Administrative Units Design in Support Of Territorial Development in Turkey

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Using spatial data collaboratively provides noteworthy benefits to environmental, social, and economic context. As a part of Spatial Data Infrastructure (SDI) development at different implementation levels in Turkey, spatial data that represents administrative units and are modelled for multipurpose usage supports a variety of areas from census and demography to public health and environment for planning, maintaining, or rationalising activities. In Turkey, public institutions have different approaches to describe administrative units and to collect on database. In view of SDI concept, there is an unorganized structure and spatial and technical standards have not been determined yet. In this study, spatial data and coding standards were developed to describe Centrally and Local Administrative Units, Statistical Territorial Units, and Jurisdictions. As a base for collection of spatial data, polygon-based administrative boundaries into a spatial hierarchy contribute to a better understanding of territorial unbalanced development. With a case study, the data was collected and organized on geodatabase for Turkey at national level and for TR90 region at local level, including Trabzon, Rize, Giresun, Ordu ve Gumushane provinces, according to NUTS II statistical classification. Non-spatial and statistical data was collected from different institutions for health, wealth, and population distribution applications. Sharing Information Model was built to enable cooperative use of the data from different resources. Applications and map products from demography to economic analysis were produced that enables to present spatial data at different scales and applications with different cartographic representation.

1. INTRODUCTION

Geographic Information (GI) has economic value as a major component of Public Sector Information and has social and policy value for providing the basis to integrate
policies and to provide noteworthy benefits to citizens, business, and governments (Craglia, 2004). Geographic Information Systems (GIS) functionality provides a powerful decision support in various applications domains. But, the focus is changing toward integrating these systems into a society perspective. Spatial Data Infrastructure (SDI) enables compiling and sharing the data through the partnerships with local, regional, and national level stakeholders. By this way, using spatial data collaboratively provides noteworthy benefits to environmental, social, and economic context (Aydinoglu and Yomralioglu, 2006). As a part of Spatial Data Infrastructure (SDI) development, GI should be grouped into a variety of different theme such as Governmental Units, Cadastral, Geodetic Control, Elevation, Hydrographs, and Transportation. And, these are modelled to challenge a variety of user needs. But, in Turkey, it should be taken into consideration that there is an unorganized structure and spatial and technical standards have not been determined yet in view of SDI concept.

In this study, as a part of SDI, spatial data sets representing administrative unit theme are modelled for multipurpose use. A case study was produced for Black Sea region of Turkey. Applications and Information Products from census and demography to public health and environment were produced. These enables to present spatial data at different scales and to produce applications with different cartographic representations.

2. MODELLING ADMINISTRATIVE UNIT SPATIAL DATA SETS

Administrative Unit theme is a concept that determines responsibility areas of related association/institution, are surrounded by administrative boundaries, and have importance for managing a country or region effectively. For example; Trabzon Province, Esentepe District, or any institution can be accepted as an administrative unit with their boundaries. Administrative Unit Spatial Theme presents administrative unit centers and their administrative areas and forms layers that can be used at local, regional, and national levels. Spatial Data Themes presenting administrative units can be used as base layers on many thematic applications executed by different institutions.

SABE-Seamless Administrative Boundary of Europe and EuroBoundaryMap projects produced by EuroGeographics were based on modeling Administrative Unit data themes. Spatial data sets presenting Administrative Units were produced for 36 European countries with these standards describing geometry and conceptual model at different
administrative levels. Each country has its own administrative hierarchy. These spatial data sets should be modeled depending on this hierarchy from highest level to lowest level. SABE contains information about the following features (Euro Geographics, 2004);

- An administrative unit is controlled by an administrative authority (e.g. Commune in Belgium and France, Ward in Britain, Gemeinde in Germany, Kunta in Finland, Občina in Slovenia).
- Each administrative unit has a name and a unique code.
- An administrative unit is composed of one or more administrative areas.
- One administrative area of each lowest level administrative unit is its mainland polygon. All other areas are labelled as exclaves (islands).
- It belongs to (is included in) a unit at a higher level of the national hierarchy and is composed of (consists of) lower level units.
- It may host the residence of a unit at a higher level in the hierarchy.
- The relations between administrative units are country specific.
- A condominium is an area governed by different authorities.
- An administrative boundary segment is a line which separates two adjacent administrative areas. It may exist only at the lowest level administrative division or it may separate units at more than one level.

2.1. Current Administrative Structure in Turkey

Administrative Structure of Turkey was constituted by Central and Local Administrations. Central Administrations and their boundaries;

- Country (Ülke) Boundaries determined by international agreements.
- Regional Boundaries that do not exist legally, but possible with special laws.
- Province (İl) Boundaries that surround provinces. Province is the main and the biggest administrative unit having governor of central administration locally. 81 provinces constitute the country with national boundary.
- County (İlçe) Boundaries that surround counties. Counties constitute provinces and have head official of central administration locally. And, 923 counties constitute country.
- Sub-county (Bucak) Boundaries exist legally, but are not active actually and do not have head official. Therefore, it is not used as an administrative unit in spatial data sets.
• Village (Köy) Boundaries that surround villages. That is the smallest central administrative unit, but has local head.

  Local Administrations and their boundaries;
• Metropolitan Municipality (Büyükşehir Belediyesi) Boundaries can not be described hierarchically because there is no a standart structure for their covering area. Metropolitan Municipality as an administrative unit covers counties and sub municipalities.
• Municipality (Belediye) Boundaries cover municipalities that must be built in county centers and in centre of population having population more that 5000.
• District (Mahalle) Boundaries cover districts that constitute municipalities. These are the smallest local administration with their local heads.

The Nomenclature of Territorial Units for Statistics (NUTS) boundaries; NUTS was established by Eurostat more than 25 years ago in order to provide a single uniform breakdown of territorial units for the production of regional statistics for the European Union. NUTS regions do not have any Administrative connection to Central Administration of Turkey. But, NUTS nomenclature serves as a reference for the collection, development and harmonization of Community regional statistics, the socio-economic analyses of the regions, and the framing of Community regional policies. Therefore, NUTS boundaries are combined with Administrative Unit Spatial Data Theme. While, In Europe, there are 78 regions at NUTS I level, 221 regions at NUTS II level, and 1093 regions at NUTS III level, in Turkey, there are 12 regions at NUTS I (Bölge) level, 26

Figure 1: Conceptual Data Model of Administrative Unit Hierarchical Structure
sub-regions at NUTS II (Alt Bölge) level, and 81 provinces at NUTS III (İl) level (URL-1). NUTS III regions are the same of Provinces of Central Administration. The boundaries of NUTS I and NUTS II are formed with the boundaries of Provinces.

Beside this; responsibility areas of Public Institutions such as General Directorate of Land Ownership and Cadastre (TKGM), State Water Works (DSİ), etc. should be modeled spatially from national to local level.

Hierarchical structure of Administrative Unit of Turkey can be seen on Figure 1 illustrating with UML diagram. From national level to local level, It can be arranged hierarchically as NUTS I (Bölge), NUTS II (Alt Bölge), NUTS III- Province (İl), County (İlçe), Municipality (Belediye), and District/Village (Mahalle/Köy) in order. So that, the lowest level administrative units are District situated inside Municipality areas and Villages situated outside Municipalities and their contiguous. Combining Districts and Villages in a dataset constitutes Counties and Provinces hierarchically (Aydinoglu, etc., 2007).

**2.2. Creating Administrative Unit Code**

Administrative Unit Code (IDBK) is required to form relationship among databases representing administrative units. Public Institutions such as Turkey Statistics Institute (TURKSTAT) and General Directorate of Local Governments use different hierarchical definitions related to administrative units. Therefore, IDBK should be produced in respect of country’s administrative hierarchy as explained in SABE products. Hierarchical structure of Administrative Units that is used to produce IDBK can be seen on Figure 1 illustrated with UML diagram.

IDBK can be defined as seen on Figure 2. Because there is no IDBK that is defined from national to local level hierarchically, Administrative Unit definitions used in public

![Figure 2. Administrative Unit Coding](image-url)
institutions are combined. To illustrate this, Administrative Unit Codes of TURKSTAT combined with NUTS codes are defined from Country level to County level. Coded values of General Directorate of Local Governments are defined for Municipalities, Villages, and Districts. As seen on Figure 2, this IDBK with 12 digits can be used on Administrative Unit Spatial Data Sets. Table 1 shows IDBK examples from national to local level (Aydinoglu, etc., 2007).

Table 1. Example IDBKs at different levels

<table>
<thead>
<tr>
<th>Administration Level</th>
<th>IDBK</th>
<th>Example</th>
<th>Structure Determination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country (Ülke)</td>
<td>TR0000000000 Türkiye</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>NUTS1 (Bölge)</td>
<td>TR9000000000 Doğu Karadeniz Bölgesi</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>NUTS2 (Alt Bölge)</td>
<td>TR9000000000 Trabzon Alt Bölgesi</td>
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<td></td>
</tr>
<tr>
<td>NUTS3 (İl)</td>
<td>TR9010000000 Trabzon İli</td>
<td>7</td>
<td></td>
</tr>
<tr>
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<td>TR9011200000 Trabzon/Akçaabat İlçe</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Metropolitan Municipality</td>
<td>TR100BB00000 İstanbul Büyükşehir Belediyesi</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Municipality (Belediye)</td>
<td>TR9011205000 Trabzon/Akçaabat İlçe/Akçakale Beldesi</td>
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<td></td>
</tr>
<tr>
<td>Köy/Mahalle (Village/District)</td>
<td>TR9011205012 Trabzon/Akçaabat İlçe/XXX Köyü</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

2.3. Designing Administrative Units Spatial Data Sets

With a high level view, package groups a set of information to organize a model into more abstract structures. Data themes are collections of common geographic elements such as Administrative Units, Transportation, and Hydrographic. Administrative Unit as a data theme was grouped into Datasets in respect of common logical class and set of attributes to produce Administrative Unit Spatial Data Model. As seen Figure 3, Administrative Unit data theme abbreviating IB are grouped into datasets such as NUTS, Central Administration, Local Administration, and Institutional Responsibility Areas. And then, Feature Types are determined to provide one more level of classification to identify subcategories of features within a dataset. By this way, Regions, Sub-regions, Province, County, Metropolitan Municipality, Municipality, Contiguous Municipality, District/Village, and Administrative Center are determined as Feature Types.

Administrative Unit data theme was modeled for meeting the needs of local governments and central administration. A set of specifications were produced for creation, maintenance, and sharing GI. Specifications of Administrative Unit Data Theme include Datasets, Feature Types, Uses of Data, Recommended Attributes, Domains, and Spatial Integrity Rules. Figure 4 shows Administrative Unit Data Theme including datasets and their attributes and relationships.
Figure 3. Data Sets and Feature Types of Administrative Unit Data Theme

Figure 4. Administrative Unit Data Sets with Their Attributes
3. CASE STUDY FOR TR90 REGION

TR90 sub-region including Trabzon, Rize, Giresun, Ordu, ve Gumushane provinces, according to NUTS2 statistical classification, was chosen as a pilot area. The data obtained from KTU GILab works is used on this case study. These data is obtained from Directorates of Public Works, Province Private Administration, and Municipalities. These data was converted and designed on GIS environment. The information related to Administrative Unit theme was collected from Directorate of local Governments. These data was combined on ArcGIS Geodatabase environment according to Administrative Unit Spatial Data Model.

Statistical and Demographic data was extracted from TURKSTAT Regional Statistics web site. These includes Census, Demography, Economy, and Employment data on digital spreadsheet format. Health data was collected from Province Directorate of Health and Cancer Registry Center. Administrative Unit Code named as IDBK was added to these spreadsheets for each administrative unit record. And then, spatial datasets and databases were combined on GIS environment.

3.1. National / Regional Level

A variety of applications and information products can be developed at national and regional level. For example; Figure 5 shows Turkey Administrative Unit Map with the using of BOLG, ABOL, and N3IL datasets and features. And, Net-Immigration Map was produced with the combining of ABOL dataset and Net-Immigration statistics.
4.2. Province / County Level

A variety of applications and information products can be developed at province and county level. Figure 6 shows interactive TR90 and Trabzon Province Map as a internet mapping application. This application was produced with the using of N3IL, ILCE, and IDME datasets and statistics data.

Figure 6. Internet TR90 and Trabzon Province Map

4.3. Municipality/ District / Village Level

A variety of applications and information products can be developed at municipality, district, and village level. For example; Figure 7 shows Trabzon counties Literacy Distribution Map and District/Village Cancer Incidence Map. This application was produced with the using of ILCE and MAKO datasets, statistics and health data.

Figure 7. Trabzon Counties Literacy Map and District/Village Cancer Incidence Map

5. CONCLUSIONS

Public Institutions has produced spatial data on different formats and standards in Turkey. Collecting and sharing spatial data coming from different sources have difficulty.
Especially, it is difficult to get District and Village Administrative data sets from local governments. To execute various thematic applications, Administrative Unit data theme should be modeled and combined as a part of SDI development from national to local level. By this way, it is required to build Data Sharing Information Model as examined in this study. This approach enables a variety of applications from census and demography to public health and environment for planning, maintaining, or rationalising activities.

REFERENCES


