The boundary and the effects of Cadastral Surveying in Cyprus

Introduction

Cyprus is an island situated in the north-eastern part of the Mediterranean Sea, with a total area of 9251 km². The history of Cyprus goes back 11000 years. There is archaeological evidence that since the 6th millennium B.C. the Cypriots practiced agriculture on a communal basis and that by 1400 B.C. the idea of individual ownership had developed. What can be described as a title to land is an inscription of the 5th century B.C. excavated at Dali village (near Nicosia), indicating the development of private ownership in ancient Cyprus. It indicates that then, there were not only royal lands but also private ownership mentioned by owners’ names. It also indicates the existence of land taxation as well as of inheritance in those days.

The geographical position of our island which is located at the meeting point of three continents (Europe, Asia and Africa) and its natural resources were the main reasons of disputes for centuries for a lot of countries who wanted to have access on it. Cyprus went under possession of many countries and through their governing, each one developed a different kind of land registry system.

Our current institutional frame of land registry has its roots to the systems established during the Ottoman occupation of Cyprus (1570-1878). The law back then subdivided the Property Rights into the legal ownership and the right of possession. There were five categories of land. The most important are two. In the first category, the owner of land had absolute ownership (both legal ownership and the right of possession) in trees, buildings and village land. In the second category that concerns cultivable land and forests, the legal ownership belonged to the state and the right of possession belonged to the owner of the land.

In 1878, Cyprus went under the British sovereignty. At that time the whole island was for the first time surveyed and mapped for demarcation and classification of the land and its people. The first full triangulated map of Cyprus was then produced.
After the independence of the island in 1960, the authority responsible for the operation of land registration is the Government of Cyprus through the Director of Land and Survey Department. The Department of Lands and Surveys (D.L.S.) is the oldest department in the government service dating back in 1858. It has the responsibility of land registration, ownership, valuation, survey and cartography, ensuring the protection of the interests of individual landowners and serving as an instrument of national policy regarding the market of real estate as well as a mechanism to support economic development of our country.

**Boundary definition in Cyprus**

Cadastral surveying has to do with determining and defining land ownership and boundaries.

In Cyprus, no transfer of, or change on any immovable property is valid unless registered in the District Lands Office. The principal components of the Cyprus system include the register and the cadastral plans. The system of land registration is that of title.

Cyprus is wholly covered by cadastral survey which according to the method used and the degree of accuracy is classified into the following categories:

a. Unsound Survey
b. Chain Survey
c. Plane Table
d. Resurvey

**Unsound Survey**

It was carried out between 1904 and 1911 for the preparation of cadastral plans on scale 1:2500. It is in fact a chain survey method but purely graphical, no field notes were recorded and the available control was very rare. It covers part of Famagusta district.

**Chain Survey**

The chain survey method was used after the establishment of the triangulation in 1915. All field measurements were recorded in the field books. Cadastral plans on scales from 1:500 to 1:2500 were prepared and used for the general registration.
**Plane Table**

By 1919 it was realized that the survey of the island could not be completed by 1929, which was the time target set. Chain survey was a very slow method and it was therefore decided to survey the remainders of the island using the method of plane table.

The plans of scale 1:5000 produced by this method were used later for the sporadic registration of properties.

Obviously the cadastral plans that came up using the above methods have many inaccuracies and errors so a new method was adopted at a later stage.

**Resurvey**

The resurvey project started the last few years in order to replace all existing cadastral plans with new ones, on scales 1:1000 and 1:2000. This project involves the cadastral plans, field survey data and photogrammetric data.

As far as cadastral surveying engagement is concerned, until recently only the employees of the Department of Lands and Surveys could legally carry out such surveys. With the voting though of the new survey law in 2005, private surveyor engineers are actively involved in the conducting of cadastral surveys on the island.

To become a licensed surveyor in Cyprus, one has to become a member of the Rural and Surveying Engineers Section of the Cyprus Scientific and Technical Chamber and have at least one year experience in the engagement of cadastral surveying.

Cyprus through the Land and Survey Department managed to implement a fully integrated Land Information System (LIS). The increasing needs for supply of data and information that relates with immovable property in relation with the rapid developments of modern technology, lead the D.L.S. in December of 1989 to adopt a new project for the development and implementation of a Geographic Information System (GIS).

The GIS has been designed and developed having two major components:

A. The Survey Related Applications (Geographical components)

B. The Legal/Fiscal Applications (Legal/Fiscal components)
Four main databases have been developed in the Department:

1. Survey Data Base
2. Digital Cadastral Data Base
3. Topographical Data Base
4. Legal/Fiscal Data Base

The survey, digital and topographical data bases constitute the spatial components of the GIS, and the Legal/Fiscal data base mainly constitutes the descriptive components.

**Survey Data Base**
The Survey Data Base (S.D.B.) stores information related to the geodetic network (control points), current survey data (survey data position, parcel dimensions, coordinates, the area of the parcels, boundary descriptions) and historical records about the formation of the plot and other geographical details that are surveyed.

**Digital Cadastral Data Base**
The Digital Cadastral Data Base (D.C.D.B.) was created from the digitization of the existing cadastral maps and is available in raster and vector format. It has been designed to provide an up-to-date continuous cadastral map base to support cadastral mapping and the land information system functions. The cadastral map plays a fundamental role and formulates the basis for the development of a National Land Information System.

**Topographic Data Base**
This Data Base includes topographic features such as rivers, lakes, contour lines, digital terrain model, etc. It is used for the production of topographic and thematic maps.

**Legal/Fiscal Data Base**
This Data Base includes applications, declarations, mortgages, forced sales, attachments, local enquiry, registrations, tenure, land consolidation, leases, licenses, notations and valuations. It facilitates land transactions while improving and accelerating valuation and assessments. It also reduces duplication of land administration work.
The GIS data bases are built in such a way so as to ensure an integrated Land Information System for each property unit using as connective element the parcel number of the property.

Surveyors should do the appropriate preparation for efficient execution of survey work in the field. After the preparation they survey spotted, linear and surface features such as wells, ovens, bore holes, fences, sunk walls, roads, rivers, channels, buildings, water tanks, etc.

Whatever is surveyed should be coded with the codes specified by the D.L.S. Both employees of the Department and private surveyor engineers must use this code list so as to have the same communication code language in order to build reliable cadastral survey maps. Surveyors have to survey the first and the second cycle of the property boundary parcels so as to study the whole area around the parcel and to make the relevant checks.

Special attention has to be given to the determination of the correct position of roads (or rivers, footpaths, channels, etc.). Many times their existing position on the ground differs from the registered position as shown on the cadastral maps. In such cases the surveyed features need to be adjusted in an optimum way with the registered ones. If this is not possible then the registered position of them must be adopted.

After the completion of the survey work in the field all measurements are downloaded and edited. For the determination of property boundaries a large set of information is taken into account such as digital cadastral maps, field books, cadastral records, photogrammetric data and satellite images.

1. **Digital cadastral maps** that were raised from raster format and are used as a reference base.
2. **Field books** that have recorded measurements and contain isolated sketches of the field. One thing we have to take into account is that the information of field books is not always determinative due to mistakes that probably occurred in previous survey works.
3. **Cadastral records** that refer in cadastral drawings and previous surveys.
4. **Satellite images & orthophotomaps** are very helpful giving a picture of the current situation in the plot areas.

5. **Photogrammetric data** that concern photo lines, contour lines e.t.c.

6. **Land Laws** according to the Immovable Property and Tenure Law.

It is quite important to pay attention to the area of the parcel. Surveyed, registered from titles, as well as digitized from existing cadastral maps areas must be compared so as to limit fluctuation within the allowed limits.

All the above data are analyzed and combined together so as to determine the parcel boundaries. After several checks the final outcome of the boundaries is registered into the survey data base (S.D.B.) of the GIS system carrying the exact coordinates. The accuracy of the Survey Data Base is approximately 15cm.

In rare and difficult occasions a group of specialists from all the sections of D.L.S. may get involved to reevaluate the data and finally decide the definitive boundary.

**Access to cadastral information**

Access to cadastral records is granted to the employees of the D.L.S. and the private surveyor engineers who are registered in the record of the qualified surveyor engineers of Cyprus according to the relevant law.

Private surveyor engineers though do not have direct access to the GIS data bases of the D.L.S. The required data are given to them by the relevant section of the Department.

With regards to the public, citizens have no access to cadastral records. They only have the possibility to be notified the exact position of the boundaries of their property which are indicated to them either by the D.L.S. or by a registered surveyor engineer. Every owner is guaranteed with the “certificate of registration of immovable property”. 
Boundary disputes

Boundary conflicts always existed among individual land owners and even among family members. Whenever there is a dispute over the common boundaries of adjacent Cyprus properties, the owners must apply to the Director of the Land Registry of the district where the property is situated in order for him to determine such dispute. According to the law this procedure is obligatory and it should be followed since it is the Director who determines disputes of this nature in the first instance. The dispute is resolved in accordance to the Immovable Property and Tenure Law with one of the 3 following ways: (1) With the determination of the boundaries by the Director of the Department of Land and Surveys, (2) By an amicable settlement without the removal of the registered common boundary, (3) By an amicable settlement where the registered common boundary is removed and the boundary line is readjusted.

In the case that the position of the landmarks is determined by the Director of the D.L.S., if any of the involved parts is not satisfied, he has the right to file an appeal before the Court within 30 days from the day the decision is notified to him. The Court has the authority to issue an order as may think proper and just.

In the case that the settlement is amicably resolved by the parties themselves, the Director of the D.L.S. has still the obligation under the law to issue a decision that is final and no appeal can be filed against it. No owner can change his mind and back out from an amicably boundary dispute resolve as it has been agreed between him and the other involved part.

Practically the procedure followed by the Land Registry is to request the parties to sign a declaration for the resolve of the dispute. Furthermore, the owners are also requested to sign the topographical plan which shows either the common boundary of their properties or the one resulting from their agreement.

If an owner changes his mind about the amicable settlement and the Land Registry doesn’t involve, the Director is under an obligation by virtue of the law to issue a decision determining the dispute as it has been agreed between the parties and to notify them accordingly.

If the owners have settled their dispute in another way that is through an amicable settlement between them without the involvement of the Land Registry and in the process one of them backs out, any procedure that has been determined by the parties
themselves is terminated and dismissed. The only remaining solution is for the affected owner to submit an application at the Land Registry in order to settle the boundary dispute.

The Director is always under a mandatory duty to resolve a dispute as to the boundaries by determining them in the best possible manner based on the available information and the Land Registry records.

The owners have the possibility to make a dispute application about a specific side of their property, only once.

Legally, only employees of the D.L.S. can resolve boundary disputes. Private Surveyor Engineers are not allowed to handle such cases. If the dispute arises after an application of boundary definition which is carried out by a private Surveyor Engineer, then he can only indicate the landmarks that are not involved in the dispute area. The common landmarks of the dispute can only be indicated by the Land Registry officer.

The same procedure is being followed for the resolution of the dispute, as for the determination of the boundaries.

When the position of the landmarks is defined and after the completion of the survey work, the involved parts are being informed and the position of the common registered boundary of their properties is pointed out to them.

**The function of the coordinates**

As property values increase it is very important to survey accurately. Even a few centimeters of land may affect the value of a property or may cause a dispute between owners of adjacent properties.

With the development of technology and the computerization of data, it is required to use coordinates during the engagement of cadastral survey so as to have reliability in the determination of the position of boundaries.

In Cyprus the Geodetic Reference System was founded in 1993 (CGRS’93) and it is based on the world ellipsoid WGS of 1984. The projection is in Transverse Mercator localized and the formal coordinates are called LTM. The fundamental point of the system is placed on the highest mountain of Cyprus, Troodos, and is called Chionistra.

The national geodetic network constitutes of 3 classes of points:

- 1\(^{st}\) class points: 40 primary control points with 15Km distance between them
- 2\(^{nd}\) class points: 304 points with 6Km distance between them
• 3rd class points: about 12000 points with a few hundreds of meters between them. These points are mainly used for local surveys.

All control points were created with GPS observations.

Cyprus Geodetic Reference System of 1993 is connected with the European Terrestrial Reference Frame (ETRF) of 1989 and the International Terrestrial Reference Frame (ITRF) of 1991, since 6 permanent stations of CGRS’93 were measured in ETRF and ITRF coordinates. This allows Cyprus to participate in research projects that require international cooperation and mutual global reference system. The system presents an implementation of WGS84 in Cyprus and provides the basis for all cartographic and surveying activities on the island.

At the beginning of the 20th century surveyors in Cyprus used the Geodetic Reference System of 1913-15, based on the ellipsoid of Clark (1858). The projection was in Transverse Cassini-Soldner localized and the coordinates were called Cassini. However, this Geodetic System had many inaccuracies and errors, so it was decided that it should be aborted. Previous surveys that referred to Cassini coordinates must be transformed into LTM coordinates of CGRS’93. This is required to achieve uniformity and the same level of accuracy between surveys.

After the completion of any survey work in the field that concerns cadastral surveying, collected data is further processed at the D.L.S. office and the coordinates of the property involved are being stored in the Data Bases of the Department of Land and Surveys.

Using coordinates and computerizing data, Surveyors accomplish higher efficiency in the conduct of survey cases, as well as quality, reliability and effectiveness.

The meaning of the property boundary is enormous due to the great developments and the increment of the value of land in Cyprus over the last few years. It is therefore quite important to have clear and accurate boundaries providing citizens with the essential information, that are needed to identify rights and privileges and make the best land decisions.