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Geo-metadata in spatial data infrastructure and e-governance

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In the whole world the need of the spatial data has been increasing and much more people want to reach the spatial data via internet. At this point, the importance of spatial data for e-government projects is indisputable. SDI provides a basis for spatial data discovery, evaluation, and application for users and providers within all levels of government, the commercial sector, the private sector, academia and by citizens in general. An SDI facilitates the conveyance of virtual unlimited packages of Geographic Information. The ultimate aim of GIS, under an e-Government/National SDI umbrella, is to support spatial decision-making and sustainable development both for regional and territorial plans. One of the works in technical framework of SDI is to establish metadata registration. Turkey has been going on GIS and SDI studies for years. Therefore in this paper, SDI studies and geo-metadata portal in Turkey are explained.

Key words: Turkey, SDI studies, geo-metadata portal, sustainable development, decision-making.

INTRODUCTION

In the whole world, the need of the spatial data has been increasing and much more people want to reach the spatial data via internet. Therefore, sharing the spatial information, data and applications in electronic environment among different organizations, disciplines and projects that provide interdisciplinary infrastructure is needed. At this point, the importance of spatial data for e-government projects is indisputable. "Spatial Data Infrastructure" (SDI) is often used to denote the relevant base collection of technologies, policies and institutional arrangements, that facilitate the availability of and access to spatial data. SDI provides a basis for spatial data discovery, evaluation, and application for users and providers within all levels of government, the commercial sector, the private sector, academia and by citizens in general. An SDI facilitates the conveyance of virtual unlimited packages of Geographic Information. This information comes in three basic forms: 1) Spatial data, 2) tabular data and 3) image data. Geographic data refers to information about the earth's surface and the objects found on it (Hossain, 2008). Geographic Information System (GIS) is a computer-based system that integrates the data input, data storage and manage-ment, data manipulation and analysis, and data output for both spatial and attribute data to support decision-making

activities. The ultimate aim of GIS is to support spatial decision-making (Malczweski, 1999).

On 15 May 2007, the European Union's Directive for an "Infrastructure for Spatial Information in Europe-INSPIRE-" came into force. This directive obliges the governments of the European member-states to harmonize their spatial information and make it available. A lot of work needs to be done in both legal and technical fields. One of the works in technical framework is to establish metadata registration. It is the first implementation rules in INSPIRE Directive. Implementing rules are linked to the INSPIRE Directive which provide supplementary technical regulations for the interoperability and (where possible) harmonization of the collections of spatial information and services. Member States shall ensure that metadata are created for the spatial data sets and services corresponding to the themes listed in Annexes I, II and III of the directive, and that those metadata are kept up to date (Kadaster International, 2007).

Based on the principle of freedom of information, public bodies, citizens and companies will have better access to this information. Turkey has been going on GIS studies for years and had begun SDI studies at the beginnings of 2000s. In this paper, SDI studies in Turkey are described chronologically and geo-metadata portal is explained in

detail.

SDI STUDIES IN TURKEY

SDIs aim at facilitating and coordinating exchange, sharing, accessibility and usage of geospatial data and encompass networked spatial databases and data-handling facilities, complexes of interacting institutional, organizational, technological, human and economic resources (Batuk et al., 2008). Information Technology (IT) investments in the developed countries have ace-lerated to improve the performance and the quality of the public services since the mid-1990s. In this parallel, European Union has also launched "eEurope" initiative in 2000, to become "the most competitive and dynamic knowledge-based economy in the world" and later, EU included the candidate countries into this process by forming an equivalent initiative, "eEurope+". Turkey attempted to catch up with the standards of this IT movement since 2001. Turkey has to make a significant improvement in order to be a part of the future, integrated "European Information Society" (Aydin, 2005).

As an evidence to Turkey's commitment to succeed in transforming Turkey into an information society, e-Transformation Turkey Project is well underway and achieving its short term targets. e-Transformation Turkey Project was launched as part of Turkey's commitment to join the European Union and, in particular, to leverage Turkey's potential to become an important player in the global arena. In line with the government's schedule, the initial focal point in this project has been the Short Term Action Plan (STAP), which covers 2003 to 2004, for implementing specific tasks. The structure of this action plan describes the objectives, the institutions that are in charge and are affiliated with, the duration, and financial needs if any. STAP puts 73 actions in force under 8 sections. One of the sections is e-government (State Planning Organization, 2004; State Planning Organi-zation, 2003). In the concept of the Prime Minister's Office Notice dated as 04.12.2003 and numbered as 2003/48, e-Government Transformation Turkey Project Short Term Act Plan had come into force. The studies related to national SDI have been initialized with the 47th Action in STAP in 2004 (Devlet, 2004). Act 47 as "Initial Study for Turkish National Geographic Information System (TNGIS)" had been executed by the General Directorate of Land Registry and Cadastre (GDLRC) with participation of the different institutions, organizations, universities, private sector, municipalities and presented to T.R. Prime Ministry State Planning Organization after application term. At the end of the study of Act47 a report had been prepared. In this report, the geographic information system studies in our country and abroad had been investigated, the detailed analysis for existing situa-tion had been made, the problems and the expectations had been determined; the Application Plan for 2005 had been suggested. The same action was adopted in plan

2005 and replaced with the 36th Action, "Initial Infras-tructure Studies for National Geographic Information Systems". The main goal is same in both of the actions. The goals in the 36th Action are to determine standards for classification data, metadata, production data, storing data, quality and sharing data; to prepare National GIS Infrastructure Policy/Strategy Document containing descriptions of communication infrastructure, institutional organization duty and responsibilities; to determine legal arrangement requirements. GDLRC has the responsibility to execute the 36th Action as the 47th Action. In the scope of this action, three commissions were constituted: 1) Standards Commission, 2) Technical Infrastructure Commission, and 3) Administrative/Legal Infrastructure Commission (Yalcin et al., 2009).

According to the Information Society Strategy and supplementary Action Plan, which was published and approved by Superior Planning Committee on 11.07.2006 with number 2006/38, the action number has been changed to 75 and the action was changed into an application project. 75th Action, "Establishing Geographic Information Infrastructure", is under "Action Plan for 2006 to 2010" and projected under title "Modernization in Public Management (MPM)". It aims to develop cooperation and interoperability among public institutions, to decrease resource waste, to increase productivity during work processes, to develop policy and decision processes based on information and communication technology. The result purpose is to determine the concept of the geographic data and the standards of data exchange and to create portal that provides sharing of the geographic information (Yalcin et al., 2009). Until today, contact units in each institution, execution committee, technical committee and project office have been constituted related to the 75th Action that is under the responsibility of GDLRC. On 16.12.2009 Agreement for Service on Feasibility Research to establish the Turkish National Spatial Data Infrastructure (TNSDI) was signed by TURKSAT A.Ş. This feasibility research is near completion.

GEO-METADATA PORTAL STUDIES IN TURKEY

Data and metadata are published through spatial web services. Directing and accessing the metadata services are implemented via a central GeoPortal. GeoPortal queries and retrieves spatial metadata from web services according to the user's criterion (Batuk et al., 2008). The first implementation rule in INSPIRE Directive for national SDI is metadata. The directive says Member States should create metadata for the spatial data sets and services corresponding to the themes listed in annexes of the directive (Kadaster International, 2007). Geo-metadata portal in Turkey was established by the General Directorate of Land Registry and Cadastre (GDLRC) under the power of Articles 103, 104 and 105 in Large Scale Maps and Map Information Production

Regulation (LSMMIPR) dated as 15.07.2005. The aims are to follow map related metadata in different institutions in one-center, to prevent from duplicate map production, to collect large scale spatial data in the concept of Spatial Data Infrastructure, to provide metadata standardization by using TC 211 ISO 19115 standards, to reach true and reliable data on time, to avoid waste of time to search any data in a huge amount of data, to provide necessary information to Decision Support Systems, to provide coordination among different map related institutions, to create an infrastructure for Turkish National Geographic Information System. All public intuitions that are related with map production in Turkey are members of this project.

In Turkey, Geo-Metadata Portal serves on http://hbb.tkgm.gov.tr/metadata/ web site to publish and update metadata. Geoportal was designed in accordance to the ISO 19115/TC 211 Digital Geographic Information System Standards. Data sets and web services were saved in GIS Portal Toolkit of ESRI. Users can directly connect ArcIMS Web Service to present geographic data and ArcSDE/SQL Server was used as database. ESRI GIS Portal Toolkit provides technology and service solution for National Spatial Data. User Interface was created for users to register, publish, query and access the spatial information. It has much type of functions on Metadata User Interface: Administration function, online metadata registration function, query function. In addition to this, Ground Control Points (GCP) function were developed to search information related to GCP. Metadata and GCPs were integrated with GoogleEarth to provide broad visual capabilities (Yalcin and Bakici, 2008; Yalcin et al., 2009).

ADMINISTRATIVE FUNCTIONS OF GEOPORTAL

Each public institution has the responsibility for its own metadata to register into the geoportal. The "institutions' management function" is to control the public institutions/ organizations that have the responsibility and rights to register spatial metadata to the portal. On this interface, both a new can be registered and an institution is searched. When adding a new institution, name, short name, telephone number and address are registered. The "users' management function" is to control the rights of the users who work in these institutions. On this interface, both a new user can be added and a user is searched. Each user has the authority to register its own institution's metadata. When adding a new user, user name and surname, user id, user password, institution name, address, telephone number, fax number, authority type are filled.

APPLICATION FUNCTIONS OF GEOPORTAL

For "metadata registration function" online form is filled after a responsible employee reaches the webpage with his/her user name and password. This form contains metadata content type, spatial boundaries, metadata information, metadata owner information, metadata distribution information and last step to attach any information file. Figure 1 shows the first step, metadata content type, to register metadata. All the steps are mandatory to pass each other with "next" button. The second step, spatial boundaries, is determined by sheet index, coordinate list, choosing or selecting on map. Metadata Information that is created according to TC 211 ISO 19115 standards, has metadata subject, title, production method, version, published date, process summary, aim to produce, keywords, spatial (place) words, projection, scale, data type, data usage limitations etc.

"Metadata query function" can be used without any user id and user password. The simple search is possible with "what" and "where" keywords. In addition to this, detailed search can be done by the type of metadata, institution, continuity of the project, project number, and subject with different combinations. The result can be viewed as summary of metadata (Figure 2) and project area (Figure 3). The view is integrated with GoogleEarth. If the user is a system administrator or institution administrator, the metadata can be deleted, updated, approved or rejected by their functions. In this part, one of the most important services is "Search 1/5000 Scale Photogrammetric Maps". Also 1/5000 scale maps can be searched on portal by their producer institution, General Command of Mapping or General Directorate of Land Registry and Cadastre, by the function of "Search 1/5000 Scale Photogrammetric Map Production Project Areas". Therefore, photogrammetric sheets can be searched before planning any project.

The other query type is about Ground Control Points (GCPs). This can be searched both textually (Figure 4) and with GoogleEarth Integration without any password (Figures 5 and 6). When searching GCP number, the aim is to follow the numbers of ground control points with their degrees as C1, C2 and C3 in 1/100 000 scale in the scope of Large Scale Maps and Map Information Production Regulation. It shows the last point number in 1/100 000 scale and it is notified that the last updated time of this information, generally in 24 h. On "searching approximate coordinate function", approximate coordinates of the points in the Archive Department of GDLRC can be searched by Europen Datum 1950, ITRF Datum 1996, political boundaries, selecting and drawing on maps. The results, the coordinates of GCPs, can be provided on, also with the format .txt, .xls or .doc. "approximate point analysis function" is useful for surveying. Before going to the survey land, planned area is investigated in the scope of GCPs distribution. The distances among C1-C2-C3 which decreased GCPs are determined in the regulation. Using this function, the duplicate GCP within the limited area is prevented (Yalcin and Bakici, 2008; Yalcin et al., 2008).
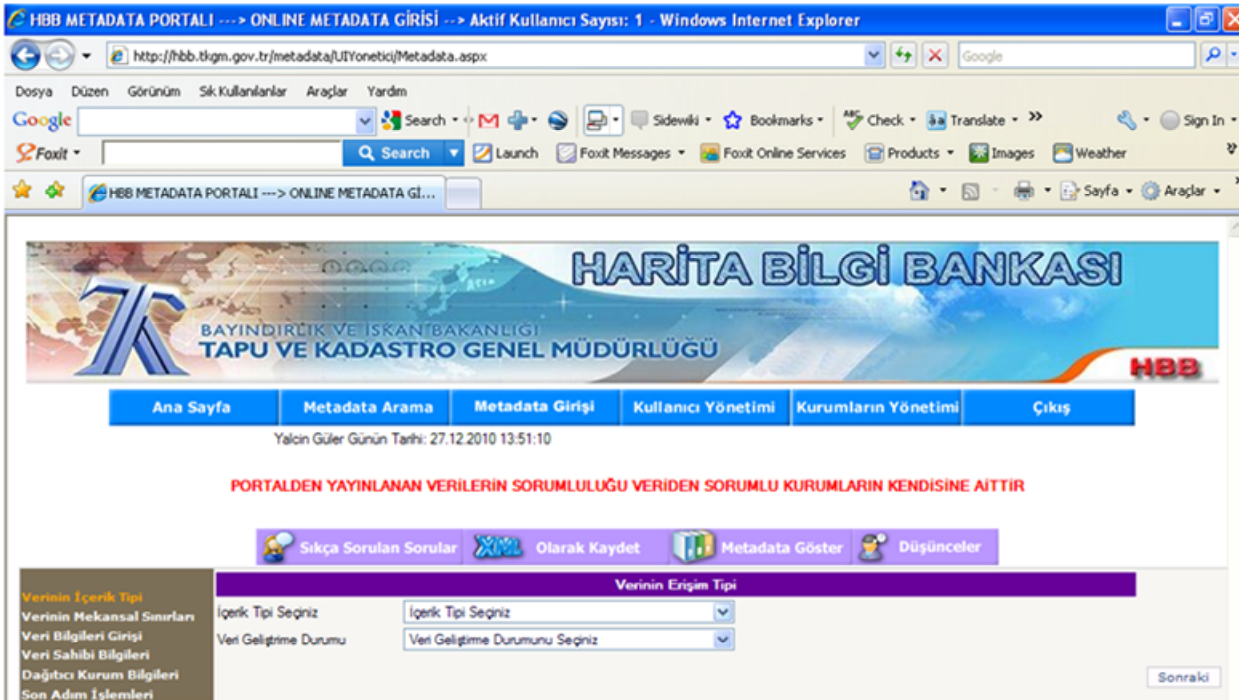

Figure 1. The first step for online metadata registration is "metadata content type".
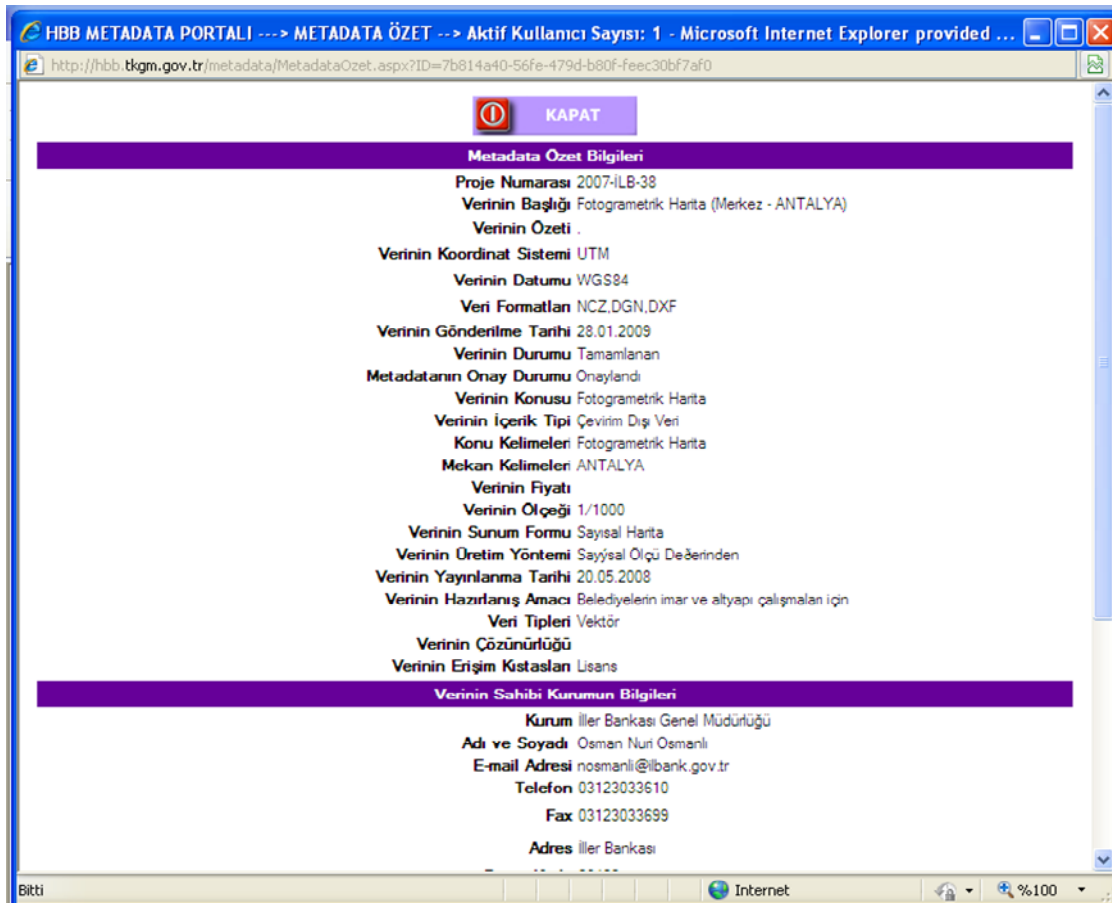

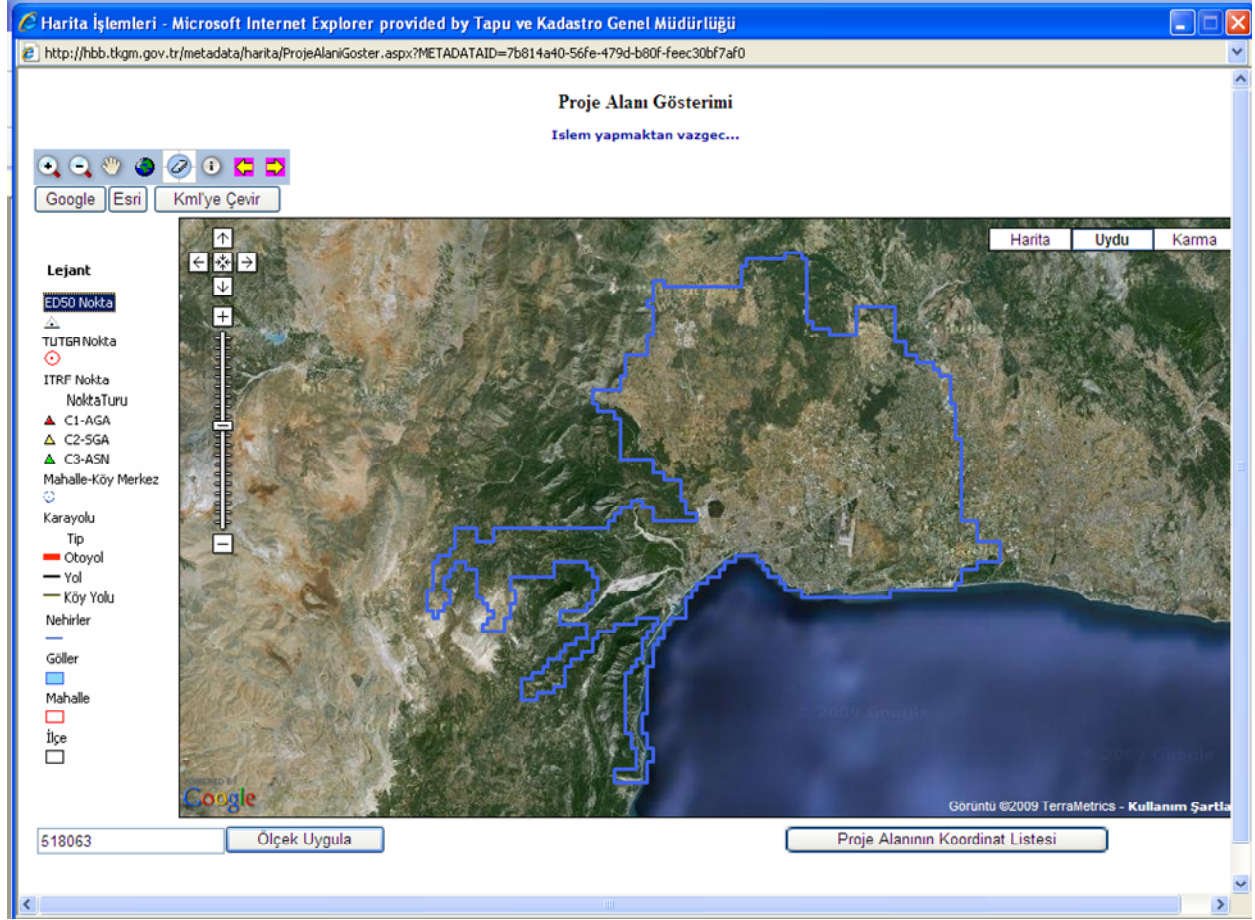**Figure 2.** Summary of metadata after searching.

Figure 3. Project area after searching.

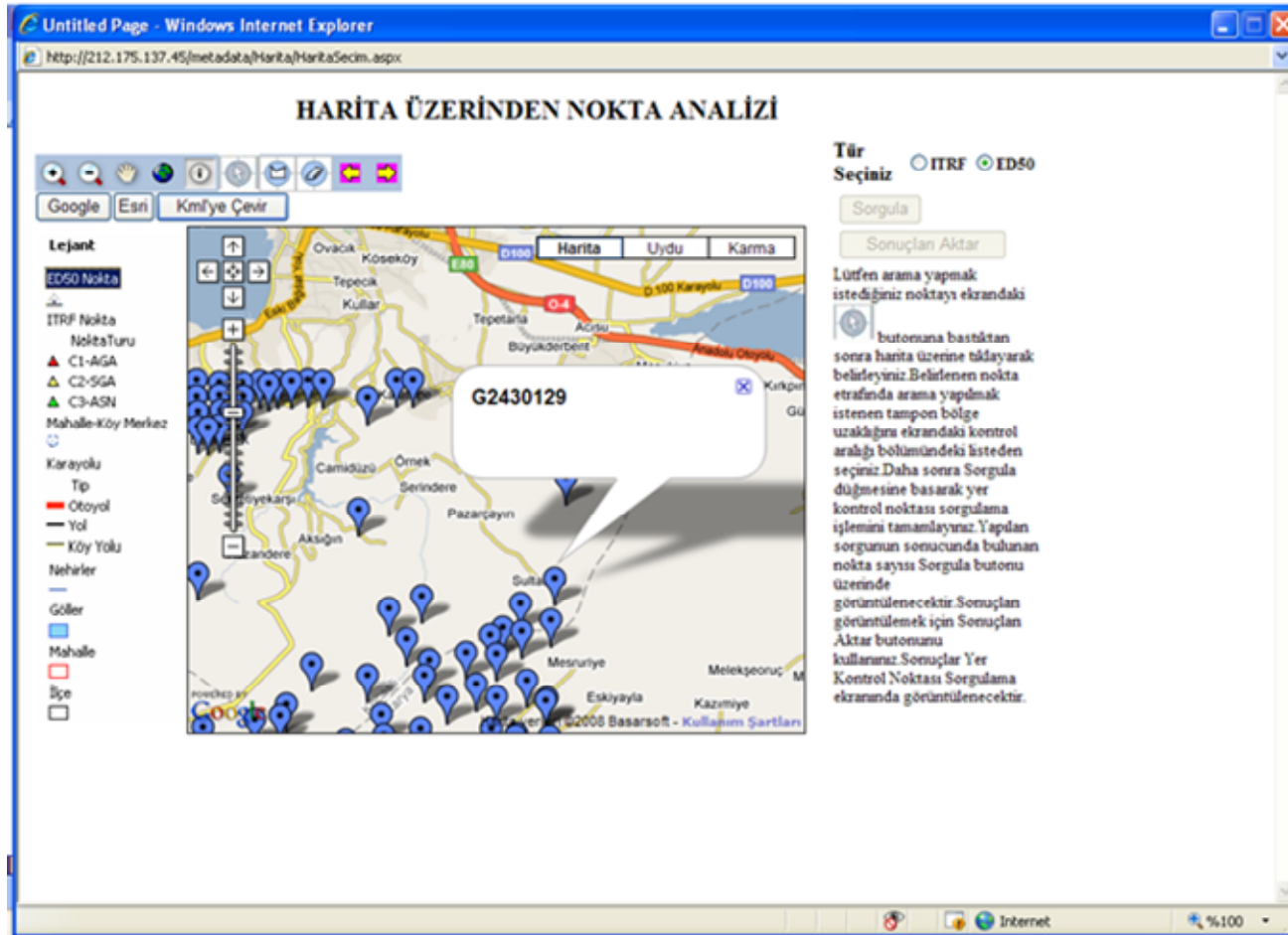**Figure 4.** Searching GSPs textually.

Figure 5. Searching GCPs on map.

Conclusions

The triangle of economic, social and environmental bases goes to good governance. Good governance in each country and at the international level is essential for sustainable development (Magel, 2006; Mengi and Algan, 2003). To develop, updated spatial data provides infrastructure to decision-makers and planners, especially in the circumstances of natural disasters and planning. It is possible to obtain reliable, applicable and effective results, when GIS, under an e-Government/National SDI umbrella, is used; because these processes requires up to date and any related data which is stored in distributed databases. It facilitates decision on any kind of plan.

Geographic information is increasingly a part of the commerce, government and academia world. Administrative and economic decisions are based on spatial information. In recent years, GIS development takes metadata into account to save time and money because data expense has the largest part of most GIS budgets. Metadata supplies a summary for data set and describe thematic content, spatial reference system, quality, type,

scale, projection system, etc. The number of GIS and metadata users increases because of the technical advancements, web technology, SDI initiatives and interoperability.

Geo-metadata portal in Turkey is a key tool for sustainable development and a base for SDI. It is a fundamental for security issues such as risk management and an opportunity project for different users, to have different levels of access such as searching, registering, publishing and administrating. Portal provides quality policies to the customer with good, fast, sound, proper and correct service. It takes care of environmental values also. The metadata help in many thematic map areas. Some of these can be considered as the following: Socio-economic sciences, environment, agriculture, food, health, energy, settlement, land reform, land policy. This logic underlines the sustainable development with economic, social and environmental bases. The linkage between sustainability and information society development is provided with technology tools. At this point, the importance of spatial data cannot be discussed, and it is known that spatial data is basic for e-government
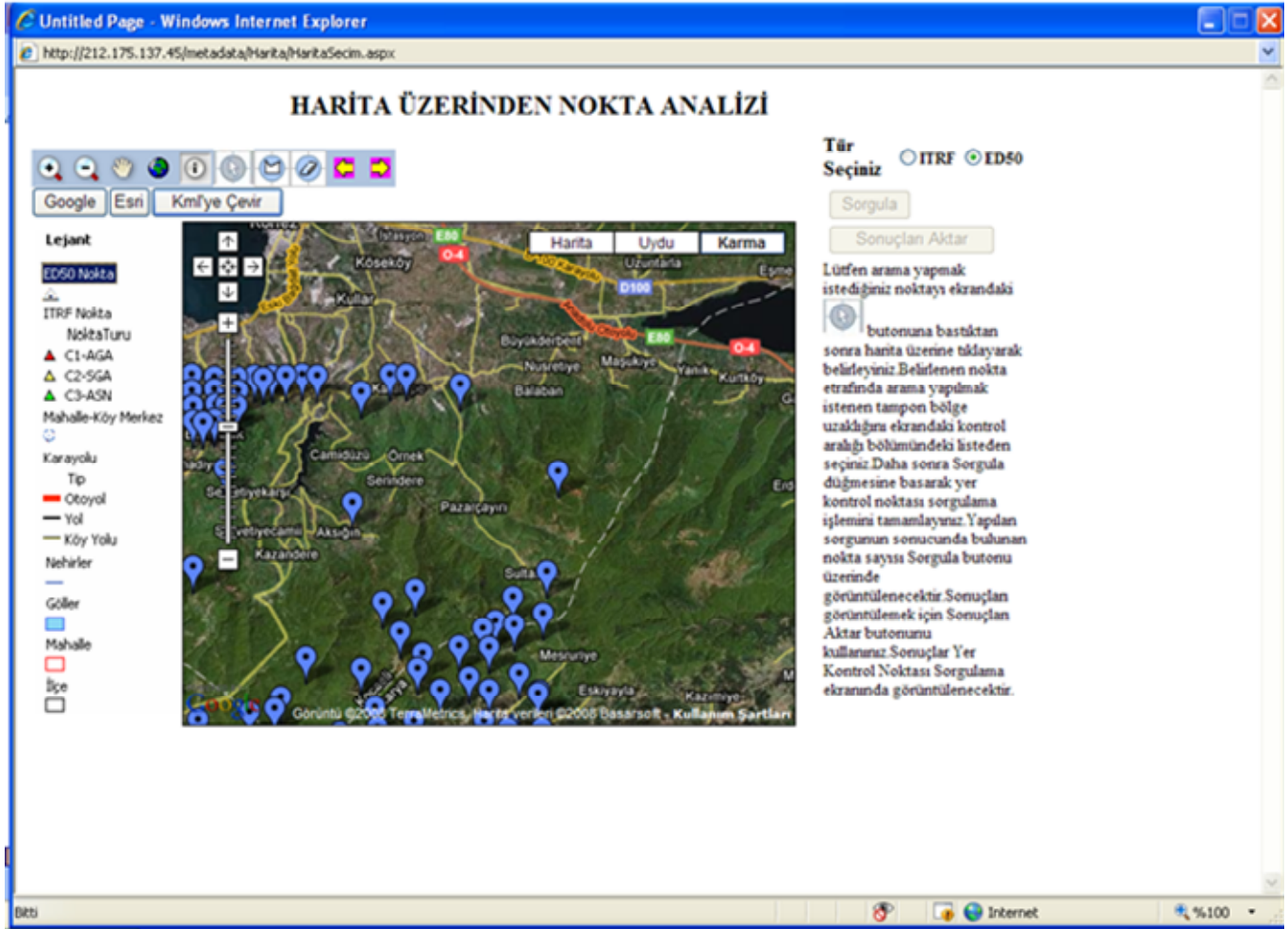
Figure 6. Searching GCPs on satellite view.

projects.

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