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# Surveying and Mapping Strategy for Supporting the Emerging Land Market in Albania

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# **SURVEYING AND MAPPING STRATEGY FOR SUPPORTING THE EMERGING LAND MARKET IN ALBANIA**

by

**Ahmet Jazoj, Spiro Lamani, and Leart Lira**

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**ABSTRACT.** This article describes the strategy and procedures that are followed in Albania for the production of cadastral maps and the importance of these maps for the Immovable Property Registration System (IPRS), which will serve the future land market. The procedure for producing base cadastral maps for registration purposes is to use existing maps, choose appropriate scales, and transform these into one, unique coordinate system. The strategy for surveying and mapping is to begin with the existing level of technology and gradually introduce new techniques.

# **SURVEYING AND MAPPING STRATEGY FOR SUPPORTING THE EMERGING LAND MARKET IN ALBANIA\***

by

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Moving toward a market-oriented economy involves the development of various types of markets. One of the first steps of the transition in Albania has been the property privatization process, that is, the transformation of state property into private holdings. Land privatization plays an important role in this procedure as well as in the development of the economy. A critical issue encountered in this activity is the setting up of a land registration system. The implementation of an Immovable Property Registration System (IPRS) has now begun in Albania as part of the Land Market Action Plan, which is supported by technical and economic assistance from the U.S. Agency for International Development (USAID) and the European Union PHARE program.

## **1. BACKGROUND**

The area of the Albania comprises 28,748 kilometers<sup>2</sup>, of which 7,000 kilometers<sup>2</sup> are agricultural, 10,400 kilometers<sup>2</sup> are forested, 4000 kilometers<sup>2</sup> are pasture, 500 kilometers<sup>2</sup> are urbanized, and the remaining sectors are lakes, rivers, roads, seaside beaches, rocky expanses, and the like.

Albania is a mountainous country with scattered holdings of agricultural land, most of which is in the western lowlands alongside the river valleys and on the southeastern plateau. Land reclamation has been carried out in some of these areas, creating 52,000 hectares of new agricultural land from the swamps; land improvement has provided another 200,500 hectares. As a result of this work, before land privatization, land parcels in those areas had an average size of about 12 hectares.

The main activities in rural areas, where about 64 percent of the population lives, relate to agriculture and livestock. Production and incomes in this area depend on the land. The average

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\* Paper prepared for "GIS/LIS '94 Central Europe" conference, 13–17 June 1994, Budapest, Hungary.

quantity of agricultural land per person is 0.22 hectare, varying from 0.103 hectare to 0.449 hectare across districts. For the rural population the quantity of agricultural land per capita varies from 0.18 hectare to 0.63 hectare.

All land was state property under the centralized economy. In July 1991, the Land Law and its derivative legislation determined criteria for the distribution of 530,000 hectares of agricultural land. This land was allocated to 380,300 rural households either in full ownership or in usufruct. Then in November 1992, privatization of ex-state-farm land began; this process is expected to allocate full ownership rights for 36,000 hectares and usufruct rights for 96,000 hectares. It is hoped that the distribution program will benefit 70,000 rural households. Ultimately, Albania will privatize 96 percent of its cultivated land.

Combining the results of the privatization of agricultural land and that of housing units in state-constructed apartment buildings, the total number of private properties in Albania is about 2.5 million.

Efficient registration of these private properties and other public holdings requires the inauguration of a unique, permanent system based on the individual parcel. All registration documents and maps from different organizations such as rural cadastre, forest and pasture cadastre, urban cadastre, and *hipoteka* office will be included in the system. The basis of this system will be the cadastre map, which will show the location and size of each parcel, along with its respective owner.

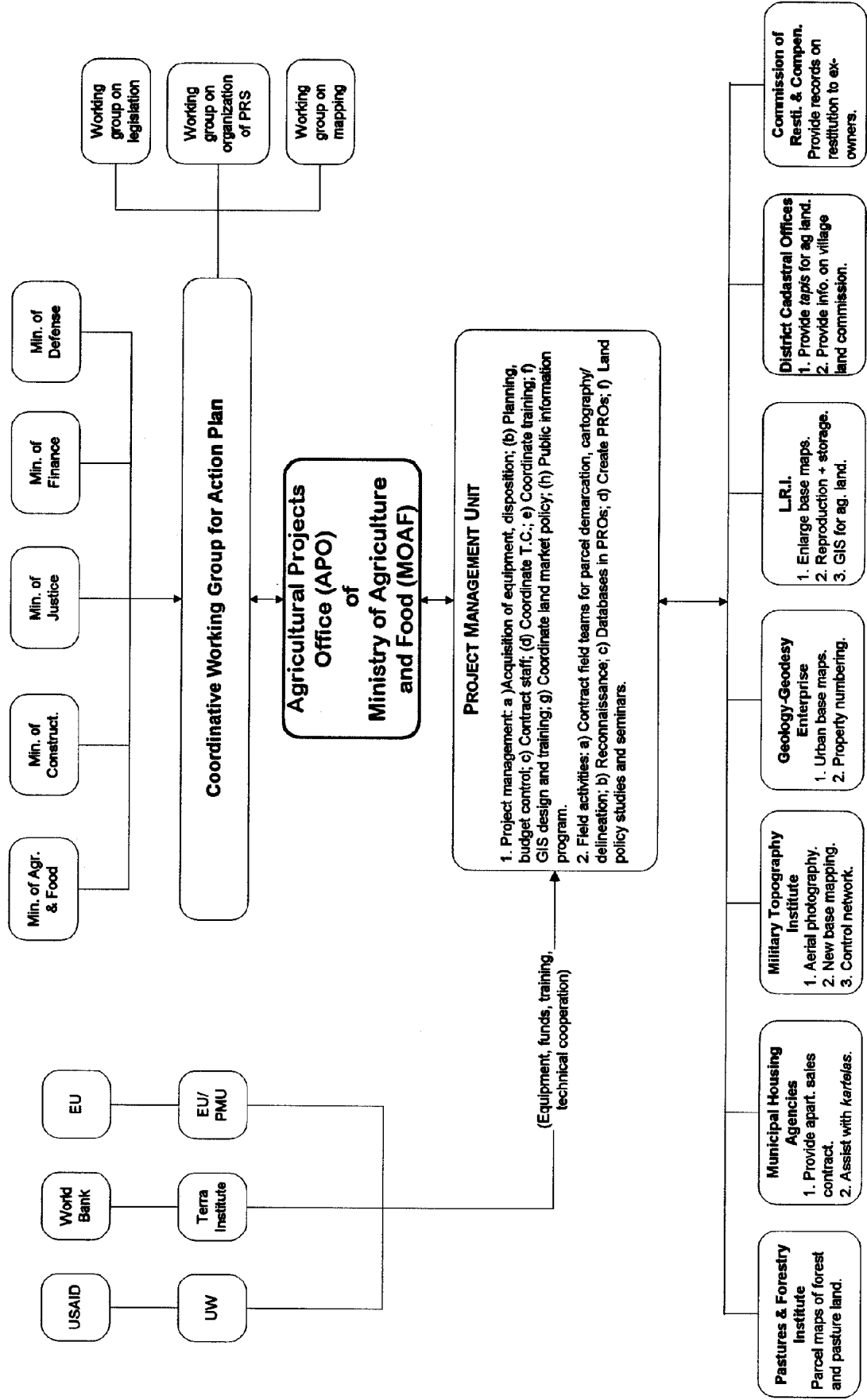
## **2. ORGANIZATIONAL STRUCTURE FOR IMPLEMENTATION OF IMMOVABLE PROPERTY REGISTRATION SYSTEM (IPRS)**

The requests and needs of different ministries were taken into account in implementing the Immovable Property Registry System (IPRS) so that the scheme would be multi-functional. As J.J. Marschener said in "Boundaries and Records in the Territory of Early Settlement from Canada to Florida" (1960):

We finally propose that the cadastre is made in such a way, that in time and by following the recommended rules, it will contain the proofs of title to a property, yet we do not wish the cadastre to be purely a fiscal instrument, we do wish its mission to be more elevated, we wish the cadastre to be an inventory of the landed property of a country, the great book where every proprietor can find the title to his property, we wish the cadastre to be the foundation of the statistics pertaining to the land, of the statistics of the agriculture, of the mortgage system, of farm credit, in short, to be the source that contains the answers to all questions concerning real property. Considered from this point of view, we feel that the organization of the cadastre is one of the greatest benefits that can be bestowed upon the country.

Thus, a Co-ordinative Working Group, consisting of specialists from different ministries, was created to set up the IPRS in Albania. This Co-ordinative Group established working subgroups, one of which deals with surveying and mapping. All the main surveying and mapping institutions that participate in different aspects of base map preparation for the IPRS Action Plan in Albania are included in this subgroup. The organizational structure is shown in Figure 1.

**FIGURE 1. Organizational structure for Land Market Action Plan**



### 3. CURRENT MAPPING SITUATION

In Albania there are considerable and useful mapping data which vary in quality and availability. This information is used to speed up the map-producing process in places where project work is under way. The data come from three main resources:

- 1) cadastre maps of agricultural land produced by the Land Research Institute at a scale of 1:5000;
- 2) maps of urban areas produced by the Geology and Geodetic Enterprise, Ministry of Construction, at the scale of 1:500 or 1:1000; and
- 3) small-scale maps produced by the Military Topographic Institute.

#### 3.1 CADASTRAL MAPS OF AGRICULTURAL LAND

The production of cadastral maps was done for about 40 years by using the classical methods (tachymetry) at a scale of 1:2500 and 1:5000. About 1,070,000 hectares, or about one-third of the entire area of the country, were surveyed with this method, including 629,000 hectares of cultivated agricultural land, or 90 percent of all agricultural land. These surveys were mainly in the lowland areas of the country. The maps were used not only for cadastral purposes but also for different considerations such as land irrigation systems, land management, and so forth. Two co-ordinate systems for cadastral maps production are applied: (1) one system based on the Bessel ellipsoid is used to produce maps at a scale of 1:2500; (2) and the other system based on the Krasowski ellipsoid is used to generate maps at a scale of 1:5000. The Gauss-Kruger projection is used for both systems; for the first system the central meridian is 20°, and for the second it is 21°.

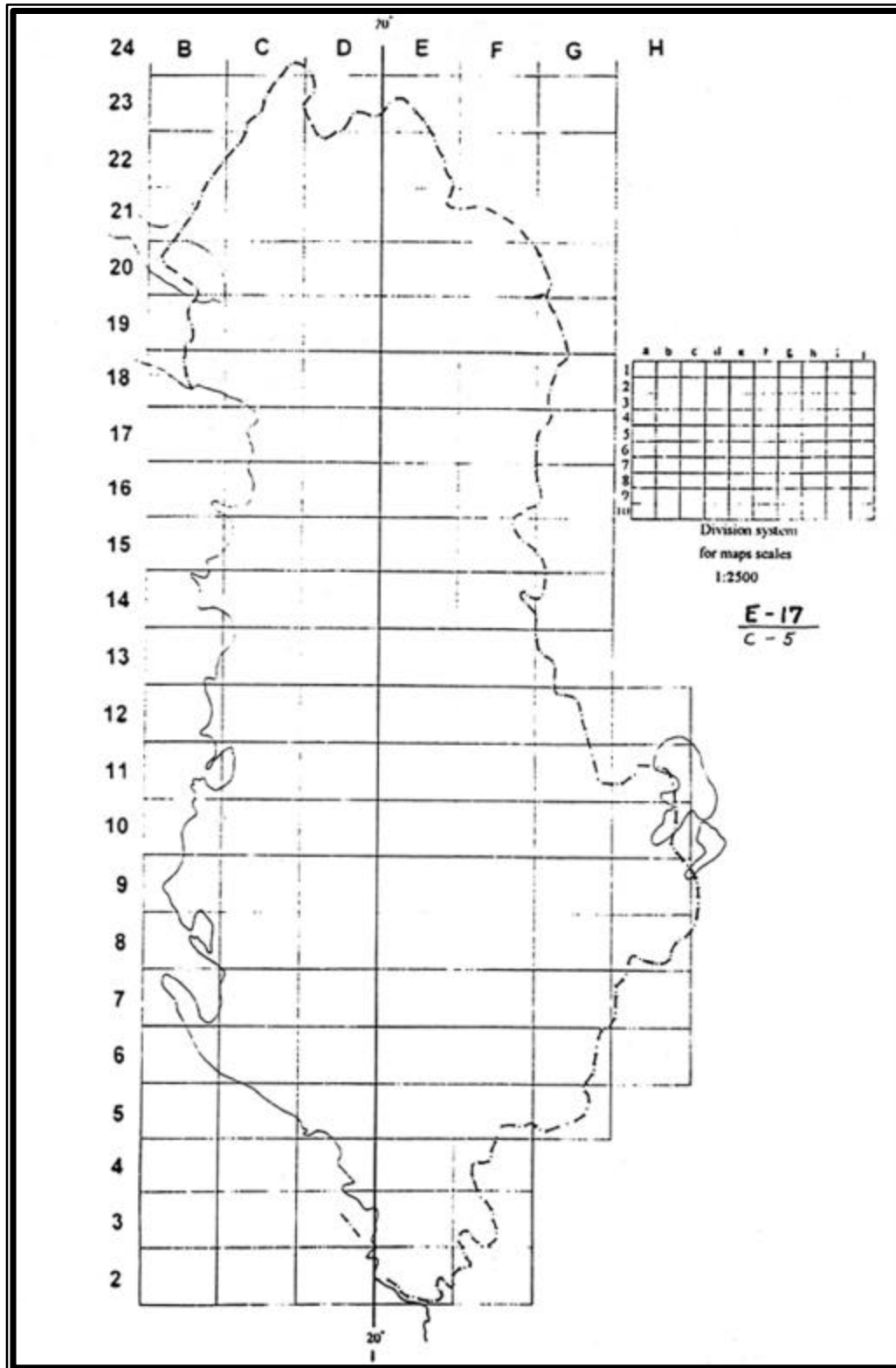
The maps at the scale of 1:2500 in the Bessel co-ordinate system are based on a map sheet layout system unique to Albania. All the Albanian territory is covered with 90 X 60 centimeter map sheets starting from each side of the 20° central meridian and all the sheets are referenced by their orthogonal grid values (see Figure 2). Map sheets produced in the Krasowski system are referenced by geographic coordinates.

All surveying at the scale of 1:2500 and 1:5000, which is used for producing cadastre maps, is done using the tachymetry method with different kinds of instruments, but mainly with Zeiss Theo-020 theodolites. Drawing is done by hand using polar coordinatographs R.A.ROST-WIEN.

#### Status of agricultural land maps at Land Research Institute, Albania

Krasowski maps 1:5000		Bessel maps 1:2500		New survey 1:5000	
Sheets	Area (ha)	Sheets	Area (ha)	Sheets	Area (ha)
2050	890,000	353	180,000*	500	300,000

FIGURE 2. Albanian maps connection system on Bessel ellipsoid



Division system for maps scale, 1:25000

### 3.2 MAPS OF URBAN AREAS

Most of the maps for urban areas were done using the Krasowski system. These maps cover 42 cities surveyed at a scale of 1:500 with a total area of about 14,400 hectares. This area is drawn on approximately 2000 90 X 60 centimeter sheets.

### 3.3 MAPS PRODUCED AT MILITARY TOPOGRAPHIC INSTITUTE

These maps are, in general, at a small scale and are not suitable for the production of cadastre base maps. However, some of these maps, at a scale of 1:10,000 and 1:25,000, will serve for the registration of forests, pastures, and other large parcels of land.

### 3.4 CONTROL POINTS (NATIONAL TRIANGULATION NETWORK)

Most of cadastre maps that are currently used in Albania are based on the Krasowski ellipsoid and Gauss-Kruger projection. We are now working on the transformation of all maps in the Bessel system into the Krasowski system in order to have a single system covering the entire country.

The UN Ad Hoc Group of Experts on Cadastral Surveying and Land Information Systems reached the following conclusion:

Cadastral maps and other land information systems should always be based on a network of homogeneous control points, preferably connected to the national geodetic control. Although the primary concern is that the position of each parcel must be correct relative to its immediate surroundings, longer-term considerations indicate that it also should be correct in its absolute position in space in respect of the national co-ordinate system.

The national triangulation network covers all the nation's territory and is composed of three orders. The first order (see Figure 3) is based on seven baselines, which were measured using invar wire equipment, with a relative accuracy better than 1 part in a million. Laplace points were measured at the extremes of the initial sides with the following errors:

$$(\text{Latitude}) m_{\phi} = \pm 0.25''$$

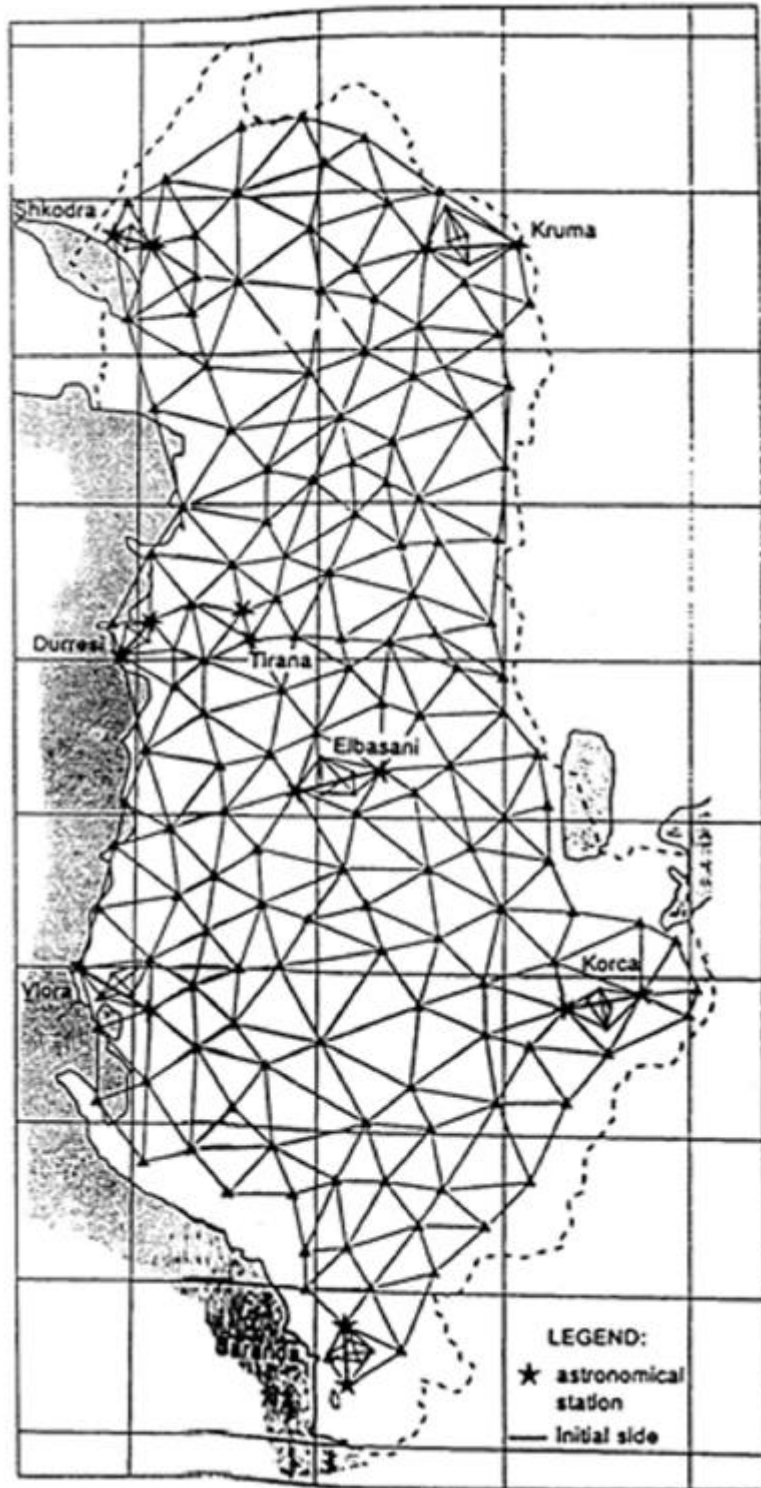
$$(\text{Longitude}) m_{\lambda} = \pm 0.22''$$

$$(\text{Azimuth}) m_A = \pm 0.50''$$

The average side lengths of the triangulation network are shown in the table below:

Order	Average length of triangle sides (S) (km)	Standard error (m)	Triangle disclosure (W)
I	15	$\pm 0.9''$	$\pm 3''$
II	8	$\pm 1.5''$	$\pm 6''$
III	4	$\pm 2.5''$	$\pm 9''$

FIGURE 3. New first order triangulation network of Albania



The standard error between the positions of the two closest points is less than 0.125 meter, which satisfies normal accuracy specifications for maps at a scale of 1:2000.

The national triangulation network is densified in order to provide the survey control for maps at a scale of 1:2500 and 1:5000 (see, for example, Figure 4). The frequency of point densification corresponds with mapping scale; the distance between points varies from 0.7 kilometer to 1.7 kilometers. The proportional accuracy of fixation of adjacent control points is better than one part in 700, which means they provide adequate control for vertical-staff tachymetry. In general, densification is done by the intersection method from national network points using a Zeiss Theo-010 theodolite.

## 4. BASE MAPS FOR IPRS

The strategy developed to produce cadastral maps for the entire country uses all data sources. (Figure 5 shows those areas that already have topographic-cadastral maps.) This strategy has two main components:

- ♦ combination of all existing maps resources, and
- ♦ update of all existing maps.

The steps carried out in this process are:

- ♦ taking a map inventory in every district and determining the criteria that will be used for their connection with each other; and
- ♦ determining the final scale for different areas and the surveying methods that will be used for those regions where there are no cadastral maps.

### 4.1 USE OF EXISTING MAPS

The privatization process has resulted in extensive land fragmentation that is difficult to depict on the existing 1:5000 scale cadastral maps. Therefore, it was decided that all the cadastre maps for intensive agriculture areas, which will be managed by the registration offices, will be at a scale of 1:2500. (Figures 6 and 7 show examples of cadastral maps for an area before and after land distribution.) Cadastral maps for both city-urban and village-urban areas will be at a scale of 1:500 and 1:1000. The transformation of cadastral maps at a scale of 1:5000 to 1:2500 will be done by photographic enlargement of 1:5000 sheets dividing them into four parts. The corner point co-ordinates of 1:2500 sheets are calculated as arithmetical means of the corner point co-ordinates of 1:5000 sheets, thus maintaining dimensions and accuracy.

In order to eliminate paper distortion errors on the transparent 1:5000 sheets, the calculated dimensions of the 1:2500 sheets are fixed on the enlarged projection image.

The maps produced using the Bessel system are being transformed to the Krasowski system using transformation parameters that are derived using national network points whose co-ordinates are known in both systems.

FIGURE 4. Albania: Scheme of densification of triangulation, 1994

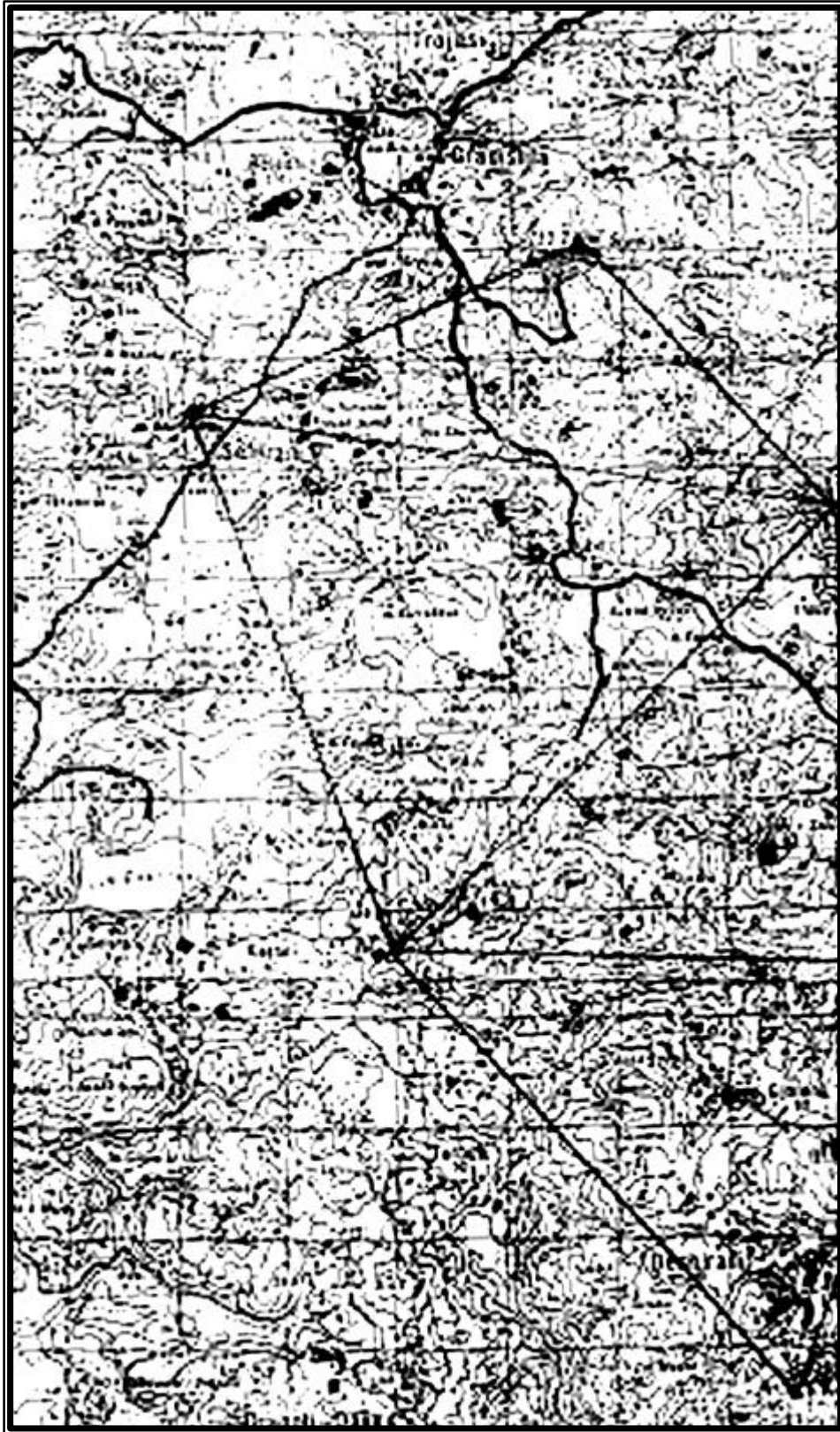
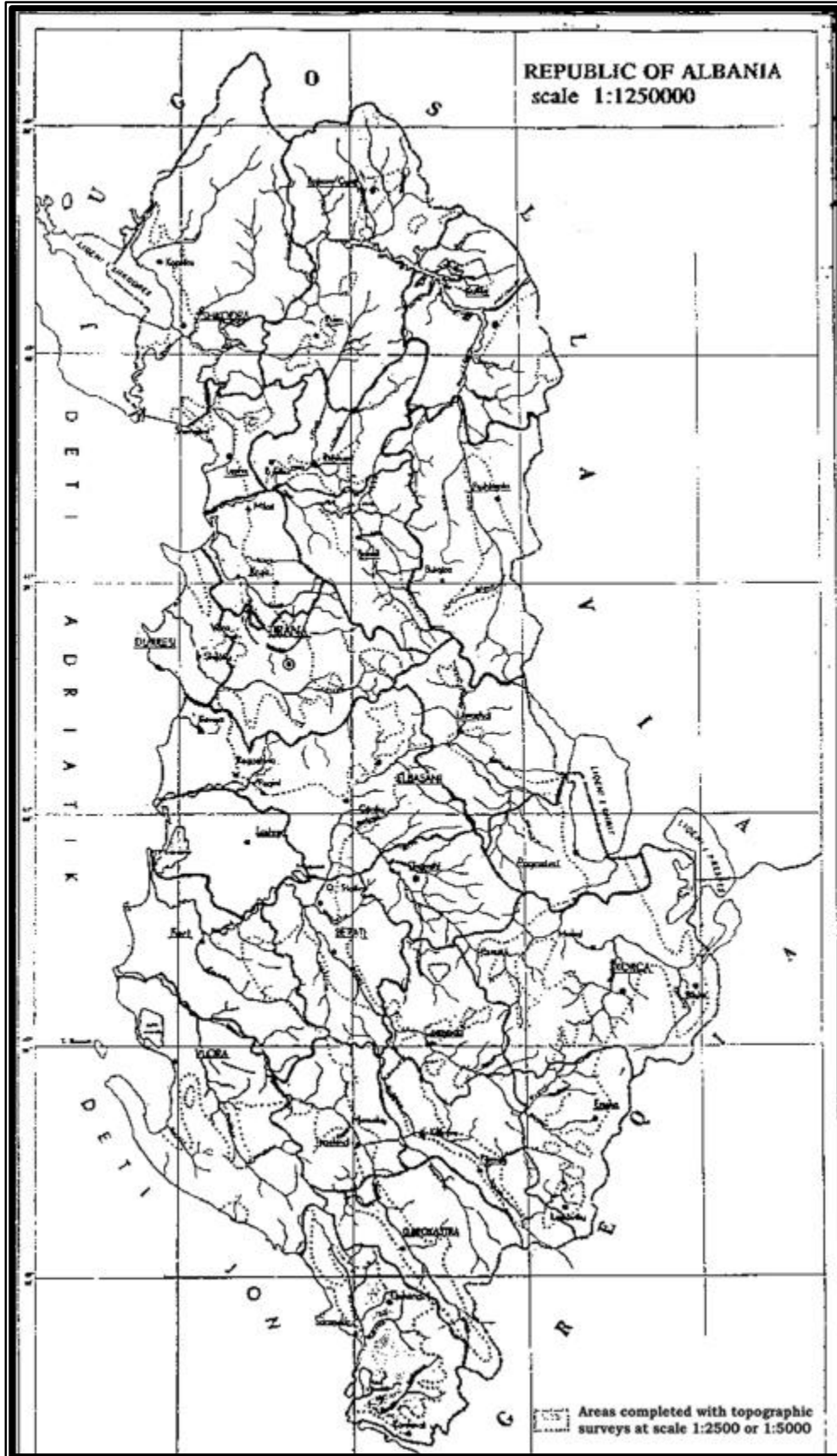


FIGURE 5. Albania: Areas covered with topographic-cadastral sheet maps, 1994



**FIGURE 6. Quadrant cadastral map of ex-cooperative in Albania before land distribution (scale 1:5000)**



FIGURE 7. Quadrant cadastral map of ex-cooperative in Albania after land distribution (scale 1:2500)



The new cadastral maps consist of a combination of the original topographic maps and the updated, traced copies prepared by the district cadastre offices.

The base original for the IPRS will be film positives on which both the geographical graticule and grid (orthogonal kilometer) networks are drawn. Afterward, the new parcels created by the land distribution process will be drawn.

For updating maps, the field teams are using enlarged maps at a scale of 1:2500, drawing in every parcel in order to reflect all the changes that have occurred on the ground as the result of the land distribution program. Updating is done using steel tape in the flat areas and tachymetry in the hilly and mountainous areas. In addition, the owner of each parcel is identified, making sure that the map parcel number corresponds with the number on the title documents. The field teams are also delineating on the maps:

- 1) boundaries between rural areas and urban areas,
- 2) boundaries between cadastral villages,
- 3) boundaries between communes, and
- 4) boundaries between districts and between prefectures.

The maps for urban areas of villages will be integrated with the base index maps of properties depending on the density of buildings and other features. Maps with a scale larger than 1:2500 will be used in those cases where greater clarity is needed to show the boundaries and positions of parcels.

In urban areas, index maps will be at a scale of 1:500 using existing maps. These maps have not been up-dated so they often do not show the current situation. Since they were produced 10–15 years ago, field up-dating together with identification of owners is required.

Skilled surveyors, supported not only by the necessary equipment and materials but also by regulations and procedures for surveying and mapping, will carry out these processes. Technology improvement will be undertaken at the same time.

After an index parcel map of an administrative unit is completed, one copy will be displayed in that area for a period of two months, so that all the residents of that region can see where the parcels and the properties are shown on the map.

## **4.2 NEW MAPS**

The other component of the surveying and mapping strategy is the production of maps for those areas which have none. A plan has been drafted detailing what methods will be used and in which areas.

Most of the western lowlands, about 4000 kilometers<sup>2</sup>, will be photographed using aerial photography at a scale of 1:10,000. Aerial photography will be used for the production of new photo maps at a scale of 1:2500 for rural areas. Urban areas included in the area will be photographed at a scale of 1:2500 so that 1:1000 maps can be prepared.

Aerial photography will also be taken in those areas where maps are very old and were done under the Bessel system. This includes one of the most intensively cultivated agricultural areas and one of the main areas for tourism and infrastructure development.

The production of photo maps is possible in Albania using current photogrammetric and printing capabilities and training personnel on the use of such modern devices as stereoanalytical equipment. Since new technology permits the production of photo maps at a scale of 1:2500 from photographs taken at a scale of 1:20,000, photographs that were produced by the Military Topographic Institute during 1980–1990 may be used for map production in those mountain areas where changes have been minimal and where little fieldwork is needed. A combination of photogrammetric surveying and field surveying will be used

Aerial photography does not show all property elements, only those that are visible from the air on the photograph; this does depend on the scale of the photography. In those cases where physical boundaries are not visible and where the land is all cultivated with the same crops, fieldwork will be needed in order to complete the survey.

In mountainous areas where cadastral maps do not exist, the total area of small land parcels is about 70,000 hectares. For surveying this area, it would be necessary to photograph a physical area of about 300,000 hectares. In such areas the surveying will be done by field methods—either by tachymetry using theodolites or else by total stations. Total stations will also be a new technology for the country.

Even though it is clear that technology transformation can promote progress, traditional tachymetry will continue to be used as long as the cost of surveying is kept low. New equipment and technologies will continually replace traditional equipment and technologies during the duration of this project. Mapping methods will be oriented toward digital information.

Data capturing methods will be determined by the surveying and mapping techniques that are currently used and by techniques that will be used in the future. This will be facilitated by using computerized systems that are appropriate for the collection, recording, and processing of data that are referenced by spatial position. The final product will take account of the needs of digital information users. In the future, the information for areas that are currently covered with maps will be digitized using digitizing or scanning methods. These technologies are not well known in Albania, so it will be necessary to train personnel who will maintain the registration system and transform it into a modern Land Information System (LIS). LIS will help to eliminate both unnecessary information and duplications. Geographic Information System (GIS) will also help in the administration of the many kinds of textual information that is necessary for registration.

The cadastral maps (parcel index maps) will also be used for the integration of parcel information with other particulars such as land use, infrastructure, natural resources, and soil maps, which all show the type and characteristics of land.

The introduction of new technology has begun with the training of personnel and the purchasing of new equipment in order to extend mapping capacity. The new technology will also include use of the Global Positioning System (GPS) for surveying of control and detail points. A combination of all methods and technologies will be used in order to achieve the best results. An important task in the process will be to familiarize personnel with the new technologies and equipment.

In the areas where forests and pastures are concentrated, and which are not priorities at the moment, maps at a scale of 1:10,000 and 1:25,000 and maps of the forest cadastre will be used for registration purposes.

We consider surveying, mapping, and LIS as instruments for the improvement of the graphic display of parcel properties and thus for the implementation of land policies which will improve land administration.

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