

Session I – Supporting paper

**DIGITAL MAPPING FOR THE 2001 POPULATION CENSUS IN ALBANIA:
TECHNICAL ASPECTS AND BENEFITS**

Submitted by Albania¹

I. BACKGROUND

1. Albania is a country in transition, where important transformations are going on since 1990. The economic transition has been accompanied by extensive social consequences, first of all the extraordinary internal population migration, resulting in intensive settlements around the main cities, as well as the international emigration. Given the situation, the census geography component was an important aspect in the 2001 Population and Housing Census even though its implementation faced some difficulties during the first phase of the project. This paper aims to describe, briefly, the role of digital mapping in the 2001 population and housing census of Albania.

II. CENSUS GEOGRAPHY FRAMEWORK

2. In census geography maps provide the framework for: census planning, census logistics support, census operations monitoring, analysis of census data and furthermore they are a precious tool for disseminating the results. In a census project the main objective is to produce Enumeration Areas (E.A.s) maps to be used by enumerators during the collection of data in the fieldwork. E.A.s have to cover all the Country but they cannot overlap; they should be in harmony with the current administrative division, their boundaries must contain either urban or rural areas, and they should contain, approximately, an equal number of households. Moreover, the E.A.s maps must show to enumerators where the dwelling units are and they have to show and identify, unequivocally through codes, the location of each building.

3. Albania is administratively divided into 12 prefectures, 36 districts and 374 municipalities and communes. Municipalities and communes are also divided into 74 cities and 2,977 villages, which constitute the lowest administrative tier in urban and rural areas, respectively. Tirana, the capital of the country is divided into 11 mini-municipalities. In most of the cases the cities are under municipalities, while villages are within communes boundaries.

¹ Paper prepared Roberto Bianchini (University of Rome “La Sapienza”), Muhijdin Llagami (Head of the Cartographic Department, INSTAT), Emira Galanxhi (Head of the Demographic Department, INSTAT).

4. The 9,834 urban E.A.s maps having 80-100 dwellings on an average were prepared by the Cartography Department of INSTAT on the basis of available cadastral maps provided, in hard-copy format, either by the Central Registration Office of the Immovable Properties, or by private companies. Almost all these maps were converted to the same scale (1:1,000) by the Cartography Department in order to facilitate the fieldwork activities of map surveyors and enumerators. The urban areas were also delineated into sub-units (statistical zones) according to a cartography sub-division used in a previous survey. To the administrative area of each village was assigned, generally, a single E.A.

III. DIGITAL MAP DATABASE IMPLEMENTATION

5. The digital map database was developed during the post-enumeration phase, due to time constraints in the preparatory phase of the census operations. Although the development of digital map databases is traditionally a pre-census activity, it also has a great added value in the post-census activities, mainly in identifying errors in the tabular database and in census data dissemination. Following the *Principles and Recommendations for Population and Housing Censuses* (United Nations, 1998) the international contributors and the management of INSTAT were strongly supporting the implementation of news technologies in census mapping, such as the application of geographical information system (GIS), remote sensing and Global Positioning System (GPS).

6. The main objective of the external technical assistance was to assist the Cartographic Unit of INSTAT in setting up a GIS unit in order to create and maintain a GIS database on census data to be used as basic infrastructure for statistical geo-referenced information coming from different sources. In a one-year period, the following results have been achieved:

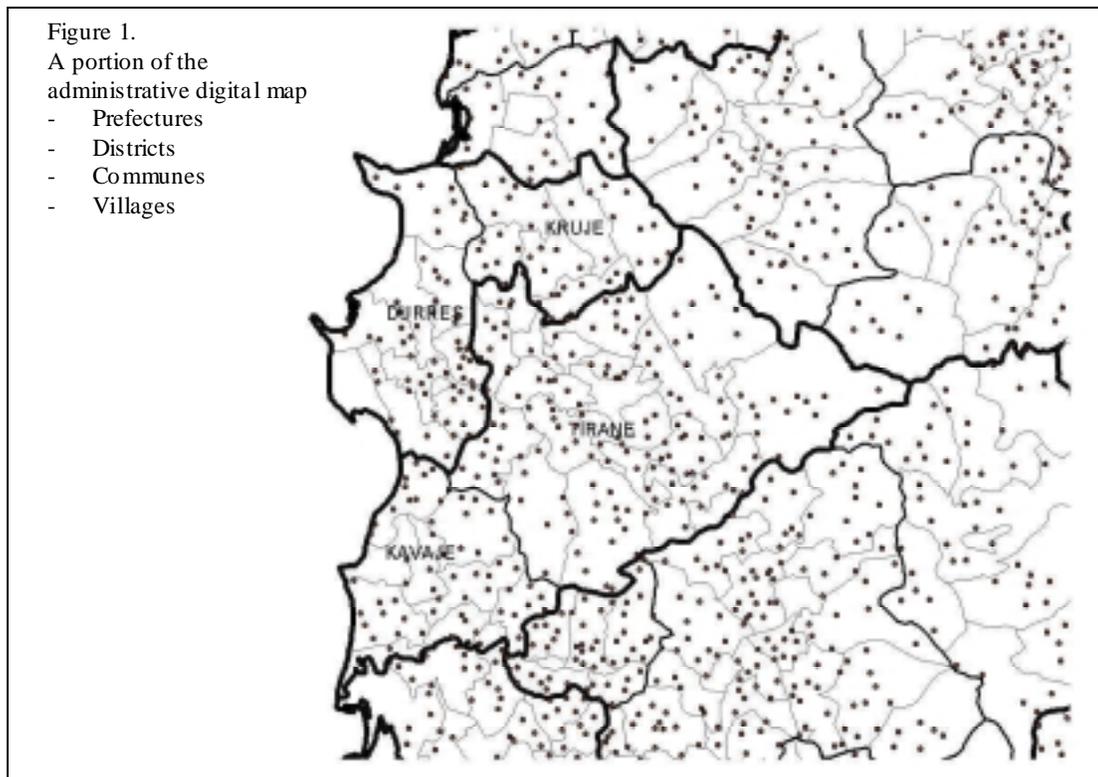
- The creation of a GIS based tool for census data dissemination results and statistical spatial analysis.
- The development of a critical mass of expertise in digital cartography and GIS for three members of INSTAT staff.
- The implementation of a digital cartographic infrastructure in GIS format to be used for future censuses and surveys activities.

7. The work was performed in Albania and in Italy, directly by INSTAT staff with technical external support provided within the PHARE Project *Technical Assistance to Support the Development of the Statistical System and the Implementation of the General Population Census 2001 of the Republic of Albania*. The on-the-job training was organized in part abroad due to the lack of specific cartographic equipment at INSTAT.

The creation of the administrative digital map database

8. An existing hard-copy administrative base map of Albania at scale 1:200,000 have been converted to digital data in raster format by A0 size scanner and geo-referenced in an absolute spatial reference system (WGS84) suitable for the GPS technology. As second step, the boundaries of Communes and Municipalities have been digitized as polygons and the 2,977 villages have been digitized as points. Districts and Prefectures have been obtained, through a spatial GIS tool, by combining Communes/Municipalities and Districts, respectively. Each of these geographic features representing an administrative unit was coded in a GIS environment to allow the linkage of tabular data to administrative map layers in order to display and analyze census data at different administrative level (Figure 1.). This digital spatial infrastructure was used to produce thematic maps at district level for the first census publication².

² The population of Albania in 2001. Main results of the population and housing census, INSTAT, 2002.



Digital mapping for the city of Tirana

9. For the city of Tirana, the capital of Albania, a new approach was selected. The population amount of Tirana was one of the most awaited results of the census data collection. Estimates were largely differing due to the rapid urban growth since 1990. Local Authorities have had not established the new urban limit. A major objective was to define accurately urban boundaries of Tirana and to calculate the corresponding urban area to be used in density ratios. Furthermore, a digital map database at E.A.s level was necessary to show and investigate the expected differences in the census data spatial distribution in the area of Tirana.

10. A high-resolution (1-meter) panchromatic Ikonos satellite image covering all Tirana area was used as a base map to draw the new urban limit of the city and to digitise the 1,137 E.A.s boundaries from about 1,000 hard-copy A4 format maps and the 11 administrative Mini-municipalities boundaries (Figure 2.).



Figure 2. A portion of the satellite image with E.A.s boundaries

11. In census spatial organisation, the extension of an urban area is often defined by the officially recognized administrative boundary, even though the external surrounding territory is densely settled. This situation produces the underestimation of urban areas. For the city of Tirana, INSTAT was promoting, in collaboration with the local Authorities the adoption of the new urban limit.

12. In order to increase the geometric accuracy of the satellite image, a set of ground control points were measured in the field by GPS and a selection of contour lines were derived by an old map of Tirana. The result was the production of the digital orthophoto map of Tirana in a WGS84 spatial reference system suitable for a wide range of geo-statistical applications.

The digitalisation of the new urban limit of Tirana, the Mini-municipalities boundaries and E.A.s boundaries in a GIS environment allowed the calculation of the accurate extension of the city, the Mini-municipalities and the E.A.s. Through the linkage of census tabular data to the census geographic units, different geo-statistical analyses have been performed. This GIS based tool was used to produce thematic maps at E.A.s level for the first census publication².

IV. BENEFITS AND LESSONS LEARNED

13. In addition to the benefits underlined above, some other element can be taken into account:
- Cost saving: for future censuses as well as for post-census surveys, instead of repeating the manual drafting of E.A.s of Tirana, the digital map database can be easily updated;
 - Research tool: making digital map database available in a Geographical Information System (GIS) environment linked to a comprehensive set of demographic indicators will interest non-traditional users to census data for the development of specific researches in the field of regional planning, physical environment, public health planning, geomarketing, etc.
 - Income generation: INSTAT could become a service and data provider of spatially referenced population data sets.

- Statistical data dissemination: thematic mapping are the simplest and successful way to spread the interest for statistical data.
- NUTS database: a detailed study could be carried out in order to include Albania in the Central European Countries NUTS-like nomenclature.

14. Nevertheless, the production of a comprehensive digital map database would have lead to a greater amount of advantages if performed during the census preparatory work. A more intensive training and a larger cartography staff would have been also useful. Apart from that, the most important successful factor of the work carried out in digital mapping for the population census was the great cooperative attitude among external and local Institutions and especially among the persons involved. In the future, a census atlas based on the implemented digital map database will be also produced.