

RENEWAL AND COMPLETION PROBLEMS IN GEOGRAPHICAL DATABASES IN TURKEY AND A PROPOSAL MODEL

Ali Erdi, S. Durduran*, Ç. Yildirmiş

Selcuk University, Konya, Turkey

*Email: durduran2001@yahoo.com

ABSTRACT

Defence, security, public works, and many other branches of government require small-scale, current geographical databases. With this aim, small-scale geographical databases in Turkey were produced in the past and are still in use today. There are, however, problems in using the available geographical databases. These problems in forming, sharing, updating, and meeting requirements necessitate the reconfiguration of the present system. Classical approaches are preferred when updating the present geographical databases. Many errors and difficulties in recording new objects have occurred in the field, in scanning and collecting data from related institutions, and in recording and controlling nonstandard completion data. Thus it is difficult to achieve the desired high quality data with the present method. In this study, we introduce and discuss updating and completing small-scale maps of geographical bases. The Geographical Information System formation studies in Turkey are summarized, and a model is proposed for the formation, updating, and completion of systems of small-scale maps of significant databases.

Keywords: Geographical Information System (GIS), Data, Maps

1 INTRODUCTION

Today, information is needed to conduct even the slightest research in any given subject. It is imperative that this information meets the users' needs and is up-to-date and accessible. The properties of the information obtained emerge as an important factor in the success of the services offered. Many institutions have been formed in Turkey to meet the various needs of the citizens. Usually, each institution gathers, assesses, and stores its own data. This effort on the part of each individual unit to obtain the data it needs creates various problems. Sharing of data among the units and integration of the data become difficult and sometimes even impossible. This study explores the institutional activities that deal with geographical databases and the institutional activities that are connected with them.

2 THE CURRENT SITUATION OF GEOGRAPHICAL DATABASES IN TURKEY

There are various institutional bodies in Turkey founded in accordance with the nature of the public service they give. Each institution individually gathers, processes, and endeavours to update the data it needs to fulfil the tasks that it was founded to deal with. The leading institutions that engage in geographical database activities are given in Figure 1.

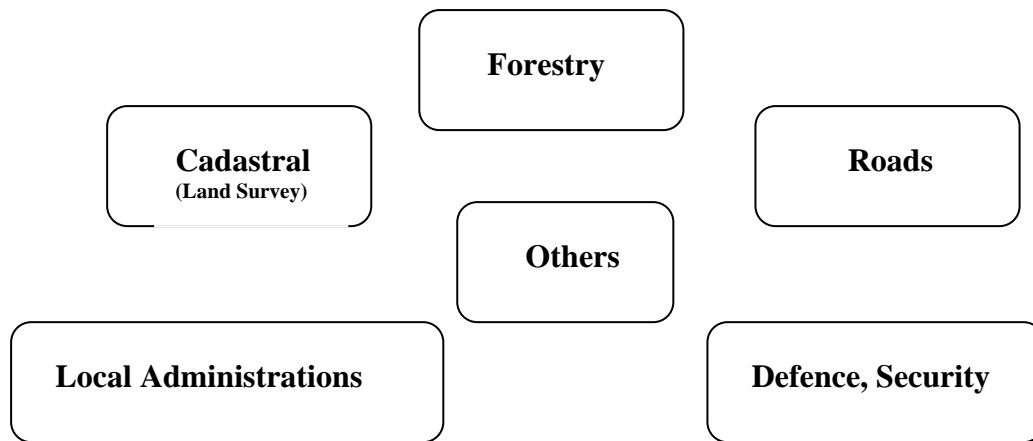


Figure 1. Some of the institutions in Turkey that conduct activities on a geographical database

Each institution given in Figure 1 was founded to serve a particular purpose. Because a centralized databank has not yet been established in Turkey, each institution has individually gathered, updated, and integrated the information that it needs.

Data groups have been established for special purposes within each institution in Turkey. The methods pursued in collecting, storing, updating and integrating the data in each data group that meets only for a particular institutional purpose exhibit differences. Figure 2 shows leading data groups in Turkey.

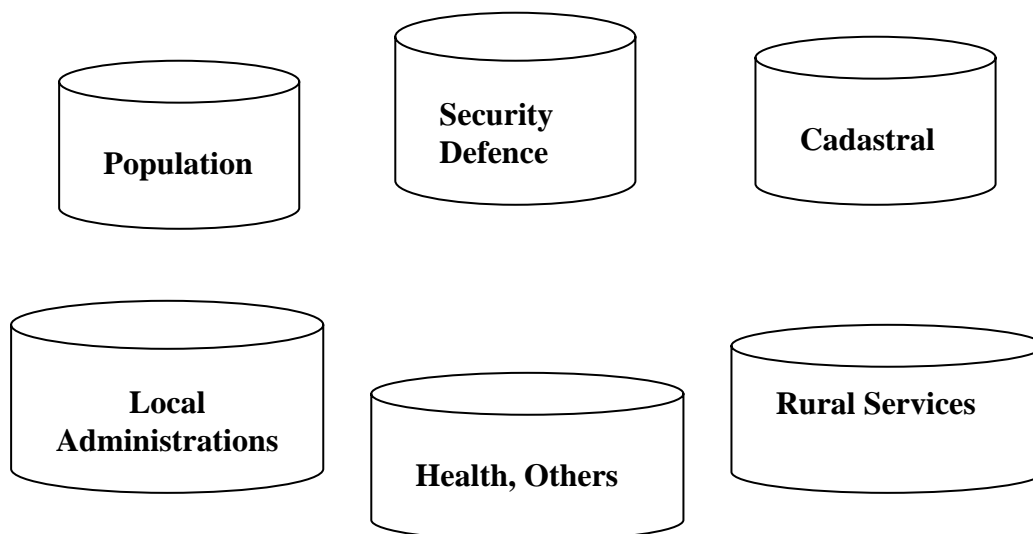


Figure 2. Some Institutional Data Groups in Turkey

Each data group given in Figure 2 has its own system for data standards and method of collecting, archiving, and updating the data. Therefore, difficulties and even impossibilities are experienced in data sharing and hence data import. Efforts aimed at a common data standard for Turkey are also made with difficulty.

Integrating and updating activities in these databases specially created by institutions are implemented with difficulty. Since integrating and updating are required for some databases because of the joint efforts of various institutions, the diversity of the problems further increases. 1/25 000 and smaller scale geographic map bases that are used for security and public works can be given as an example of this situation.

3 EFFORTS TO INTEGRATE AND UPDATE GEOGRAPHICAL DATABASES

In Turkey, topographic maps covering the whole of the country have been completed for purposes of Regional Planning, Public Works, Natural Disasters, Defence, etc. Efforts are underway to digitalise these maps, which were completed using traditional methods. Topographic maps prepared at various times lose their currency over time because various public works such as roads, irrigation, bridges, land regulation etc. constantly change the landscape. Institutions keep records of these activities according to their own standards and use them accordingly. Current archiving and data saving efforts are mostly sufficient for their purposes since their works are often limited to a local area. Although the existence of a different recording system for each work does not pose a problem because there is no need for a total display of data, serious difficulties are experienced in special cases like natural disasters.

Great efforts are expended in incorporating these changes in landscape into the general geographical databases (topographic maps), and they are often completed with great difficulty. The authority to integrate and update data belongs to the institution that produces the basic topographic database, and it is responsible for the data. After the institution prepares the topographic database and puts it into service, it contacts the provincial units for integrating and updating and demands data to be used for the latest updating. Data information exchange is performed with the method given Figure 3. Each graphic piece of information that comes from provincial units is digitalised according to the steps in Figure 3, and non-graphic information is compiled and transferred to the GIS environment.

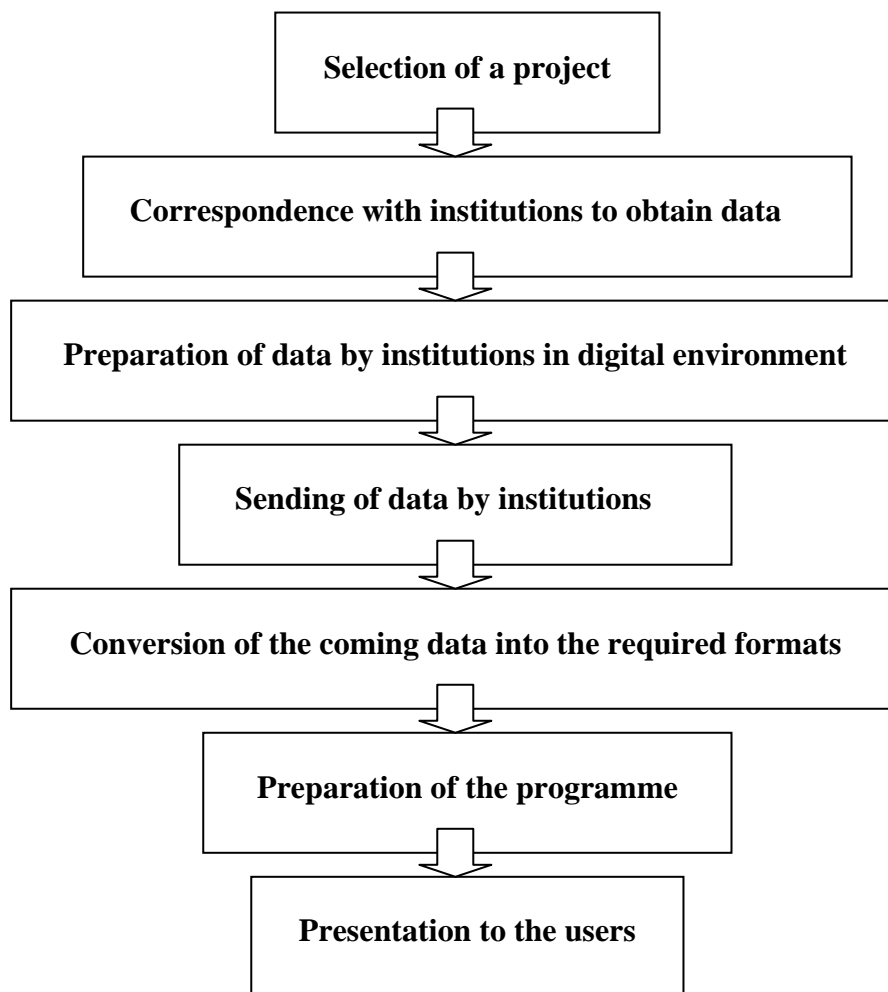


Figure 3. Flow diagram for data exchange operations

The data compiled from the executive public institutions can be grouped under 4 headings as in Figure 4.

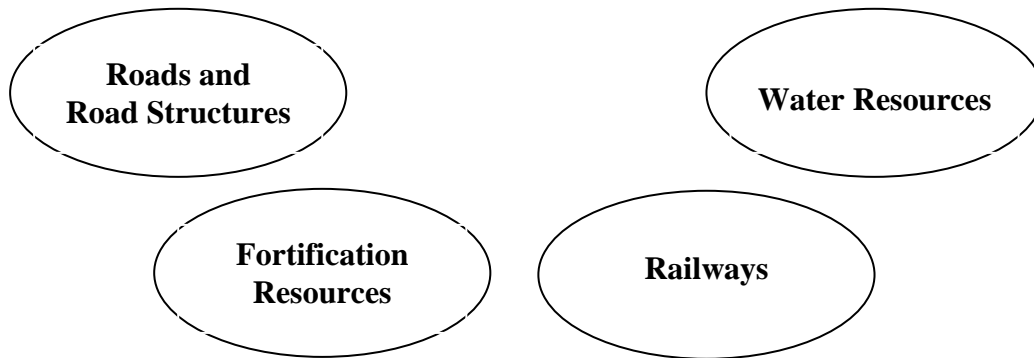


Figure 4. Data compiled from executive public institutions

3.1 Roads and Road Structures

Data about roads and road structures are requested from the institutions given in Figure 5 and data integration and exchange operations are performed. [1]

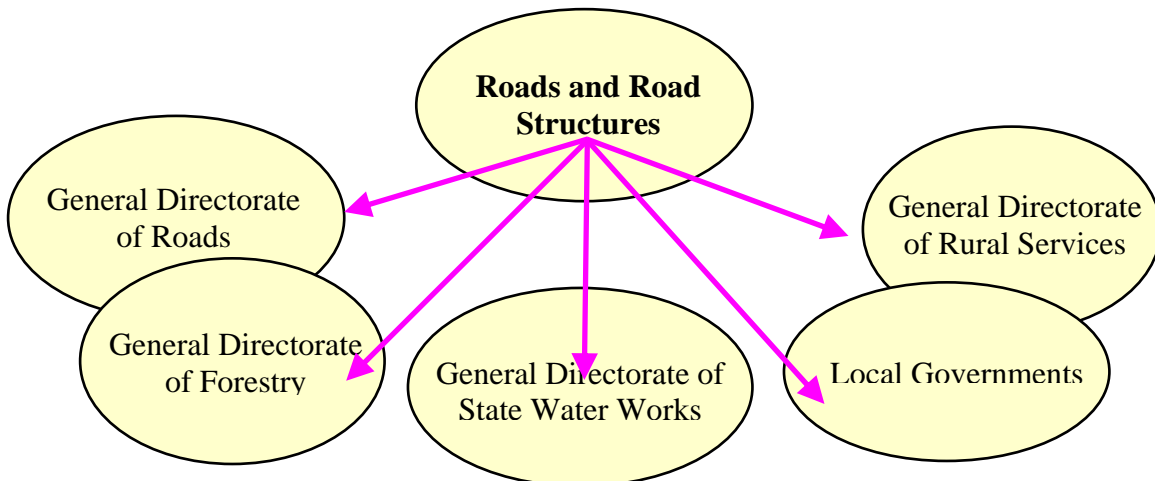


Figure 5. Data sources for roads

Information about roads requested from public institutions given in Figure 5 is recorded in the attributes table given below with the number of attribute data stated next to them. Table 1. [2], [3]

Table 1. Road attributes data table

	Attributes Table	Data Area
	Road	17
	Bridge/Overpass/Viaduct	26
	Tunnel/Underpass	12
	Sharp Bend	8
	Critical Point	7
	Narrowing/Expanding	7
	High Inclination Road	6
	Road Maintenance Facility	15
	Shallow Passage	10
	Waterway Passage by Ferry	10

Similarly, 16 pieces of attribute information are gathered from six different institutions given in Figure 6. [2]

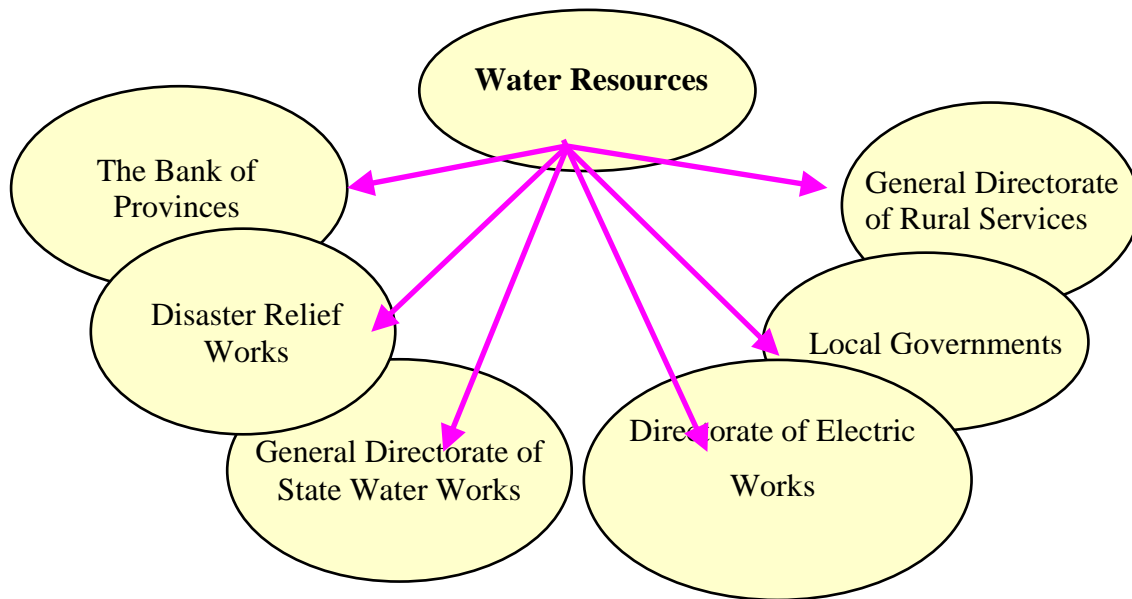


Figure 6. Sources of Data about Water Resources

4 PROBLEMS EXPERIENCED IN DATA COLLECTION

- Few instances of data exchange between institutions existed in the past in Turkey.
- GIS activities for institutions are relatively recent in nature.
- There is reluctance on the part of the institutions to share data.
- Although by law, institutions are required to establish a data collection unit, in practice these units have not been formed. As a consequence, data is not sent from the institutions to the centre. The administration of the data integration centre has adopted the method of obtaining data from the central body of each institution.
- However, as most of the data are located in the provincial offices of the institutions, it has been impossible to obtain the data requested by the General Directorates.
- A different method has been used to obtain the existing data in the provincial branches of public institutions. In order to obtain information from the provinces, 762 staff members were given the necessary training, and thus the data were obtained from the source as in Table 2.
- During the data collection, no technical personnel were found in the provincial branches of some institutions to obtain information.
- Some data that were supposed to be included in the institutional documents could only be obtained orally.
- The process of data collection has taken 3.5 years.

Table 2. The Turkish Republic Roads Inventory Form

7580321 - KARAYOLU ENVANTER AZAZI FORMU
(FORM NO: 1)

KARAYOLLARI GENEL MÜDÜRLÜĞÜ
14. 3. 2007 - 140000000

Yayın 8. 2. 1992. Mevc. durumu: **Bekli.** Ölçümde birim: **D. 3135** Kontrol birim: **10. 14**
Ölçümde birim: **D. 31715** Kontrol birim: **Boş**

(1) TARIH	(2) KARAYOLU GENİRLİĞİ (m)		(4) YOLUN YAPISI			(6) KURULUŞ YILI	(7) KARAYOLU GENİRLİĞİ (m)	(8) KURULUŞ YILI	(9) YOLUN YAPISI	(10) YOLUN YAPISI	(11) YOLUN YAPISI	(12) YOLUN YAPISI	(13) YOLUN YAPISI	(14) YOLUN YAPISI	(15) YOLUN YAPISI	(16) YOLUN YAPISI	(17) YOLUN YAPISI	
	Sol	Sağ	YOLUN YAPISI	YOLUN YAPISI	YOLUN YAPISI													
28+500																		
28+200							h2-3											
28+250							h2-3											
27+900							h2											
27+850																		
27+750							h2-3											
27+500																		
27+300																		
27+250																		
27+050																		
26+950							h2-12											
26+750																		
26+650							h2-8											
26+600																		
26+520																		
26+450																		
26+400																		
26+200																		
26+100																		
26+050																		

5 PROBLEMS WITH THE DATA OBTAINED

Various problems are encountered with the formats, shortcomings, accuracy, and currency of the data to be incorporated into the system. The information to be incorporated can be grouped under the titles of graphic and non-graphic information. In many institutions these data are in the form of non-digital, traditional documents and printed forms.

In regard to the format of the data concerning roads, there is no information about the coordinates of details on roads in the printed inventory tables where institutional road data are entered. Instead of coordinate information, the positions of details are determined by measuring from the beginning of the road with a vehicular audiometer and are expressed in kilometres, see Table 3. The kilometres of road details obtained with this method do not coincide with the details on the map.

While graphic road data are marked approximately in the printed maps of General Directorate of Roads, they are prepared in the form of sketches in the roads of other institutions.

Table 3. Field Analysis Information Table for Attributes of Roads

Karayolu																			
DetayNo	Pafiası	BaşlangıçSağa	BaşlangıçYukarı	BitişSağa	BitişYukarı	KurumAdı	YolNo	YolGenişlik	PlatformGenişlik	SerisiSayısı	Uzunluk	Ulaşım	Refüj	YolKaplama	Durum	KutuDrenaj	ZayıfTemel	BozukSath	Ernemelgin
1	F19	554880	4584910	553430	4586090	002	022-2	6	8	1	1800	004	002	005	028	000	000	000	000
2	F19	551580	4582300	550460	4584610	002	023-2	6	8	1	2871	004	002	005	028	000	000	000	000
3	F19	551580	4582300	550210	4580800	002	022-2	6	8	1	2130	004	002	207	028	000	000	000	000
4	F19	551780	4581830	551580	4582300	002	021	6	8	1	834	004	002	005	028	000	000	000	000
5	F19	563550	4587410	550330	4570270	002	999	6	8	1	26267	004	002	005	028	000	000	000	000
6	F19	558100	4587740	556910	4588750	002	023-2	6	8	1	1650	004	002	207	028	000	000	000	000
7	F19	558690	4587910	560630	4590200	002	024-2	8	10	1	3518	004	002	207	028	000	000	000	000
8	F19	559390	4577080	554880	4584910	002	020	6	8	1	9500	004	002	005	028	000	000	000	000
9	F19	563170	4587120	564000	4582910	002	018-2	6	8	1	5046	004	002	207	028	000	000	000	000
10	F19	567830	4588450	563550	4587410	002	021	8	10	1	4800	004	002	005	028	000	000	000	000
11	F19	567170	4590360	564750	4591690	002	025-2	8	10	1	2800	004	002	207	028	000	000	000	000
12	F19	566470	4588580	567550	4590710	002	026	6	8	1	2292	004	002	005	028	000	000	000	000
13	F19	567550	4590710	572680	4592130	002	027-2	8	10	1	5348	004	002	207	028	000	000	000	000
14	F19	575400	4588600	567830	4588450	002	021	8	10	1	7500	004	002	207	028	000	000	000	000
15	F19	572680	4592130	574060	4592970	002	028	6	8	1	1655	004	002	005	028	000	000	000	000
16	F19	574790	4592390	575170	4593070	002	001	6	8	1	765	004	002	005	028	000	000	000	000
17	F19	574060	4592970	583540	4588280	005	020-04	7	9	1	12900	004	002	207	028	000	000	000	000
18	F19	573300	4591880	576260	4588810	002	029-2	8	8	1	4300	004	002	207	028	000	000	000	000
19	F19	578810	4590310	578740	4594770	002	002	6	10	1	4350	004	002	005	028	000	000	000	000
20	F19	577660	4589040	582810	4594780	005	59-03	6	8	1	7800	004	002	005	028	000	000	000	000
21	F19	577330	4588080	581190	4584690	002	006	6	8	1	5095	004	002	005	028	000	000	000	000
22	F19	581190	4584690	583590	4585860	002	005-2	6	8	1	2600	004	002	207	028	000	000	000	000
23	F19	581190	4584690	577630	4581480	002	007-2	6	8	1	4373	004	002	005	028	000	000	000	000
24	F19	577010	4588290	582800	4574010	005	567-01	9	9	1	16880	004	002	207	028	000	000	000	000
25	F19	559240	4565230	576640	4587960	002	999	6	8	1	29887	004	002	005	028	000	000	000	000
26	F19	553650	4569240	576310	4588270	005	59-01	6	8	1	32475	004	002	207	028	000	000	000	000
27	F19	564000	4582910	564480	4582400	002	017	6	8	1	650	004	002	005	028	000	000	000	000
28	F19	566960	4583010	572120	4580350	002	999-1	6	8	1	6600	004	002	999-2	028	000	000	000	000
29	F19	577630	4581480	572120	4580350	002	999	6	8	1	5212	004	002	005	028	000	000	000	000
30	F19	575710	4581140	575590	4580110	002	009-2	6	8	1	845	004	002	207	028	000	000	000	000

Not all the information has been accessed because the necessary information has not been entered in some of the columns in the inventory tables where institutional data properties exist. Most of the data in the institutions is preserved in traditional environments in the form that it was first collected without being updated. In some provincial branches of institutions, information on roads and water is 15 or 20 years old. Information about the same data exists with different information attributes in different public institutions. As there exist fundamental problems such as a lack of standardisation, shortcomings, currency, and accuracy due to the abovementioned reasons, attaining the set goals becomes very difficult.

6 NATIONAL AND INTERNATIONAL GIS ACTIVITIES ACROSS THE WORLD

In technologically advanced countries, activities about Geographical Information Systems are conducted by a “board of experts” appointed by law. These boards guide and coordinate GIS activities and prepare the technical and administrative regulations (laws, directives, and statutes) for these activities.[4],[5],[6] Examples of this are:

- American Federal Geographic Data Committee (FGDC)
- American Geospatial One-Stop Project (GOS)
- European Union Geographical Information Database

7 CONCLUSION AND SUGGESTIONS

Initially, the procedure for the Field Analysis System in Turkey was planned so that data would be sent to the centre by the institutions, and the data would then be presented to users after being turned into the required format. As a consequence of the problems encountered, the project’s section that was to perform data acquisition now does data collection. This situation led to an additional cost arising from data collection activities. Various problems arose in attaining the desired results in integrating and updating data.

For ideal GIS activities in Turkey, a board appointed by law and funded properly should be established. Under its guidance, the following steps should be taken:

- The country’s geographical data infrastructure and standards should be prepared.
- Geographical data should be collected with the joint efforts of public and private institutions.
- A geographical information system network that resembles a database should be set up.

- Geographical data exchange between institutions that offer public services should be conducted according to standards to be determined.

Despite all the difficulties experienced, it can be said that, as a result of dedicated efforts, information that is needed in Turkey has been, to a great extent, put into digital systems, reviewed, and processed using Geographical Information Systems technology, and final products have been presented to the users, thereby setting the system going.

The data in the system should be kept up-to-date so that the system can survive. To this end, the programme will be sent to public institutions, and they will be asked to inform the headquarters at regular intervals of any changes that have occurred in their data. It is believed that if the system is implemented successfully, public institutions will be able to utilise the system to their advantage in matters of GIS activities, disaster management, emergency management, and national defence. In addition, it has been assessed that the feasibility of scale 1/25.000 topographic map integration activities using the institution's data is possible only if:

- A standard format is prepared for data produced on similar subjects between institutions.
- Regulations are made that will ensure the sharing and use of the data produced between all institutions.
- Institutions' areas of responsibility are determined for data produced by different institutions.
- Data updating is performed by establishing coordination between institutions and setting standards for the country, thus avoiding wasting time, personnel, and resources originating from the reproduction of data by different institutions.
- Data security is ensured and legal regulations are made that will entitle access to the existing data.

In this way, maps of scale 1/25.000, which are our country's basic topographic maps, will be prepared faster and in a more up-to-date manner. Figure 7-8. [7]

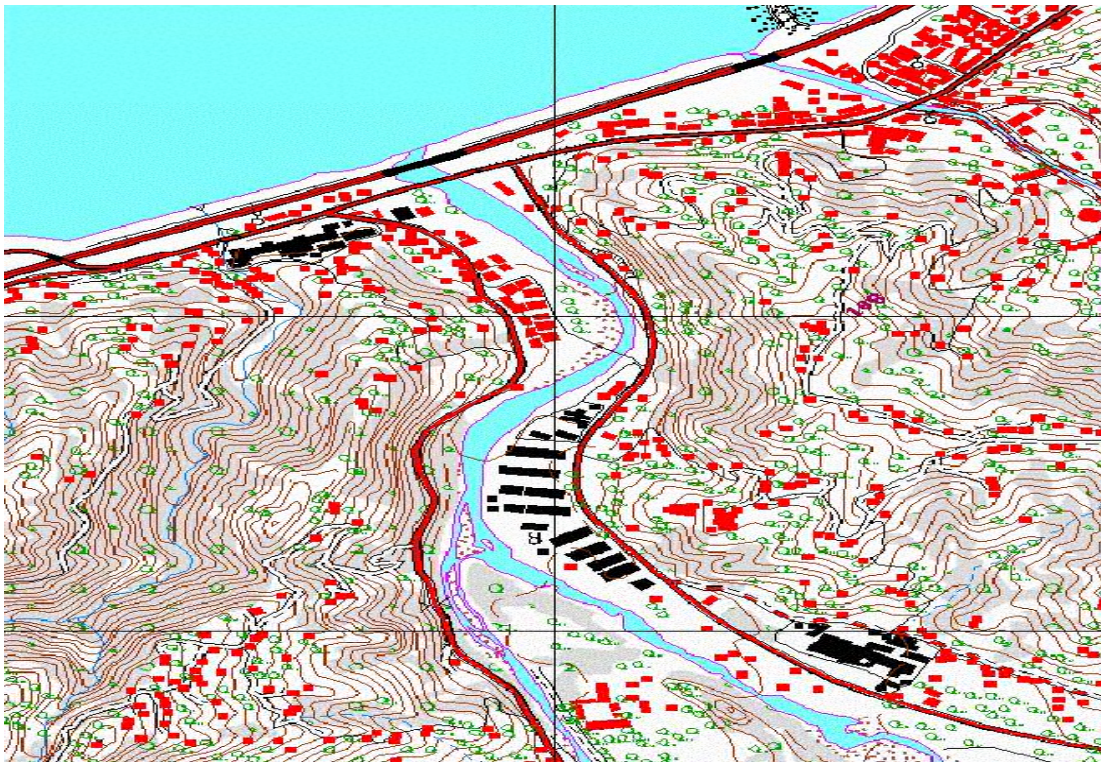


Figure 8. Section before Integration



Figure 9. Section after Integration

8 REFERENCES

- [1] HGK, Road and Road Building regulations, General Command of Mapping, 2002, Ankara
- [2] HGK, Water Resources Regulations, General Command of Mapping, 2002, Ankara
- [3] TRR, Road building regulations, 1999, Ankara
- [4] FGDC Retrieved from the World Wide Web April 10, 2007: <http://www.fgdc.gov>
- [5] Geospatial One-Stop Retrieved from the World Wide Web April 10, 2007: http://www.bts.gov/gis/geospatial_onestop/index.html
- [6] INSPIRE Retrieved from the World Wide Web April 10, 2007: <http://inspire.jrc.it>
- [7] ESRI, *Understanding GIS, the ARC/INFO Method*. New York, 1997, ESRI.