

# DEVELOPING GEODATABASE AND COMPILATION OF SOCIO ECONOMIC MAPS FOR GJILAN MUNICIPALITY

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## **Abstract**

*Although Gjilan is one of the largest economic and developed cities in the Republic of Kosova, for this city has never issued a publication, or a research summary related to socioeconomic topics, as well their cartographic representation. Thus, we conclude that through compilation of various socio-economic thematic maps, as well establishing of geodatabase, will achieve the goal of high-level design of the socio-economic aspects of the Gjilan Municipality.*

*The current situation in physical and social terms throughout the territory of the Municipality of Gjilan have been analyzed, as prescreening toward compilation of 29 thematic maps, with information on socio-economic aspects for development of the municipality. It was main objective of this research, which will be presented in this paper.*

*The research topic consist a diverse contents and it is very informative for the municipality, current conditions in the socio-economic aspects, as well for the level of official GIS and mapping in the municipality level. By using of this contents (maps and geodatabase), the municipality of Gjilan will be able to serve many citizens in general and the business community in particular. Compiled maps will probably not cover whole needs of municipality and citizens, however will help them to fulfill their basic needs.*

*The compiled maps represent a reality of the situation until year 2012, as zero series, aimed to support the dynamic analyses in future period for spatial planning, management of the environment, and overall sustainable development of the Gjilan municipality.*

**Keywords:** *Gjilan municipality, Socio economic maps, series 2012, geodatabase, thematic maps, dynamics of development.*

## **INTRODUCTION**

The performed research is linked to mapping of the socio-economic phenomena's in Gjilan municipality, by creating series of socio-economic maps with data pertaining to year 2012. Through this research, the current state of socio-economic growth in the region will unveil through thematic maps, aimed to give significant contribution to the development of social life in the municipality.

The municipality of Gjilan, as well as the entire Republic of Kosova, is very poor with thematic maps in the field of socio-economic geography. The subject matter will fill a gap created decades on the municipality of Gjilan.

The intention of the paper to this subject will have a direct influence on the standardization of spatial data structure to socio-economic mapping, as a first step towards the establishment of spatial data infrastructure in the area of socio-economic geography. Data structuring have been achieved by mathematical formatting of the input data and their inclusion in an integrated GIS.

Series 2012 represents the null series of socio-economic maps for Gjilan municipality, to be used in a future as base-reference point for performing the spatial analysis of the region of Gjilan, respectively for analysis of dynamic changes in the municipality area. Based on this element, the proposed topics besides scientific features could be used as a template by other municipalities in Kosova for tracking changes of the socio-economic factors in their municipalities.

In a technology and methodology aspects, research belongs to the contemporary themes, using GIS technology for establishing of the geodatabase and compilation the series of thematic maps. The list of potential data sources assure that during research has completely overviewed the state of socio-economic factors in the municipality of Gjilan in year 2012, by exploring the responsible state and local institutions, as well performed field researches for collecting the spatial and statistical data, in order to represent the real state of socio-economic factors through the socio-economic maps.

## **RESEARCH OBJECTIVES**

The main goal of the research is exploring of natural, social and economic elements directly associated to the complex development of the Gjilan municipality, within the Anamorava region. Physical and social conditions of the region, provides suitable opportunities for economic development of the municipality, in different economic fields.

Main research objectives are:

- Representation of current socioeconomic occurrences
- Producing maps for socioeconomic phenomena
- Creating the database structure for socioeconomic analysis
- Creating the GIS database with socioeconomic data
- Use of GIS technology for geospatial analysis of socioeconomic phenomena
- The proper use of thematic mapping methods for presenting of socioeconomic phenomena
- Creating original series as the basis for dynamic analysis of socioeconomic phenomena in the future
- Identifying the existing resources in Kosovo, related to socioeconomic phenomena in the area of Gjilan municipality.

## **GJILAN MUNICIPALITY**

Anamorava is the geographic region that lies in the southeastern part of the Republic of Kosova, which is identified with the Morava River (old name of the river Morava is Angros). Gjilan is the central city of the southern part of the Eastern Region of Kosova. Location of Gjilan is at the junction of the roads since ancient times, in an antique, from the middle Ages until today. In this region passes the shorter road which comes from Dubrovnik, from within the Balkans and further goes east to Istanbul through Sofia, and south to Thessaloniki through Skopje.

Through historical past, by political and economic changes, some roads over time have lost their importance, while many historical-political troubles have sparked other interests, and so today around the Gjilan the associated regional roads intersect with different parts of Kosovo, which consequently estimated the Gjilan Municipality with appropriate geostrategic position.

Before the decentralization Gjilan municipality had 515 km<sup>2</sup> area, with 54 cadastral zones, while with the new territorial regulation of the Kosova, within the area of Gjilan municipality have been created two new municipalities of Novo Brdo and Partesh, so many of villages have been joined to them. After decentralization, from the Municipality of Gjilan are removed 132 km<sup>2</sup>. Now under the new statute, the Municipality of Gjilan is consists of 42 cadastral zones with 49 settlements, with population nearly 90000 people.

The Gjilan municipality has very irregular shape lengthwise NE-SW. It lies between 42°14'40"N, and 42°35'42"N latitude, as well between 21°15'56"E and 21°38'47"E longitude.

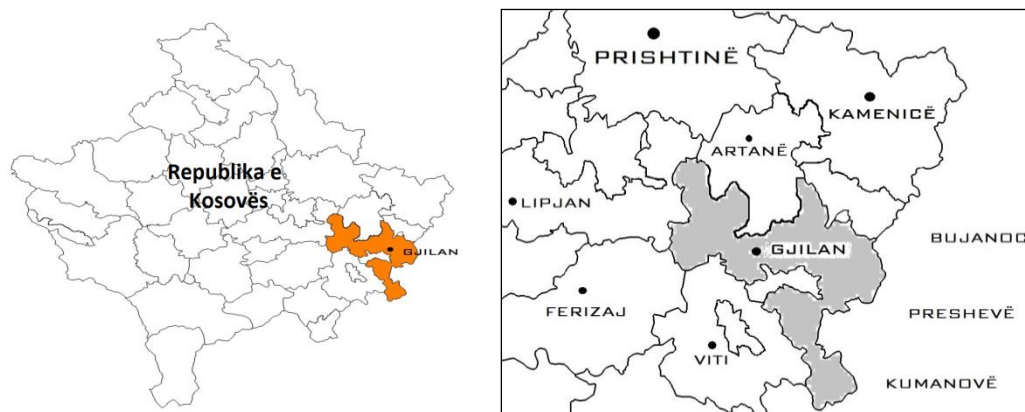


Fig.1. Position of the Gjilan municipality within the Republic of Kosovo

## STATUS WITH SOCIO-ECONOMIC MAPS IN GJILAN MUNICIPALITY ON YEAR 2012

Determination of the Municipality of Gjilan as the object of study, as well presentation of the real current situation of socioeconomic phenomena in its region, does not belong only to this municipality. A similar situation is in all municipalities of Kosovo. Absence of geodatabases in municipality-local level as one of priorities for obtaining information concerning to socioeconomic elements, is the situation in which we encountered the Gjilan municipality on year 2012. During the interviews with the municipality officers, non-use of GIS and non-compilation of thematic maps for the municipality purposes have been recognized!

Lack of thematic maps and databases, were a major disadvantage both locally as well as in the central level. All previous projects related to spatial planning and spatial management were conducted with non-harmonized, non-structured and non-integrated data. Quality of some existing maps is in very low level, mainly compiled based on cadastral and orthophoto maps. Such a situation can be clearly seen even in the web site of the municipality (<http://kk.rks-gov.net/gjilan>).

## DATA SOURCES

As potential sources for collecting data to be used for establishing of geodatabase and compilation of thematic maps, we explored archives of eight institutions. Through exploring of official data owning by the municipality, as well other relevant responsible institutions up to the national level, lack of various statistical data has been recognized, which later had negative effect on performed spatial analyses and compilation of thematic maps.

### Data from the local Archives in Gjilan:

Inter Archive Gjilan has the old photographs of the town of Gjilan from various periods, which show its historical periods, to be compared with current photographs, in order to understand changes that were made in industry, handicrafts, infrastructure etc.

### Data from the Gjilan municipality:

Data from the Municipality of Gjilan consist the Anamorava works written by Suzanne Mushkolaj, then the list of historical monuments protected by the Institute for Protection of Monuments in Kosovo (IPM) in the Regional Cultural Centre in Gjilan, as well the sectors for public services in the communication, water supply, etc.

### Data from the Education Department:

From the Department of Education were received data which show the number of teachers, in which settlements or locations are schools, school name by specifying the objects of kindergartens, primary and secondary schools, number of students, number of teachers to in secondary schools and ethnicity of students.

### Data from the Health Department:

Data from the Health Department include the number of MFHC (Main Family Health Centers), FMC (family medicine centers or Ambulances) and the AMF (ambulance Mobile Family), also the number of ambulances in the Gjilan

Municipality, where are they, gender structure of health workers, the number of visiting the health centers and the services they provide these centers, while from the Directorate of Gjilan Regional Hospital were collected data for managerial staff of the hospital, the municipal population gravitating in this hospital, medical staff, training, health departments, units which provide medical services and beds capacity Hospital patients.

Data from the Agriculture Department:

From Agricultural Department were obtained data on the number or list of municipal beekeepers, poultry or farms chickens for the Municipality of Gjilan, dairies list of the Municipality of Gjilan, register areas with fruit trees, with over 50 hectares in the territory of the Municipality of Gjilan, as well as other capabilities for agricultural production.

Data from the Department of Public Services:

Traffic sector is used as official register of roads and their names in the Municipality of Gjilan, i.e. highways, regional and local roads. Exploiting also been given by the Department of Urban and Environmental Protection eg: Municipal Development Plan. The Centre for Social Welfare provided data related to total number of jobseekers by qualification structure, the total number of unemployed by age group, the total number of unemployed females by qualification, the number of job seekers national affiliation by qualification and the number of job vacancies in 2012. From Municipal Business Center, has been obtained data on the number of businesses and their types, etc.

Statistical data from the Statistical Agency of Kosovo:

From Statistical Agency of Kosovo have been received data on the total number of population in Kosovo municipalities, including the Municipality of Gjilan. The data includes the population number of the settlements within the Municipality of Gjilan, shy of the population including national structure within the population, age structure, sex, religious structure, mortality rate, the population by marital status, the resident population born in the municipality of age, population by country of birth, gender ratio, age ratio, addiction and the percentage of the population aged 75 years and over in the general population, as well the main source of livelihood in the Municipality of Gjilan and employees under the main activities in the Municipality of Gjilan.

Orthophotos of the Gjilan Municipality from Kosovo Cadastral Agency:

From the Kosova Cadastral Agency the orthophotos of year 2012, as well the administrative border of the Municipality of Gjilan has been used.

## **DEFINING OF THE MATHEMATICAL ELEMENTS AND DATABASE STRUCTURE**

Due to data source obtained from the Kosova Cadastral Agency, geodatabase and maps were compiled in Kosova state coordinate system “KosovaRef01” (table 1), so the map scale of printed maps is calculated separately for each map based on bellow parameters:

- Correlation between the paper format, map frame and the municipality dimensions;
- Graphical percent cover with map symbols; and
- Minimal dimensions (distance and/or area).

Table 1. Parameters of state coordinate systems of the Republic of Kosova

Name:	KOSOVAREF01
Year of defining:	2001
Datum:	ETRS89
Ellipsoid:	GRS 80
Map projection	Gauss–Krüger
Projecting zone:	7 <sup>th</sup>
Width of the zone:	3 <sup>0</sup>
Prime meridian:	Greenwich
Central meridian:	21 <sup>0</sup>
Origin of latitude:	Equator
False easting:	7500000m
False northing:	0m
Scale factor:	0.9999
Length units:	Meter
Origin of elevations:	Mareograph “Molo Sartorio” – Trieste, Italy

Due to various sources of input data, collected data were in different types and formats. Thus, before their usage, data harmonization and map generalizing processes have been conducted as a necessary precondition toward establishing of geodatabase and map compilation. Geodatabase consist eight feature datasets, as are shown in figure 2, with wide range of feature classes and relationship classes.

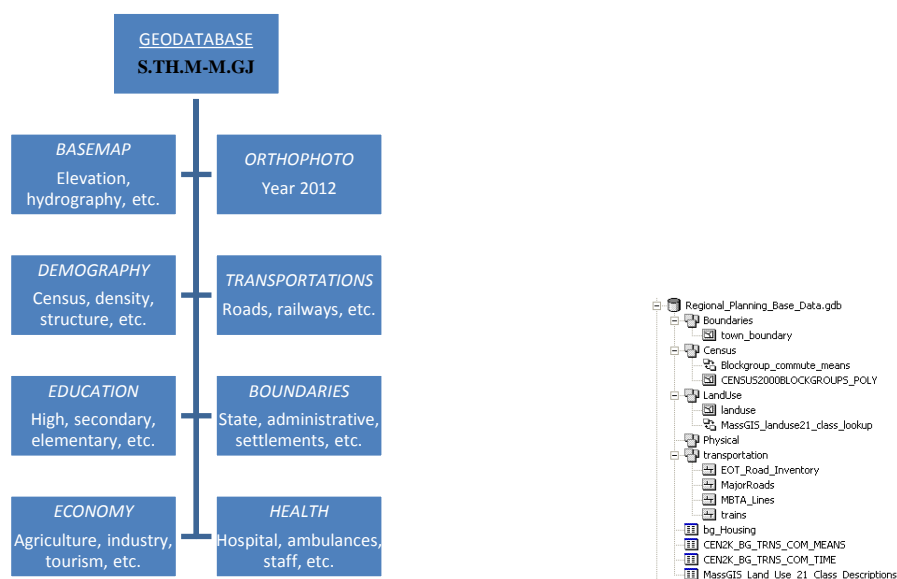


Fig.2. Structure of Geodatabase “S.T.H.M-M.GJ” with eight Feature Datasets

## PROCESS OF COMPILATION THEMATIC MAPS AND PERFORMING SPATIAL ANALYSES

Research of the socio-economic phenomena, obtained from different sources and then harmonized, passed many phases as basic research methodology:

- Method of analysis and synthesis
  - Analysis of important natural factors for spatial decision making processes
  - Analyses of spatial laws
  - Descriptive spatial analysis
  - Qualitative and statistical data analyses
- Method of quantitative and statistical data
  - Collecting, processing and selection of data

- Data classification by fields
- Functional classification of statistical data
- Analysis of statistical series
- Method of field observations
  - Data collection
  - Field identification of the spatial problems
  - Supplementary field identification of spatial processes and phenomena
- Chronological sorting method of natural and economic phenomena factors  
Through this method, natural factors were mentioned briefly as basic prerequisites for socioeconomic development, while separate detailed analysis were performed for socioeconomic factors.
- Mapping method  
Through mapping method, 29 thematic maps have been compiled, by using methods for thematic mapping in GIS software, such as cartograms, diagrams, vectors, isolines, etc.
- Method of tabular and graphical interpretation
  - Table of calculation and presentation of socioeconomic phenomena
  - Calculated introductions of outputs in tables and graphics

Developing of geodatabase, has been performed by using ArcGIS software tools, which was given to the officials as operating GI system, while 29 maps were compiled as cartographic output of research. Below is the list of maps:

1. Administrative map of the Gjilan municipality
2. Settlements map of the Gjilan municipality
3. Relieve map of the Gjilan municipality
4. Hydrographic network of the Gjilan municipality
5. Number of jobseekers by qualification in the Gjilan municipality
6. Number of jobseekers by age group in the Gjilan municipality
7. Number of female jobseekers by qualification in the Gjilan municipality
8. Number of jobseekers by ethnicity in the Gjilan municipality
9. Job vacancies by qualification in the Gjilan municipality
10. The main livelihood source in the Gjilan municipality
11. Employees by sectors in the Gjilan municipality
12. Number of population in the Gjilan municipality
13. The population density in the Gjilan municipality
14. The gender structure of population in the Gjilan municipality
15. The ethnical structure of population of the Gjilan municipality
16. The population age structure in the Gjilan municipality
17. Religious structure in the Gjilan municipality
18. Marital status in the Gjilan municipality
19. The road map of the Gjilan municipaliy
20. Education objects in the Gjilan municipality
21. The number of pupils in primary schools of the Gjilan municipality
22. Health facilities in the Gjilan municipality
23. The number of health workers in primary health care of the Gjilan municipality
24. The number of patients in primary health care in the Gjilan municipality
25. Pharmacies in Gjilan
26. The agricultural production capacities in the Gjilan municipality
27. Livestock capacities in the Gjilan municipality
28. Industrial capacities in the Gjilan municipality
29. Tourist map of the Gjilan municipality

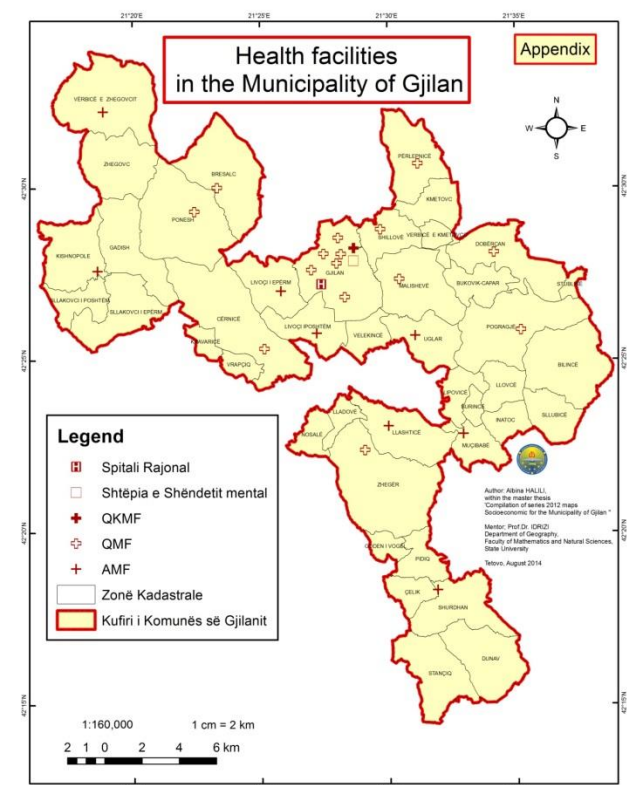
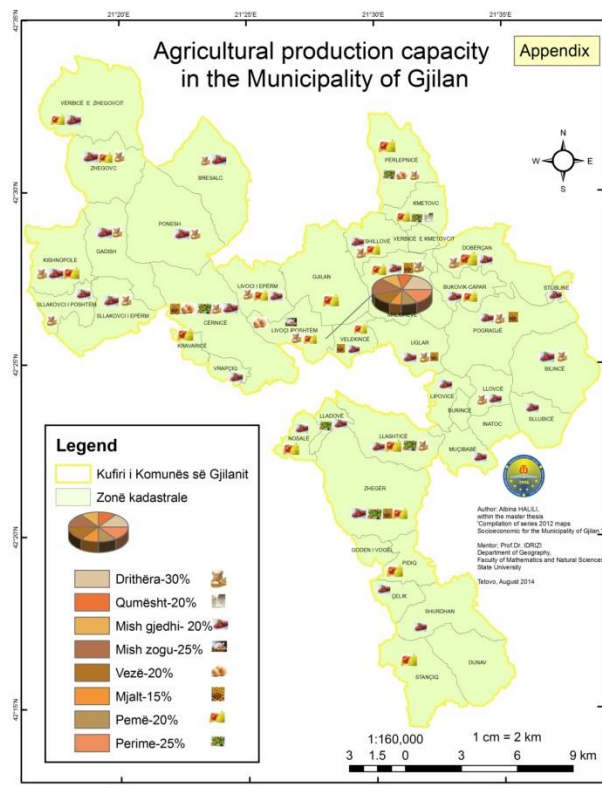
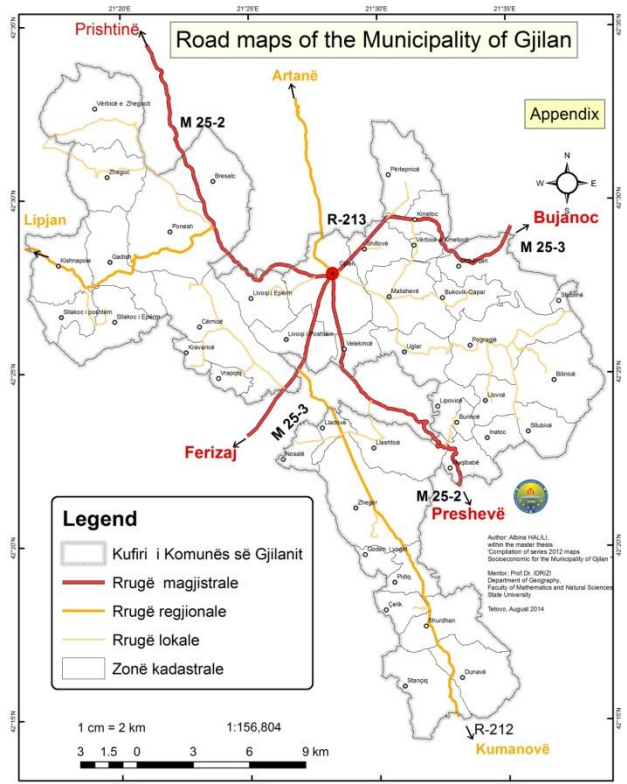
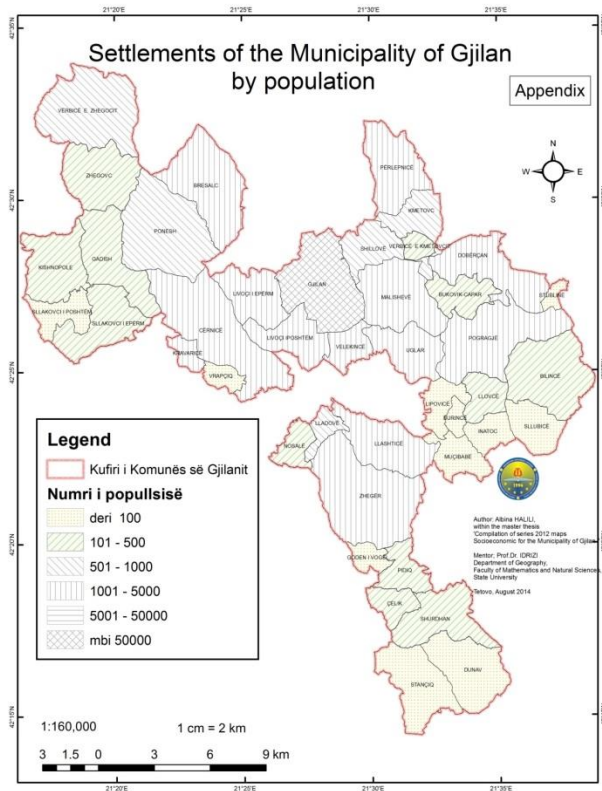


Fig.3. Four examples of compiled maps

Due to lack of official source data from the local and central government institutions, almost 10 of 29 maps (about 32%), were designed intentionally with very poor information, in order to stress the current situation with the official data, as well to increase the awareness of the local institutions for collecting, establishing, and updating of databases.

## CONCLUSIONS

By using of the combined methodology and performed study-research, the real situation on year 2012 within the municipality of Gjilan based on existing official databases of institutions at central and local level has been represented. Within the study, large number of socioeconomic aspects of the Gjilan municipality that belong to 2012 have been analyzed, such as demographic aspects, network communications, education, health, economic etc.

Main questions and challenges through whole research were:

- Lack of such socioeconomic maps and databases on local and central level
- The problem with the data harmonization came from different sources
- Creating the database for socioeconomic phenomena and performing spatial-statistical analysis
- Using GIS technology and software for geospatial analysis of socioeconomic phenomena
- Using the right methods of thematic cartography
- Right introducing of socioeconomic factual elements
- Creating original series as the basis for dynamic analysis of socioeconomic phenomena in the future for the Gjilan Municipality

The intention of the realized research was having a direct influence and impact on the standardization of spatial data structure to socio-economic data-maps, as a first step towards the establishment of spatial data infrastructure in the area of socio-economic geography in Kosovo. Series 2012 represents the null series of socio-economic maps for Gjilan municipality, to be used in a future as reference point for performing the spatial analysis of the dynamic changes within the region of Gjilan municipality. Besides scientific background, the proposed topics could be used as a template by other municipalities in Kosova for observing of spatial changes of the socio-economic factors in their municipalities.

From the technological and methodological point of view, research belongs to the contemporary GI themes, by using the GIS technology for establishing of the geodatabase and compilation the series of thematic (socio-economic) maps. The list of used data sources assure that during research has completely overviewed the state of socio-economic factors in the area of the municipality of Gjilan in year 2012, by exploring the responsible state and local institutions, as well performed field researches for collecting the spatial and statistical data, in order to represent the real state of socio-economic factors through the 29 compiled socio-economic maps and established geodatabase with eight feature datasets.

Developing a database followed by 29 compiled maps, could serve as the prognosis for future years for the spatial analysis, evaluation and dynamics, as well time change of socioeconomic elements within the municipality. This research, by correlative analyses of the spatial phenomena of the municipality, in combination with the natural and social characteristics of the population needs such as education, health, agriculture, industry, tourism, etc., will affect and support the sustainable welfare and socio-economic development of the population life and business!

## REFERENCES

1. Jusufi O, 2004, "Vendbanimet e Kosovës"-Gjilani, Prishtinë
2. Stanković B, 1975, - Pomoravla e Kosovës 1941-45, Nish
3. Basha T, 2008, -Fjalor Enciklopedi shqiptar, Tiranë
4. Rexhepi F, 1998, -Gjilani me Rrethinë, Prishtinë
5. Selmani A, -Gjurmët historike për Gjilanin me Rrethinë, Prishtinë 2009
6. Selmani A, 1998, -Gjilani me Rrethinë, Tiranë
8. Shukriu E, 2004-Kosva antike, MASHT, Prishtinë



9. Kurteshi I, 2012, - Gjilani me Rrethinë-Studim monografik, Gjilan
10. Kryezi B & Tahiri.S, 2012, - Monografia e qytetit të Gjilanit, Gjilan
11. Laçi S, 2006,-Gjeografia e Kosovës dhe trevave shqiptare përtej kufijëve të Shqipërisë, Tiranë
12. Mushkolaj S, 2013, -Anamorava, Prishtinë
13. Meleqi H,-2006, Gjeografia e Kosovës, Dispensë, Prishtinë
14. Idrizi B, 2006, - Hartografi, Shkup

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