Scientific Research and Essays Vol. 6(22), pp. 4732-4737, 7 October, 2011
Available online at http://www.academicjournals.org/SRE
DOI: 10.5897/SRE11.825
ISSN 1992-2248 © 2011 Academic Journals

Full Length Research Paper

Using spatial technologies for the planning of coastal zones: A case study of Kaynarca coast in the Sakarya Delta

Akif Karatepe

Department of Geography, Faculty of Arts and Sciences, Sakarya University, 54187, Sakarya, Turkey.
E-mail: akaratepe@sakarya.edu.tr.

Accepted 29 August, 2011

During the last decades, developments in computer technologies have rapidly increased. Depending on these, geospatial information technologies have also significantly developed, and now they improve our decision making ability about most of our daily life plans and problems. In terms of coastal zone management, geospatial technologies can be useful for the sustainable development of the coastal zones. In this study, short definitions about coastal zone terms such as shore line, shore edge line, coast and coastal stripe were given and then explained the main geospatial technologies and their importance on coastal zone management. In addition to these, specially, this paper focused on, how can be GIS and GPS used for determining the shore edge line on which given coastal area named Kaynarca coast's in the Sakarya Delta because of occurring shore edge line problems recently in this coastal area of Black Sea. Therefore, it is essential to determine the shore edge line in order to make planning and implementations in the coasts and coastal stripes.

Key words: Spatial technologies geographic information systems and global positioning systems (GIS and GPS), coastal zones management and planning, shore edge line, Sakarya Delta, Kaynarca district.

INTRODUCTION

Coastlines areas support intensive human activities. We have been using the coastlines for natural harbors, food source, tourism, and waste disposal and even for settlements (Christopherson, 1997). Comparing of coastal areas with other landforms of the earth surface, coastal areas have been rapidly changed by the natural processes (Akyol et al., 1997). Thus, coastal areas have always been changing by natural and human factors in every day. In other words, coastal places are considered to be unique and dynamic environment influenced by both physical and human made processes. Due to these, coastal zone management is essential for the sustainable development. Better understanding of natural environment and using it properly in daily life, geospatial technologies welcomed to our daily lives in early 1960's (Karatepe, 2008). Geospatial technologies consist of three main systems. One of them is geographic information systems (GIS), and the others are remote sensing (RS), and global positioning systems (GPS) (Karatepe 2007). The term "geographic information systems" (GIS) means a set of computer tools to capture, manipulate process and display spatial or geo-referenced data. By GIS technology we mean the integration of all the methods and tools that can be useful to establish a decision support system for spatially related problems (Fedra and Feoli, 1998). With providing data to the GIS and GPS, RS technologies area also very important for monitoring coast line and its changes. But in this study, just GIS and GPS were used for determining and mapping shore edge line in the Kaynarca coast of Sakarya Delta.

STUDY AREA

Study area is located in the Northwestern part of the Kaynarca district of Sakarya province, Turkey. Karaboğaz Place, which is part of the Birlik village, is located 25 km from Kaynarca and 50 km from the city center of Sakarya. Study area takes place on the west coast of

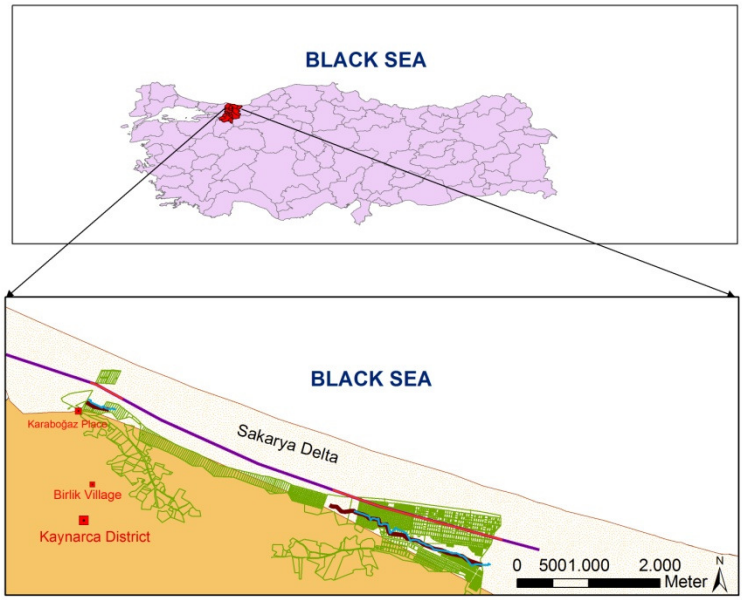

Figure 1. The location map of study area.

Figure 2. A View from Sand Dunes.

Sakarya Delta and between 30° 22′ 30″ to 30° 28′ 00″E and 41° 08′ 19″ to 41° 10′ 30″N and lies approximately 6 km to the southwest side of Black Sea (Figure 1).

Sakarya Delta has a view of a coastline running alongshore, at the back a new dune chains, as to at the far behind old dune chains, trenches and plains between these (Figure 2).The main unit of delta morphology consists of dunes which are formed by sea waves and wind together. In this area houses are constructed in the sandy territory. Agricultural soil is sand dune. Animals ramble in the sand area; roads are constructed along the sandy area (İnandık, 1963).

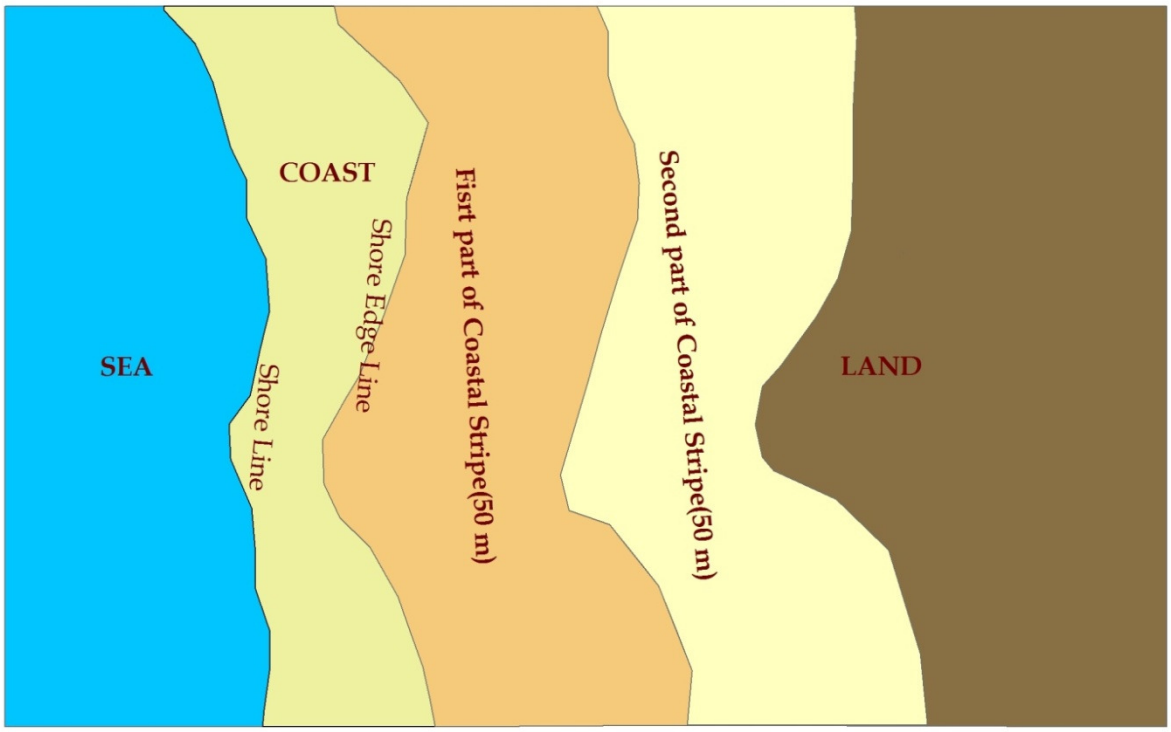

Figure 3. Coastal terms according to Turkish coastal law (Modified from Sesli and Akyol 2002).

PROBLEM SITUATION

Although there are plenty of buildings lots in study area, just a few lots appropriate for the settlements because of entire area covered with sand and sand dunes. Seaboard land was divided into blocks and parcels in different sizes in sixties and seventies in 20th century. Housing is only available at the parcels far 3 to 4 km from seaside even though abundance of the parcels. In current situation, there is no possibility to settle in this place due to both geomorphologic and legal condition. Most of the parcels had bought unseen by the landowners 30 to 40 years ago, are located within coastal area according to Turkish Coastal Law no: 3621 and shore edge line determined by The Ministry of Public Works and Settlement on 16th September, 1998. Therefore land title cancellation and registration enforcement for the parcels available at coastline is started dating from 2008 by public treasury. During court case, for making best right decision I was appointed as a geomorpholog in the earth science committee, by the court of Kaynarca. Our mission was to determine whether the parcels in litigation that are in the case study area are within the shore edge line or not and also to redefine a new shore edge line.

Definitions of coastal area terms

According to the Turkish Coastal Law, the definitions of the coastal terminologies are as follows (Figure 3).

Shore line

The line that joins the points where water meets the land in seas, natural and artificial lakes and rivers, excluding overflow. It can be changed some meteorological events.

Shore edge line

The natural boundaries of the sandy, pebbly, rocky, stony, rushy, swamp and similar locations formed by the water movements towards land after coastal line at seas, natural and artificial lakes and rivers. This border can not be changed even though sea is filled obtain the land.

Coast

The area between the shore (coastal) line and shore (coastal) edge line.

Coastal stripe

From the shore edge line towards the land: Coastal stripe is the area of horizontally minimum 100 m. This are

Figure 4. The sample dug parcel.

consist of two parts. First part of it is first 50 m of coastal stripe and second part of it is second 50 m of it.

MATERIALS AND METHODS

This study consists of two parts. First part has conducted in the study area. Therefore field trip was held to the study area. In April 2009, earth science committee and court board arrived at Kaynarca district, Birlik village, Karaboğaz place where the parcels in litigation are located. Every parcel in study area was dug approximately 2 to 3 m by digger machine for observing of soil and terrain structure (Figure 4). After investigation of terrain structure, it was determined that whether the parcels are located within the shore edge line or not required by coastal law application regulations drawn up in accordance with law no 3621, title 5 and 6

At the same time, at the request of the court, new shore edge line was redefined according to coastal law application regulations. Due to this, almost 6 km was walked along the coastline and based spots were registered by GPS from particular places in study area (Figure 5).

Second part of the study has conducted in office environment. After field trip, study area parcels map was prepared by ArcGIS 9.2 and then redefined new shore edge line, which shown as the 2nd shore edge line in the Figure 6, was drawn by transferring the registered spots from the study area to the parcels map. Depending on the new shore edge line, conclusion report was prepared and presented to the court of Kaynarca, Sakarya.

Either before or after our committee, two different scientific groups went to the same study area. They also determined shore edge line and prepared reports. The line determined before is displayed as 1st shore edge line and the line determined after is displayed as 3rd shore edge line (Figure 6).

RESULTS

As understood from the excavations and surface observations in study area, almost all of the parcels in litigation are located on the beach sand that degree of sorting is high and well-washed. There are no clay-sized particles in the beach sand. In some places, they are composed of brown materials of fine sand and silt size with thin layers or lenses. This material is enriched with ferrous minerals in some places is composed of principal components of beach sand.

As is decided in accordance with Turkish Coast Law no 3621, in the case study are almost all observed parcels in litigation are within the shore edge line defined by the ministry of public works and settlement and some of them

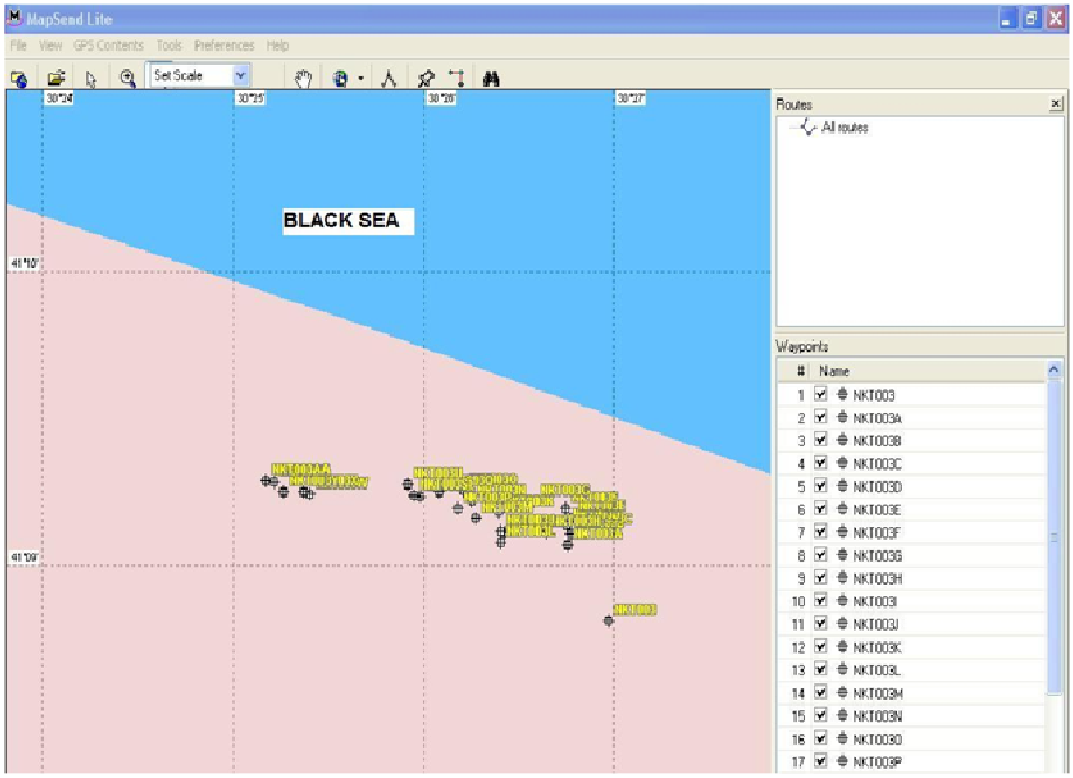

Figure 5. The spots registered by GPS in the study area.

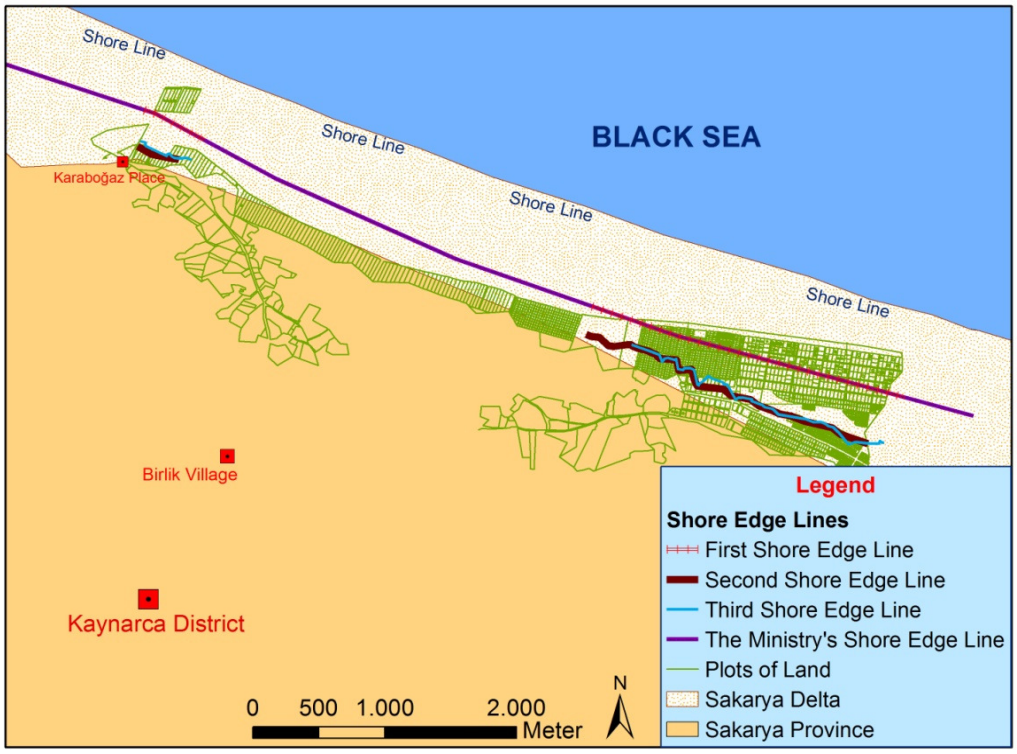

Figure 6. ArcGIS base map showing the shore edge lines determined by the Ministry of public works and settlements and by the scientific committees studied the area.

are on the shore edge line. Beyond this, in addition to the present parcels, it is observed that there are other parcels which inside the new shore edge line must be within coastal area with the resulting of redefining of shore edge line determined by our committee.

DISCUSSIONS

When the landowners had bought the parcels, which are now inside the coastal area, the shore edge line had not determined yet by the ministry of public. In spite of shore edge line determined by the ministry of public works and settlement on 16th September, 1998, most of parcels were bought by landowners before 1998.

In current situation, there is no possibility to settlement in this place because of both geomorphologic features and legal condition. Land owners have been affected by this situation. So, they can't sell their lands and can't build house on them. Now the question is how this problem can be solved. Solving these problems in some way is very significant in terms of the coastal zone management, so a new coastal planning must be done for preventing future problems.

Furthermore the landowner's problems, both the redefined shore edge line and conclusion reports prepared by the scientific committees were different. Even though the 2nd shore edge line, defined by our committee and the 3rd shore edge line defined by next our committees are just about the same, 1st shore edge line defined by previous committee is very different. Not only court but also land owners are put on the difficult situations with these differences.

On the other hand, the reports of consultative authority and determining commission have never got along with each other. In this way, claimant and defendant of the law court have a right to object to the law court. To solve this problem, the definitions and explanation in the coast law and the relevant regulations have been in need of correction so as to the content of geomorphologic detail which will not give opportunity to wrong interpretations (Turoğlu, 2009).

Beside these things that mentioned above, when defining coastal area and shore edge line, GPS, GIS and also RS which are today's most popular spatial technologies have not been used. If these technologies had had used, these kind of problems could not happened.

Conclusions

In this case study, the parcels situated in western part of Sakarya Delta at Sakarya province, Kaynarca district, Birlik village, Sarıboğaz location, were investigated in terms of whether those parcels within shore edge line or not according to Turkish Coastal Law 3621 and its application regulations. Furthermore, clarifying of current parcels situations, GIS and GPS were used for determining and mapping new shore edge line in the study area.

As of geomorphologic structure of the study area, it is inevitable that shore edge line must be redefined in refer to Coastal Law by showing regard to provisions in the coastal law and its regulations. Therefore a new commission has to be set up and new shore edge line must be defined by this commission over again.

In terms of landowners, it is necessary that unjust treatment of proprietors who acquired land from the area knowing or unknowing, must be relieved. For this purpose valuation commission has to be set up and land values also have to be reprised. When reprising, land owners must not be suffered again.

In order to make better planning and implementations in the coastal zones, it is essential to determine the shore edge line. For doing these, spatial technologies such as GIS, GPS and RS have to be used. This application will reduce coastal area problems and provides convenience to the decision makers for solving these kinds of problems.

REFERENCES

Akyol N, Tüfekçi M, Seyhan K, Demir O (1997). The Use of Coasts and its Relations with Public Benefit in Turkey: Using the coastal are of Trabzon and its results. 1st National Conference on Coastal and Marine areas in Turkey. Proceedings Book of Turkey's Coasts, pp. 195-205.

Christopherson RW (1997). Geosystems: An Introduction to Physical Geography. Prentice Hall, 3rd Publication in USA.

Coast Law of Turkey (1990). Law Number, p. 3621.

İnandık H (1963). Sakarya Delta. Istanbul University, J. Geography Instit., 13: 83-98.

Karatepe A (2007). Using Geographic Information Technologies in the Geography Education. Unpublished PhD Thesis. Marmara University. Instit. Educ. Sci., p. 241.

Karatepe A (2008). Spatial Technologies in Geography Education. Methods and Approaches in Geography Teaching. Aktif Publishing, pp. 193-216.

Fedra K, Feoli E (1998). GIS technology and spatial analysis in coastal zone management. Published in EEZ Technol., 3: 171-179.

Sesli FA, Akyol N (2002). Investigation of the Relations between Coastal Line Cover and Land ownership by Using Geographical Information Systems. International Symposium on GIS, September 23-26, İstanbul- Turkey.

Turoğlu H (2009). The Coastal Law (Number 3621) and its Applied Problems. Turkish Geography Bullet., 53: 31-40.