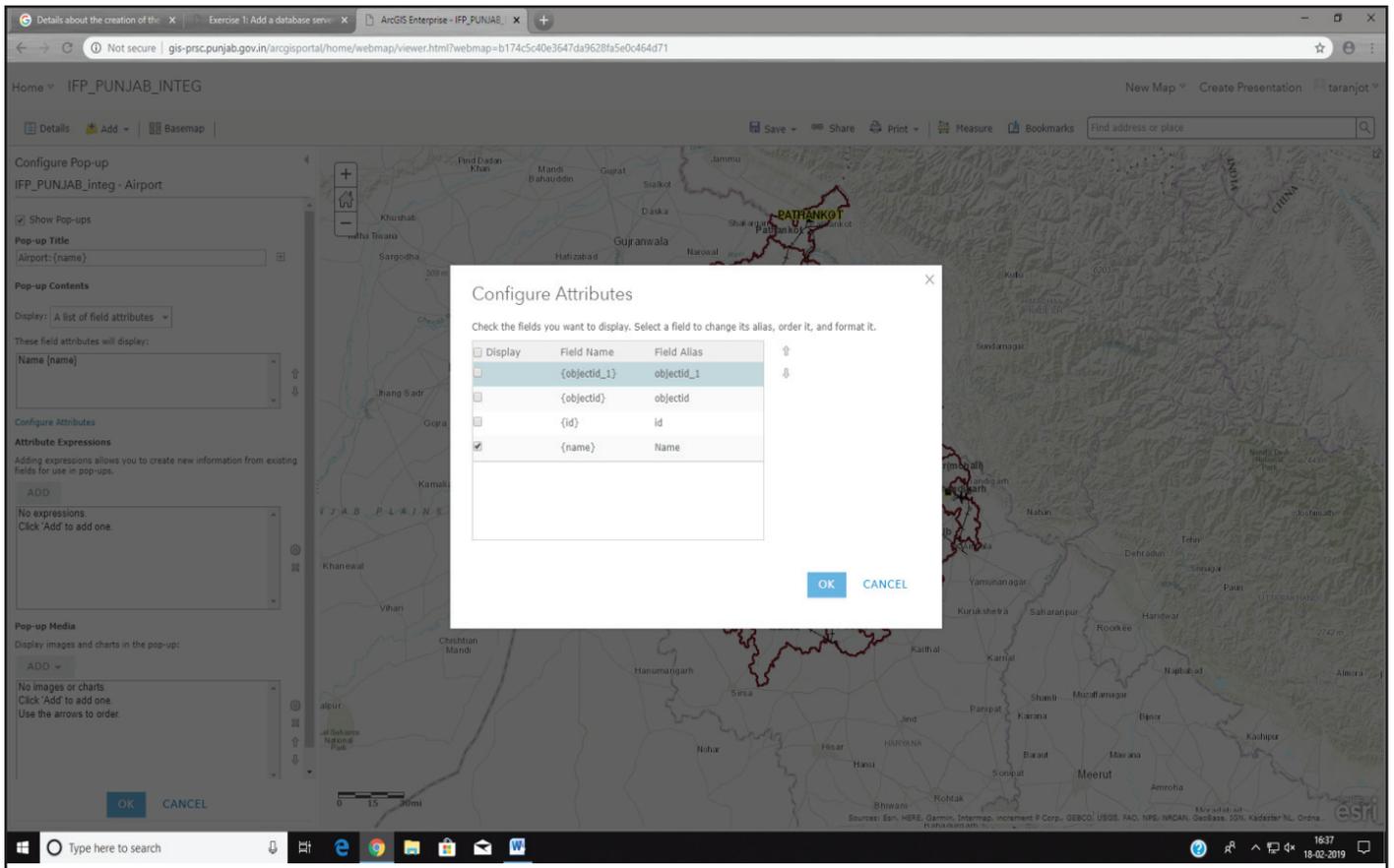


Fig. 2: Configuration of Pop-ups in Map Viewer

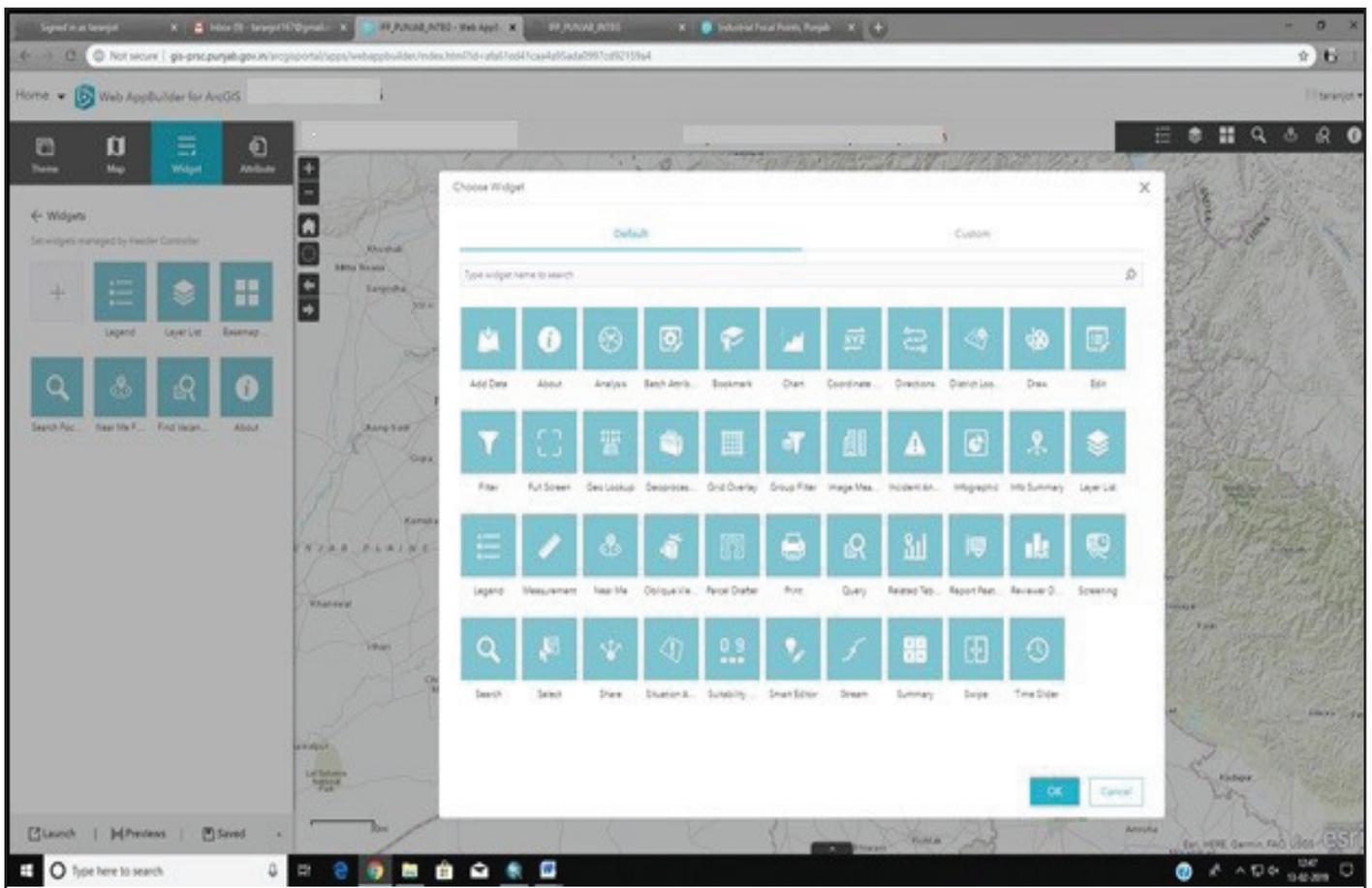


Fig. 3: Various Widgets in Web AppBuilder for ArcGIS

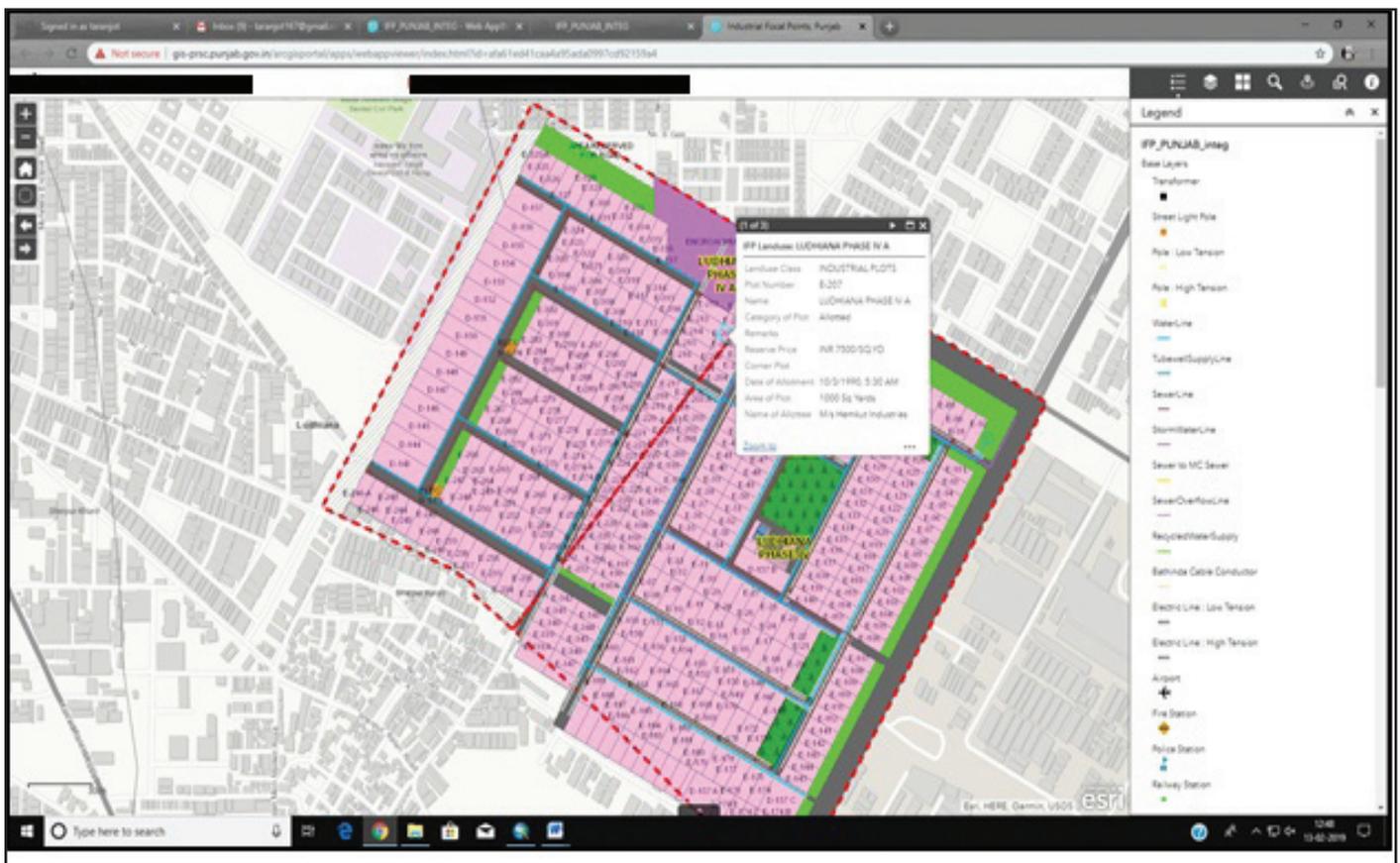


Fig. 4: Final Web GIS Application