Advanced GIS

http://publish.mersin.edu.tr/index.php/agis/index

e-ISSN:2822-7026

Researching the use of infrastructure in land management

Davut Balcı[*1]

[1]*Mersin University, Institute of Science, Department of Remote Sensing and Geographical Information Systems, Mersin, Turkey*

Keywords
Infrastructure,
Drinking Water,
Sewage,
Route,
Land Management

Research Article
Received: 24/04/2022
Revised: 28/05/2022
Accepted: 01/06/2022
Published: 25/06/2022

ABSTRACT

Since soil is the cornerstone of human life, it has an important place in both individual and social life. Therefore, the soil needs management for its continuity, that is, its sustainability. Infrastructure is the general name of the facilities such as transportation, electricity, internet, drinking water, sewerage, road and landscape for a building or an area where people live, work or reside. Infrastructure work and facilities are of great importance for the quality of life and economy. In this study, the use of infrastructure in land management was investigated. The importance and contributions of land management were researched and presented during the infrastructure project design and implementation studies. Various problems can be encountered while making infrastructure projects. If we reduce these problems to 3; we can reduce the passage of highways as passing from the state waterworks structure and passing from the private property. In the study, although we talk about how these 3 problems can be solved in general, it has also been tried to find solutions to other problems and problems. The technical specifications of Iller Bank, which has become professional in infrastructure in our country and have carried out many studies with its technical team, have been used as material.

1. Introduction

If we define the land in general before defining the land management; Land: the piece of land integrated with everything on earth (mountain, plain, building, stream, lake, etc.).

Land management, on the other hand, is the management needed to benefit from natural resources with high efficiency and to prepare sustainable development policies in rural and urban areas, both environmentally and economically (Çete & Yomralıoğlu, 2009; Demirel & Gür, 2008). İşiler (2012) explains the importance of land management as follows: Today, it has become mandatory to manage land, which is seen as a social scarce resource, in line with sustainable development goals. Effective and beneficial land policies are needed for the management of land, which is a consumable and finite resource (Yomralıoğlu, 2021). Ownership, value and land use information provided by land administration systems is needed for the development of land policies. In other words, while sound land information enables the development of appropriate land policies, well-formed land policies support effective land management and administration (Çelik & Çoruhlu, 2021; Ünel et al. 2020). The land is a source of wealth for individuals as well as an economic value for countries and even an important part of social and political life for societies.

Infrastructure is the general name of the facilities such as transportation, electricity, internet, drinking water, sewerage, road and landscape for a building or an area where people live, work or reside. Infrastructure work and facilities are of great importance for the quality of life and economy (Şahin & Yakar, 2021; Ulvi et al., 2020; Doğan & Yakar, 2017; Yakar & Mırdan, 2017).

In an article in the Zoning Law No. 3194, the importance of infrastructure is mentioned as follows; Buildings cannot be licensed unless the owners of the parcels on both sides of the infrastructure, which has been completely constructed by the relevant person or institutions in more than one residential area, with the permission of the relevant management, receive a fee (price) corresponding to their own parcels.

In this study, infrastructure works carried out in different areas were examined in general terms. Various suggestions were presented by mentioning the technical specifications and issues to be followed in infrastructure works, the land problems experienced during the project and implementation phases and the solution methods that can be brought to these problems.

2. Material and Method

Study, planning and feasibility study principles are the first work to be done on the land where the project is planned and is the cornerstone of land management. According to the study, planning and feasibility study

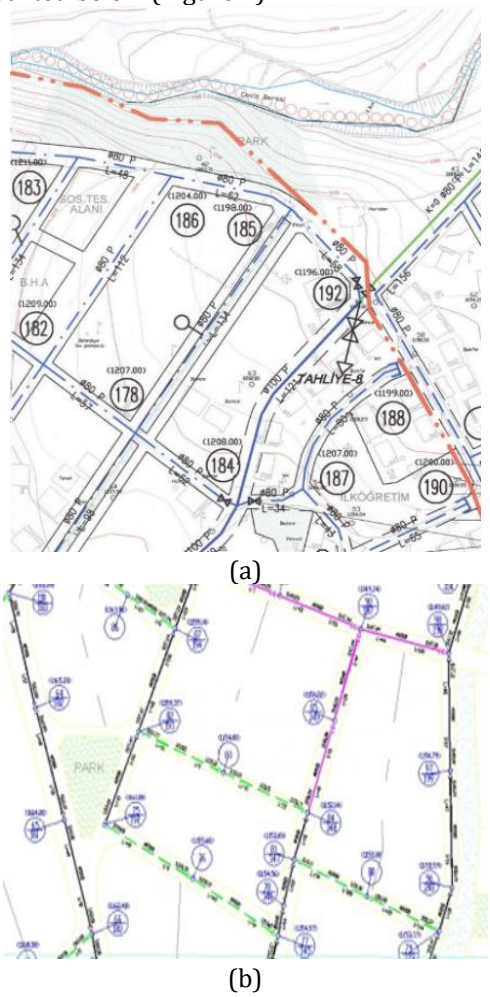
***Corresponding Author**

*(davutbalci1412@gmail.com) ORCID ID 0000–0003–0874–324X

Cite this article

Balcı, D. (2022). Researching the use of infrastructure in land management. *Advanced GIS*, 2(1), 18-23.

principles, the land management is done and the project stage is started. The titles of survey, planning and feasibility study principles related to land management are presented below (Figure 1).



(a)

(b)

Figure 1. (a, b) Drinking water network line designed on the zoning plan

a-) Administrative, Geographical and Historical Condition of the Land. The name of the working area in the field, the name of the district and province to which it is administratively affiliated, the closest transportation network or networks (air, land and railway) in the study area or study area; geographically, the winter-summer transportation conditions, general topography, vegetation, climate and precipitation intensities together with the dates; Historically, historical development and special situations are indicated.

b-) Socio-Economic and Cultural Situation. All events and phenomena that can be evaluated economically as well as a society can be called socioeconomic. The economic characteristics of the people living in the study area, development activities, commercial areas, the status of entertainment centres, health, education, transportation status, sports, tourism, industrial status, the status of military units and other organizations, livelihoods, urbanization, market areas, parking areas, state of agriculture and animal husbandry.

c-) Condition of Existing Facilities. The status of the existing facilities in the project area is analysed and detailed in the report. In which year and by which administration the construction of the existing facility was made; It should give information about the pipe types used in the application, the type of bedding-liner material and the trench depths. If there is no active facility on the land and a new infrastructure work is planned, when the application (construction) will take place, the water requirement and population amounts are specified as parameters required for the project.

d-) Map and Zoning Plan Situations. Map and zoning plan situations are perhaps the most important topic of survey, planning and feasibility studies in terms of land management. Whether the study area is within the zoning boundaries or not, if it is within the zoning boundaries, the regulation and approval dates are obtained from the relevant municipality and added to the report. At the same time, the zoning plan projection year and population are included in the report. With the above information in the report, only the current situation can be studied. The following information is added to the report so that future studies can be carried out; whether there are revised or additional plans, the status of the development areas in the zoning plan and whether they meet the needs.

2.1. Some Important details from technical specifications

Obtaining maps of transmission line and main pipe routes

It is prepared on a 1/2.000 or 1/1.000 scale.

It includes 75m right and left of the transmission line. However, this figure 2 may vary considering the topographic structure of the study area. The elevations of some and polygon points are determined by round-trip levelling and these elevations are recorded on the map (Iller Bank, 2021a).

For an optimal numerical model, it is necessary to take detailed points from the field. For 1/2.000 scale, there should be a minimum of 40 points on 10.000 m^2, and for 1/1.000 scale, there should be 80 points on 10.000 m^2 (Iller Bank, 2021b).

All-natural and human elements (highway, railway, river, stream, building, land, etc.) on the transmission line route are specified and the areas where it cuts the route are determined.

If there is a garden on the land, whether it is planted or cultivated or not, and if there is information on the land vegetation, areas with features such as swamps and landslides are shown on the maps.

Detail points are shown with their elevations and numbers on the map. The comma of the jeans represents the detail point. The texts are written perpendicular to the north on the map. North direction and scale are shown on maps.

Continuity of the map is ensured by making a bellows so that the top point is outside the paper, in order to draw the map on paper of certain sizes. After examining different solutions on these drawings, the approved route is applied to the field.

For the application process, the polygons and detail points previously established on the land are used. The polygon line is not selected coincident with the pipeline route. On the route, the source, maslak, stream crossing,

highway crossing, horizontal drilling, pumping centres, air chimney, etc. in the project. productions are marked.

2.2. The application is made according to the following principles

It can be applied by using satellite or terrestrial photogrammetric methods for the application process.

The application process is applied depending on the ground control points.

Application sketch and plans; It is prepared for the implementation of projects and plans on the ground.

Length measurement accuracy is ± (5 mm + 5 ppm) and better theodolites are used.

Electronic theodolites with an angle measurement accuracy of ±10CC (3'') and better are used.

The distance between the theodolite and two measurements cannot exceed 500m.

Geodetic GNSS receivers are used in the application with GNSS. The largest base length cannot exceed 5000 m.

In these application processes, it is done according to the application method with coordinates.

While the application is being made, it is measured and calculated in 10CC thinness with electronic devices that can directly measure 100CC at angles, and the lengths are measured and calculated in centimetres thin with an electronic distance meter. However, previously checked and approved steel tape measures are used in the application process of lengths up to 20 meters.

2.3. Ditch width and depth

There are certain standards for trench widths, depths and distances from the top of the pipe to the ground level in the transmission line and network lines. While determining these standards, traffic load calculation due to the pressure to be applied to the pipe, frost and heat event due to the adverse conditions of the seasons, etc. It is determined to be at least 1.00 m from the top of the pipe to the ground level, taking into account other effects.

However, where the altitude is more than 2000m, the depth from the top of the pipe to the ground should be 1.25m. The trench width is determined as 40 cm + pipe diameter, usually 20 cm to the right and left of the pipe, in addition to the pipe diameter.

Under normal conditions, the values given above are valid, but these values can be reduced by considering the water drainage difficulties in areas where groundwater is too close to the surface or too much, in cases where filling cannot be done on the ground in urban applications. In other words, the depth from the top of the pipe to the ground can go below 1.00 m. If there is a possibility to fill on the ground after the transmission line is laid, the pipeline is placed above the groundwater level, in this case parallel passages are considered so that the filling does not interfere with the surface waters.

(a)

(b)

Figure 2. Ditch digging

Under normal conditions, the values given above are valid, but these values can be reduced by considering the water drainage difficulties in areas where groundwater is too close to the surface or too much, in cases where filling cannot be done on the ground in urban applications. In other words, the depth from the top of the pipe to the ground can go below 1.00 m. If there is a possibility to fill on the ground after the transmission line is laid, the pipeline is placed above the groundwater level, in this case parallel passages are considered so that the filling does not interfere with the surface waters.

When the drinking water transmission line coincides with other network lines, it can be crossed in parallel or by planning lower or upper crossings. However, in cases where there is overlap or convergence with the sewerage zones, intersection point projects are prepared. Trench excavation depth can be increased or decreased when necessary by taking special precautions and measures against wastewater.

Drinking water transmission line; It cannot approach the sewer, storm water and waste water pipes less than 3.00 m horizontally. Drinking water transmission or network line at intersections; It should be 30,00 cm higher than the sewer, rain water and waste water pipes and their chimneys should not intersect.

2.4. Bedding and covering

Before the trench excavation work is completed and the pipes are laid in the transmission lines, crushed stone (gravel) is poured into the trench, which we call bedding, in a way that is usually 15 cm (Figure 3). After the pipes are laid on the bedding, crushed stone is poured, which is generally called 30 cm lining. Importance of bedding and covering; after the line is completed, it distributes the pressure that will come from anything on it by spreading. In this way, the pipes will not be damaged. Of course, bedding and coverage amount and crushed stone size (0.32, 0.70, 0.22 mm) vary according to the location and structure of the land.

Figure 3. Bedding and covering

2.5. Study area

The study area of İller Bank Gaziantep Regional Directorate was chosen as the study area. It covers 5 provinces including Gaziantep, Kahramanmaraş, Şanlıurfa, Adıyaman and Kilis with all their districts and villages. Although 4 of the provinces are from the South-eastern Anatolia Region, only Kahramanmaraş is in the Mediterranean region. This field of study was chosen because I am a Gaziantep Iller Bank personnel and have a good command of the region, projects and practices.

2.6. Data

The physical data in the study were obtained from the Gaziantep Regional Directorate of Iller Bank, and the technical principles to be followed in the field were obtained from the Iller Bank Technical Specifications. These technical specifications;

-Technical specifications for the preparation of studies, feasibility and projects in drinking water facilities

-Technical specification for the preparation of architectural projects

-Water intake structures project technical specification

- Soil survey technical specification

These specifications refer to the principles and rules that must be followed in infrastructure applications.

2.7. Method

While looking for solutions to the problems, literature research, the regulations of the institutions were examined and interviews were made with the technical experts related to the subject. The method is preferred because there are many problems and factors in the field, so there is more than one solution method, so more than one method has been preferred.

3. Results

As can be seen in Figure 4, the transmission line passes through the citizen's land. There are different options for a solution here;

Solution 1: The consent of the land owner can be obtained.

Solution 2: Expropriation can be applied to the part of the land that can pass through the transmission line.

Solution 3: Since the transmission line passes 1m above the earth's surface, the transmission line can be laid with the verbal consent of the land owner without any payment or transaction.

Figure 4. Personal possession

Here, the 3rd solution is applied. Because, after all, this transmission line is a drinking water transmission line and drinking water goes to its own compatriots or relatives. Here, the person used his conscience and human values and gave verbal consent.

As can be seen in Figure 5, the transmission line passes through the citizen's land. There are different options for solution here;

Solution 1: The consent of the land owner can be obtained.

Solution 2: Expropriation can be applied to the part of the land that can pass through the transmission line.

Solution 3: Since the transmission line passes 1m above the earth's surface, the transmission line can be laid without any payment or transaction by obtaining the verbal consent of the land owner.

As in the previous example, the 3rd solution is applied here as well. The reason is the same as the previous example. As seen in Figure 8, the transmission line passes through the dry creek bed owned by the State Hydraulic Works (DSI). Here, there are no different options for the solution as in the previous examples, there is only one solution; Permission can be obtained by correspondence between institutions (the institution that tendered the project (İlbank) – DSI).

If this area was not a dry creek bed but a stream rehabilitated by DSI, DSI regulation certainly does not allow the expropriation limit of the creek improvement area to be approached more than 6 meters.

Figure 5. General directorate of state hydraulic works land (Dry stream bed)

After the necessary approvals were obtained from DSI by making inter-institutional correspondence, the project started to be implemented. As can be seen in Figure 6, the ownership of the transmission line passes through the General Directorate of Highways (KGM). The solution here is similar to Figure 5 and is as follows; Permission can be obtained by correspondence between institutions [the institution that tendered the project (İlbank) - KGM]. However, when we look at the KGM regulation, it in no way brings it closer to the expropriation limit of highways than 6 meters. It only allows horizontal transfers in the forms and methods within the regulation.

F**igure 6.** Crossing the Highways

As seen in Figure 6, the transmission line did not go directly under the highway. From a certain part of the line (S416), it was crossed to the other side of the highway with horizontal drilling and the line proceeded on the right of the road. In order for the transmission line to continue from where it was in the project again, horizontal drilling was carried out at S419 in accordance with the KGM horizontal drilling procedures and principles, and the other side of the highway was passed. This is how the problem is solved here.

4. Conclusion

In this study, some problematic examples of infrastructure work such as transmission lines and sewer lines in the field are given and discussed. In the findings part, the problems with the citizen, DSI and KGM are presented with pictures in Figure 6-7-8 and Figure 9.

Three different solutions have been proposed for the problems with the citizens in the field. These solutions are as follows;

Solution 1: The consent of the landowner can be obtained.

Solution 2: Expropriation can be applied to the part of the land that can pass through the transmission line.

Solution 3: Since the transmission line passes 1m above the earth's surface, the transmission line can be laid without any payment or transaction by obtaining the verbal consent of the landowner.

During the project works, a plan-quote is prepared 75 m to the right and 75 m to the left of the route where the line will be built, and all public institutions and organizations are informed about the project work with a distributed cover letter, and the public institutions and organizations that have ownership on the route notify this property in written and digital form; The project is revised through these data. If there is still a public institution or establishment property on the route after all these procedures, the following solution method is applied. There is only one solution to the problems with official institutions in the field, and that is as follows;

The problem can be solved by correspondence between institutions. Here, the parties of correspondence are the institution that tendered the project and the institution holding the property on the route where the line passes.

Acknowledgement

Thanks to the information of Iller Bank and Iller Bank Gaziantep Regional Directorate, who benefited from both the working area and technical specifications in the study, and to Kamil UZUNDERE, Technical Expert Survey Engineer, a member of Gaziantep Iller Bank, Project and Spatial Planning Directorate.

Author Contributions

The study was carried out by a single author.

Statement of Conflicts of Interest

The author declares no conflicts of interest.

Statement of Research and Publication Ethics

Research and publication ethics were complied with in the study.

References

Çelik, M. Ö., & Çoruhlu, Y. E. (2021). Land management within this framework of sustainable protected areas in Turkey. *Turkish Journal of Land Management*, 3(1), 40-52. https://doi.org/10.51765/tayod.904206

Çete, M., & Yomralıoğlu, T. (2009). An approach for Turkish land administration system. *Journal of Geodesy and Geoinformation,* 2009(1), 34-44.

Demirel, Z., & Gür, M. (2008). Land management and its effects on change in our profession. *Journal of Geodesy and Geoinformation,* 2008(1), 5-11.

Doğan, Y., & Yakar, M. (2018). GIS and three-dimensional modeling for cultural heritages. *International*

Journal of Engineering and Geosciences, 3(2), 50-55. https://doi.org/10.26833/ijeg.378257

İşiler, M. (2012). *Legislation analysis about land management in Turkey* Publication No. 323953) [Master's thesis, Istanbul Technical University]. YÖK National Thesis Center.

Iller Bank. (2021a). *Iller Bank*. Retrieved February 25, 2021 from https://www.ilbank.gov.tr/dosyalar/ilbank-teknik-sartnameleri/02

Iller Bank. (2021b). *Iller Bank*. Retrieved October 17, 2021 from https://www.ilbank.gov.tr/storage/upload/files/icmesuyu-etut-fizb-tekn-sart.pdf.

Şahin, M. A., & Yakar, M. (2021). WebGIS technology and architectures. *Advanced GIS*, 1(1), 22-26.

Ulvi, A., Yakar, M., Yiğit, A. Y., & Kaya, Y. (2020). Production of 3 Dimensional point clouds and models of Aksaray Kızıl Kilise by using UAVs and photogrammetric techniques. *Journal of Geomatics*, 5(1), 19-26. https://doi.org/10.29128/geomatik.560179

Ünel, F. B., Kuşak, L., Çelik, M. Ö., Alptekin, A., & Yakar, M. (2020). Examination of ownership status by being determined the shoreline. *Turkish Journal of Land Management,* 2(1), 33-40.

Yakar, M., & Mırdan, O. (2017). Compared problems at modeling of cultural heritages with unmanned aerial vehicles. *Journal of Geomatics*, 2(3), 118-125. https://doi.org/10.29128/geomatik.306914

Yomralıoğlu, T. (2021). *Lecture notes for land management*. ITU Academic Open Archive.

© Author(s) 2022.
This work is distributed under https://creativecommons.org/licenses/by-sa/4.0/