

# **REGIONAL CARTOGRAPHY MAPPING THE REGION OF EPIRUS [GREECE] IN 13 MAP SHEETS**

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## **Abstract**

The aim of this paper is to present the design of a Regional map, combining techniques, tools and information-seemingly diverse – and succeed to compose a map which will comply with the general and fundamental principles of cartography and its function in the Internet. This application refers to the region of Epirus and is actually an administrative map of this region in scale 1:100.000 equally distributed in 13 sheets, 37x48 cm each.

Such a great scale was selected to depict the region and record a great number and amplitude of administrative information, so that the derived product can serve administrative needs, as well as to help design regional services and educational needs (for primary and secondary level). Thinking that a graduate Surveyor Engineer of the Region could easily handle such an issue, we believe that the present endeavour will aid the relatively easy but in any case informal, [ad hoc], process of producing such maps.

The need for an up-to-date map has led to the search and discovery of sources available to the public which nevertheless provided current data such as the road network and even a surface coverage of residential areas. The search for sources which would update current data led mainly to the use of specific navigation software and both with the Google maps webpage; helped to form the relief map. The contribution of Google Earth

as well as other services and institutions were important, so as to check and complete the data being registered and also depict various information.

Finally the depiction of a series of information was considered necessary so as to enrich the map with data such as airports, ports, marinas, churches, monasteries etc, which were sought in existing maps (by the University, the Hellenic Military Geographic Service etc).

## **1. Introduction**

The aim of this project is to create a map of the region of Epirus in Greece combining techniques, tools and information, seemingly diverse, and succeeding in the end to compose maps which obey the general and fundamental principles of cartography. The application refers to the region of Epirus and is an administrative map of the region plus four demographic maps in a scale of 1:100.000, equally divided into 13 sheets, 37x48 cm each (Figure 3). The choice of such a grand scale for depicting a region aims to register a great number and width of administrative and population information so that the end product serves the needs to administrate and design regional services. Bearing in mind that a graduate Surveyor Engineer of the Region can easily deal with such an issue, we believe that this approach will help to a relatively easy and in any case, informal process of producing such maps.

The main administrative map is characterised by the density of information as –among others- municipal and community districts are depicted within their limits. The same goes for all settlements in the region according to the National Statistical Service of Greece (NSSG) census Population of 2001. As it is a great-dimensioned map a distribution on 13 sheets has been predicted. The separate sheets of the administrative map as well as the four thematic maps are presented via a multimedia tool on a computer and it is possible that they be used for educational, administrative and other purposes.

Maps are considered a fundamentally essential tool in teaching Geography; it is therefore possible for students to approach basic geographical concepts and foster skills which relate to identifying, collecting and evaluating geographical information by using these maps. Through an electronic way of presenting them in the Internet, the specific order of maps can be accompanying material to teaching Geography depending on the needs and level of the class. Map use will enable students to obtain a fuller picture of the region's administrative division and also the morphology of the terrain enriched by the necessary demographic data.

The need for an up-to-date map has led to the search and discovery of sources which though available to the general public could provide current data like for example the road map or a superficial coverage of residential areas. The search for these sources has led mainly to the use of a navigation software so as to update existing data, as well as

the use of Google maps webpage to compose the relief. The contribution of Google Earth software was important for checking and completing information being registered as well as of other state and private Institutions and Services. Finally the depiction of a series of other pieces of information was considered crucial in order to enrich the main map with data including airports, ports, marinas, churches, monasteries etc sought in existing maps (A.U.Th., H.M.G.S., market maps etc).

## **2. Collecting and processing the project data**

During data collection, the map data used were provided by the University through digitizing the H.M.G.S. maps. These records are separated into categories in:

- Point data (Epirus settlements)
- Line data (rivers, road classification, contour lines)
- Areal data (Greek Regions, Greek Prefectures, Municipalities, municipal and community districts, lakes)

### **2.1 Sources and procedures of data collection**

#### **TopoNavigator™**

As has been mentioned already, the need for an updated map was our main problem and led us to look for sources available to the public. The maps existing in the market were at best in a scale of 1:130.000. This is why we ended up using territorial data in vector image composed by the navigation software TOPONAVIGATOR v3.6 NAVIGATION ON COMPUTER AND GPS GARMIN (Figure 1) of a private company. The advantage of the specific software is the use of the Greek Geodetic System of Reference (GGRS'87) providing precise coordinates and thus making it possible to draw information e.g. concerning monasteries, churches etc. 105 pictures have been used from the software concerning the region of Epirus which made up a

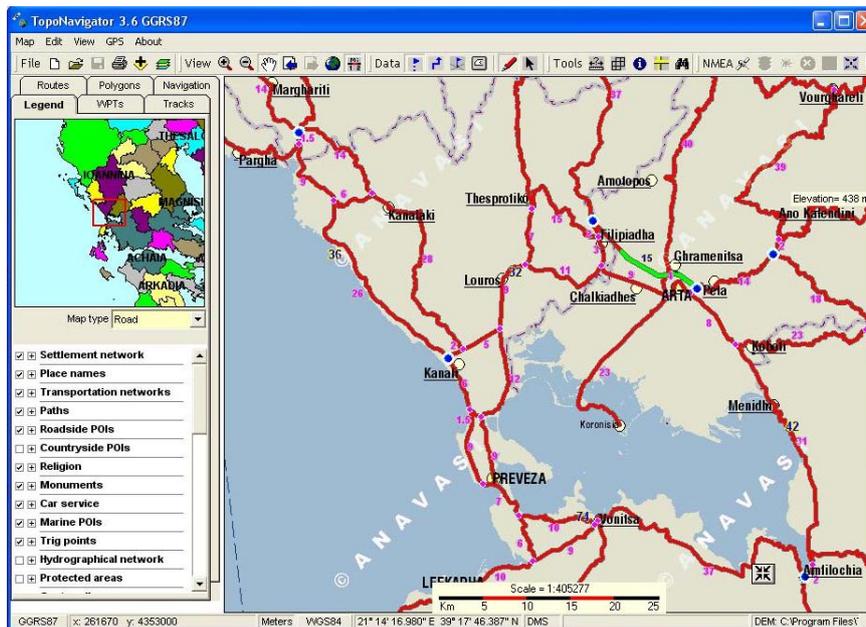


Figure 1. The navigation software TopoNavigator™ v3.6

unified one. Let it be noted that these images were received after the software was set at a 1:50.000 scale so that the information was enough and distinct. The georeference of the image was realized on a digital background giving the necessary data for our project.

### Google maps and Google Earth

Google maps (<http://maps.google.com/>) were used as the main source of creating the relief. 26 pictures were taken, which composed a whole, with the aid of image processing software Adobe Photoshop 7.0. After completing the composition, the georeferencing of the image on a digital background was complete so as to be adapted to it, as well as possible. On this same image, through the same software, we proceeded to the elimination of letters, inscriptions and other redundant data such as the road network, rivers etc.

The need for an elementary rendition of the town plan of Arta, Preveza, Ioannina and the neighbouring areas has led us to the composition of four satellite pictures deriving from smaller ones which were received through Google Earth following the completion of their georeference on the digital background. Afterwards there was collection of data such as the road map, town-plan coverage, airport location etc. The contribution of Google Earth was valuable since in every step of the project a great number of data was tracked down, confirmed or clarified through observing satellite images such as locating the questionable position of numerous settlements especially if we consider that in many cases very few houses may comprise an autonomous settlement.

Other sources of information include:

- EGNATIA ROAD S.A. relating to the national road network
- the Hellenic Military Geographic Service (HMGS) provided data concerning curves of equal depth or even the depths of the sea
- the Greek National Statistics Service (GNSS) provided population data concerning 1991 and 2001 censuses
- various other sources concerning tourist maps, travel guides etc.

### 3. Special issues on process and rendition

#### 3.1 Rendition of administrative limits

The main map has great dimensions (128cm x 186cm), therefore the administrative limits should not only be clear but also correspond to the administrative division they define. It was decided to have the form as shown in Figure 2. To have this form, impact zones (buffer) around the inner limits of the prefectures and municipalities were created. Then there was processing so that the surfaces of the impact zones don't overlap or adjoin each other.

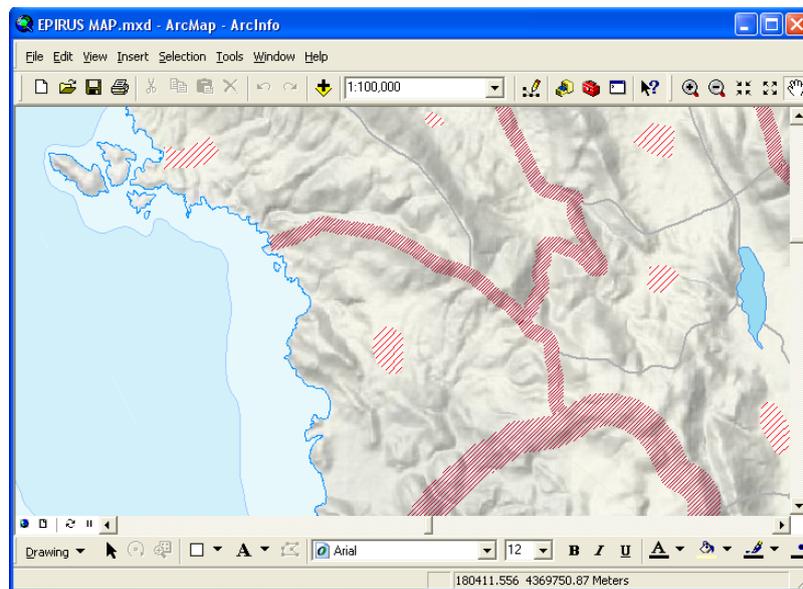


Figure 2. The administrative limits and surface overlay.

#### 3.2 Surface symbolizing of the most important settlements

It was decided to digitalise the surface coverage (area symbol) of the settlements so as to reproduce the geographical area which is inhabited more perfectly. This advantage was given through TopoNavigator™ and used as a source to digitalise all settlements of

the region of Epirus (Figure 2). Whenever it was necessary to confirm data on Google Earth, the software was very reliable. Let it also be noted that while all settlements were digitalized, only the country seats of municipalities and municipal districts were reproduced.

### **3.3 Other thematic symbols**

The thematic symbols used were such as to make communication with the user easier. The symbols were chosen primarily according to their vivid value and their ability to be understood without having to look them up each time on the legend.

## **4. Final map composition**

A number of derived maps could be produced like:

- Population distribution of the region of Epirus (2001) [on a settlement level],
- Population density of the region of Epirus (2001) [on municipal and community districts level],
- Population change in the region of Epirus (1991-2001) [on municipal and community districts level],
- Population age groups in the region of Epirus (2001) [on municipal and community districts level]

### **Legend**

These five maps were originally designed to function as autonomous entities of equal dimensions, 128x186 cm and in a scale 1:100.000 each. The geographic grid of meridians and parallels is every 15'. To compose the maps a Transverse Mercator projection in geodetic datum of GGRS'87, was used. The coordinate grid which appears along the geographical one is every 10 kilometres and the figures of the coordinates appear to the map in different colours.

From left to right on the map legends are the guide map and the legend interpreting thematic symbols. In a frame on the left are data concerning the composition and creation of the map; that is the title, the numeral and graphic scale as well as the geodetic system of reference according to which the map is made.

The whole area is divided in 13 sheets (Figure 3) which were named after a representative or characteristic geographic feature they depict (e.g. 6, METSOVO). The distribution was done so that the region of Epirus lengthwise and width wise is equally divided in four parts respectively and no small part of land is left out requiring additional sheets of map.

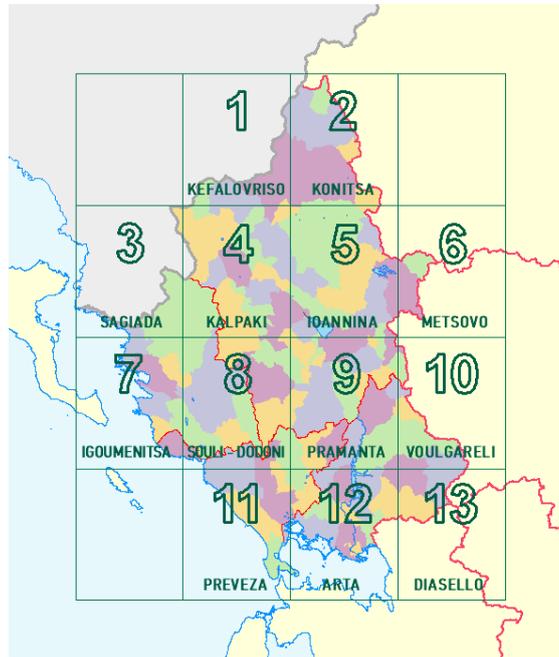


Figure 3. The distribution map



Figure 4. (Sheet 12)  
Administrative map 2001

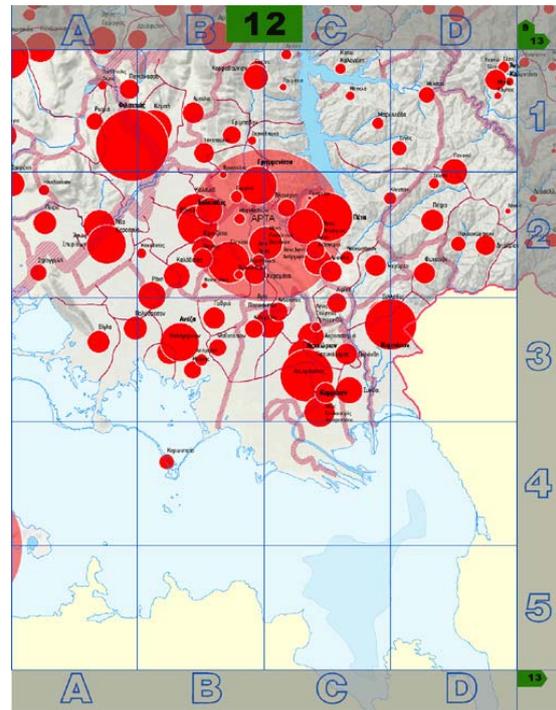


Figure 5. (Sheet 12)  
Population distribution map 2001

On the sheets, the already mentioned grid does not exist but is contained in a transparent frame on their three sides which are separated in 20 smaller sheets to better locate depicted features and facilitate the overlapping with adjacent sheets. On the top of the page is the page number and on the left top and bottom are the numbers of the sheets that adjoin (Figures 4-5).

### The printed map edition

In its printed form, it appears on a double-faced map, showing on one side the administrative map (Figure 6) in a scale 1:100.000 and on the other the four thematic maps in a scale 1:200.000 (Figure 7) with a common legend. On this map coexist the four already mentioned maps entitled:

- Population distribution of the region of Epirus (2001)
- Population density of the region of Epirus (2001)
- Population change in the region of Epirus (1991-2001)
- Population age groups in the region of Epirus (2001)

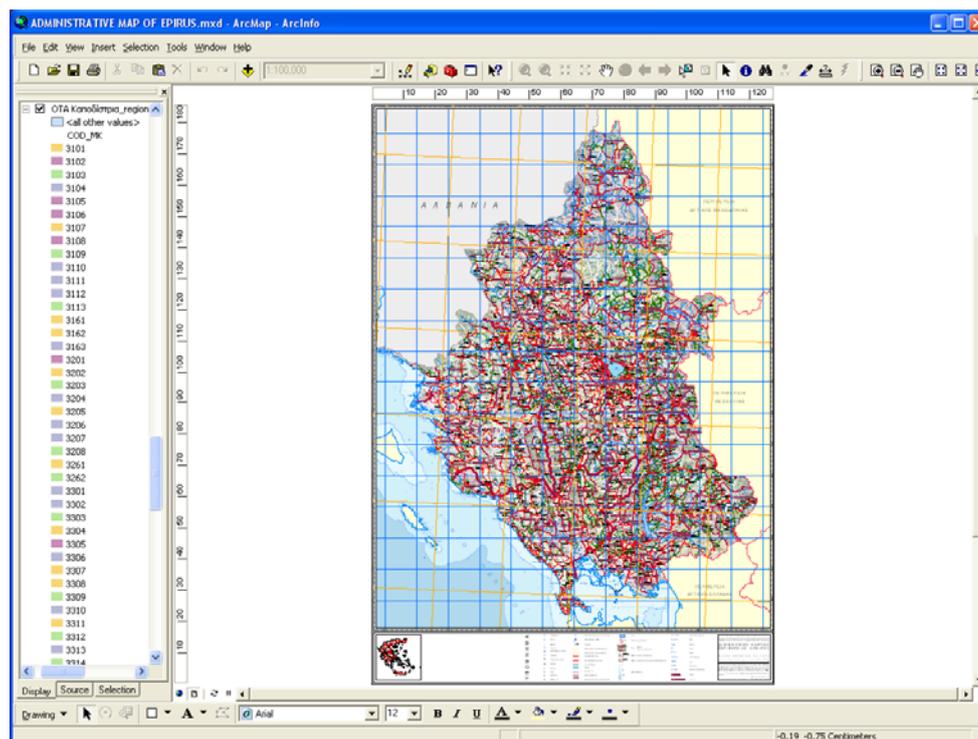


Figure 6. The administrative map [recto].

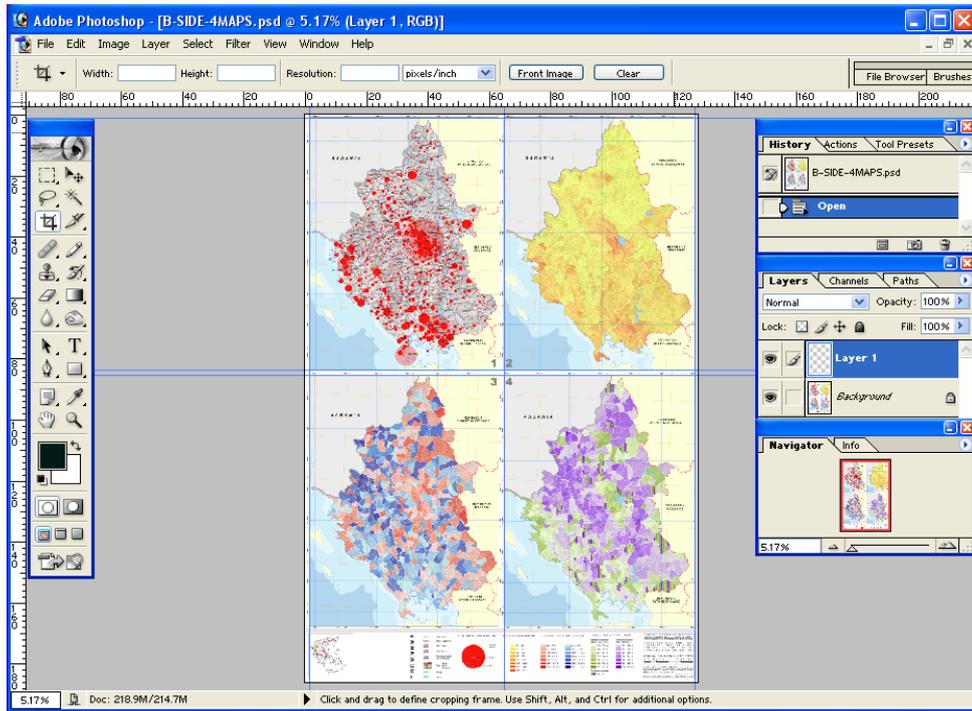


Figure 7. The four thematic maps [verso].

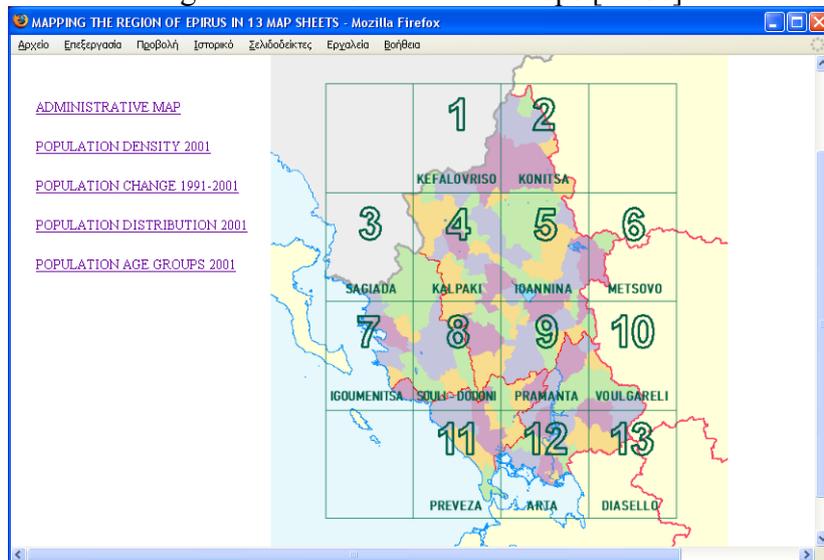


Figure 8. The first “page” of the electronic map

## 5. The electronic map edition

The sheets of the distribution maps are presented on Web browser software (such as Internet Explorer, Mozilla Firefox). The application has a simple form and aims to present the map sheets. Starting from the initial stage which is presented in Figure 8, the

user is guided to one of the separate sections of maps and then with the aid of hyperlinks existing on the distribution map they are led to each map sheet separately.

## **6. Technical features of the application**

The webpage creation was achieved with the help of Dreamweaver MX software of Macromedia. The image processing was made possible by using Photoshop 7.0 software of Adobe. The whole process of creating the map was concluded by Arcgis 9.2 software of ESRI.

## **7. Conclusions**

The use of non-conventional sources in creating maps aiming to obtain up-to-date data, is a challenge for every cartographer and geographer. At the same time remains a strenuous process since it is demanded of him to follow unknown paths which have great dangers and difficulties, nevertheless having its very own excitement.

The search in maps already on the market has revealed plenty of differences and also mistakes forcing us to look for other more reliable sources. Features such as the categorization of the road network were issues of personal evaluation since there was not an integrally valid source or an absolute agreement between the maps available to the user. There was a serious effort to render to a satisfactory realistic level the geographic area by providing features of the natural and relevant to people surroundings.

We believe that the maps created, whether printed or presented on distribution sheets on an electronic map file, are a complete proposition of viewing the region of Epirus in the Internet, from which information can be “taken”. This information can be used in various applications and could potentially be valuable visual material in teaching subjects that have to do with the area and also be an easy tool to handle for geographic navigation and identification of the area by employees of related services.

Due to all this, the project is an experimental approach, helping to deal with needs that education and administration face on a daily use map. We hope for the continuation of our effort, along with relevant maps for the rest of the Greek Regions, contributing in this way to what we could call development of the Regional Cartography in Greece.

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