Spatial Data Management From Local To Center

Dr. Emin Bank, Turkey

Key words: Spatial Data, Spatial Data Management, Distributed Data, Distributed Data Management, Central Data Management, Client- Server Data Management

SUMMARY

The importance of spatial data and the market of spatial sector are increasing day by day. The basic aim in the implementation of spatial data in a country is to have that data to be used as efficiently and economically. For this purpose, it is aimed to have the spatial data produced once and to be used by multiple users/institutions for many times as well as having the distributed data as integrated and saving up in data production and maintenance costs.

It is possible to collect the spatial data under three main titles. The first title includes some basic base data like maps, plans, aerial photos and satellite images produced as based on horizontal and vertical geodesic network of the country. The second title includes manmade data and the infrastructure data like address, property, building, road, electric/water/sewage/rain water and finally the third titles includes the natural source data like forest, water, geology, landscape, environment, mine, climate, and protected areas. Natural source data is more static when compared with manmade data.

There are institutes that responsible of gathering and archiving of the basic base and natural source data and that data is carried to the electronic environment and opened to web share through these institutes.

The data called as manmade data is the one which is produced and updated in the transit process of rural to urban area. That data is produced through the projects applied by Local Government and opened to share as generating the country wide inventory by the institutes responsible in the center. It is more dynamic than the other data groups and needed constant development and update.

It is too important to develop an inventory for the data produced by Local Government in the center authorities through an automation process to have the SDI updated all the time. For sample, each day many rural areas are zoned for housing, thousands of buildings got licenses, new parcels are being created and new roads or network systems are being developed. So, to create the country wide updated inventory of that data, distributed-center system integration should be provided.

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1. THE IMPORTANCE OF SPATIAL DATA

The only planet we know that the life exists in it is our world. The world faces with some problems such as Increasing Population, Descending Resources, Climate Change, Distorted Urbanization, Natural disasters, Environmental pollution. Geographic information system (GIS) is an important tool for understanding and solving these problems. Problems can only be solved by the effective application of GIS facilities such as Accurate Planning, continuous monitoring of positional changes, Selecting the Right Location, Accurate Analysis, Decision Support. Because the value of spatial position is getting better day by day,the geospatial sector has been growing in importance in recent years.

It is necessary to regulate and appropriately manage spatial data which are costly and time consuming to obtain. Today, countries are becoming more and more aware of the importance of spatial data and are creating spatial data infrastructures at the national level to organize and manage these data.

National Spatial Data Infrastructure (NSDI) is a framework for managing spatial data Figure 1. NSDI covers of technologies, policies, and institutional arrangements that together facilitate the creation, exchange, and use of automated geospatial data and related information resources across an information-sharing community.
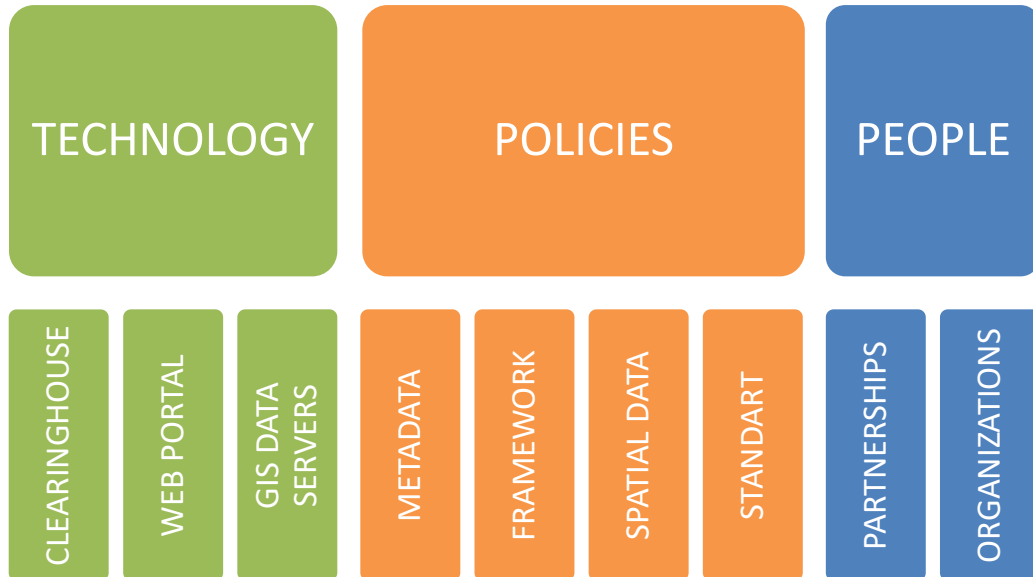

Figure 1 : NSDI Framework

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It is possible to collect the spatial data under three main group. The first group includes some basic **base data** like maps, plans, aerial photos and satellite images produced as based on horizontal and vertical geodesic network of the country. The second group includes **manmade data** like address, property, building, road, electric/water/sewage/rain water and finally the third group includes the **natural source data** like forest, water, geology, landscape, environment, mine, climate, and protected areas. Natural source data is more static when compared with manmade data.

The data called as manmade data is the one which is produced and updated in the transit process of rural to urban area (Figure 2).
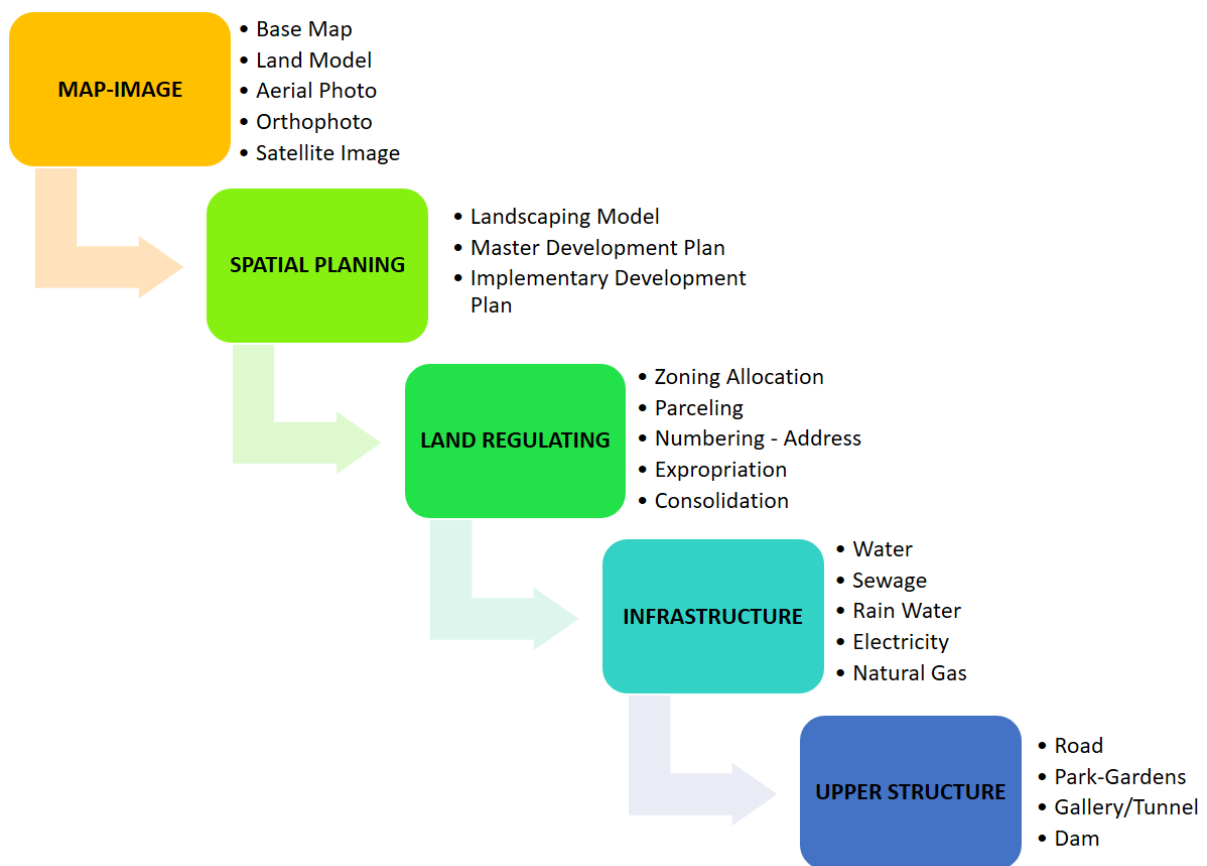

Figure 2 : Manmade data in the transit process of rural to urban area.

We need primarily basic spatial data such as map, aerial photograph, satellite image. Before construction, we make plans such as commercial area, social area settlement area. After suitable

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places identified for the construction Land arrangements must be made Infrastructure services must be completed before construction. After all these studies are completed, structures such as roads, parks, buildings can be constructed. That data is produced through the projects applied by Local Government and opened to share as generating the country wide inventory by the institutes responsible in the center. It is more dynamic than the other data groups and needed constant development and update.

2. HOW TO MANAGE SPATIAL DATA PRODUCTION AND SHARING

Spatial data production is an expensive business in terms of time and cost. The manufacturer must be the only one. It should be stored by the institution responsible for production.

Spatial data is usually produced locally by local authorities and managed by the central authorities at the country level. Figure 3.
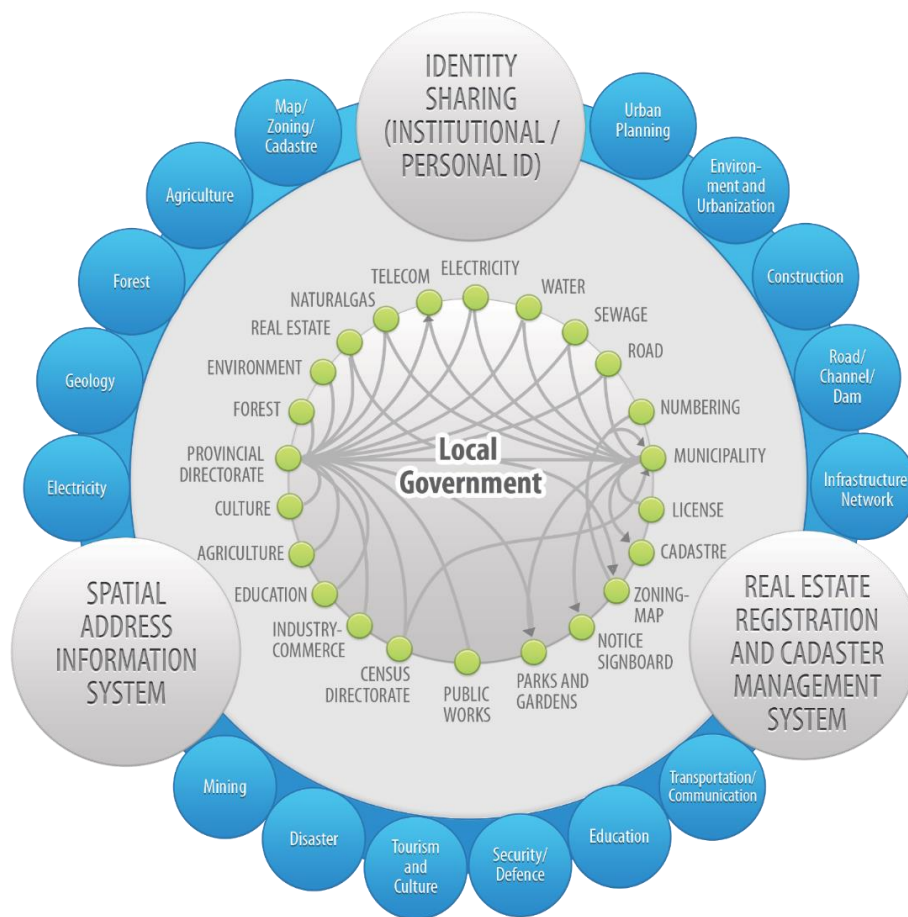

Figure 3 : Spatial data is produced locally, stored and shared central.

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Institutions responsible for the production, storage and sharing of spatial data in a country must be defined. A matrix of data production and sharing responsibilities should be prepared. This matrix should contain at least the following headings. Headings are exemplified by address data.

- Spatial data set (Address,…)
- Sub-dataset (Building, Building entrance gate, Street..)
- Geometric type (Point, area, line)
- Scale (1:1.000)
- Data production and sharing responsibility (municipalities, Special provincial administrations,…)
- Coordinating agency (Population citizenship affairs)
- Relevant law, regulation (…)
- Responsible ministry (Ministry of Interior)
- Potential users (Almost all ministries)

Central agencies should be responsible for the integration and sharing of distributed data. Generally, portals are created by the central authorities. Figure 4.
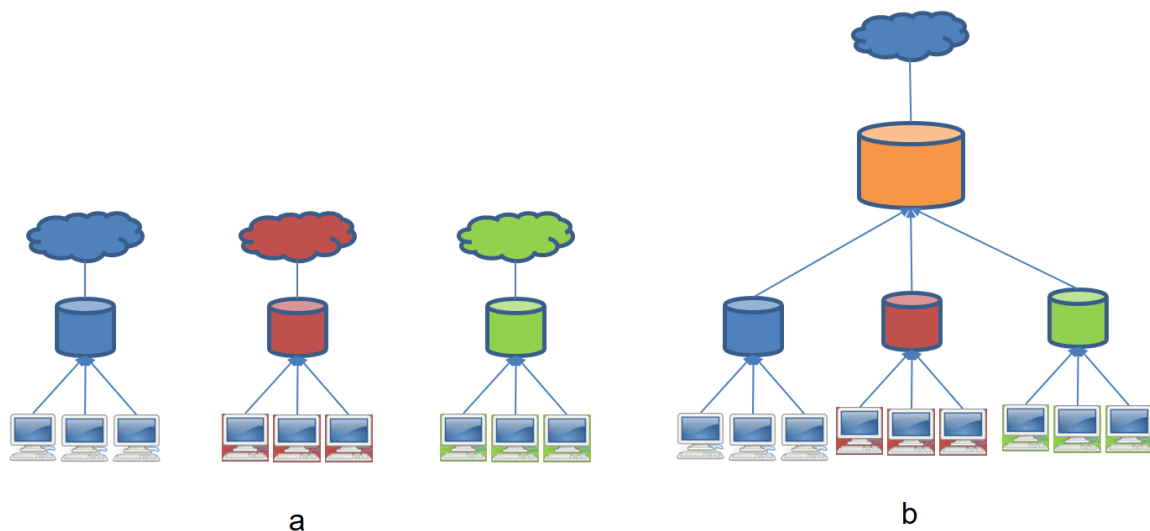

Figure 4 : a) Independent data sharing of units, b) Integrated data sharing with centralized administration of units

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For example, the spatial address data is generated by municipalities in Turkey. Responsibility for making changes also belongs to the municipalities. In other words, we can say that address data is owned by the municipality. However, central government is responsible for the integration and sharing of address data in the country dimension.

In the same way, parcel ownership data is produced by the cadastral directorates. The responsibility for making changes belongs to the cadastral directorates. However, integration and sharing of ownership data in the country dimension is done by the central institution.

In this structure, local administrations and central administrations need to work in an integrated manner. In a sense, automation is required. Individual portals can be set up to share address, property, and other location data, or production warehouse links can be shared via a single portal.

The most suitable architecture for data generation at the client and data sharing from the center is the client server architecture. There are two main groups in data processing in this system. One of them is users, clients and the other one is the center. These two groups communicate via internet or intranet. Figure 5.
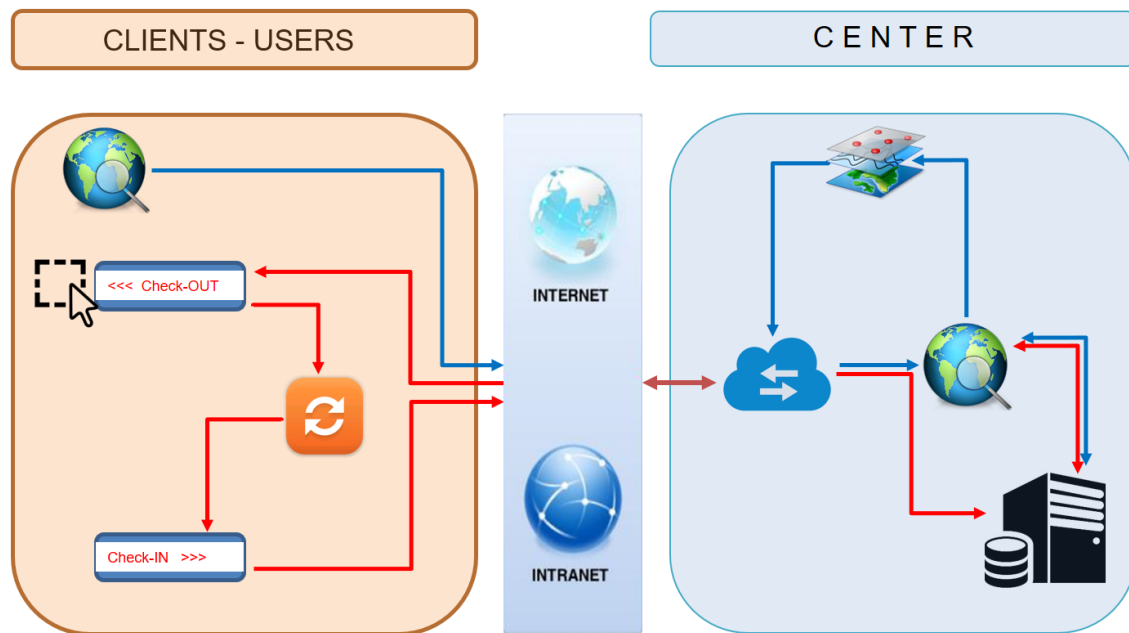

Figure 5 : Client Server Architecture

The check-out and check-in mechanism is very useful for updating the data in this architecture. The processing speed is increased when the data to be processed is received from the computer. It is also unaffected by situations like internet interruption. For security reasons, direct access

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to the database and transactions are prevented. All transactions are performed in a controlled manner. The method of operation of the check in check out mechanism is explained below.

- When the user wants to perform an operation, he or she should search and find the data to be processed first and then should select the data set to process.
- It downloads this dataset to its own computer. It is called as check out from database.
- Then it would realize needed update and sends it back to the center. It is called as check in to database.

In this process, it is possible to trace which data is received and sent back. The system is not affected by the interruption or the performance of the internet.

Many geographic information system client server architecture application was made in Turkey. Here are a few examples done by the NETCAD software company (Figure 6).
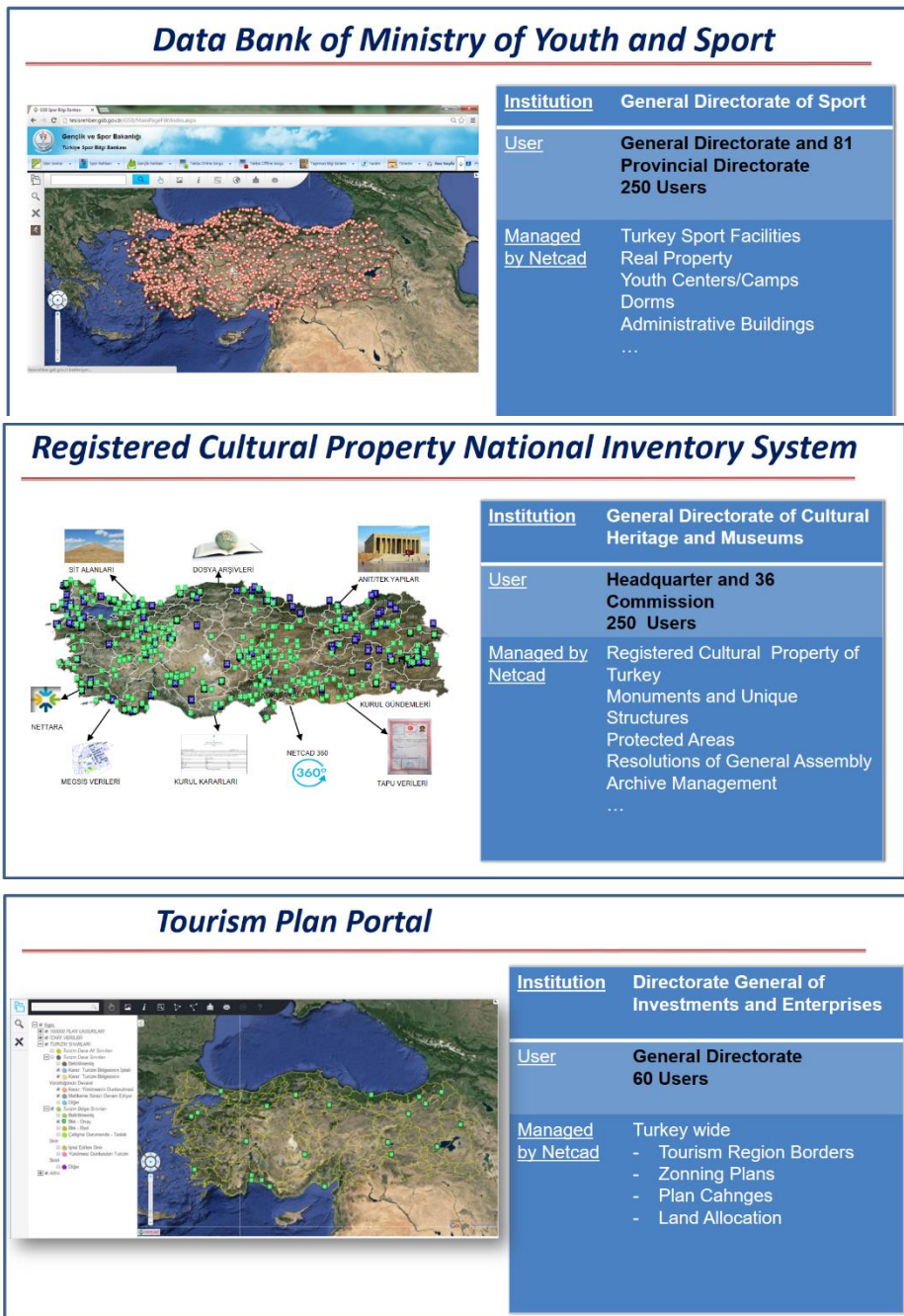
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Figure 6 : Some GIS applications implemented in client server architecture

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3. CONCLUSION

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BIOGRAPHICAL NOTES

Dr. Emin Bank is Geodesy and Photogrammetry Engineer. He has been completed Master and PhD education in the field of GIS. He has served 20 years in the General Command of Mapping as GIS Expert in mostly Spatial Data Infrastructure projects in national wide.

After retiring in 2000, he has served 7 years in the GIS private companies as GIS Expert.

After, he has served 4 years in the Ministry of Interior as GIS and e-Government Expert. After that he has served 2 years in the Scientific and Technological Research Council of Turkey (TUBITAK) as GIS Expert and 2 years in TUBITAK Space Technologies Research Institute as Deputy Director. He was retired in 2013 from TUBITAK and he has been serving in NETCAD software company since April - 2013 as the Corporate Representative

Dr. Emin Bank is experienced in Intergraph, ESRI and NETCAD software platforms.

He is also experienced in the implementation and the project management of enterprise GIS projects in national wide.

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