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## **ANALYSIS OF GEOGRAPHIC/URBAN INFORMATION SYSTEM WEB PRESENTATIONS OF LOCAL GOVERNMENTS IN TURKEY**

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**ABSTRACT:** Web sites are media environments, which ease our life, provide rapid access to requested information, constantly updated and provide information to people who wants to be informed. As Geographical Information Systems (GIS) has developed parallel to technology and integrated to new Technologies, use of this technology has become more popular. This technology is used as GIS integration by local governments in municipality websites. GIS provide better services in local governments and used in decision making mechanisms, taxing, planning in substructure and upper structure studies and for assisting in each matter within the scope of municipality's assignment area.

Web sites are tracking mechanisms which provides updated information about the municipalities they are builded for and shares plans via internet. Incompatible and unstandardized structure of municipality web sites, cause disintegration especially for GIS supported applications in mapping and prevent creating a system. First criteria in creating a website, studying applications in it and reconstruction is to define the purpose of applications and standards in design of these websites.

In this study, website profiles of local governments in Turkey are studied in terms of City Guide and E-Municipality applications and comparative analyses are made. Correspondingly, similarities, differences and deficiencies are revealed. According to the required results it is concluded that data structure and web content is not of standards and it is needed to be standardized in international terms.

**Keywords:** Local Government, GIS, Urban Information System, E-Municipality, City Guide

### **1. INTRODUCTION**

Technological developments increase everyday. Especially communication technologies have developed extraordinarily since last 30 years and still developing. Developing information technologies have made it easy to access worldwide information and sources of information. In other words, it has become one of the basis of globalization. Now distances has no importance for accessing or sending information. Each kind of information can be transferred to digital media especially by developments in internet and data exchange is possible all around the world.

Globalization, changes in democracy and transition to information society by the changes in sense of citizen and change in local governments and international

regulations bring production of e-applications. These applications have a lot of benefits for institutions. Information and communication technologies are of great potential for public sector as in private sector. Information technologies have served a lot of opportunity for increasing the quality of internal management efficiency and quality of public services which are served to citizens (Moon, 2002). Studies emphasize that information and communication technologies provide operational efficiency, decrease in costs, quality of service, conformability, renovation and big potential of experience for private and public sectors (Ndou, 2004).

Applications provide savings from a lot of bureaucratic procedures, personnel expenses, time, space, etc. in comparison to traditional method. Municipalities,

which are local government institutions, have gone through a reconstruction process in this e-transformation process. A lot of municipality have started to give electronic municipality services. Web technologies provide new possibilities and opportunities to municipalities in performance management, public relations, participative management, social responsibility and e-business/service/trade areas (Henden, 2004).

Geographic Information Systems (GIS) are the most important search and application device in electronically municipality services. Citizens are able to access maps with Geographic information, construction plans, building permits, addresses. Today, GIS is an essential device for some municipalities and a lot of municipality transfer their verbal, paper or CAD data to GIS media. Web applications are the best platforms for serving GIS transformed data to citizens.

GIS and information technologies serve efficient devices to local governments for valuation and management of sources. These devices provide storage, valuation, analyzing, service, report and modelling of spatial data (Fosu and Ashiagbor, 2012). Primary benefits of GIS for local governments are; efficiency, income growth, increase in accuracy rate, decision support, management of sources and saving of time, money and work labour as it provides task automation [URL1]. By these benefits, GIS are able to be used as a very strong device in local governments for planning, social development, environmental protection, integration in public security, infrastructure management, waste site selection, transport planning, health, education, modelling, mobilization management, urban studies, land and construction management (Tataro lu, 2007; Zhou and Charnpratheep 1996; Charnpratheep et al. 1997; Das 2016; Reitsma 1990; Sui 1992, 1998; Miller 1994; Clarke and Gaydos 1998; Arentze et al. 1998; Arsanjani, 2013; Gupta, 2016; Fortney 1996; Fraile 2016; Trammell and Pratt 1998; Erdi and Ilgaz 2014). GIS and Urban Information Systems are provided for the benefit of local managements as a gift of developing information technologies and make great contribution for efforts in solving increasing and complicating urban problems (Pekta , 2009).

There are data standards which constitute Geographic Information Systems and make it an exact information system. Standardization states contracts and rules developed by users for providing integrity and openness for the subjects that differences are not desired. International standardization approach aims change in goods and services by removing global technical obstacles. So, general purposes of standardization can be ordered as; avoiding lost of time and cost, providing efficient use of information, avoiding information loss, easing information transfer and increasing quality (Anonymous, 2012). GIS/Urban Information System standards are determined by international institutions and establishments for interoperability. The most important of these data standards are; Inspire, Dublin Core, Open Geospatial Consortium and ISO/TC211.

European Union Spatial Information Infrastructure Interference (INSPIRE) is established in the control of European Commission General Directorate of Environment in 2001. It aims providing consistent and shareable information for supporting Europe policy in environment, agriculture, transportation and a lot of sectors in local, regional and national level.

E-applications of municipalities, which are installed by GIS infrastructure, require a lot of spatial data for planning, informing, managing and etc. purposes about the place which is lived in. These data are gathered from various sources and in different standards, protected and served to users in different types and forms. In Turkey, local and central governments serve these data with different standards and figures in conformity with today's technology.

In this study, website profiles of local governments in Turkey are studied with regards to Urban Guide and E-municipality applications and results are given in tables. Also, resemblances, differences and deficiencies are presented.

## **2. MATERIAL AND METHODS**

Turkey is between the 36° and 42° north latitudes and 26° and 45° south meridians. Turkey's lands are roughly like a rectangle. It is 1600 kilometers length and 800 kilometers width. It is the biggest 37th country of the world with regard to square measure. Generally, Turkey is a country with large amount of its lands are in Anatolia and a small part is in the Europe continent. Turkey's population data is 79.814.871 according to 2016 [URL2]. Turkey has 30 Metropolitan Municipality, 51 City Municipality and 919 District Municipality.

City Guide is an application which is applied for municipalities and introduces their physical structure spatially and enable some cultural inquiries. Urban Guide generally enable accessibility of city's important places, avenue, street, address searches locationally, location information for surveying, satellite images, construction information, Cartographic presentations, etc. information.

Necessities of information age in developing and globalizing world, has brought great responsibilities to local managements. Individuals', institutions', which means users, expectations from municipalities increase constantly due to technological developments. For this reason, local governments serve a system via internet, on which citizens are provided service and can do almost all their works without going to municipality buildings. This system is called as E-Municipality application. E-Municipality application provides a citizen oriented, more regular system to users with activity, efficiency, transparency, accountability, non-repetitive structure. In this study, City Guide, which includes GIS/ Urban Information System applications of local governments in Turkey and content of E-Municipality applications are studied from municipalities' websites and results are shown as tables. ArcGIS software is used for questioning and analyzing required data.

## **3. RESULTS AND DISCUSSIONS**

Municipalities can be established in our country in settlement areas which has 5000 and more population. Municipalities are local governments which fulfil needs of citizens in local ground. In 2012, settlements with over 750.000 population are called as metropolis by the 6360 numbered Law. In this study, Metropolitan Municipalities', City Municipalities' and District Municipalities', which are one of the local government units in Turkey, websites are considered separately with regards to City Guide and E-Municipality applications.

### 3.1. City Guide Applications

#### 3.1.1. City Guide Applications of Metropolitan Municipalities

There was 16 Metropolitan Municipalities in our country but it has increased to 30 in 2012 by 6360 numbered Metropolis Law (Figure 1). Each Metropolis has their own specific City Guides.



Figure 1. Metropolitan Municipalities in Turkey

In almost all City Guides in Metropolitan Municipality websites, there are cultural areas, health institutions, governmental agencies, educational institutions, contact detail searching and address searching. Applications of City Guides of Metropolitan Municipalities are shown in Table 1.

Table 1 Applications of City Guides of Metropolitan Municipalities

Country	Cultural Areas	Address Searching Governmental Agencies	Educational institutions	Health institutions	Contact Detail Searching	Pharmacy On Duty
Adana						
Ankara	x	x	x	x	x	x
Antalya						
Aydin	x	x	x	x	x	x
Balikesir	x			x	x	x
Bursa					x	x
Denizli	x	x		x	x	x
Diyarbakir						
Erzurum						
Eski ehir						
Gaziantep						
Hatay						
istanbul	x	x		x	x	x
zmir	x	x	x	x	x	x
K.Mara						x
Kayseri	x	x	x	x	x	x
Kocaeli	x	x	x	x		x
Konya	x	x	x	x	x	x
Malatya						x
Manisa	x	x	x	x	x	x
Mardin						
Mersin						

Mu la							
Ordu	x	x	x	x	x	x	x
Sakarya							
Samsun							
.Urfa	x	x	x	x	x	x	x
Tekirda							x
Trabzon							
Van							

In Metropolitan Municipalities, map and GIS related other applications are; 360° virtual tour, 3D city guide, address information system, transportation information system, changes of satellite images through years, sheet index change and GIS for children. Table 2 shows which municipalities have these applications.

Table 2. Metropolitan Municipalities City Guide GIS/CIS related applications

Country	Zoning Status	3d City Guide	Changes Of Satellite images Through Years	Cemetery Information System	Sheet ndex Change	Transportation Information System	360° Virtual Tour	Address nformation System	GIS For Children
Adana									
Ankara				x		x	x		
Antalya									
Aydin							x		
Balikesir	x						x		
Bursa		x		x		x	x		
Denizli	x			x			x	x	
Diyarbakir				x			x		
Erzurum							x		
Eski ehir				x					
Gaziantep									
Hatay									
istanbul			x		x		x		
zmir		x	x	x	x				
K.Mara									
Kayseri		x	x	x		x			
Kocaeli									
Konya	x	x	x	x	x	x	x		x
Malatya	x			x					
Manisa	x								
Mardin									
Mersin									
Mu la									
Ordu	x								
Sakarya				x			x		
Samsun									
.Urfa	x						x		
Tekirda				x			x		
Trabzon	x			x					

Van								
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According to Table 1, it is seen that the most successful cities are Ankara, Aydın, zmir, Kayseri, Kocaeli, Konya, Manisa, Ordu and anlurfa. The most common application is Pharmacy on Duty with 53,33% rate. Other applications are; 40% cultural area, health institutions, transportation and 360° virtual tour. While address application is 36, 67%, rate of questioning government agencies is 30%. The least common applications are address information system with 3,33% and GIS applications for children. It is determined that Address Information System, which is based upon ArcGIS software, is only available in city of Denizli (Figure 2). GIS application for children is available only in Konya city (Figure 3).

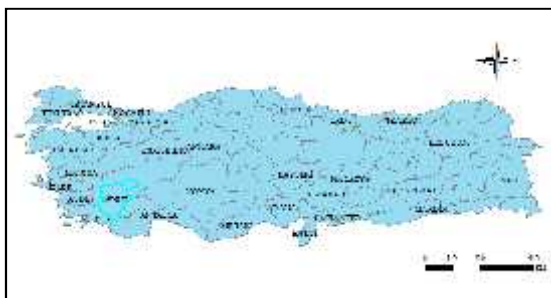


Figure 2. Metropolitan Municipalities which have Address Information System Application



Figure 3. Metropolitan Municipalities which have GIS Application for children

### 3.1.2. City Guide Applications of City Municipalities

There are 51 City Municipality in Turkey (Figure 4).

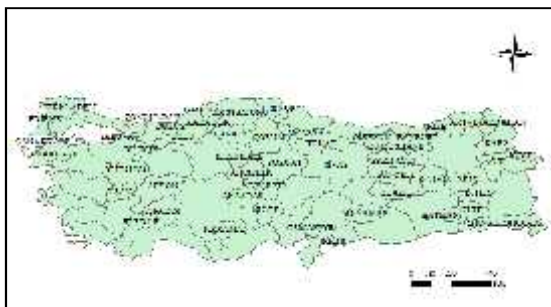


Figure 4. City Municipalities in Turkey

City based numbers and percentiles of city municipalities' applications in city guides are given in Table 3. According to Table 3, the most common city

guide application in city municipalities is address application with rate of 35,29% (18 pieces). Other applications are cultural area (33,33%), transportation (31,37%) and governmental agencies, education, health, 360° virtual tour (29,41%). The least common applications are 3D city guide with the rate of 1,96%, 3D cemetery information system, transportation information system and address information system applications.

Table 3. City guide applications in City Municipalities

Application	Quantity	%
Cultural Areas	17	33.33
Address Searching	18	35.29
Governmental Agencies	15	29.41
Educational Institutions	15	29.41
Health Institutions	15	29.41
Contact Detail Searching	16	31.37
Zoning Status	14	27.45
3d City Guide	1	1.96
Changes Of Satellite Images Through Years	2	3.92
Cemetery Information System	7	13.72
3D Cemetery Information System	1	1.96
Transportation Information System	1	1.96
360° Virtual Tour	15	29.41
Address Information System	1	1.96
Pharmacy on Duty	12	23.53

There are both cultural and transportation applications at the same time in 16 city municipalities (Figure5). Address information system and Pharmacy on Duty applications only take place in Düzce City Municipality (Figure6).



Figure 5. City Municipalities which have cultural area and transportation applications



Figure 6. City Municipalities which have Address information system and Pharmacy on Duty applications



### 3.1.3. District Municipalities City Guide Application

There are 919 District Municipalities in Turkey and they have same features with city municipalities with regards to City Guide content. Only 172 of 919 District Municipality has City Guide application. The most common applications in 172 District Municipalities are cultural area, address, health institutions, governmental agencies, transportation, education institutes and zoning status applications as in City Municipalities. One of the most common and frequently used searchings in City guides is Address Searchings. Diagram 1 shows searched districts of cities in District City Guides. According to Diagram 1, it is seen that districts' websites of developed cities such as Ankara, stanbul, Bursa and Kocaeli have more address search applications.

Diagram 1. Address search in District Municipalities

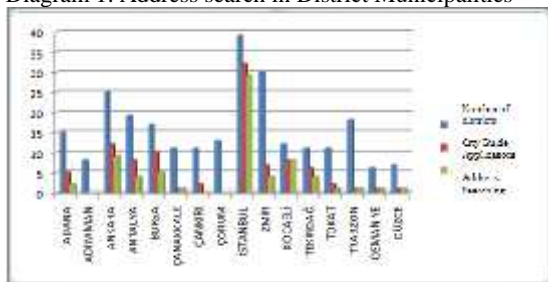


Diagram 2 shows distribution of cities' districts with Pharmacy on Duty application. According to Diagram2, Pharmacy on Duty application is most commonly used in districts of stanbul and Ankara cities. Pharmacy on Duty and Address Information system is only available in stanbul city Zeytinburnu District (Figure 7).

Diagram 2. Pharmacy on Duty Application in District Municipalities

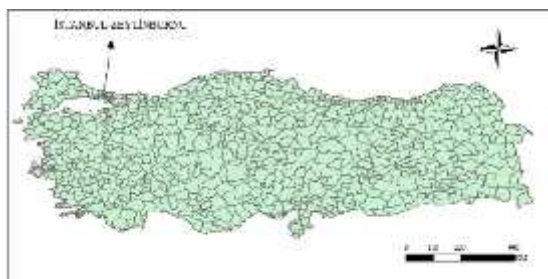
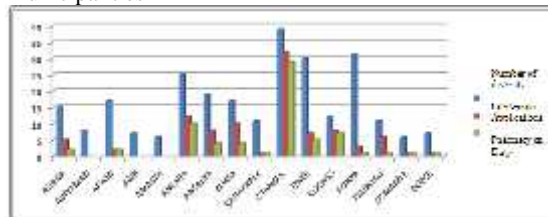


Figure 7. District Municipality which has Pharmacy on Duty and Address Information System Application

## 3.2. E-Municipality Applications

### 3.2.1. Metropolitan Municipality E-Municipality Applications

Metropolitan Municipalities aim providing quality service to citizens with E-Municipality application. For this reason, user satisfaction is desired via online system with citizen focused contents. E- Municipality applications make it possible to access information such as knowledge acquisition, payment, registry search, demand/complain, marriage service, declaration, document tracking, public transportation service schedule, building abrasion rates, garbage collection times, chimney cleaning, theater e-ticket, e-market, e-library, e-blood bank, career employment, e-pay roll and land market value.

Table 4 and 5 show E-Municipality applications of Metropolitan Municipalities' in their websites.

Table 4. E-Municipality applications of Metropolitan Municipalities

Country	Access Information	Payment	Registry Search	Demand/Complain	Marriage Service	Declaration	Document Tracking	Public Transportation Service Schedule	Career Employment
Adana	x	x		x		x	x		
Ankara		x	x			x		x	
Antalya	x	x			x		x		
Aydin	x	x		x					
Balikesir		x	x						
Bursa		x					x	x	
Denizli		x					x		
Diyarbakir		x			x				
Erzurum									
Eski ehir	x					x			
Gaziantep		x						x	
Hatay									
stanbul		x						x	
zmir		x				x			
K.Mara	x	x					x	x	
Kayseri									
Kocaeli		x					x	x	
Konya	x	x					x		
Malatya	x	x	x	x	x	x	x		
Manisa		x							
Mardin									
Mersin	x	x						x	
Mu la		x	x						
Ordu	x		x	x					
Sakarya						x			
Samsun									
.Urfa		x	x	x					
Tekirda	x	x	x	x					x
Trabzon		x							
Van	x	x		x					

Table 5. Metropolitan Municipalities GIS/CIS content E-Municipality Applications

Country	Building Abrasion Rates	Garbage Collection Times	Chimney Cleaning	Theater E-Ticket	E-Market	E-Library	E-Blood Bank	E-Pay Roll	Land Market Value
Adana								×	
Ankara			×						
Antalya				×	×				
Aydin									
Balikesir									×
Bursa						×		×	
Denizli									
Diyarbakir									
Erzurum									
Eski ehir									
Gaziantep									
Hatay									
stanbul									
zmir						×			
K.Mara						×			
Kayseri									
Kocaeli									
Konya									
Malatya	×	×			×				×
Manisa	×								×
Mardin									
Mersin									
Mu la									
Ordu									
Sakarya									
Samsun									
.Urfa	×								×
Tekirda	×								×
Trabzon									
Van									

According to Table 4 and 5, it is seen that Malatya is the most successful city with regards to E-Municipality applications in Metropolitan Municipality websites. Table 6 shows E-Municipality applications' availability in 30 Metropolitan Municipality. According to Table 6 the most common E-Municipality application in Metropolitan Municipalities is Online Payment with 73,33% rate. 11 of (36,67%) of 30 Metropolitan Municipality are of Knowledge Acquisition application. Document tracking application is of 26,67% rate. Career employment, garbage collecting hours, chimney cleaning, theater e ticket, e-market applications are available only in 1 Metropolitan Municipality (3,33%). E-Blood application is not available in any of the Metropolitan Municipalities.

Table 6. Number of E-Municipality Applications in Metropolitan Municipalities

Applications	Quantity
Access Information	11
Payment	22
Registry Search	7
Demand/Complain	7
Marriage Service	3
Declaration	6
Document Tracking	8
Public Transportation Service Schedule	7
Career Employment	1
Building Abrasion Rates	4
Garbage Collection Times	1
Chimney Cleaning	1
Theater E-Ticket	1
E-Market	1
E-Library	4
E-Blood Bank	0
E-Pay Roll	3
Land Market Value	4

According to analysis executed with ArcGIS; Chimney cleaning application is only available in Ankara Metropolitan Municipalities (Figure8), theater e-ticket application is only available in Antalya Metropolitan Municipalities (Figure 9) and career employment searching is only available in Tekirda Metropolitan Municipalities (Figure 10).



Figure 8. Metropolitan Municipalities E-Municipality Application/ Chimney Cleaning



Figure 9. Metropolitan Municipalities E-Municipality Application/Theater E-Ticket

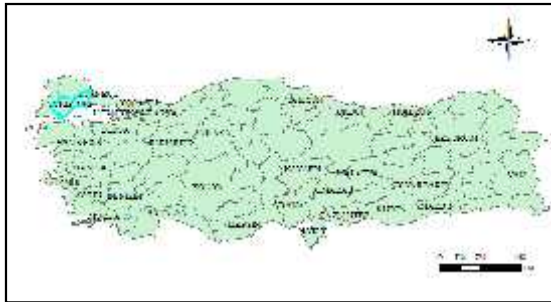


Figure 10. Metropolitan Municipalities E-Municipality Application/Career Employment

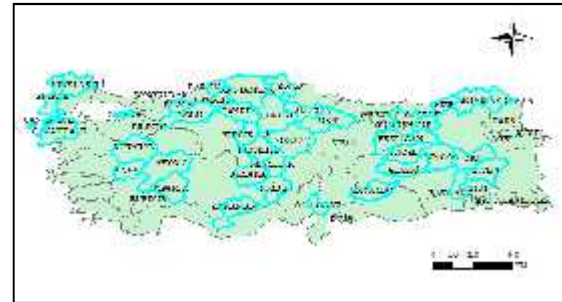


Figure 11. Cities which have Payment Application in City Municipality websites

### 3.2.2. Metropolitan Municipalities E-Municipality Applications

Numerical illustration of 51 Metropolitan Municipalities' web sites' e-municipality applications are given in Table 7.

Table 7. Number of E-Municipality applications in City Municipalities

Applications	Quantity	Percentage
Access Information	51/17	33.33%
Payment	51/37	72.55%
Registry Search	51/25	49.01%
Demand/Complain	51/21	41.18%
Marriage Service	51/13	25.49%
Declaration	51/14	27.45%
Document Tracking	51/12	23.53%
Public Transportation Service Schedule	51/0	0%
Career Employment	51/23	45.09%
Building Abrasion Rates	51/4	7.84%
Garbage Collection Times	51/0	0%
Chimney Cleaning	51/0	0%
Theater E-Ticket	51/0	0%
E-Market	51/0	0%
E-Library	51/1	1.96%
E-Blood Bank	51/0	0%
E-Pay Roll	51/3	5.88%
Land Market Value	51/27	52.94%

Payment, declaration, land market price searching's, which are commonly used E-Municipality applications in City Municipalities, analysis with ArcGIS are shown in Figure 1.21, Figure 1.22 and Figure 1.23. Payment application is available in 37 cities (Figure 11). E-declaration application is available in 14 cities in total, which are Kırklareli, Edirne, Yalova, Afyon, Bartın, Karabük, Çankırı, Yozgat, Kır ehir, Sivas, Ni de, Osmaniye, Adıyaman and Batman (Figure 12). Also, land market value application is available in 27 cities (Figure 13).

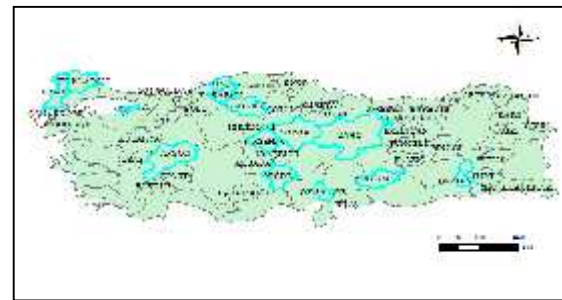


Figure 12. Cities which have Declaration Application in City Municipality websites

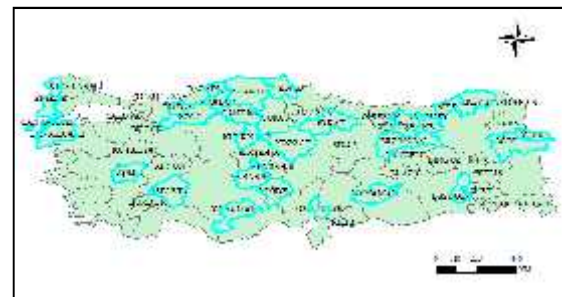


Figure 13. Cities which have Land Market Value Application in City Municipality websites

### 3.2.3. District Municipalities E-Municipalities Applications

In Turkey, 323 of 919 district municipality have e-municipality application. 277 of 323 district municipality have debt payment application, 195 have land market value application, 112 have registry search application, 189 have building abrasion rate application, 96 have request/complain application, 92 have declaration application and 82 have information acquisition application. Figure 14 shows 82 district municipality which have information acquisition application. Additionally; there are e-marriage (65), document tracking (50), garbage collection hours (15), e-pay roll (15), e-library (10), e-blood bank (3), career employment (2) and transportation hours (1) applications. Transportation hour is only available in Ulubey district of U ak city (Figure 15). But there are not chimney cleaning, theater e-ticket and e-market applications.





Figure 14. Cities which have information acquisition application in their district municipalities.

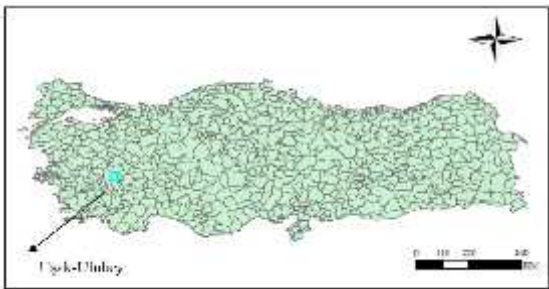


Figure 15. Cities which have transportation hours applications in their district municipalities

### 3.3. Study of GIS/CIS Applications in Local Governments of Developed Countries

Websites of developed countries' state/cities are searched. Generally each country has below subjects in their websites.

- Environmental quality
- Natural environment
- Waste management
- Health
- Tourism
- Urban planning
- Land management
- Housing
- Culture
- Infrastructure
- Air and noise
- Public areas
- Energy saving
- Education

### 4. CONCLUSIONS

The study has revealed the necessity of web services and 30 metropolitan municipality, 51 city municipality and 919 district municipalities of these cities are studied. These municipalities' websites are studied as city guide and E-municipality applications. As a result of this study, it is seen that the most common applications of city guide are; cultural area, address, governmental agency, educational institutions, health institutions and organizations, transportation information, zoning status, 360° virtual tour and pharmacy on duty searching's. In E-municipality application, information acquisition, payment, registry search, request and complain, e-wedding, declaration, document tracking, building

abrasion rates, market value searches are commonly used applications. It is seen that there is only one different application in the websites of some municipalities between city guide and e-municipality applications.

It is seen that applications of websites in developed countries are more environmental and human focused. When studying applications of websites in Turkey, it is seen that they are different from applications in the world. There are not satisfying applications, which citizens are involved in management, in municipality websites in Turkey. Websites of municipalities are not applicable for paying bills, accessing cam images of the city, information about tenders and applications, sufficient and transparent management understanding which citizens can involve in management. There are only applications which can be called as service for citizens.

It is seen that there are not a standardization in index and visibility of the websites and each website are created by different software companies upon request of administrators. It is necessary to provide a standardization considering existing INSPIRE fundamental principles.

Consequently, it is necessary to produce a system for all municipalities in Turkey by considering INSPIRE principles which will gather Geographic data, unite data which are coming from different sources, eliminating people or institutions that will prevent using and sharing information and easing use of Geographic data and preventing data repetition. All municipalities should have same system and data infrastructure by this system. Correspondingly, webpage design differences, which are sourced due to various web designers used by municipalities, will be eliminated and a single type of system visibility will be created. So municipalities will be able to use and publish most common data and searching applications with the same website design according to size and needs of municipalities. Also, creating standardization for municipalities will solve previous integrated data problem, differences in applications and searching's, data sharing problems.

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