1st
WESTERN BALKAN
CONFERENCE
GIS - MINE SURVEYING – GEODESY - GEOMATICS

PROCEEDINGS

OF

FIRST WESTERN BALKAN CONFERENCE

ON

GIS, MINE SURVEYING, GEODEZY AND GEOMATICS

3 – 4 October 2018, Tirana, ALBANIA

COORDINATED BY:

Prof.as.Dr.Edmond HOXHA

ORGANISED BY:

Albanian Society for Mine Surveying and Geomatics
Department of Mine Resource Engineering in Faculty of Geology and Mining, Polytechnic University of Tirana
International Society for Mine Surveying (ISM)
GEOWEB Project, Erasmus +
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TIRANA 2018

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Mine Surveying, Geodesy and Geomatics,
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LIST OF CONTENTS

CHAPTER 1 GENERAL INFORMATION

CHAPTER 2 SCIENTIFIC FULL PAPERS

GIS SESSION

MINE SURVEYING

GEODEZY

GEOMATICS

CHAPTER 3 SCIENTIFIC ABSTRACTS

CHAPTER 4 WINNERS OF THE CONFERENCE, PHOTO GALLERY

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FEW WORDS ABOUT

FIRST WESTERN BALKAN CONFERENCE
ON GIS, MINE SURVEYING, GEODESY AND GEOMATICS
TIRANA, ALBANIA, 3-4 OCTOBER 2018

"Western Balkan Conference on GIS, Mine Surveying, Geodesy and Geomatics" held in Tirana, Albania 3-4 October 2018 brought together researchers, experts, scientists, professors, speakers and other key people and institutions, discussing the innovative research and advanced applications on these fields at an international platform. Attending this professional events was a great way to stay in current with what is happening in GIS, Mine Surveying, Geodesy and Geomatics industry and also provides fantastic opportunity to enjoy a good time while networking with others in the sector.

It is our duty to help and support young generation and because of that, the Organizing Committee invited young researchers and students to participate and publish there's work in the Conference. In this conference participated many students, presenting their papers, where many of them were high quality and very promises for the future.

As we all know many individuals and professional organizations across Western Balkan offer great contribution to the economy providing also the geospatial community with free information and access. We are filling great and very honoured to recognize and award this contribution. For this reason, the last night of the Conference was a Gala Dinner Award Ceremony for Scientist in Western Balkan. I once again want to congratulate all the winners of these event and wish them success in the future.

As the conclusion, in the last days, many participants estimated this event as very successfully and as a very good base to continue in the future.

I hope we all together will be able to continue this Conference and make it a good tradition which gather together scientists of Western Balkan and more.

In the name of Organizing Committee!
Co-Chair of the Conference
Prof.as.Dr.Edmond Hoxha

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The First "Western Balkans Conference on GIS, Mine Surveying, Geodesy and Geomatic“ is organized with initiative of: Albanian Society for Mine Surveying and Geomatics, and Department of Mine Resource Engineering in Faculty of Geology and Mining, Polytechnic University of Tirana, together with:

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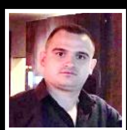

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THE TOPIC OF THE CONFERENCE

The Western Balkan Conference on GIS, Mine Surveying, Geodesy and Geomatic is the first Regional Conference on these field. It will serve as interdisciplinary platform for the presentation of new advances and research results in these fields. The conference brought together leading academic scientists, researchers, engineers and scholars in the domain of interest from Western Balkan and other countries of the world.
Topics of papers presented on the Conference included as following

- GIS and Cartographic Theory
- 3D Cartography; 4D Cartography and Data Bases
- Art, Culture and Cartography; Map design
- Cartography and toponymy, general and derivate aspects
- Cartography for sustainable development
- Census and other thematic maps
- Collaborative mapping, Volunteered geographic information, Social Cartography
- Data quality
- Digital Technologies and Cartographic Heritage
- Digital Technologies, Cartographic Heritage and Cartography applied to historical and archeological heritage
- GIS and Cartography on Environmental Risks and Disasters mapping
- GIS on Education and Training
- Geoinformatic
- GNSS
- Web GIS
- Methods and Applications in Geophysics
- Geointelligence
- Geology
- Oil and Gas
- Military mapping; Crime maps
- Mine Surveying; Micromine
- Mining in general; exploitation; underground and open cast; etc.
- Environment
- Mineral processing, environment protection, etc.
- GIS, Mine Surveying & Geodesy in Geology and mine Geoprocessing, Data modeling and Geospatial analysis; Geographical Data Base
- Geospatial analysis
- GeoVisualisation
- Hydrographic mapping
- Applications in Geology, Oil and Gas
- Geographical/cartographic delimitation of Geographical indications
- Map projections
- Maps and the Internet
- New development on GIS, Mine Surveying, Geodesy and Geomatic
- Maps, GIS and Hazards and Disasters
- Maps, GIS and Security
- Maps, GIS and Sustainable development
- Marine, Military and Topographic Cartography
- Mountain Cartography
- Open Source Technology and Web Services
- Remote Sensing;
- Rural cadaster mapping and surveying; Urban cadaster, Planning and city management
- SDI, Standards, Data Integration and quality; Metadata, Open Source GIS
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- Thematic Cartography
- Topographical Mapping and Mountain Cartography
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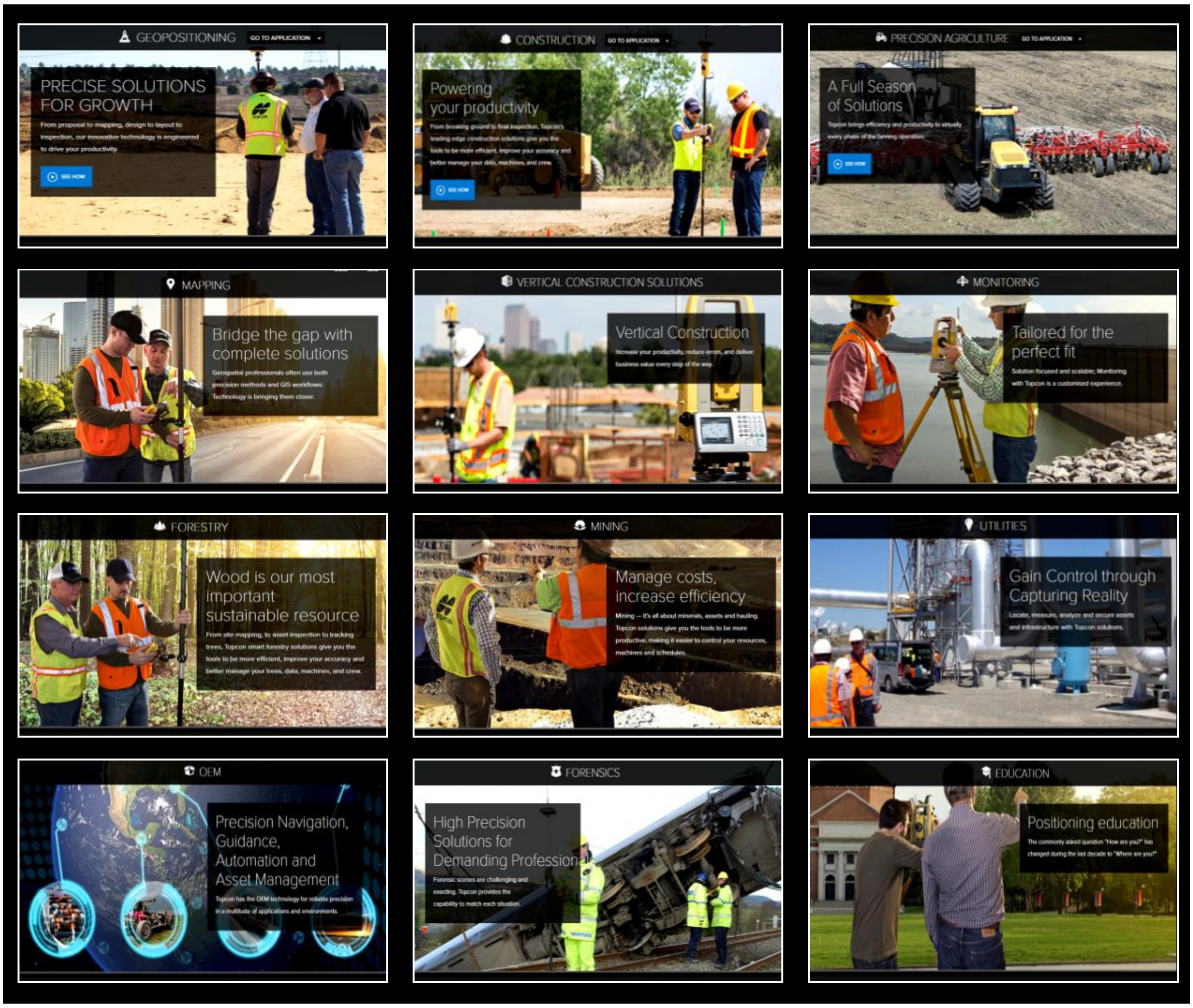

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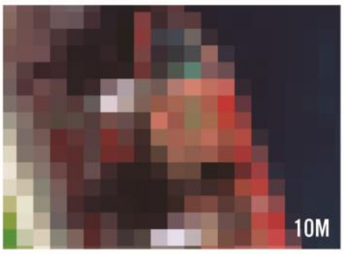
ABOUT US

Based in Munich, Germany and established in 2002, European Space Imaging is the leading premium supplier of global very high-resolution (VHR) satellite imagery and derived services to customers in Europe, North Africa and CIS countries.

With over 15 years' experience, European Space Imaging have developed a reputation for expert and personalized customer service and an unbeatable track record for supplying tailored very high resolution imagery solutions to meet the diverse projects and requirements of their customers.

Furthermore, European Space Imaging are the only European satellite data provider to supply imagery at true 30 cm resolution and who own and operate their own multi-mission dedicated ground station for direct satellite tasking and local data downlink.



DIRECT SATELLITE TASKING

European Space Imaging is the only European satellite data provider that can fully utilise all DigitalGlobe very high resolution satellites and currently operates a dedicated multi-mission ground station with direct data uplink and downlink to WorldView-1, WorldView-2, WorldView-3 and WorldView-4. In addition, we can also locally plan and receive images from GeoEye-1.

This unique offering allows for direct satellite tasking, taking into account real-time weather information and enabling customer flexibility to ensure we get a high quality image each and every time. Direct satellite tasking can significantly increase the effective collection capacity of our satellites to obtain the greatest quality image with minimal cloud coverage. Our real-time weather assessments are updated every 15 minutes to maximise pass collection and react quickly and takes into consideration several environmental factors including expected cloud cover, available sunlight and the time of day that the satellite will cross the requested area of interest.

VERY HIGH RESOLUTION

WorldView-3 and WorldView-4 proficiently deliver 30 cm very high resolution imagery. WorldView-3 has an average revisit time of less than a day and is capable of collecting up to 680,000 km² per day. With WorldView-4 joining the DigitalGlobe satellite fleet, the total constellation now has the capability to image a location an average of 4.5 times a day at 1 m ground sample distance or less.

In addition to 30 cm resolution imaging, we are also able to offer 40 cm and 50 cm satellite imagery for projects requiring less detail from satellites WorldView-1, WorldView-2 and GeoEye-1.

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BUSINESS APPLICATIONS

Very high resolution data is beneficial to multiple business applications across various industries such as agriculture, forestry, maritime, civil government, emergency management, defence and intelligence, land planning, cadastre and more. The detail of the imagery gives you a new perspective from which to make informed decisions about the viability and future of your projects. It allows you to monitor the changes in your environments, accurately map in very fine detail and even predict the future without ever having to step foot outside.

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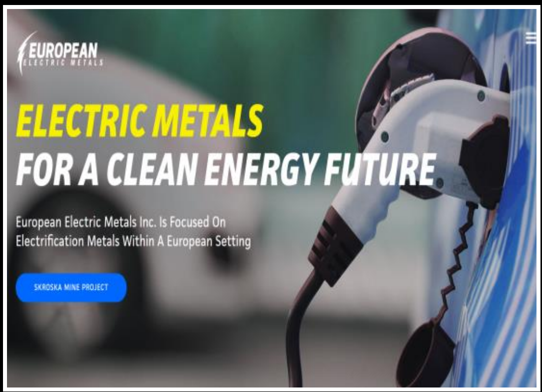

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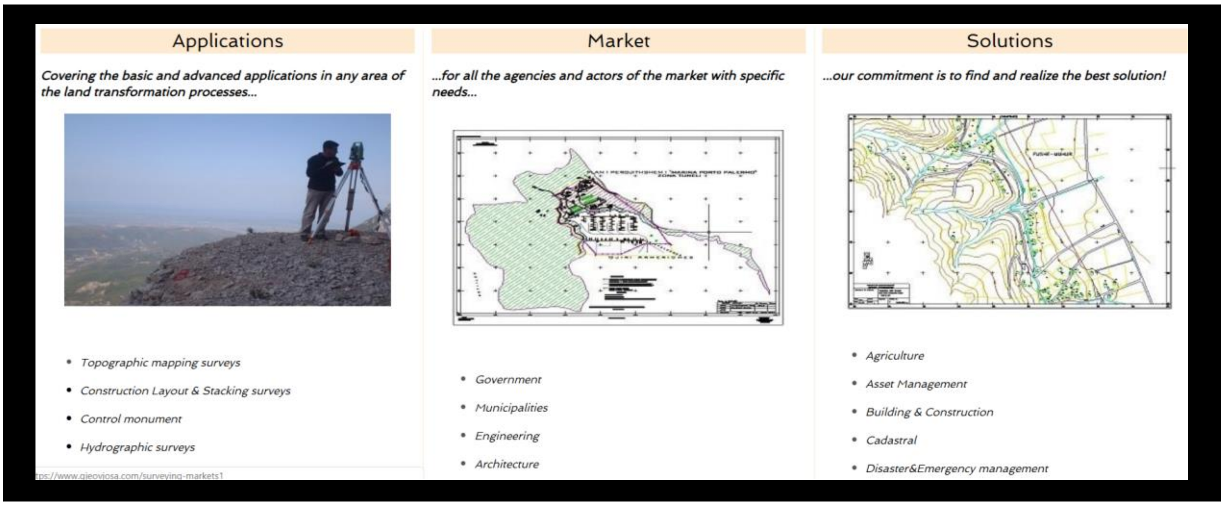

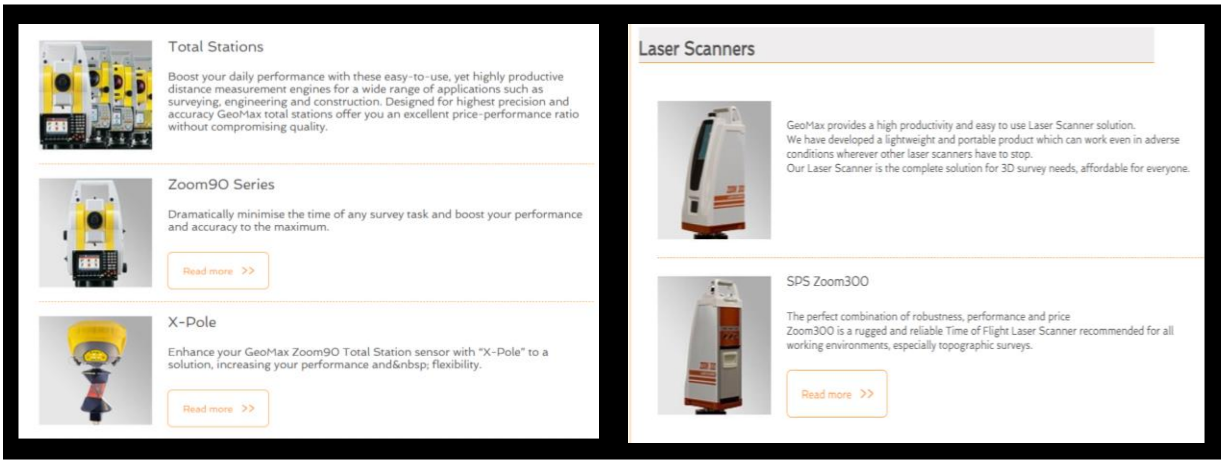

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POLIS University is a "university space for thinking" in the fields of science planning and development of the territory, applied design, construction and technology, civic leadership and private entrepreneurship. Legally, POLIS University is a higher education institution with the "University" status, registered and institutionally accredited (included all programs offered by the institution) by Albanian and European authorities as result of implementation of joint programs with universities of EU countries. POLIS University aims to provide the new generation with the right tools, techniques and strategies; to create capable professional leadership, "liveable spaces", more equal cities, more sustainable and related to the environment. POLIS University organizes simultaneously FULL–TIME and PART–TIME studies.

"Full–Time" studies consist of courses that take place during 15 weeks each semester and longitudinal detachments from work, from Monday to Friday. This is more typical for studies after high School, like: Bachelor, Master of Science and Integrated Programs.

Below is the list of Full–Time Studies:

- Bachelor in Art-Design,
- Bachelor in Civil Engineering,
- Bachelor in Environmental Studies,
- Msc. integrated studies/ 5 years, in Architecture and Urban Design,
- Msc. integrated studies/ 5 years, in Urban Planning and Management,
- Master of Science in Applied Design, Master of Science in Environmental Management,
- Master of Science in Civil Engineering (2 specialties: Geo-technic & Structures

Part–Time Studies:

"Part –Time" or referring to the new law 80/2015 ***"Extended period"*** studies consist of courses that take place during the weekends, from Friday, 13:00 to Sunday 17:00. This is more typical for Professional Masters. **Below is the list of**

Post-secondary professional vocational study program in energy efficiency, (120 ECTS, 2 academic years),

Professional Master in Design Parametric with profiles:

- Architecture and Parametric Design,
- Aesthetic Structural Design,
- Landscape and Urban Design

Professional Master in Territorial Development Policies in cooperation with research institute IHS – Rotterdam, in Erasmus University, Holland, with profiles:

- Spatial Planning and GIS Application,
- Housing and Land Development
- Urban Social Development & Human Resources

Professional Master in Business Administration in collaboration with IPAG Business School, Paris, France with profile:

- Entrepreneurship and Innovation,
- Real Estate
- Marketing and Strategy

POLIS University, organizes a joint PhD Program in Architecture and Urban Planning in cooperation with the Ferrara University in Italy.
The programs are recognized by both Albanian and Italian authorities and are committed to the highest quality research and innovation.

OPENING OF THE CONFERENCE

The conference was opened on 3 October 2018 by:

Prof.as. Dr. Edmond Hoxha

Co-Chairman of the Conference together with:

Prof.as. Dr. Skënder Lipo

Head of Mineral Resource Engineering Department at the Faculty of Geology and Mining

Prof.as. Dr. Huaan Fan

Erasmus GEOWEB Project Coordinator

Prof.Dr. Anatoly Okhotin

President of International Society for Mine Surveying (ISM)

The Conference was greeted by:

Prof. Dr. Andrea Maliqari

Rector of Polytechnic University of Tirana, ALBANIA;

Mr. Andi Seferi

Deputy Mayor of Tirana Municipality;

Prof. Dr. Anatoly Okhotin

President of International Society for Mine

Mrs. Aida Breti

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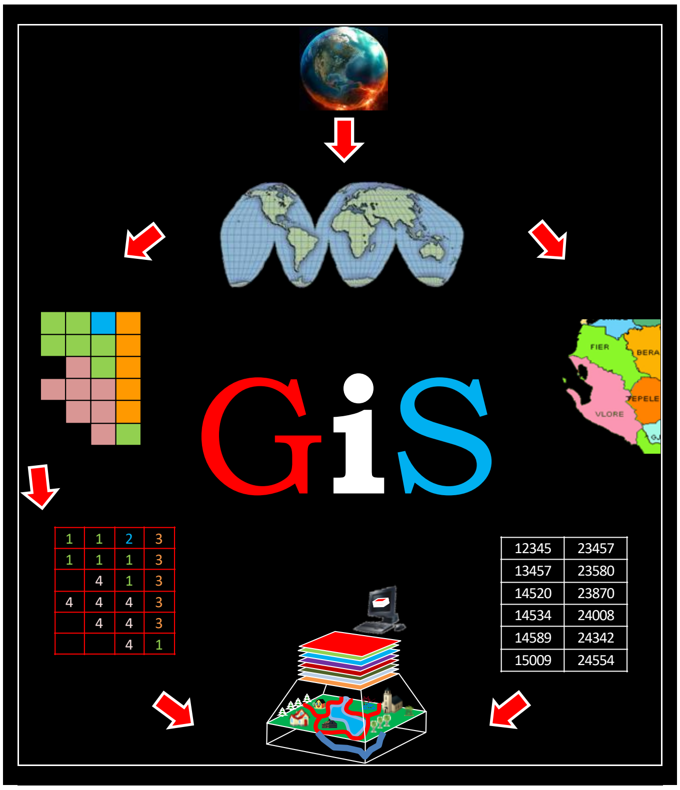
CHAPTER 2

SCIENTIFIC FULL PAPERS



GiS

Geographical Information Systems

SUSCEPTIBILITY MAPPING

A CASE STUDY IN KARPEN-BALLAJ AREA, WESTERN ALBANIA

MSc. Besnik AGO[1]; Prof. Asoc. Dr. Shkëlqim DAJA[1]; Prof. Dr. Çerçis Durmishi[2]

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ABSTRACT

In this paper, a simple GIS-based methodology is used to assess the landslide susceptibility in Karpen-Ballaj area, Western Albania. The methodology is based on the spatial distribution of landslides and of causal factors. This method called bivariate, proposed by van Westen, 1993 has provided good results. Seven factors including geology, slope, aspect, land cover, distance from drainage, distance from roads and precipitation were used. Landslide inventory map is prepared based on topographic and geologic maps as well as satellite images and orthophotos.

The relationships between the detected landslide locations and the controlling factors were identified by using ArcMap 10.3. Six classes of susceptibility were identified as follow: No Susceptible, Very Low, Low, Moderate, High and Very High Susceptible. The produced map can be used for better urban planning.

Keywords: Landslide Susceptibility, GIS, Albania.

1. INTRODUCTION

Landslide susceptibility is the possibility that a landslide will occur in a particular area on the basis of the local environmental conditions [5]. The method used to assess the landslide susceptibility is based on an accurate evaluation of the spatial distribution of both the "causal factors", for failure, and/or of the past landslides [6]. This procedure requires the interpretation of a large spatial data of the study area. To assess landslide susceptibility, in most cases numerical weighting values are assigned to each class of the considered causal factors [6], thus GIS represent a powerful tool in landslide susceptibility mapping procedures.
Different approaches in assigning weighting values can be used. We have chosen to use bivariate statistical analysis, in which each causal factor map is combined with the

landslide inventory map and weighting values based on landslide densities are calculated for each causal factor class [7].

2. STUDY AREA

The study area is located in the western part of Albania, between the Karpen and Ballaj village, in its western part is Adriatic Sea and in the east is the lowland of Kavaja. It has a length of about 7.2 Km and a width about 6.5 Km, the total area is 28 Km^2. The terrain is mostly hilly (Figure 2). The study area is characterized by a Mediterranean climate. The average temperature ranges from 8 to 9 ^{O}C in January to 22-23 ^{O}C in July with an average annual temperature of 16 ^{O}C. The annual average rainfall is 931.2 mm / year and the maximum rainfall observed during the last 30 years ranges from 1200 to 1500 mm / year. We have chosen this area because it is highly affected by landslides phenomenon. These phenomena have also caused damages in houses, road infrastructure, loss of agricultural land, etc. (Figure 1).

Figure 1 *Examples of landslides in the study area.*

3. METHODOLOGY

This paper presents the results of the GIS-based statistical analysis for generation of landslide susceptibility mapping using Geographic Information System (GIS) for Karpen-Ballaj area in Western Albania (Figure 2). Seven factors, such as geology, slope, aspect, land cover, distance from river, distance from roads and precipitation, are taken into account for the analysis. The relationships between the detected landslide locations and these seven factors were identified and analysed by using GIS-based Bivariate statistical method. The analysis was based in the following formula [3]:

$$Wi = \ln \frac{DensClas}{DensMap} = \ln\left(\frac{NpixXi}{NpixNi} / \frac{\sum NpixXi}{\sum NpixNi}\right)$$

Where: ***Wi*** *= the weight given to a certain parameter class;* ***DensClas*** *= the landslide density within the parameter class;* ***DensMap*** *= the landslide density within the entire map;* ***Npix(Xi)*** *= number of pixels, which contain landslides, in a certain parameter class;* ***Npix(Ni)*** *= total number of pixels in a certain parameter class.*

The Figure 2 shows the procedure used to prepare land-slide inventory map, relevant factor maps, weighted factor maps and the susceptibility map.

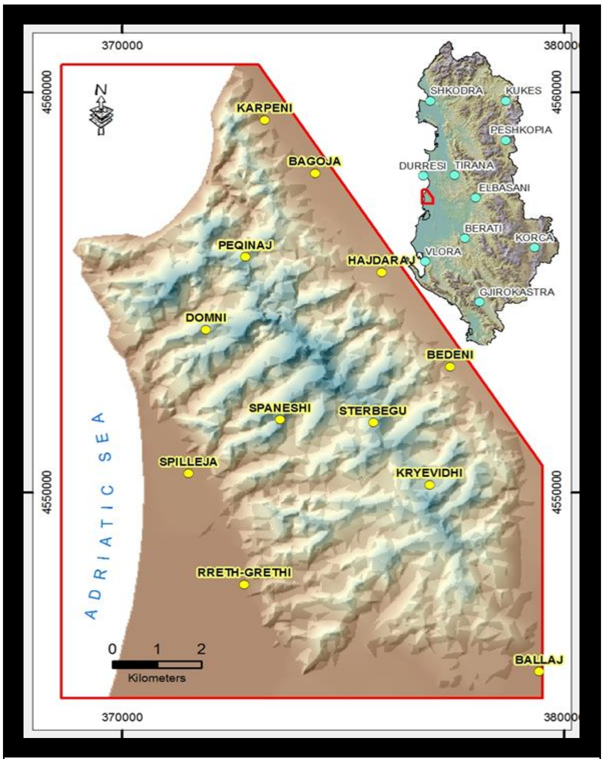

Figure 2 *Geographic location of study area*

4. PREPARING OF SPATIAL DATABASE

a. Landslide Inventory map

The existing landslide inventory map is very important for analysing the relationship between landslides distribution and causing factors. In order to prepare a detailed landslide inventory map, several sources of data such as topographical map, 1:10.000 scale, satellite images, orthophoto, etc. and several field surveys were used. In total 240 landslides were mapped (Figure 4).

b. Geology

Landslides are generally controlled by the lithology of the land surface. Lithology is very important in providing data for susceptibility mapping, for this reason is very important to group the lithological types [1].

Therefore, a geological map of the study area is digitized from the existing geology map at 1:25.000 scale prepared by Albanian Geological Survey (AGS).

Neogene deposits, consisting in two formations such as "Helmësi" (N_2^1h) and "Rrogozhina" (N_2^2 rr), as well as the quaternary deposits (Q) are clearly distinguished (Figure 4). *"Helmësi" Formation ($N_2^1 - (h)$)*, these deposits are predominated by clays, which are light gray to bluish gray colour and from soft to compact. *"Rrogozhina" Formation ($N_2^2 - (rr)$)*, these deposits are characterized by gravel, coarse grained sandstones, conglomerates with clay intercalations. Quaternary deposits (Q), consist mainly in weathering products (gravels, sands and clays). Alluvial, marshy and lagoon deposits are encountered in the foot of the hills.

c. Slope

Slope angle is the most important parameter in the slope stability analysis [2]. The slope map of the study area, prepared from DEM, is shown in Figure 5; four classes of slopes are identified.

d. Land cover

In this study the land cover map is taken from CORINE land cover map, 2006. Land cover is divided into four categories (Figure 6, Table 1).

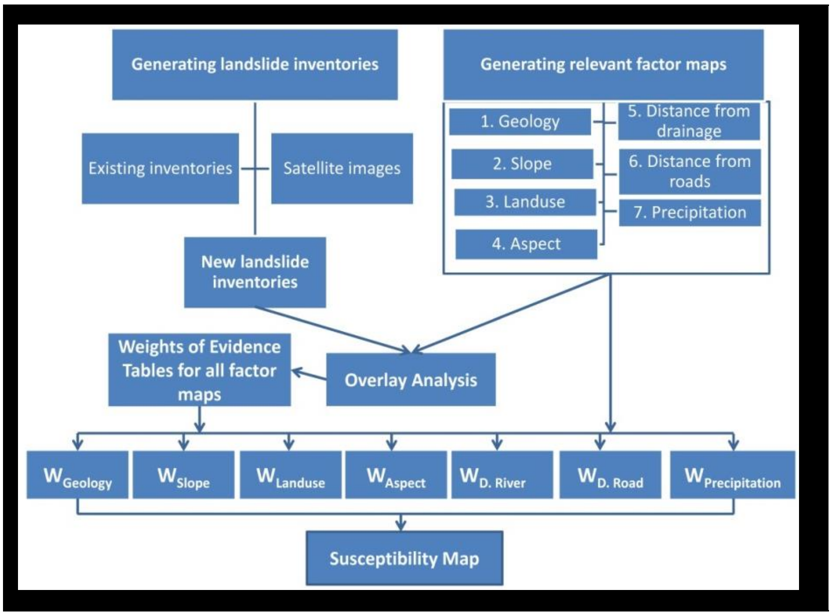

Figure 3
The methodology flowchart

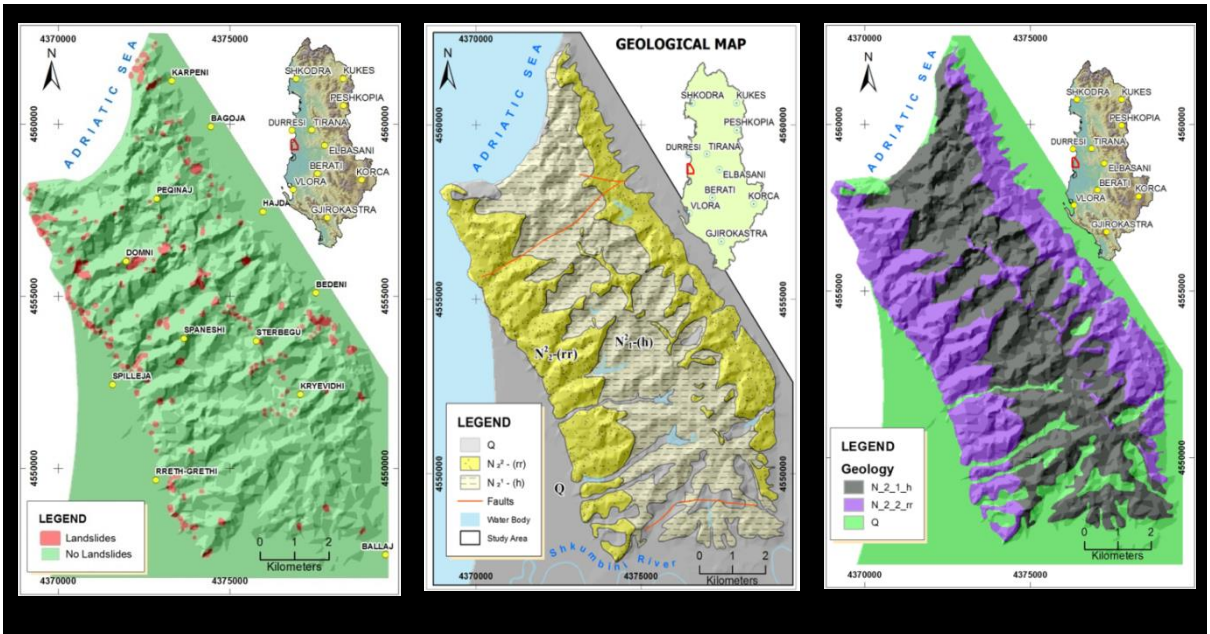

Figure 4	**Figure 4** *Geological map of the study area.*

e. Aspect:
Aspect is considered as a landslide controlling factor. The aspect map is prepared based on DEM and is divided into ten categories (Figure 7, Table 1).

f. Distance from drainage
Water streams may affect the slope stability by eroding the slopes or by saturating the lower part, thus the slope is less stable. Five different buffer zones are identified (Figure 8, Table 1).

g. Distance from roads
Similar to the effect of the distance from drainage, landslides may occur on the road and on the side of the slopes affected by roads. Taking into account this factor five different

buffer zones are created on the path of the road to determine the effect of the road in the stability of the slope (Figure 8, Table 1). The roads map is prepared using the recent satellite images and orthophotos.

h. Precipitation

The saturation degree of the material in the slope is an important parameter that controls its stability. Precipitation plays an important role in landslide initiation. The data used are taken from hydro meteorological station of Durres and Kryevidh, [9].

Table 1 *Weighting values (Wi) of the considered causal factors classes.*

Factor	Class	Ranking	Npix (Ni)	Npix(Xi)	% Npix(Xi)	Wi
Geology	N_2^1-h	1	58552	252	20.8	-0.203
	N_2^2-r	2	50523	923	76.2	0.425
	Q	3	67200	36	3	-1.108
Slope (°)	0-5	1	79772	134	11.1	-0.612
	5-10	2	51050	422	34.8	0.08
	10-20	3	42205	570	47.1	0.294
	>20	4	3248	85	7	0.581
Land cover	Artificial Surfaces	1	11233	108	8.9	0.146
	Agricultural areas	2	130692	596	49.2	-0.178
	Forest and semi natural areas	3	32881	507	41.9	0.351
	Water bodies	4	1469	0	0	0
Aspect	Flat	1	40715	7	0.6	-1.602
	North	2	8576	68	5.7	0.062
	North-East	3	11239	87	7.3	0.052
	East	4	15696	158	13.2	0.166
	South-East	5	22426	162	13.6	0.022
	South	6	15784	162	13.6	0.174
	South-West	7	11117	86	7.2	0.052
	West	8	17590	117	9.8	-0.014
	North-West	9	24035	222	18.6	0.129
	North	10	9097	124	10.4	0.298
Distance from drainage (m)	0-50	1	30252	453	37.4	0.338
	50-100	2	19775	322	26.6	0.375
	100-200	3	22838	321	26.5	0.311
	200-300	4	90784	50	4.1	-1.096
	>300	5	12626	65	5.4	-0.125
Distance from roads (m)	0-50	1	10258	134	11.1	0.279
	50-100	2	17473	223	18.4	0.269
	100-200	3	33457	304	25.1	0.121
	200-300	4	26746	156	12.9	-0.071
	>300	5	88341	394	32.5	-0.188
Precipitation (mm)	1028-1119	1	97674	307	25.4	-0.34
	>1119	2	78601	904	74.6	0.224

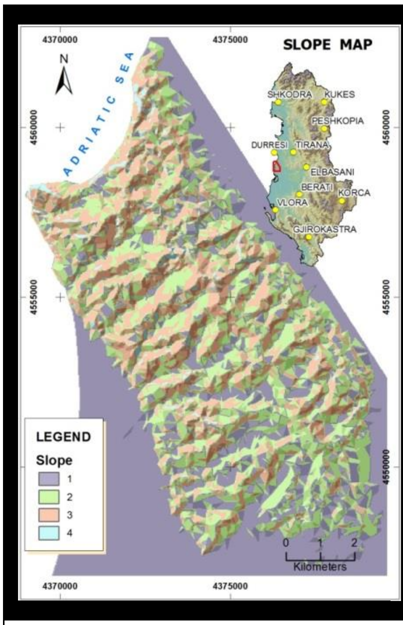

Figure 5 *Slope map*

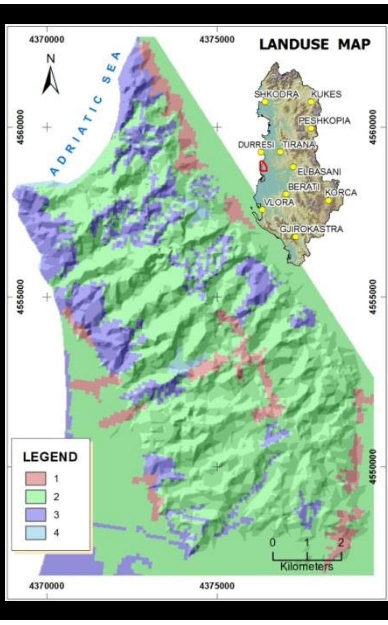

Figure 6 *Land cover map*

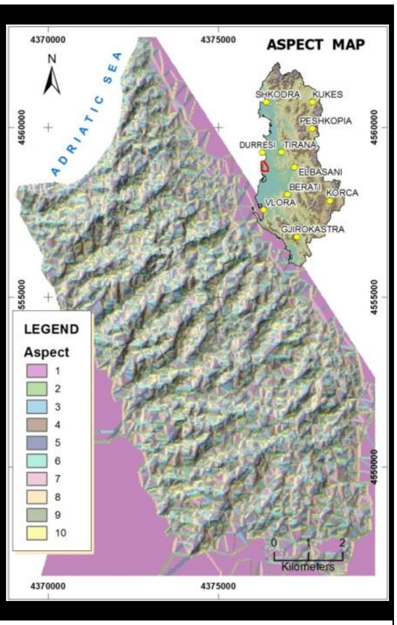

Figure 7 *Aspect map*

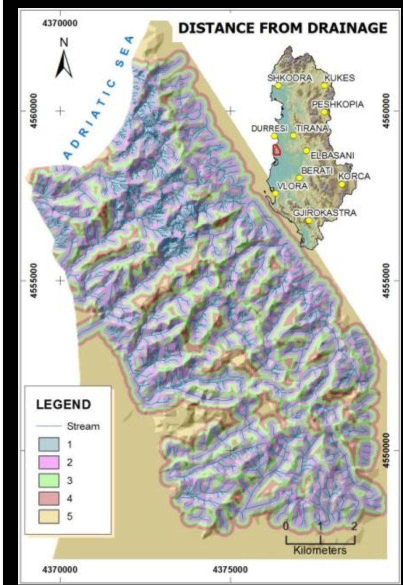

Figure 8
Distance from drainage map

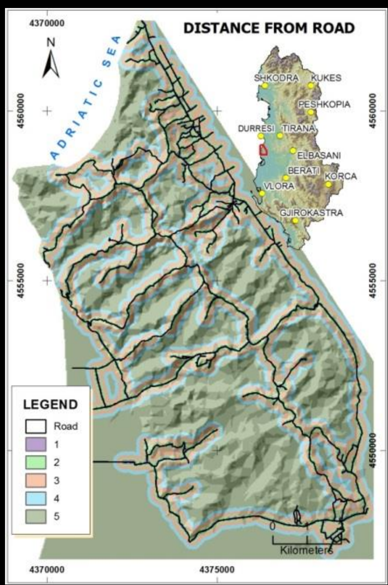

Figure 9
Distance from roads map

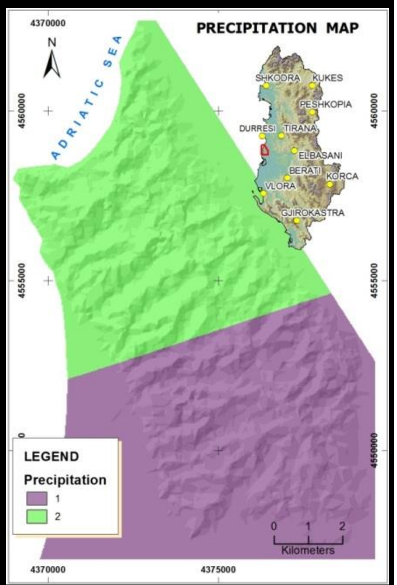

Figure 10
Precipitation map.

5. LANDSLIDE SUSCEPTIBILITY MAPPING

In this paper, the bivariate method is used to prepare a landslide susceptibility map. All factors are classified into groups for a better and faster calculation. The factors taking into account are geology, slope, land cover, aspect, distance from drainage, distance from roads and precipitation. For each factor is prepared a raster map.

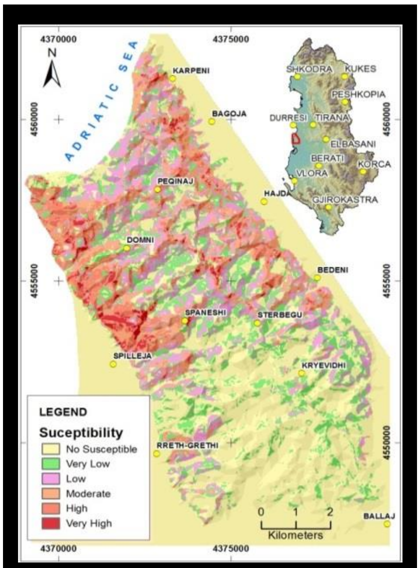

Figure 11 *Susceptibility map*

Class	Npix	% Npix
No Susceptible	103818	58.9
Very Low	21742	30.0
Low	22456	31.0
Moderate	17153	23.7
High	9193	12.7
Very High	1913	2.6
Total	**72457**	**100**

Table 2 *Landslide susceptibility classes*

After preparing all the factor raster's map an overlay analysis in ArcGIS was performed between each factor map with landslide inventory map. For each factor class, the weighting factor was calculated by the ratio between the number of pixels corresponding with landslides and the total number of pixels. This procedure is repeated for all factors and the results are shown in Table 1. A Susceptibility Landslide Index is calculated by summarizing of weighting factors for each pixel. The range of SLI variation was divided into six classes of susceptibility as follow: No Susceptible, Very Low, Low, Moderate, High and very High Susceptible, as shown in Table 1 and Figure 11.

6. CONCLUSION

- In the factors taking into account the categories with higher weighed value, W_i are as follows: Geology: N_2^2-rr, Slope: >20^o, Land cover: Forest and semi natural areas, Aspect: North, Distance from drainage: 50÷100 m, Distance from roads: 0÷50 m, Precipitation: >1119 mm.
- The susceptibility map shows that 58.9 % of the study area corresponds to Susceptible, 30 % Very Low, 31 % Low, 23.7 % Moderate, 12.7 % High and 2.6 % Very High.
- Landslides susceptibility mapping is very necessary today due to the strong impact of these processes on people and their goods.
- The obtained result shows that statistical methods are very useful for preparing landslide susceptibility maps. These results can be used for better urban planning.

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DSAS APPLICATION IN MONITORING SHORELINE

SHKUMBINI RIVER MOUTH, DIVJAKA BEACH COASTLINE, ALBANIA

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ABSTRACT

The Digital Shoreline Analysis System (DSAS) is a module with an easy user interface witch may be integrated at ArcGIS software. DSAS is developed from USGS and calculate statistically vector data, in our case position of shoreline related with time. Users can generate the vector data using satellite imagery, aerial photography and topographic maps. After generating vector data's, DSAS analyses their difference ratio.

This paper aims generation of a model using DSAS in analysing shoreline. Model data studies seven positions of shoreline including a segment of 15 km from North of Shkumbini river mouth to Divjaka beach. Used data's in generating the model of shoreline are taken from ASIG and Google Earth. In this data are analysed materials from 2002 – 2017 period of time.

From data analysis is clearly showed that Shkumbini river mouth is represented very dynamic in time. Shkumbini River has changed several times his bed, moving from South to North. As result of river mouth displacement, shoreline is repositioned, creating areas of accumulation and erosion in different time and positions.

Keywords: *DSAS, GIS, ASIG, Shkumbini River, shoreline change, Albania.*

1. INTRODUCTION

Coastal shoreline changes as result of several factors of different nature, morphological, climatological or geological. Human factor is highly impacting shoreline through deforestation, construction of buildings, roads and seawalls (blocking the natural landward migration of dunes), over exploitation of resources, HPP dams on the river beds etc. Also interactions between waves, tides, rivers, storms, tectonic and physical processes are affecting shoreline geometry.

To understand dynamic processes driving the coastal areas change, is important to have knowledge and assessment of the changes in shoreline position. The change of interface between land and water in an instant of time, defined as shoreline, is very important in indicating coastal erosion and accretion (Genz, A.S. etc., 2007).

Erosion and accretion can lead to rapid shoreline changes and can create serious social and economic problems. Quantitative analysis of shoreline changes at different timescales is very important in understanding and establishing the processes driving erosion and accretion for coastal management and interventions. Shoreline geometry and position are perhaps the most basic indicators with which to evaluate changes in coastal regions. The Digital Shoreline Analysis System (DSAS) is an extension that enhances the normal functionality of ESRI ArcGIS software and enables users to calculate shoreline rate of change statistics from a time series of multiple shoreline positions. DSAS is used in analysis of the coastal shoreline between Shkumbini river mouth and Divjaka beach.

2. DIGITAL SHORELINE ANALYSIS SYSTEM

The Digital Shoreline Analysis System (DSAS) is a freeware software extension to Esri ArcGIS v.10 offered by USGS. Multiple historic shoreline positions are used to calculate shoreline rate-of-change statistics. This extension to ArcGIS contains three main components to assist a user to define a landward baseline, generate orthogonal transects at a user defined separation and to calculate rates of change. Components of the extension include instruction on how to define a reference baseline.

This reference base line will serve for measurements, automated and manual generation of measurement transects and metadata based on user-specified parameters. Also, it will serve for output of calculated rates of shoreline change and other statistical information (*Thieler, etc. 2017*). Transects can be generated using DSAS extension. Transects are perpendicular to the reference baseline at a user-specified spacing alongshore. Transects are formed from baseline which must be long enough so most of transects cross the shoreline vectors from all dates.

Different shoreline vectors obtained are overlaid together so that the geodatabase is formed for further analysis. Shoreline change is calculated along these transects. The extension utilizes Avenue code to develop transects and rates and uses the Avenue programming environment to automate and customize the user interface. Landward movement of the shoreline (erosion) is expressed as a negative number and accretion is expressed as positive in this system.

The distance between each shoreline intersection point on DSAS transect and the baseline can be used to calculate several change metrics and statistics listed below:

Shoreline Change Envelope (SCE); represent the distance between closest and farthest shoreline at each transect. SCE is a presentation of total shoreline movement change for all available shoreline positions. SCE is not related to shorelines dates.

Net Shoreline Movement (NSM); represents a distance. Dates of only two shorelines associate the NSM. It represents for each transect the distance between the oldest and youngest shorelines or the total distance between the oldest and youngest shorelines.

End Point Rate (EPR); can be calculated by dividing the distance of shoreline movement by the time elapsed between the oldest and the most recent shoreline. EPR has advantage of easy computation and dates from only two shorelines. When are available more data, the additional information is ignored and this is a disadvantage of EPR. Also, may be missed the changes of signs (accretion to erosion).

Linear Regression Rate (LRR); is a statistic that can be determined for a particular transect by fitting a least-squares regression line to all shoreline points. The regression line is placed so that the sum of the squared residuals (determined by squaring the offset distance of each data point from the regression line and adding the squared residuals together) is minimized. The slope of the line establishes the linear regression rate. Features of linear regression method ask for all the data to be used, regardless of changes in trend or accuracy. The method is purely computational and the calculation is based on accepted statistical concepts. However, the linear regression method is susceptible to outlier effects and also tends to underestimate the rate of change relative to other statistics, such as EPR (Dolan, and others, 1991; Genz and others, 2007). For the simple and weighted linear-regression methods the standard error, correlation coefficient, and confidence interval can be computed. The output of rate calculations is organized in a table which can be linked to the transect file. DSAS facilitate the process of shoreline change calculation. Also, positional change over time can be calculated.

In summary, the use of DSAS in historical trend analysis can serve to map the historic shoreline position configuration over time covered by spatial data available (maps, areal images), evaluation of historic shoreline position and trends of individual transect (or a group of selected transects), analyses shoreline geometry and foreshore steepening using distance from mean high to mean low watermarks, and to predict patterns of shoreline behaviour, deriving historical rate of change trends, to indicate future trends with assumption that physical, natural and anthropogenic impact will be unchanged in time.

3. DSAS APPLICATION IN MONITORING SHORELINE POSITION OF SHKUMBINI RIVER MOUTH – DIVJAKA BEACH AREA

Shkumbini river mouth – Divjaka beach is the coastal area where DSAS is applied in monitoring shoreline position. The shoreline length under study is about 13 km. Shkumbini River system is the main source of sediment supply to this basin. The surface of reservoir basin of this river is 2445 km^2, with a length of 181.4 km and mean elevation about 753,2m. Historical mean of floating alluvial flow is 187 kg/sec, with a turbidity of 3040 gr/m^2. Mineralization is 317mg/l, mostly bicarbonates.

The mean River flow at river mouth is about 61, 5 m^3/sec, or a module equal to 25, 2 m^3/s.km^2 (AKM 2016). Flow coefficient for all hydrographic river system is 0.59, floating alluvial flow module is 2373 ton/km^2/year. Yearly precipitations are around 650-1700 mm and the numbers of precipitation days is 85-120. Forest vegetation in this basin (prior 1990) comprise around 44% of total surface. Actually, this percentage is much lower. This reduction of vegetation surface (mostly forests) affect directly flow coefficient values.

During the years Shkumbini river mouth has changed several times the position. Seven areal images are used in this study to monitor shoreline position, dating from 2002 to 2017. Areal images are extracted from ASIG and Google Earth Pro v.7.1.7 and the resolution and accuracy of the images are fulfilling the requirements for the maps scale (1:40000) of the shoreline position evaluation (Hernandes, C. etc. 2013). Using areal images, we have vectoring shorelines positions in 2002 – 2017 period of time.

A measurement baseline method (Leatherman and Clow, 1983), to calculate rate-of-change statistics for a time series of shorelines, is designed. This base line has served as the starting point for all transects cast. Vectorised shorelines and baseline designed are part of Geodatabase created. Using DSAS module are generated transects every 50m in spacing.

Transects are casted perpendicular to this baseline, intersecting the shorelines to establish measurement points. Transects are perpendicular to the general trend of the shorelines. This way, shoreline change rates describe the area immediately seaward of the current shoreline. After all features are created we have calculated changes statistics.

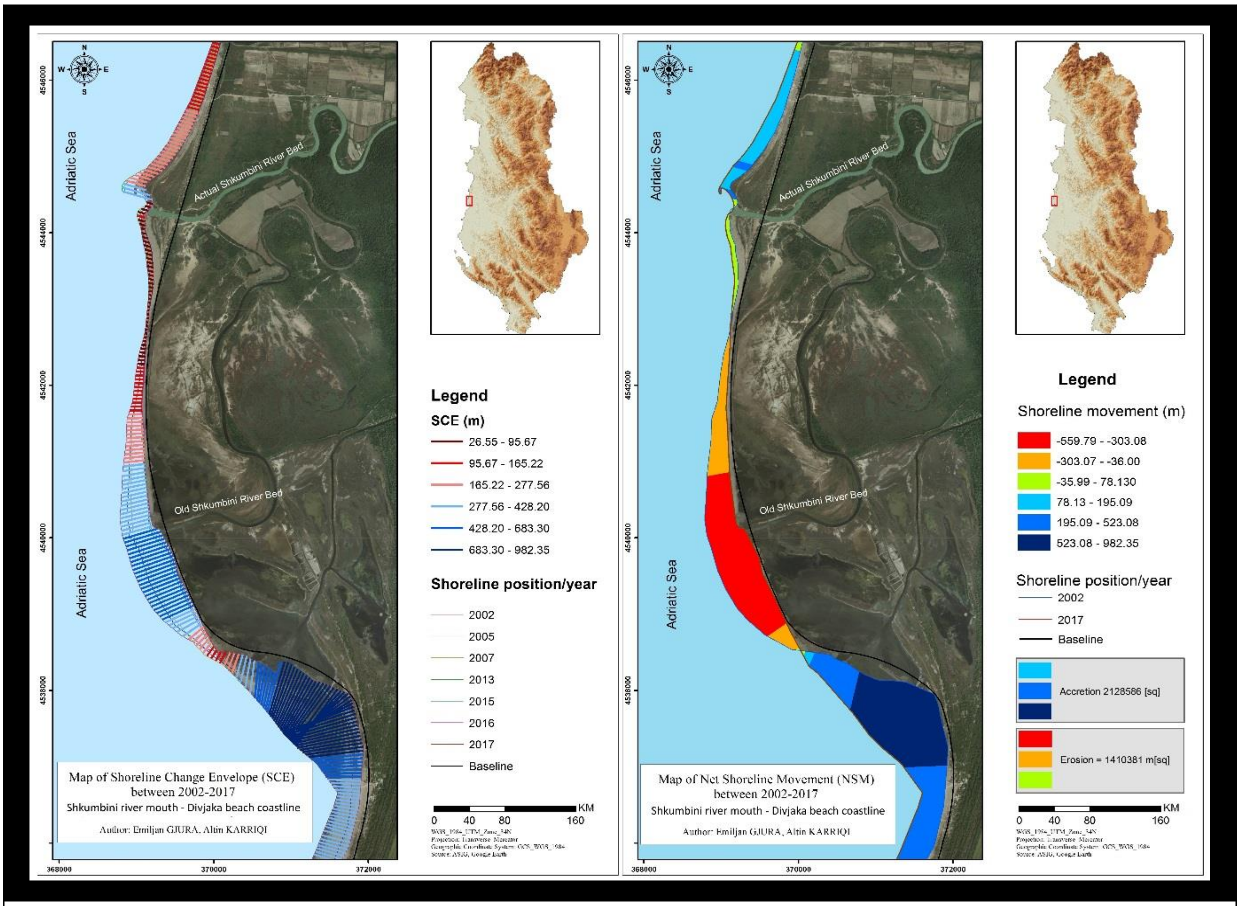

Figure 1

a) Map of Shoreline Change Envelope (SCE) at time period 2002 – 2017;
b) map of Net Shoreline Movement (NSM) at time period 2002 - 2017

Figure 1a; shows the map of calculated Shoreline Change Envelope (SCE), which represents the total change in shoreline movement for all available shoreline positions and is not governed by the age of the shorelines. During 2002-2017 period of time, SCE moves from minimum of 26m or about 1.73 m/year to maximal values of 982m or about 18.8 m/year. The biggest movement of SCE is noted in southern part of Shkumbini river mouth, near Divjaka beach. Near river mouth, SCE moves in lower amplitude compared with the southern part. The map of SCE shows the high level of shoreline change in the most part of this coastal lines. Low to moderate level of shoreline change are noted in vicinity of river mouth, southern part (with a change interval 0 – 95m).

Figure 1b shows the map of Net Shoreline Movements (NSM), which reports the distance between the oldest and youngest shoreline features for each transect. The results indicate that net shoreline movement in the area of study during the period of 15 years from 2002 to 2017 can be classified from low – moderate changes to high level of changes. At the NMS map these levels of change are represented by colours where each colour is an interval of change. Red to yellow intervals are representing erosional parts of coastal lines. Red colour shows the areas where the level of erosion is high (from -300m up to -500m). Yellow areas are those with lowest level of erosion (from 0m up to –35 m).

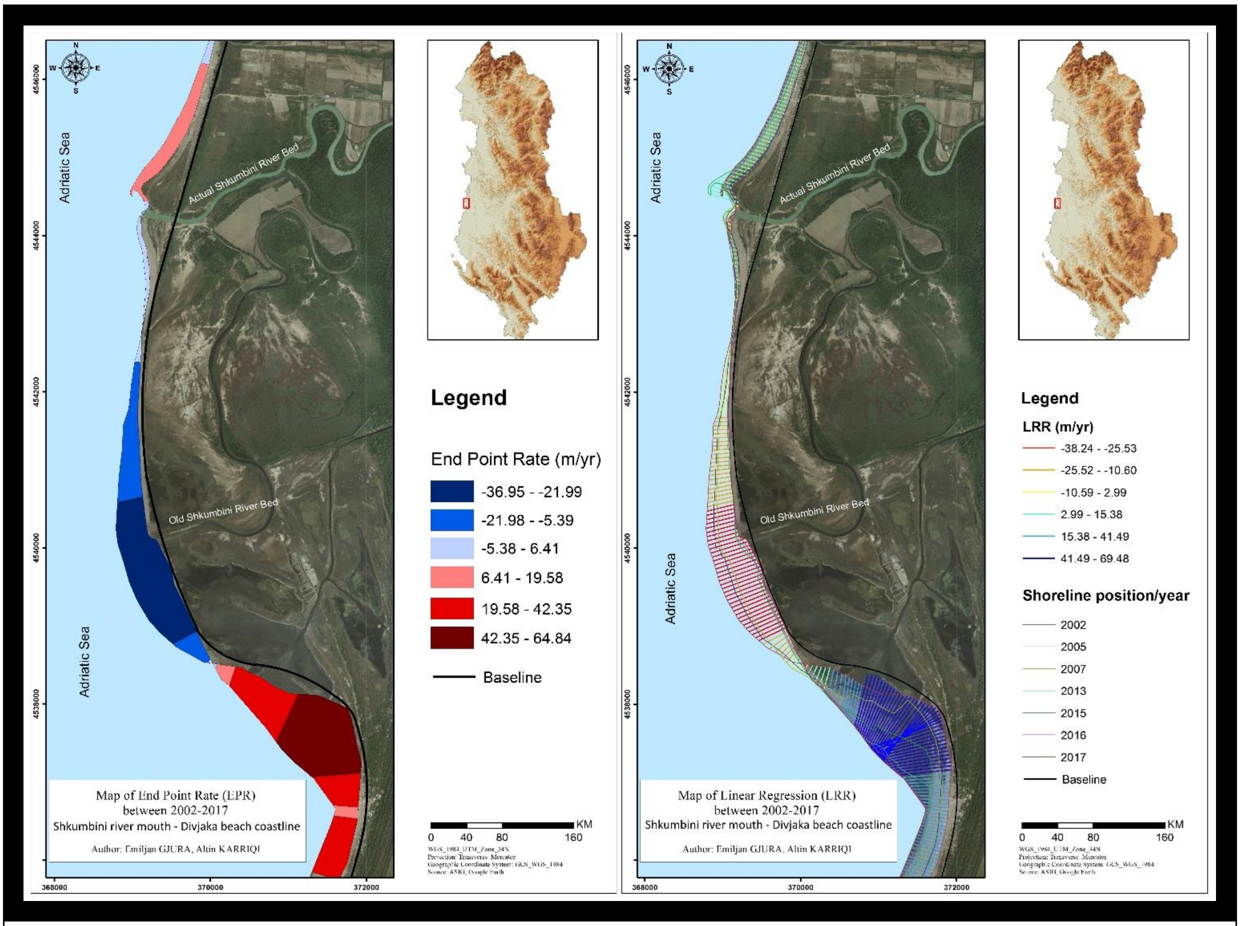

Figure 2

a) Map of End Point Rate (EPR) at time period 2002 – 2017

b) map of Linear Regression Rate (LRR) at time period 2002 - 2017

The erosional coastline goes from Shkumbini river mouth to north part of Divjaka beach for around 6 km of coastal line. The eroded surface is calculated to be approximately 1410000m^2 (or 1.41km^2). Blue colour in the map shows different levels of accretion in the coastal line in the study area. In north part of river Shkumbini mouth, low to intermediate NSM values are calculated (up to +195m). The highest values of NSM are calculated in Divjaka beach area (up to +982m). Levels of blue colour are representing different intensity of accretion (as shown in map legend). Accretion surface is calculated around 2128000 m^2 (or 2.13km^2).

At Figure 2a is presented the map of End Point Rate (EPR) which can be calculated by dividing the distance of shoreline movement by the time elapsed between the oldest and the most recent shoreline. Considering that only the end data points are used, the information contained in the other data points is entirely omitted, preventing the observation of variations in rate through time.

According to EPR map generated from DSAS module for the area of study, at the erosion areas is calculated a rate from -5m/year up to -37m/year. More intense erosion is noted at the old Shkumbini river mouth (up to -37 m/year) and at the area around (up to -22 m/ year) in a coastal line length of up to 5 km. Lowest rate of erosion are noted in southern part of actual Shkumbini river mouth rating about -5m/year, in a coastal length of about 2km. On northern part of river mouth is calculated accretion in small to moderate rate (from +5m/year up 20m/year) for a coastal line length of about 1.5km.

The highest rate of accretion is noted at Divjaka beach, where accretion rate values are from small to moderate and high rate. The highest values calculated are up to +65m/year. The coastal length where accretion is noted goes up to 4km (for the coastal line included on the study area).

Figure 2b represent map of Linear Regression Rate (LRR) at time period 2002 – 2017. LRR is determined for a particular transect by fitting a least-squares regression line to all shoreline points. Results of LRR calculation shows the same trend in accretion and erosion processes for the area of study. The maximal values of erosion are up to -38m/year on old Shkumbini river mouth area while maximal values of accretion are up to +70m/year on Divjaka beach area.

CONCLUSIONS

- The importance of quantitative analysis of shoreline changes consist in understanding and establishing the processes driving erosion and accretion in help of coastal management.

- The Digital Shoreline Analysis System (DSAS) enhances the normal calculate shoreline rate-of-change statistics of multiple shoreline positions in a time series, therefore has been used in investigating the dynamics of shoreline movements and changes, in our case at short historical time scales.
- Despite the inability of the DSAS extension to indicate the forcing driving the observed dynamics and changes in coastal environment, this module is effective in historic measurement of movement of shoreline geometry and the mapping and identification of coastline erosion and accretion.

- Changes at historical time scale on the coastal environment are easily measurable in GIS through the DSAS extension. DSAS can generate valuable information on quantitative analysis of coastal erosion and accretion and on the morphodynamic behaviour of shorelines.

- DSAS can contribute in the identification of areas of erosion and deposition, and in the variation of planimetric properties of the coastal environment.

- DSAS is applied in the Shkumbini river mouth – Divjaka beach area using aerial photos from ASIG (orthophotos of years 2007 and 2015) and Google Earth for the period of time 2002 - 2017. At this short-term study (15 years), areas of accretion and erosion are defined and analysed. At old Shkumbini River mouth coastline is noted highest range of erosional process while at Divjaka beach coastline is noted highest range of accretion process. Approximate surfaces areas for both processes are calculated. Different rates of accretion and erosion are also defined for the coastal line length of the studied area.

- Through this statistical analysis, for each transect are calculated Linear Regression Rates (LRR). This gives an idea about general trend in helping future prediction of coastal line change. This prediction can be done presuming that conditions and the forces leading the processes will remain constant in time. Similar analysis may be extended in other coastal areas, and maps of shorelines change quantitative analyses can be generated.

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USING GIS AS AN URBAN PLANNING METHODOLOGY

CASE STUDY, DROPULL MUNICIPALITY

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ABSTRACT

The municipality of Dropull is created in 2013 as the result of the new administrative and territorial reform that restructured the administrative division of the country from 365 municipalities toward a new division of 61 municipalities. After this administrative reform the "new" municipalities needed planning guidelines. In such term the drafting of local's plans started to guide the process.

For Dropull municipality the planning process was challenging due to lack of data, cadastre registration problems, shrinking population and property conflicts. The main objective of this process was to have substantial data in order to facilitate the planning and decision making process. These challenges were aimed to be addressed by using GIS mainly oriented towards online data record and overlay of information to bring together both quantitative data with its geographical location.

This Research has collected data from censuses, Orthophotos and mapping materials by previous studies, reports and various local plans. By using Geographic Informational systems, we can measure some physical parts of the urban growth. Also analytical, historic and statistical information was collected and used by comparative methods. The study aims to portray the current development of Dropull municipality, in order help the decision making process to be more transparent and acceptable. Data as a reference need to be updated systematically, because some of that data define the future strategies.

This initiative part of e-government is building and enriching the territorial information to help with the management of resources, sustainable development approaches and multilevel decision-making. The emphasis of this research stand on creating continues platform of data analysing and processing, in order to portray the current trends of development. This paper aims to analyses current development using GIS systems in order to establish a planning methodology through GIS.

***Keywords*:** Geographic Informational systems, Planning Methodology, Statistics, Multilevel decision-making.

1. INTRODUCTION

Geographic Information Systems (GIS) are a powerful set of computer-based tools used to collect, store, manipulate, analyse and display spatially referenced information. (Burrough, 1998) The purpose of GIS is to transform data into knowledge and then present this in various format to support and guide the decision making process.

GIS is a relatively new concept for Albania. After the Territorial reform and the changes into the territorial division supported by legislation, the planning process needed a new approach into planning. GIS was incorporated into the planning process to facilitate the transition of this reform, increase transparency, acceptability and provide an ongoing platform during the process of planning.

The new territory of the municipality of Dropull was a planning challenge that needed a new methodological approach. The municipality being a new territory was faced with lack of data, incoherent information and old cartographies that did not represent the territorial changes for at least 10 years. The case of Dropull was an initiative of the local municipality to address and solve many of this problems, but at the same time to establish a vision and clear feature objectives.

During the process of planning the Working group composed by the Polis University experts and external experts, developed their own methodology in the data collection and process of planning. The approach was based in a mixed methodology of cross-reference and elimination. This methodology was divided into three phases.

This process provided acceptability, credibility and transparency of decision-making for the drafting of this plan. The municipality and people were fully trusting of the data analyses. This process at the same time helped to reflect the real situation in the territory of Dropull municipality (Dropull Municipality & Polis University, 2018).

2. THE CONTEXT OF PLANNING IN ALBANIA

Understanding the new reform

The planning approach in Albania has change radically during the last decades. Albania is moving from the urbanistic approach to a more comprehensive one (Toto, 2012; Allkja, 2017/a). This change is understandable due to a long term aspiration of Albania to be part of the European Union. Albania was adopted a large number of European legal directives in prospective of a more European way of planning. Driven by the need to catch up with the rest of Europe (Qorri, 2017). The mark for this "reform" in planning started in 2007 with the preparation of the new legislation on "Territorial Planning", but it wasn't until 2009 with the approval of this law that change was introduced. The Law No 10911 "On Territorial Planning", Followed by the 2014 with Law No 107/2014 on "Territorial Planning and Development" was a beginning of the institutionalization of a new planning culture (Toto, 2012). This change was not done overnight, changing from a "technical and regulatory" way of planning to a more socio-political way of planning take time and undergoes many changes in the between (Allkja, 2017/b).

To further the changes in legislation and change in territorial governance another reform was undertaken, the Decentralization reform of 2013, which aimed to consolidate and strengthen the local governance (CoM, 2015). The reform reorganized the territory from 373 municipalities and communes to 61 Municipalities including urban and rural territories (CoM, 2015).

The reforms mentioned above were supported by the drafting of first document of General National Territorial Plan in the late 2013 by the Ministry of Urban Development. This plan aimed to provide a common objective of development for the entire country as it was the first spatial plan of Albania (Qorri, 2017). The main characteristic of his plan was the collaboration of the national and local sectors to promote a comprehensive development strategy. This document served later as a general guideline and a support to this reform, for the later great intervention, that of Drafting the General Local Territorial Plans (GLTP).

The newly formed local governance units were in a "confusion" as now they had to govern a larger territory, which they knew very little about and on top of that a relatively new planning approach, which they had little experience. On top of the absence of capacities in planning at the local level, the absence of data was one of the main and greatest challenges. Therefore, the planning process in Albania faced many challenges in terms of process as well as technical capacity, therefore the central government decided to allocate financing for the preparation of GLTPs of 26 main municipalities in the country (AKPT, 2018).

Dropull Municipality: *General background*

Dropull is located in the south-eastern part of the country, in the region of Gjirokastra. This municipality has been isolated from the rest of the country during the communist era, leading to the development of cooperation and exchange with Greece, with whom they share a border. This relationship of exchange has increased over time strengthening the cooperation between the two countries, findings from the Territorial Analyses Document for this municipality.

The municipality of Dropull is composed of three administrative units the Lower Dropull, Upper Dropull and Pogon which was edited to the municipality after the new territorial reform. This division is composed by 41 settlements between the three administrative units. Placed between two important economic and cultural centres of Gjirokastra and Janina. Dropull finds its self in a strategic location for the economic development and trade. Gjirokastra being the trade, culture and historical centre for the region offers important administrative and financial services.

This city is included in the UNESCO-s list of World heritage in 2005 and its one of the rare examples of ottoman trade cities still preserved in the Balkan. (UNESCO, 1945) The heritage and culture of Gjirokastra make it an important touristic attraction that creates integration and development opportunities for the entire region including the municipality of Dropull (Dropull Municipality & Polis University, 2018).

Infrastructure

Infrastructure plays a very important role in the development of this municipality as the main access of infrastructure connects all the settlements from the Lower Dropull to the Upper Dropull crossing from Kakavija, which is the border town before reaching Greece. This connection is the spiral of the municipality and contributes to the economic development of the municipality.

The administrative unite of Pogon however is only connected with infrastructure from the lower Dropull, taking a single road that crosses two different municipalities to reach the administrative unit of Pogon which is also the highest part of the municipality.

Recourses

This municipality is partly composed of natural and cultural areas. Natural systems take more than 70% of the total surface and are rich of biodiversity, flora and fauna. Within the municipality, there is also the protected area of "Sotira's Pine" forest. These areas represent an important touristic and natural potential for the future development of this municipality. Besides the natural surface, this municipality is host to a number of significant cultural and natural monuments spread throughout the territory. These resources hold great value in supporting the future touristic development of this municipality (Dropull Municipality & Polis University, 2018).

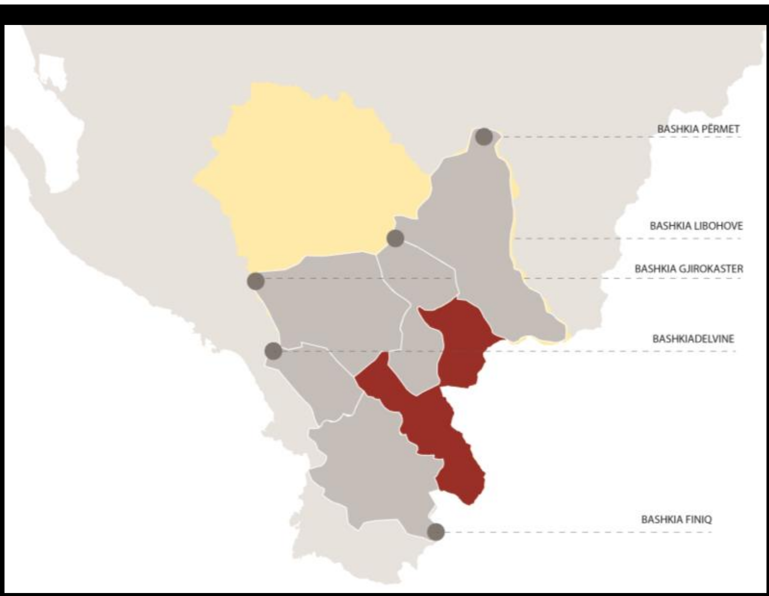

Figure 1.
Geographic Location of Dropull Municipality
[***Source***: PPV Dropull/Document of Analyses]

Population

From the Population point of view in Dropull municipality until 1990 was estimated of 20 thousand people living in its territory. After this enumeration and under the influence of several economic and political phenomena the population numbers were significant shrink, in 2015 the population of Dropull municipality was estimated in only 60% of the 1990 estimations numbers. The municipality of Dropull has not accepted the official numbers provided by the CENSUS enumeration represented in 2011 Census Data, claiming that the census was conducted with a fixed methodology which failed to take into consideration the seasonal population numbers.

Table 1. *Population according to the Administrative units of Dropull*
[***Source***: Municipality/Census/Civil office /Expert Micro census]

Population, Region, Local administrative units	Population	
	2011	2015
Lower Dropull	5,283	4,475
Upper Dropull	2,221	1,881
Pogon	910	771
Dropull Municipality	8,415	7,128
Gjirokastra Region	72,176	68,020

To address the problem during the drafting of the General Territorial plan the working team used the methodology of overlay the information and conducting a separate smaller version of census only within the municipality. In light of this information and after the micro census was conducted, in 2016 the population of Dropull municipality was estimated in 7.200 people with a 48% to 51% proportion dominated by woman (Dropull Municipality & Polis University, 2018).

Economic Development

From the Economic development point of view, Dropull has no clear data in the Municipality scale. Due to the newly founded municipality, the most reliable data is that of the region. The main economic activities in the regional scale are divided between Agriculture and trade services. The agricultural part is mainly concentrated in the Lower Dropull administrative unite, being the main supporting economy in the municipality during the 90's. The trade services are developed along the main infrastructural access from the Lower Dropull starting in Dervican up to Kakavija. In this municipality operate more than 170 private companies five of which are the biggest in the region and the country, which represent the majority of trade development in the region. These economic activities operate mainly on exporting the product to Europe therefor the strategic location of the municipality in the border of Greece, connected by strong infrastructural connection to Greece's ports facilitates the process.

3. Planning Data Gap

As mentioned during the first part the planning process, Albania was under a new reform, which naturally led the way for the development of Local General Plan's. These plans were based in the nr.107/2014, date 31.07.2014 "Territorial Planning and Development" law and the Decision of Council of Ministers Nr.686, date 22.11.2017 "On the approval of planning regulations". These legislations defined the content of the General Territorial Plan (GTLP's) and helped establish a common ground in the planning process, evaluating the different territories by the same criteria.

The methodology started with the analyses of the previous plans as literature review and all related material including sectorial plans and regional strategies, which were cross-referenced and overlaid, creating a better understand the current situation of the territory. Following the first part, a detailed territorial analysis was conducted to better evaluate the current and future potentials of the Municipality. Dropull shared a common concern as many other municipalities in the Albanian territory, the lack of data.

This was a common and understandable problem many "newly" formed territories had. Dropull unlike other territories that had lack of data, had information and classification organized by the former territory, or an updated information in years. Using this information was simply inefficient and highly inaccurate for this territory it represented. In light of the strong support that the local municipality provided and the continues support from the inhabitants of this municipality. The Working group from Polis University decided to create a new methodology in order to provide a planning platform to this particular case (Dropull Municipality & Polis University, 2018).

The process of drafting the Local general plan is rigorously intense and long process that considers the need of cooperation through many agencies, Ministries and departments. Drafting the Local plans includes the collection of data from each of 15 Ministries operating in Albania and comparing the information with the findings of the data in possession of the Municipality and the working Group for the drafting of the local plan. The main obstacle of this process was the incoherent data provided by different Ministries and agencies in comparison to the data from the municipality and the current development situation. The ministries provided data and cartography not updated or overlaid in the territory since 2007 which was the last official Orthophoto. One of the main reason of this lack was that many Ministries were going under reorganization changing their internal structures. Also in cooperation of the GTLP's many of their departments were starting to re-update their information (Dropull Municipality & Polis University, 2018).

Since this was a process that needed time the Working group decided to implement their own methodology to process and update the necessary data for the drafting of the local Plan in order to further and speed the process, keeping in mind the limited resources and the timing issues.

3.1 GIS and the planning process

GIS was firstly developed in the 1960's by Roger Tomlinson as a Canadian initiative to create a Canadian land inventory for the forest. The program continued to be develop and research long after that, by universities as a purpose to represented data in a geographic location. GIS only became massively know in the 1980 and later on in 1990 when the internet opened the doors to a new era.

GIS has adapted and changed with time to be used in a variety of situations, developing mapping tools to create digital representation of information. However, GIS is an organized collection of computer hardware, software, geographic data and people working to efficiently capture, store, update, manipulate and analyse all geographical information (ESRI, 1992).

The technology of GIS allows its users to join quantitative data that include geographic reference to display the data to its geographic location. But GIS allows the use of quantitative and descriptive data by providing tools for analysing this data (ESRI, 1992)
Understanding both, the physical and social environment is a prerequisite to the planning process. Stretching this with the visual capacity of information as a management tool and the process and application becomes clearer. The rapid integration of data from e variety of sources assembled by graphic representation in attempts to integrate a comprehensive way of planning, providing a new view to this approach (By, 2001)

The program aimed to link data with its geographic location, promoting a well-rounded evaluation. An insight into a complex discipline of planning and integrated spatial analyses that revive patterns made of several overlaid data. The computer software provided the possibility of layering difficult information, creating interactive and multiscale mapping (United Nations, 2000).

The Geographic Approach was a methodology emerging from the theory that planning as many activities take place in a geographic location creating a certain impact on this location. Operating under the Map-Evaluate-Act objectives, this methodology believed that planning could be efficient only if its impact could be represented in a geographic stimulation or scenario.

a. GIS in Albania

Integrating GIS in the Planning process in Albania initiated with a legal reform that started in 28 June 2012 with the law Nr. 72/2012 for the "Organization and functioning of the National Geospatial Infrastructure in the Republic of Albania". This legislation was incorporated to bring closer an European Parliament Directive called INSPIRE[1] issued 14 march 2004.This directive aimed to Create a common Infrastructure of Spatial data for the European community.

The main objective of this new law was to create a common, national geospatial infrastructure in the Albanian republic, organize their operation and function, define the methodology of how to collect, create, update and process the spatial data. These objectives ultimately aim to increase transparency, protect public interest, increase service efficiency and promote sustainable development.

At the same time to manage this system emerged a need for a specific agency responsible for the Geo-information in Albania called "ASIG" Agency for Geographic Informational Systems. This agency has decision making power, executive power and coordinative functions. This agency is pared within the Board of Geospatial Information called "BIG", Big's functions include consulting and support for ASIG, this board comes together every time there is need for consulting on the decision making process (COP, 2012).

Before the approval of the law, many institutions were trying to incorporate GIS into their activities and decision making process. One of the first attempts was INSAT[2],in 2011 this institute incorporated census data reflected into an interactive online application ready to use for everyone. The online platform in which the information was grouped by topic and reflected in its geographic location, provided a new prospective to the planning process and transparency in decision-making.

b. Using GIS in the case of Dropull municipality

There were two main driving factors to using GIS as an urban planning methodology. The first factor relates to the lack and incoherent data provided by the municipality and cooperating institutions. The data provided represented information that was essential but old, with no updating or multi criteria cross-reference to the current situation. To accomplish the in-depth analyses a large amount of spatial data was required for the analyses to reflect the current situation.

The second driving factor is related to the situation of the Dropull municipality, which has gone through a 60% regression in population and at the same time hosts some of the country's biggest industries. The population census done by INSTAT reflected the regression but not the seasonal movement of people, despite the fact that they payed taxes, took care of their property or lived in the municipality for two-three months at a time (Dropull Municipality & Polis University, 2018)

c. The process

The application of GIS as a mixed method approach was a request directly from the people. Despite the legislative restrictions to using GIS the team prepared the methodology by going into three phases. The process had physical and operational challenges. The lack of experience of the municipality and its staff obliged the team to conduct a series of training before the process officially begun. During this series of training the staff presented many case studies and similar experiences from around the

[1] Infrastructure for the Spatial Information in the European Community

[2] National Institute of Statistics in Albania

world. Also trained the staff into using and understanding the process and the program itself.

In the first phase of this methodology, using the Geographic Informational Systems the team collected, processed and analysed all the material from the municipality, ministries or any agency creating a database of information. During this process, the team collected more than 50 Shape files, 100 cartographic maps and more than 200 documents referenced to the resources, development or interventions of the municipality. This material was overlaid and cross-referenced within the database by process of elimination, first eliminating the duplicated information, then organizing a meeting with all the contributing actors from the ministries and reconfirming the final information. An important role was played by the plan of Gjirokastra which was concluded when Dropull already started. These two municipalities that share a border, share a great deal of services and infrastructure interventions that benefit them both. The proposition of the Gjirokastra plan were integrated as complementary services for Dropull municipality.

During this process a team of six people composed from municipality and Polis staff were dedicated completely to this first part of the methodology.

In the second phase the working group applied a participatory micro census that reconfirmed population data and living standards, collecting information from 41 localities and more than 6700 houses. This micro census, organized separately for population and separately for industries and economic areas. The conducting of this census was of great importance to the municipality, as they were not properly represented in the former census data conducted by the INSTAT and this influenced and limited the interventions proposed by the municipality.

Polis University provided the participation of more than 150 students and professionals to conduct the research and data accumulation, this activity has distributed in a total of seven days with two separate visits. To conclude this census, the team was divided into 27 groups that were responsible for mapping and data collecting, for at least two settlements within the municipality. Two separate groups were trusted to talk to the businesses and document their activities into detailed data. After the process was complete the municipality organized two meeting the first with the inhabitants of the municipality which were asked to help with missing information or reconfirming the current records. Going back to review the information, the same process followed the second meeting.

Initiating this process with a series of questionnaires the working group collected data related to the buildings construction year, condition, materials, infrastructure, services, economic situation and social development. From the second phase of this methodology the working group in collaboration with the municipality recreated a new data base were the data of population as collected by the mini census was used to evaluate the future prediction of the population.

The third and final phase accomplished the collection of the material from the two stages mentioned above, adding a third, represented by the new Orthophoto. This raster image was used as confirmation for the quantity of data collected, comparing the findings from the two sources to a third.

Table 2. *Population Projections of Dropull Municipality*
[***Source****:* General Local Plan of Gjirokaster, Authors Calculations]

Population Projections	2015	2020	2025	2030
Dropull municipality	7,128	7,484	7,859	8,252
Lower Dropull	4,475	4,699	4,934	5,180
Upper Dropull	1,881	1,975	2,074	2,177
Pogon	771	810	850	893

After using Cross-reference and elimination process the final information was presented in a common meeting were representatives from the Municipality, neighbouring municipalities, ministries, experts, different actors and inhabitants discussed the sources and the intersection of information. The intersection points were divided in subjects of information and verified by the municipality.

Figure 2 *Photos from the Process of data collection at Dropull Municipality*
[***Source*:** PPV Dropull/ Application of Methodology/ Personal library]

This information was presented and discussed with representatives of the government as well, as the methodology and process. In order for the outcome from this plan to be accepted and acknowledged as representing the current development situation in the municipality of Dropull the materials, finding and a detailed report on the methodology steps were submitted to the central government authorities.

This process provided acceptability, credibility and transparency of decision-making for the drafting of this plan. The municipality and people were fully trusting of the data analyses. This process at the same time helped to reflect the real situation in the territory of Dropull municipality (Dropull Municipality & Polis University, 2018). To give a better understanding of the impact of this methodology, the quantitave and qualitateve data updated by the team is arranged in the table below.

Table 3. *The change in data before and after the application of the methodology*
[***Source:*** PPV Dropull/ Application of Methodology/ Authors estimation]

Topics	Before the Implementation of the Methodology	After the Implementation of the Methodology	Difference between the Before and After Data
Population	23.131 people/ by the civil records 3.301 people/ by INSTAT enumeration	7.128 people by the evaluation of the mini census, expert evaluation and public meetings	16.003 people reflected in the civil records that no longer are part of the population 3.827 people unaccounted for by the INSTAT enumeration
Infrastructure	282.88 km of linear infrastructure documented in the public records	930.46 km of linear Infrastructure documented after the implementation of the methodology	647.58 km of linear Infrastructure not reflected in the public records
Infrastructure conditions	No records of information	101.05 km of Linear Infrastructure are in Good condition/ 308.8 km of Linear Infrastructure are fair condition/ 510.4 km of Linear Infrastructure are in poor condition	No record of information before the application of the methodology/ 930.46 km of Linear Infrastructure categorized by their condition
Transport	1 line of Public transportation	1 line of public transportation/ 3 lines of semi-private public transportation	1 line of public transportation identified in the public records/3 semi- private lines that provide the rest of transport
Buildings Nr.	5,600 Buildings in the territory according to census	6.700 Buildings in the territory documented after the implementation of the methodology	1.100 Buildings not reflected in the census public records
Buildings quality	No records of information	6.027 Buildings in the territory evaluated for their quality	No record of information before the application of the methodology/ 6.027 records discovered
Services/Business	2.681 business units identified in the regional level/ No records of information for the local level	176 business units identified within the municipality/ 5 identified as the largest in the country	No record of information in the local level before the application of the methodology/176 units discovered
Urban Area	67.01 hectare of urban build areas according to census	90.57 hectare of urban build areas after the implementation of the methodology	23.56 hectare of urban build areas not reflected in the census public records
Natural areas	34949 hectare of natural areas according to Corine land use	37642 hectare of natural areas after the implementation of the methodology	2.693 hectare of land belonging to the natural system
Agriculture areas	6306.4 hectare of land belonging to this category in the public administration records	7.005 hectare of land belonging to this category / 2.815 acre cultivated agricultural land	698.6 hectare of land reflected as natural areas belonging to the agricultural system
Water areas	263.53 hectare of water resources according to	373.1 hectare of water resources after the	109.57 hectare of water resources reflected as

	public administration records	implementation of the methodology	natural areas belonging to the water system
Infrastructure area	235.03 hectare of infrastructural area according to public administration records	313.24 hectare of land belonging to this category	78.21 hectare of water management infrastructure reflected as agricultural and natural areas belonging to the water management system
Water management	261.96 km of water management infrastructure according to public administration of water supply	806.99 km of water management infrastructure after the implementation of the methodology	545.03 km of infrastructural area reflected as natural areas belonging to the infrastructure system
Municipality Surface	453.603 hectare of surface belonging to the municipality	454.099 hectare of surface belonging to the municipality	0.496 hectare of surface transferred to the neighbouring municipality of Libohova
Former local/regional/nationa l plans that effect the area	No records of information	3 National plan documents/ 2 Regional plan documents/ 4 Local plan documents	9 documents that were not taken into consideration previous to the methodology
Public- Private ownership	No records of information for the total number of buildings/ 109 public buildings owned by the municipality	5.919 buildings are privately owned and 121 are public buildings	12 public buildings that were out of order and not considered as relevant public property
Monuments	15 natural monuments/ 43 Culture monuments	11 Natural monuments/ 43 Culture monuments	4 Natural monuments that were destroyed by natural disasters and no longer existed

4. Conclusions

While a mixed methods approach was developed, the primary focus of this article is the importance of GIS application technologies in the urban planning context of Dropull municipality. The primary purpose of this particular methodology was to create a rich database, reflected the context and at the same time increase the acceptability of people in the planning process itself.

As mentioned previously the main challenge was to use and collect information that has relevant and acknowledge by the institutions, people and reflected the current situation. During the planning process a decision was made to collect the data separately and then compare and analyse by process of overlaying and elimination.

The micro census conducted by Polis University was collecting both as individual and group of data. The working group used GIS as a database to collect and analyse the data, but also keeping in mind the ability to provide a constant updateable database that can be enriched later by the municipality.

The approach was based in a mixed methodology of cross-reference and elimination. This methodology was divided into three phases: The first phase: the collection of data was composed by information from different ministries, institution and departments bringing their information and comparing the data by over layering. The second phase was to add a participatory approach to the planning process, by conducting a mini census for the population and social conditions. The third and final phase accomplished the collection of the material from the two sources, adding a third, represented by the new Orthophoto. This raster image was used as confirmation for the quantity of data collected, comparing the findings from the two sources to a third.

After using Cross-reference and elimination process the final information was presented in a common meeting were representatives from the Municipality, neighbouring municipalities, ministries, experts, different actors and inhabitants discussed the sources and the intersection of information.

The mixed methodology used in the case of Dropull used the context as a strong point into the process of collecting the data. By using GIS as a planning methodology the plan of Dropull municipality was a first example of questioning the previous source of data and providing with a methodology of testing, that the data provided represented the current development context. This method was effective mainly to the level of cooperation and dispensability provided by the municipality, central government and ministries involved into the process.

The availability of future use of the data was a legal requirement established by the planning authorities. In this context the information was stored into Shape file's and accompanied by metadata. The metadata made sure that the information stayed transparent by always knowing who attributed this information, giving the municipality the possibility of constantly updating the data.

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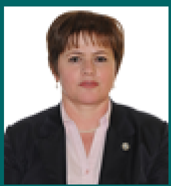

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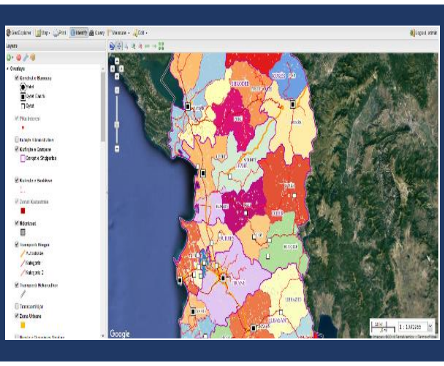

WEB GIS PLATFORM FOR SPATIAL DATA ACCORDING TO INSPIRE USING OPEN SOURCE

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ABSTRACT!

Collecting of national geospatial data according to INSPIRE standard, in a single server, analysing and distributing into web has become a major concern for state. Also, is important for those data to be updated in real time from responsible authorities.

This paper puts forward an optimized Web GIS platform, with national geospatial data in accordance with INSPIRE standard, in a single server. First, the paper introduces principle of INSPIRE schema, then it selects the open-source application software: PostgreSQL/MySQL, Geo Server, Apache. After that, it constructs the Web GIS server with the chosen software and discusses the server's work flow.

This paper also, introduces the role of authorities engaged in process as: Cadastre, Ministry of Infrastructure and Energy, Ministry of Environment and Tourism, Department of Local Issues, with their relevant data administration.

Important is that this Web GIS system will allow different users based on their roles to gather, store, retrieve, analyse, visualize and modify data not only from database to web but also from web to database, keeping the data accurate and up-to-date.

The paper gives conclusions and recommendations in implementation of this system in national level and also in municipality level, resolving many problems about accessing INSPIRE geospatial data.

***Keywords*:** Web GIS, INSPIRE, Open Source, National Spatial Data, Application Software, Database Server, PSQL, GeoServer, Updated Data, National Solution, Central Database, GIS platform, users privilege, authority based roles, WMS/WFS services.

1. INTRODUCTION

The Geographic Information System (GIS) and spatial data management are increasingly being used to facilitate information analysis and to better identify the location of facilities, services, and geographic location.

EU through the INSPIRE directive, has established rules regarding spatial data standards and services offered on the Web, to ensure the data interoperability. Stakeholders are obliged to create functional data and software infrastructures and to be compliant to defined data exchange guidelines. This obligation is supported by local law too, which for Albania is 72/12.

On the other hand, it is important that refreshed data to be available in real time. As a result of the above, there is a need to create a Web GIS from a server data that will contain spatial data according to the standards of INSPIRE (SDI), which will enable, through the configuration of services, modify and update in real time. In this thesis, we will show the steps followed for WebGIS implementation, complying with the above requirements and using open source software, which facilitates immediate implementation by the responsible authorities, while paying close attention to the INSPIRE directive for geospatial data.

Recently Albania is undergoing an urban and rural development transition. Cities come to be expanded, new buildings are built, others are ruined, new roads are added every day, changed addresses and names etc. The difficulty lies in the improvement, and updating of these data as a result of different authority's competences, as well as obtaining these data, if they exist. Starting from what we said above, we need to create a Web GIS, which will be accessed by several users at the same time. This Web GIS will bring data to a single server. Applying this project as a new model of managing and sharing SDI will be very important because:

- The implementation of this project will facilitate the work on modifying and updating of real-time data by the responsible parties
- Implementation of Web GIS can provide real-time access to various development projects, from various authorities
- It will be a key factor in facilitating the provision of updated spatial information
- Make possible to exchange this information at various national and international levels

2. OBJECTIVES

The main objectives of the project to be achieved are as follows:

- Build a single database for spatial data so that the creation, analysis, and upgrade and update are done only from a single server. This avoids confusion with regard to the latest version of the data. It also avoids creating different analysis on different servers for the same data. It happens often to receive information from several sources for the same data, causing confusion in their use. For this reason, it is an urgent need to level up all data duplications (of any authority) and provide a single source.
- Improving and updating spatial data from several users at the same time, regardless of the physical distance, according to the roles they have, via a WebGIS interface. This will enable everyone to work independently to access the data according to their role and responsibility, without being distanced from the distance and the actions of other roles.
- Creating services and accessing them from desktop GIS programs. Through this, it is offered the possibility of analyses independently according to the specific

needs of different projects. By means of the services, there are facilities for using data even as a base map, in various spatial analyses.

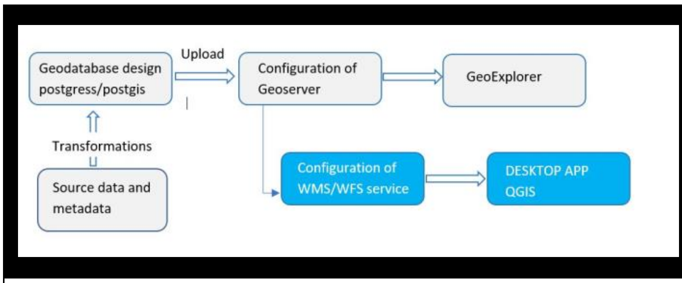


Figure 12 *WebGis Implementation scheme*

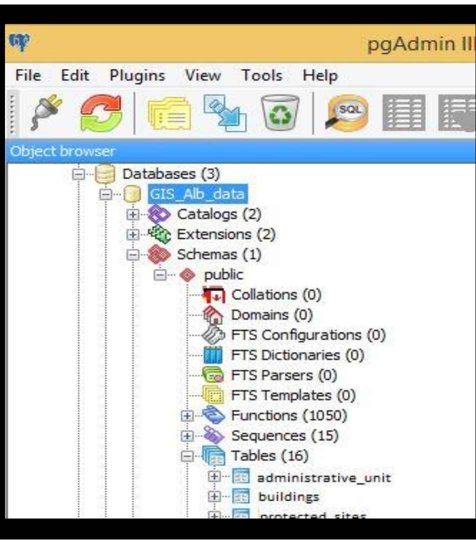


Figure 13 *Database design*

3. IMPLEMENTATION

Main software components for creating Web GIS with open source are:

- PostgreSQL/PostGIS - A powerful geospatial database system;
- GeoServer - A server for sharing geospatial data;
- GeoExplorer - An instrument in the browser, which is generally used to view, navigate, and manage data, either locally or remotely. It is built on the basis of OpenLayers and GeoExt, two Java Script libraries for building a Web GIS;
- GeoWebcache - A server that accelerates the presentation of map images by invisibly visualizing it for future use;
- QGIS - A desktop application for viewing and interacting with geospatial data and maps.

3.1. Data transformation, database creation and metadata

Data have been collected from the responsible authority, and have been transformed according to relevant specifics theme in Annex 1 and 3 of the Inspire directive. Themes collected and transformed to INSPIRE SDI are as follows:

- Administrative units
- Transport networks
- Buildings
- Protected sites
- Cadastral parcels

Apart from standardized data, metadata is another obligation from Inspire. The European Open Source Metadata Editor (EUOSME) has built an application on the Web from where users can enter and create metadata based on the INSPIRE 2007 specification. The portal can be accessed from INSPIRE's official website (http://inspire-geoportal.ec.europa.eu/editor/).

3.2. Geoserver and configuration of service

Once the database is standardized, connected to geoserver and data configurations are done, set up the coordinate system, geographic boundaries, style, display mode, and the list of layers that appear on Geoserver are shown. Then also make WMS and WFS configurations.The wms service, which allows to be accessed through the following link: *http://localhost:8080/geoserver/GIS_Al /wms?service=WMS&version= 1.0.0 & request=GetCapabilities*

The wfs service, which allows to receive vector data, will be configured as "transactional", since besides the "database to WebGis" connection also have the reverse action: "webgis to database", is accessed via link: http://localhost:8080/geoserver/GIS_Al/wms?service*=WFS&version=1.0.0&request =GetCapabilities*

GeoServer applies a very strict strategy when it comes to system data security. Almost every action and operation in GeoServer is done after user authentication. The actions and operations the user can perform with the data on GeoServer depend on rights and privileges a user has. The concept of rights and privileges is explained through the following schema:

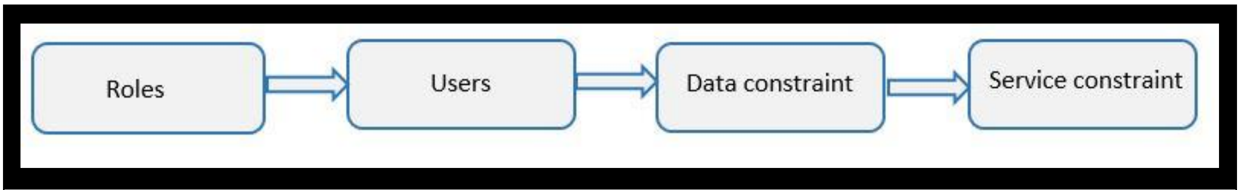


Figure 14 *Rights and privileges in geoserver*

As seen from the scheme above, initially roles are created. Roles, based on the responsible sector, relates to the rights, privileges and responsibilities of one or more layers and services. The roles to be created are:

- Role for the sector responsible for administrative boundaries (Local Issues)
- Responsible role for cadastre (cadastre)
- Responsible role for transport (Transport)
- Responsible role for protected areas (Environment)

The role may contain one or more users, depending on the persons who will be operating. So for each task and responsibility that will be executed by one or more people, a role will be created. ADMIN and GROUP_ADMIN are roles that have administrator functions, while Public role is a role that does not need authentication. After these roles, users who will execute those responsibilities are added. The roles will have these users:

- Cadastre → k.user1
  → k.user2
  → k.user3
- Transport → t.user1
  → t.user2
  → t.user3
- Local Issues → ç.user1
  → ç.user2
- Environment → m.user1

Every role created, together with its users, grants rights to the data layers. Thus, the "admin" role has the administrator's right to be able to administer all the geoserver and web panels. The "cadastre" role has the right to modify the data of the layers "Buildings" and "Cadastral Parcels", while on other layers only has view right.

The "Transport" role has the right to modify road data, railways and water transport layers, while on the other just the view right. The "Local Issues" role has the right to update the layers "Administrative boundaries", while for other layers has the view right. The "Environment" role has the right to update the layer data "Protected Zones", while the other layer has the view right. When the privilege is given to the role, this privilege is automatically passed to all users belonging to this role. The way to set rules on workspace layers from different roles should be looked at carefully since these rules also depend on the appearance of layers on the WebGis and the display of data in open source GIS Desktop programs.

3.3. WebGis

GeoExplorer is the GIS application on the web, which, with the architecture and mechanism tool, compiles and displays the layers, publishes maps and services according to the configuration made in the geoserver. Layers submissions, upgrade and update, spatial analysis and query are made exactly through this interface. Any action that is made from the database is reflected in a geoserver, which together with other configurations and rules will enable representation on Web GIS. Also, more important, it is valid and vice versa, so any data action (upgrade, update) made from Web GIS from users, affects the data directly in the database.

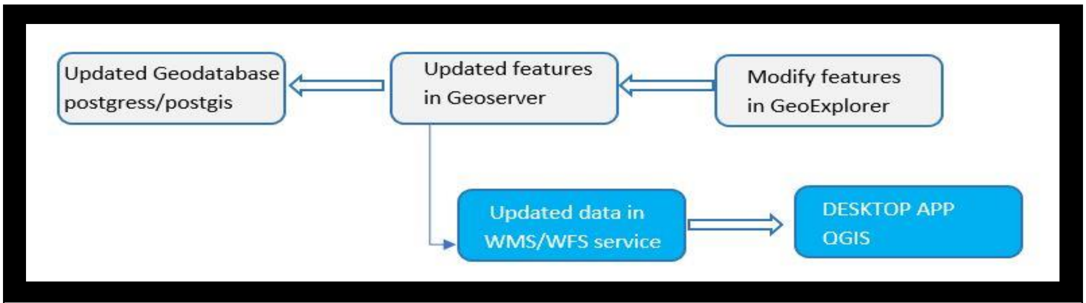


Figure 15 *Modifying data scheme from Web Gis to database*

The map that we will display on the web site, which is a complex layer of data, will be accessed through the link below: http://localhost:8080/geoexplorer. The web is user friendly and data dynamic.

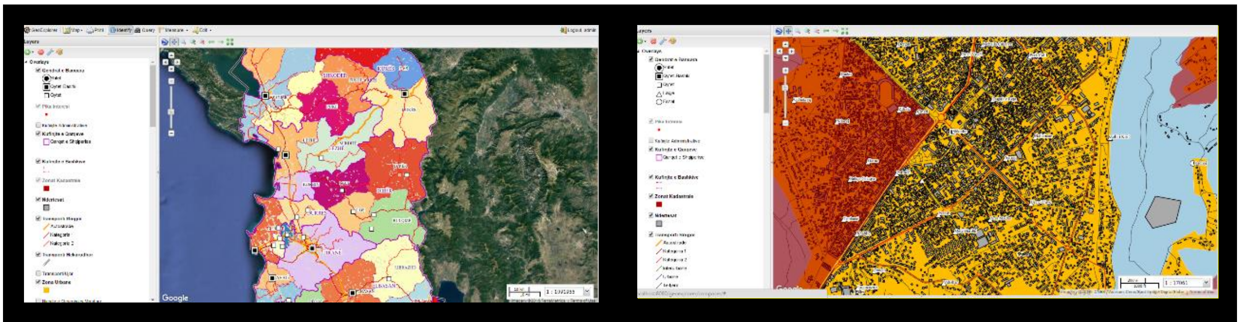


Figure 16 *Web Gis*

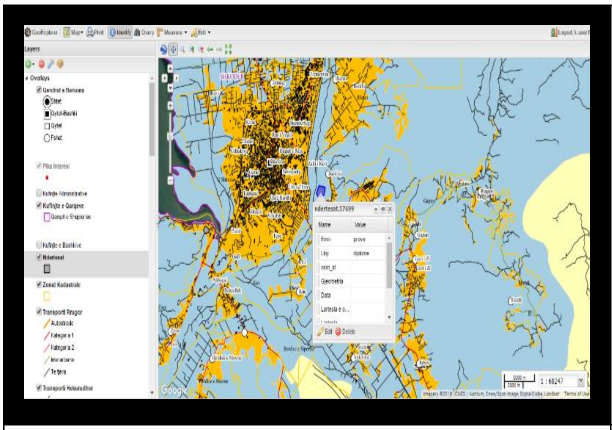
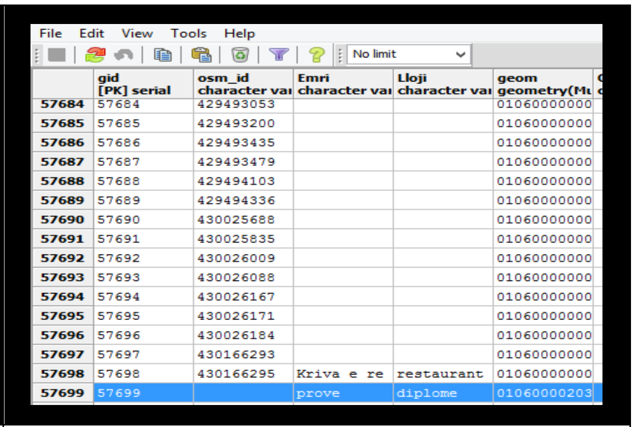


Figure 17 *Modify feature from Web Gis*



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57694	57694	430026167			01060000000
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Figure 18 *Transcript to database*

Now, is tested the connection that is made from modified data in the Web GIS, to data transcripts in the database. Cadastre role users have access to modify Buildings and Cadastral parcel layers, while for other layer data they have the right to view. Link to the user k.user1 and create a new "test" building on the map, along with the basic attributes. Also the transcripts to database, the geographic element that appears on the map is recorded in the database table. The cadastre user has the right to modify and update only data on the cadastre layers. If click on another layer that is not in the user's competences, then there will be no way to update the data because the edit function will not be displayed.

3.4. QGIS

WMS, WFS services configured on GeoServer can be connected through links on GIS Desktop applications. The connection can be handled by any open source or GIS programs. The application applied is QGIS. QGIS is a GIS program for the presentation of geospatial objects, which gives us the ability, inter alia, to connect to WMS / WMTS, WFS, WCS services. Their appearance is done through the commands located on the layer panel.

Figure 19 *WMS/WMTS, WFS, WCS services in QGIS*

4. Conclusions and recommendations

1. Standardization of geospatial data according to the format of the INSPIRE directive (SDI) will ensure data interoperability, thus increasing the efficiency of their use. Geospatial data at different national levels will have the opportunity to link to each other. Also, cooperation with international geospatial data will be possible. In this way, are ensured the applicability of the INSPIRE SDI, enabling interoperability facilities with each other at different levels of hierarchy.
2. Creating a single central database with geospatial data according to INSPIRE will lead to the removal of unnecessary local duplications, which cause confusion even for the latest improved versions. So, having SDI on a single server, it will be very easy to know where updated geospatial data are.
3. The display of database server data via the Web GIS interface will enable access to data by several users at the same time. By means of these users, whose rights and roles have been defined, the geospatial data will be improved and updated, reducing the time of the processes that depend on each other.
4. The facilities that Web GIS offers to improve and update and then provide real-time data can be utilized very well by public authorities responsible for collecting and providing data.
5. Adopting Web GIS and its implementation using FOSSGIS and FOS provides us with the opportunity to create services that enable to share data and create maps.
6. Services are provided with the ability to display data in open source GIS programs, but also on other platforms that support this data such as AutoCAD, ArcGIS, MapInfo, etc.
7. Cost for implementing this system will not be too high, as for its realization are used free and open sources.

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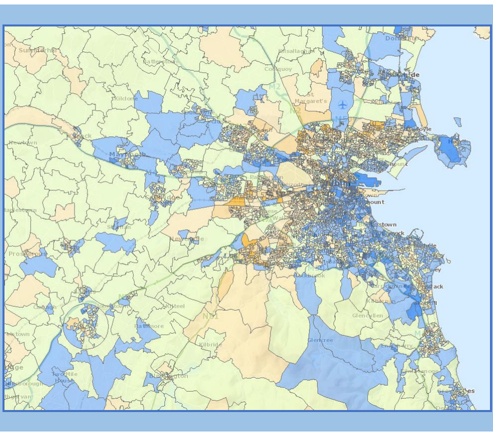

SMART CITIES AND OPEN BIG DATA

HOW ECOLOGICAL FALLACIES EFFECT DECISION MAKING IN DATA DRIVEN CITIES

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ABSTRACTS

In the smart city era, open big data is taking the lead in city governance. Many city planners and government policies rely on census data, but the way these data are interpreted can lead to different city representations. In this paper we are looking into the problem of ecological fallacies based on census data for four different spatial units in Dublin. We start by exploring how the correlation factor changes in going from small spatial areas to larger ones, following the work of Gehlke and Biehl on Modifiable Areal Unit Problems (MAUP). Then, we use ridge regression, as a statistical method for spatial datasets, to see how scale effects multivariate relationships.

As a result, this ecological fallacy analysis reveals that for a more efficient smart city, statistical models should be developed according to the purpose of the policy and area of study.

Keywords*:* smart cities; ridge regression; ecological fallacies

1. Data govern the city

"Facts and statistics collected together for reference or analysis; The quantities, characters, or symbols on which operations are performed by a computer, which may be stored and transmitted in the form of electrical signals and recorded on magnetic, optical, or mechanical recording media; Things known or assumed as facts, making the basis of reasoning or calculation" – these are the definitions of "data" (plural form of Latin word 'datum') from Oxford English Dictionary.

For many years, governments have been collecting data, in the form of official surveys such as census (mostly related to population statistics), or a collection of technical measurements (e.g. Meteorological, Environmental information like air pollution, water quality etc.), and have tried to shape the city by using this information as basis for policy making and governance. *"Data are usually representative in nature (e.g., measurements of a phenomena, such as a person's age, height, weight, colour, blood pressure, opinion, habits, location, etc.), but can also be implied (e.g., through an absence rather than presence) or derived (e.g., data that are produced from other data, such as percentage change over time calculated by comparing data from two time periods), and can be either recorded and stored in analogue form or encoded in digital form as bits (binary digits)."* [1].

Along with technology evolution, it has developed the way data are collected, processed and published. Going from traditional datasets, manual collection and storing into big files and archives, today we see a big rise in the latest technological sensors deployed and spread all over the city, with the purpose of collecting information, ideally in real-time, storing in high capacity servers, and generating the so called urban big data, which are fundamental in city governance. To better understand what really big data are, Professor Kitchin, in his "The Data Revolution" book has made comparisons between small and big data. (Table 1). [1]

	Small Data	**Big Data**
Volume	Limited to large	Very large
Velocity	Slow, freeze-framed/bundled	Fast, continuous
Variety	Limited to wide	Wide
Exhaustivity	Samples	Entire populations
Resolution and identification	Course & weak to tight & strong	Tight & strong
Relationality	Weak to strong	Strong
Flexible and scalable	Low to middling	High

Table 3 *Small data vs Big Data characteristics*

"Urban big data, city operating systems, urban informatics and urban science analytics provide the basis for a new logic of urban control and governance – data driven, networked urbanism- that enables real-time monitoring and steering of urban systems and the creation of what has widely been termed smart cities." [2].

But, this huge extension of data generation comes along with many challenges. A group of researchers at Maynooth University are trying to find ways of how best to communicate these challenges through the "Building City Dashboard"[3] project, which consists in creating a City dashboard as a tool for "providing present and future critical infrastructure for the smart city, enabling city managers to efficiently and effectively operate a range of urban services in real-time, formulate evidence-based policy and create better city plans through simulating city developments, and empowering citizens and businesses by sharing information that will facilitate participation, improve quality of life, and foster entrepreneurship." [3].

This project brought back into focus, one of the most discussed topics which is data quality. Governing a city through the data generated by itself for itself, raises the questions of how much can we trust these data produced? How can we control the quality of the data prior to communicating it to the users? "The quality and veracity of data are important because they underpin the extent to which one can trust the conclusions drawn from analysis. Data quality concerns how clean (error and gap free), untainted (bias free) and consistent (few discrepancies) the data are. Veracity refers to the authenticity of the data and the extent to which it accurately (precision) and faithfully (fidelity) represents what it is meant to." [1] On the other hand, data interpretation is very crucial as the challenge is how do we best analyse these data in order to be closer to reality and lead to better decision making.

Batty [3] suggests that to understand cities we must view them not simply as places in space but as systems of networks and flows. To understand space, we must

[3] http://dashboards.maynoothuniversity.ie/

understand flows, and to understand flows, we must understand networks - the relations between objects that comprise the system of the city.

Census data are seen by the city planners as the most trustworthy official statistics for creating and deploying new policies to run the city.

Pobal[4] is a charity who works on behalf of the Government of Ireland to support communities and local agencies towards achieving social inclusion and development. Below we are giving map examples, taken from their portal, of deprivation indices for three different spatial units i.e.: Small Areas (Figure 1), Electoral Districts (Figure 2) and Local Development Areas (Figure 3); where all the three visualizations are based on 2011 Census Data. As clearly seen by these maps, different data interpretation can lead to different decision making. This is one of the spatial data analysis challenges known for many years from the geographers as the ecological fallacy. *An ecological fallacy occurs when it is inferred that results based on aggregate zonal (or grouped) data can be applied to the individuals who form the zones or groups being studied.* [4]

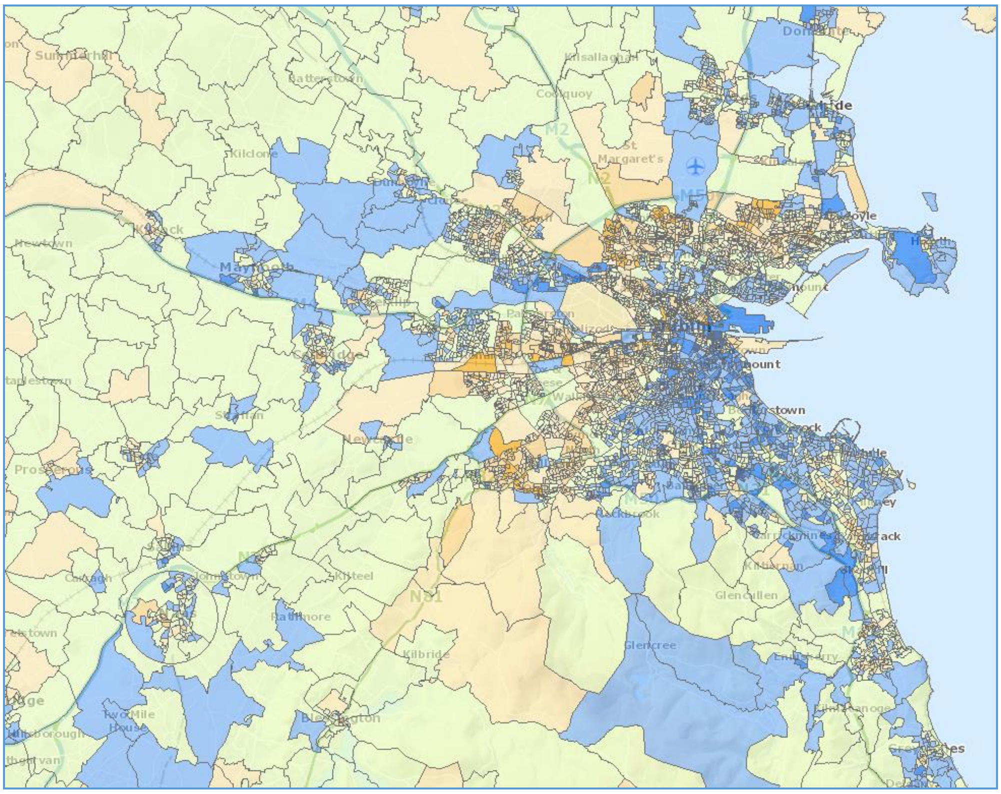

Figure 20 *Small Areas, Census 2011*

4 https://maps.pobal.ie/WebApps/DeprivationIndices/index.html

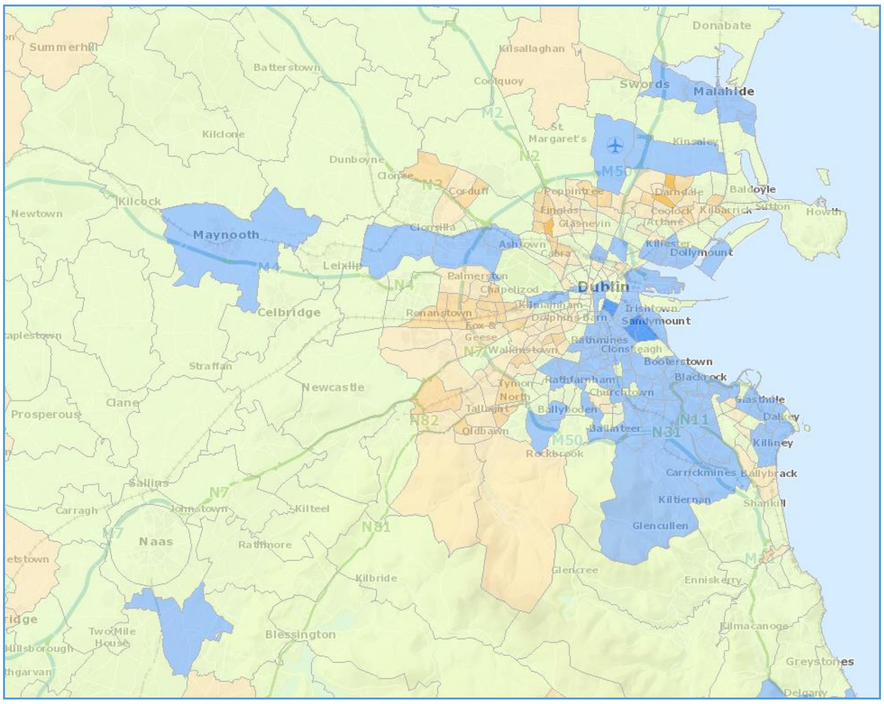

Figure 21 *Electoral Districts, Census 2011*

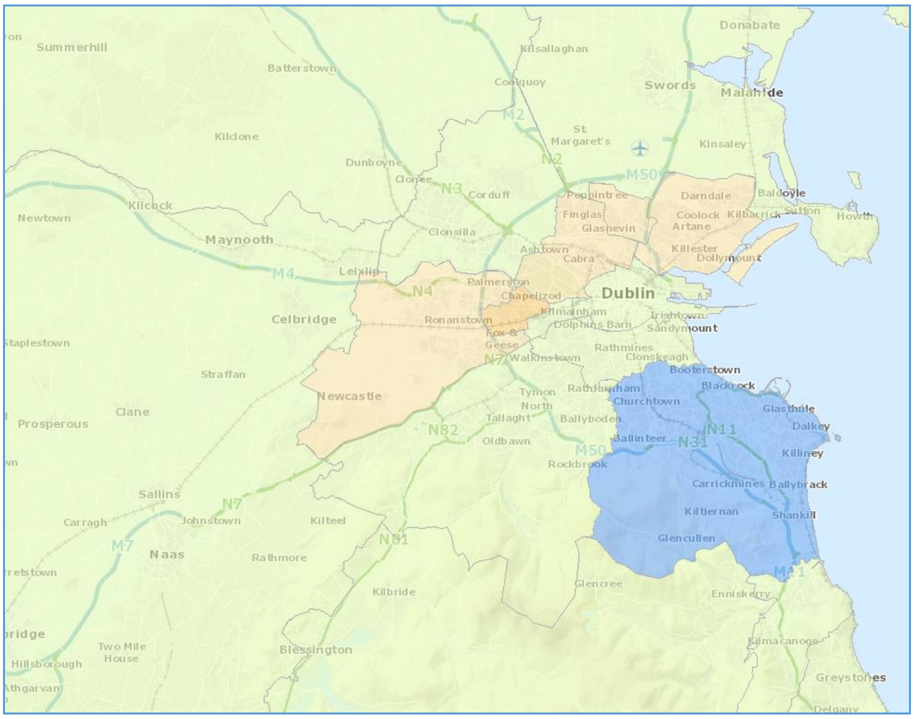

Figure 22 *Local Development Areas. Census 2011*

Modifiable Areal Unit Problem (MAUP)

Following the work of Dr. Henry Sheldon, in 1934, Gehlke and Biehl did a detailed study of grouping effects in census tract data, where they concluded that *"Variations in the size of the correlation coefficient is conditioned upon changes in the size of unit used, with a smaller value of r associated with the smallest unit rather than with the largest"* [5]. Later on, it was Stan Openshaw who came up with a new definition of the problem calling it "Modifiable Areal Unit Problem" [4]. MAUP, which is known as the ecological fallacy problem, consists in two main issues:

a. the Scale Problem: when using the same analytical method for different spatial units, where the larger units are made up of smaller units, can lead to different results; and
b. The Zoning Problem: when small units are grouped together to make larger units and by using the same analytical method, the results can be different.

Also, in 1970, Tobler brought the concept of spatial dependence by what is considered the first law of Geography: "*Everything is related to everything else, but near things are more related than distant things*." [6]

Many researchers have been working on ecological fallacies problems by exploring the effects of aggregation on multivariate relationships. Chris Brunsdon and Martin Charlton [7] have been analysing data from Irish Census by using principal component analysis (PCA). "The goal of principal component is to convert a set of *n* correlated variables into a new set of *n* uncorrelated variables whose values are obtained through a linear transform of the original variables." [7]

In this framework, following the work of many researchers, we explore the problem by using ridge regression, as a statistical method, on Irish Census Health Data.

Discussion

"If the reaggregation is to take place after the data are released we know that we are stuck with the areal units that we have, and that if we reaggreagate them to some other units, we are essentially creating arbitrary results." [8]

"Many ecological studies include the collection and use of data to investigate the relationship between a response variable and a set of explanatory factors (predictor variables). If the predictor variables are related to one another, then a situation commonly referred to as multicollinearity results." [9]

Multi-collinearity can create inaccurate estimates of the regression coefficients, inflate the standard errors of the regression coefficients, deflate the partial t-tests for the regression coefficients, give false or non-significant p-values and degrade the predictability of the model. [10]

Ridge Regression

Ridge Regression is a technique for analysing multiple regression data that suffer from multicollinearity. [10]

In ridge regression[5], we add a penalty by way of a tuning parameter called lambda which is chosen using cross validation. The idea is to make the fit small by making the residual sum or squares small plus adding a shrinkage penalty. The shrinkage penalty is lambda times the sum of squares of the coefficients so coefficients that get too large are penalized. As lambda gets larger, the bias is unchanged but the variance drops. The drawback of ridge is that it doesn't select variables. It includes all of the variables in the final model. It seeks to minimise the following equation:

[5] http://wavedatalab.github.io/machinelearningwithr/post4.html

$$\sum_{i=1}^{n}(y_i - \hat{y}_i)^2 + \lambda \sum_{j}^{m} \beta_j^2$$ *Equation 1*[6]

One needs to choose a value of lambda that minimises the mean squared error, which is done by cross validation, as a standard practice. The data we are using is from Irish census 2011, which was carried out Sunday 10th of April of that year. These data are available to download from Central Statistics Office[7] in comma separated variables (csv) format. In it we investigate the Index of Deprivation, known as the Pobal HP Deprivation Index in Ireland, by examining four different variables in four different spatial units. The variables from the census we examine are:

- "Very Bad Health / T12_3VBT",
- "Unemployed / T8_1_ULGUPJT",
- "Unskilled / T9_1_UST"
- "No Formal Education / T10_4_NFT"

The spatial areas we are using from the census are listed below along with the number of areas:

- Counties – 34 areas
- Local Electoral Areas – 171 areas
- Electoral Districts – 3,409 areas
- Small Areas – 18,488 areas

In *Figure 4 & 5* we can see strong correlations across all the variables. *Figure 6* shows there is a large change in magnitude of the eigenvalues; this is another result of high correlation. *Figure 7* shows less correlation for Local Electoral Area than for the Counties Level. Again, less correlation for the Electoral Districts as seen in *Figure 8*, where the areas are smaller. In *Figure 9-10*, which is for the small areas, there is *little* to *no* correlation in the variables.

The variables have high collinearity in the larger spatial areas and the figure falls as the amount of areas increase, i.e. as the areas get smaller, the correlation decreases. This can be seen in *Figure 11* which is a plot of the correlations of very bad health against unemployment.

[6] http://www.thefactmachine.com/ridge-regression/

[7] https://www.cso.ie/en/census/

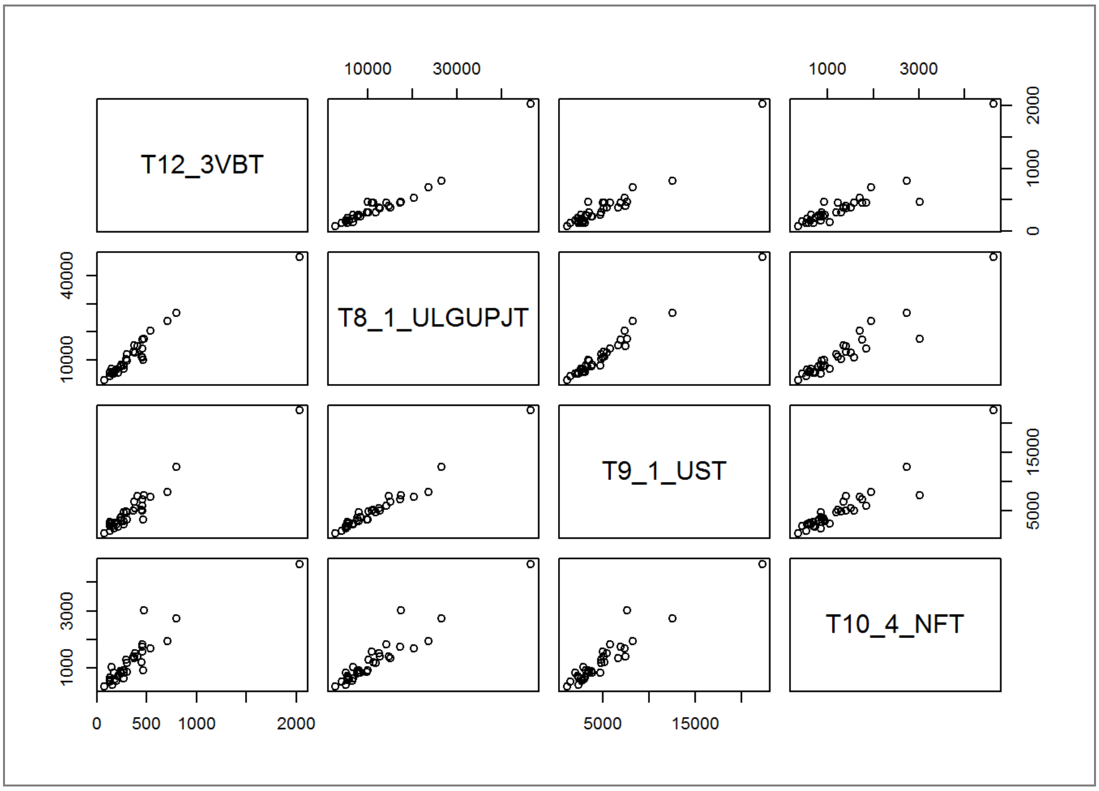

Figure 23 *Correlation Scatter Plot Counties Level*

	T12_3VBT	T8_1_ULGUPJT	T9_1_UST	T10_4_NFT
T12_3VBT	1.0000000	0.9582984	0.9619905	0.9075341
T8_1_ULGUPJT	0.9582984	1.0000000	0.9822057	0.9451590
T9_1_UST	0.9619905	0.9822057	1.0000000	0.9442438
T10_4_NFT	0.9075341	0.9451590	0.9442438	1.0000000

Figure 24 *Correlation Matrix - Counties Level*

```
eigen(corCounties)$values
```

```
## [1] 3.85011424 0.09461836 0.03762977 0.01763763
```

Figure 25 *Eigenvalues - Counties Level*

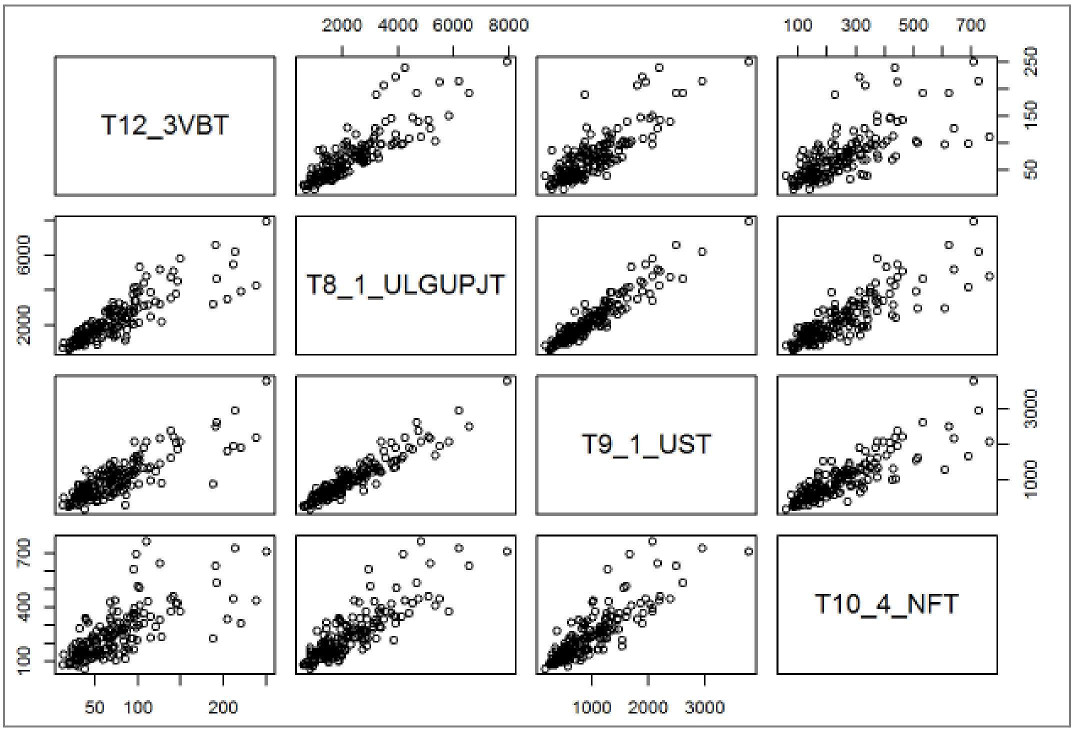

Figure 26 *Correlation Scatter Plot - Local Electoral Areas Level*

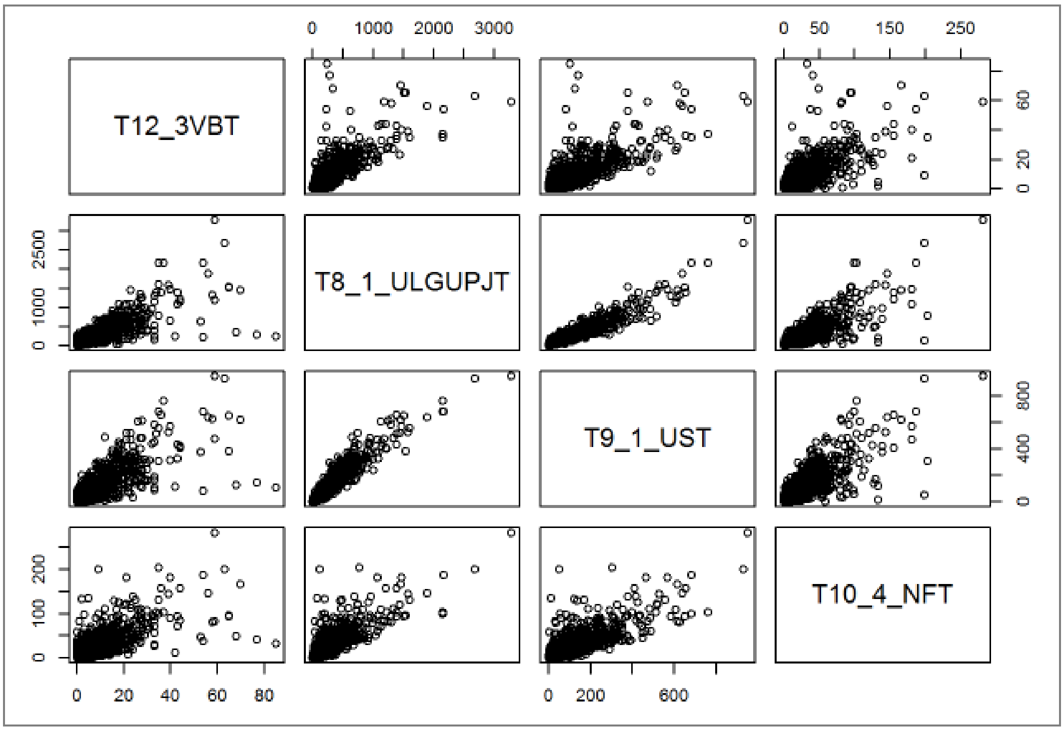

Figure 27 *Correlation Scatter Plot - Electoral Districts Level*

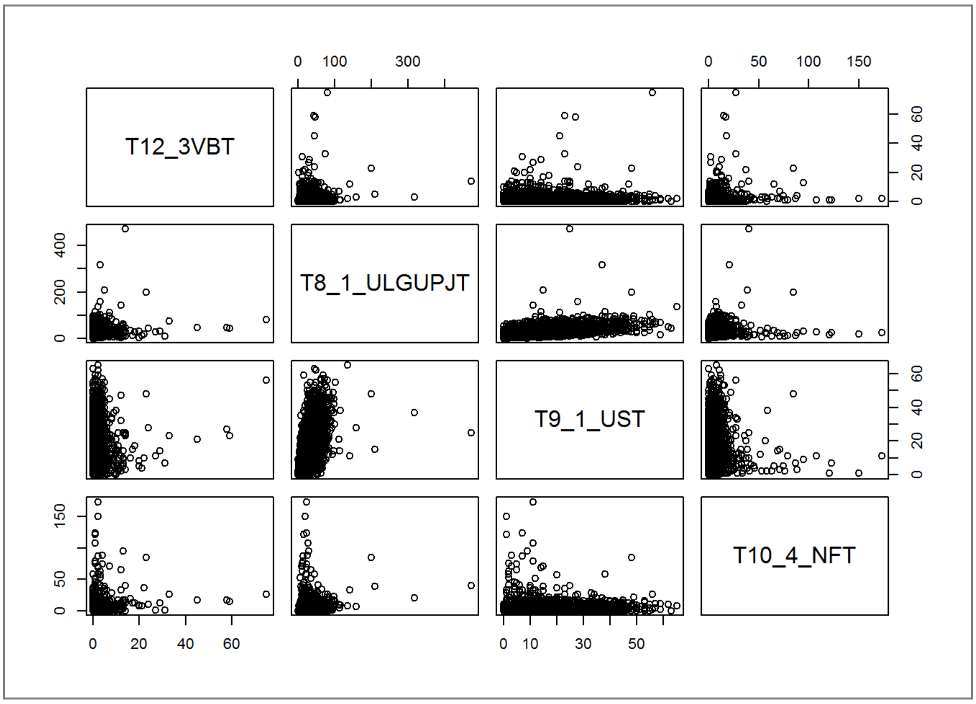

Figure 28 *Correlation Scatter Plot - Small Areas Level*

	T12_3VBT	T8_1_ULGUPJT	T9_1_UST	T10_4_NFT
T12_3VBT	1.0000000	0.2154633	0.2017666	0.2330188
T8_1_ULGUPJT	0.2154633	1.0000000	0.6038715	0.2755350
T9_1_UST	0.2017666	0.6038715	1.0000000	0.2237586
T10_4_NFT	0.2330188	0.2755350	0.2237586	1.0000000

Figure 29 *Correlation Matrix - Small Areas Level*

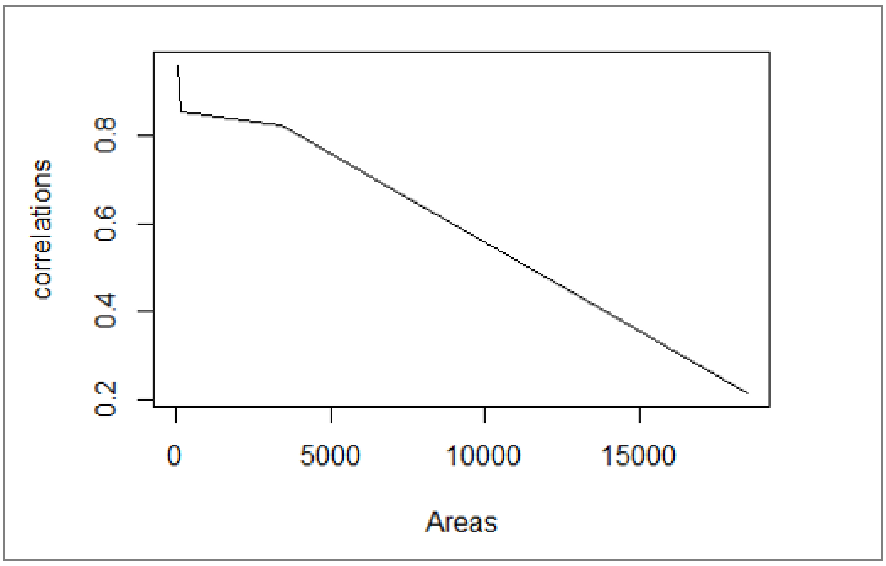

Figure 30 *Plot of the correlations*

Further below, we have done an OLS Regression on the data to for each of the four spatial areas.

```
fitCounties <- lm(T12_3VBT~ T8_1_ULGUPJT + T9_1_UST + T10_4_NFT, data = Counties)
fitCounties
```

```
##
## Call:
## lm(formula = T12_3VBT ~ T8_1_ULGUPJT + T9_1_UST + T10_4_NFT,
##     data = Counties)
##
## Coefficients:
##  (Intercept)  T8_1_ULGUPJT      T9_1_UST     T10_4_NFT
##    -65.01809       0.01693       0.05466      -0.03012
```

Figure 31 *OLS Regression - Counties Level*

Similar analysis was completed for the other spatial areas; Local Electoral Areas, Electoral Districts and Small Areas.

```
RidgeCountiesLambda0 <- lm.ridge (T12_3VBT~ T8_1_ULGUPJT + T9_1_UST + T10_4_NFT, data = Counties, lambda = 0)
RidgeCountiesLambda0 # which are the same values for the OLS
```

```
##              T8_1_ULGUPJT     T9_1_UST    T10_4_NFT
## -65.01809283   0.01692553   0.05465933  -0.03011893
```

Figure 32 *Ridge regression where lambda equals zero - Counties Level*

Figure 13 shows that when lambda equals zero, the results are the same as OLS Regression.

```
lm_seq <- seq(0, 1, 0.001)
RidgeCounties <- lm.ridge(T12_3VBT~ T8_1_ULGUPJT + T9_1_UST + T10_4_NFT, data = Counties, lambda = lm_seq)

plot(lm_seq, RidgeCounties$GCV, main = "GCV of Ridge Regression (Counties)", type = "l", xlab = expression(lambda), ylab =
"Generalised Cross Validation ") # minimum is 0.873
```

Figure 33 *Ridge regression function and Plotting Generalised Cross Validation (GCV)*

Figure 14 shows running the ridge regression on the data with the lambda value going from 0 to 1 incrementally by 0.001. This runs the function 1000 times to find the best value for lambda. Then we plot the GCV as seen in Figure 15.

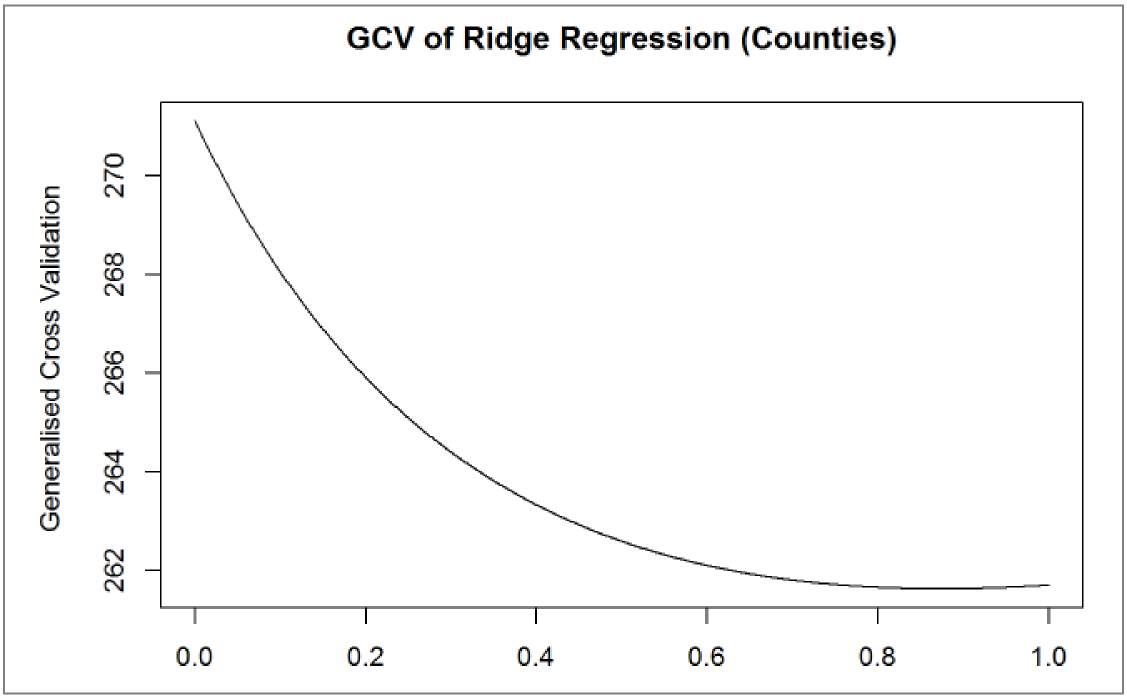

Figure 34 *Plot of the GCV of the Ridge Regression*

```
select(RidgeCounties)
```

```
## modified HKB estimator is 0.1373177
## modified L-W estimator is 0.0838505
## smallest value of GCV  at 0.873
```

Figure 35 *Calculation of the smallest value of GCV*

Figure 16 shows the calculation of the smallest value of GCV which is 0.873. This is the lowest value on the graph in Figure 15, so we will repeat the ridge regression analysis with lambda equal to 0.873 to give the best result.

```
RidgeCounties <- lm.ridge(T12_3VBT~ T8_1_ULGUPJT + T9_1_UST + T10_4_NFT, data = Counties, lambda = 0.873)
RidgeCounties

##              T8_1_ULGUPJT    T9_1_UST   T10_4_NFT
## -67.78638676   0.01702794  0.04451743  0.01183682
```

Figure 36 *Ridge regression with optimal lambda value*

Figure 17 shows a result which is closer to the true values than the OLS Regression. The same analysis was done for the rest of the spatial areas. Table 2 shows the results of the OLS Regression versus the Ridge Regression for the Intercept. The ridge regression analysis is closer to the true values than OLS regression.

	OLS Regression (Intercept)	Ridge Regression (Intercept)
Counties	-65.01809283	-67.78638676
Local Electoral Areas	3.71019	4.134993988
Electoral Districts	0.15665	0.15787138
Small Areas	0.08962	0.09128267

Table 4 *OLS regression vs Ridge regression of the Intercept values*

CONCLUSIONS

In the Pobal maps above, it is clear to see the difference in data representation. The first map (representation of small areas) could be seen to have too much noise, meanwhile in the third map (a representation in local development areas level) there could be too much scaling; whereas the second map seems like a good balance between all three. Thus, there needs to be a critical discussion in finding the correct map of spatial units for each specific issue, in order to create good city governance policy. A decision of where to build a new hospital, where is the most need for medical services etc. should be based on the best statistical visualization which represents the population's best needs. This analysis, once again, shows the importance of ecological fallacies in spatial analysis, such as being aware of the scaling and zoning effect that come about as a consequence of urban data interpretation.

In cases of multicollinearity, looking at the deprivation index, we use census data with parameters 'Bad Health', 'Unemployed', 'Unskilled', 'No Formal Education', which are shown to be highly correlated. Ridge regression is a better means of analysis on parameters that are highly correlated than ordinary least squared regression. In our analysis we have closer values to reality using ridge regression.

This is our first step in creating a model for predicting a deprivation index towards the production of new data standards and new official statistics based on big data.

Acknowledgment

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TABLE OF FIGURES

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Brian Moran is a doctoral researcher, working on the Building City Dashboards Project at the National Centre for Geocomputation (NCG), Maynooth University, Ireland. He holds a MSc in "Data Science and Analytics" from Maynooth University, Ireland. His research focuses in analytics and modelling problems: moving beyond visual analytics to perform data analytics, statistical modelling, generate and evaluate predictions, simulations, and optimisations. He has previously worked in the private sector as an IT project manager and a service delivery manager

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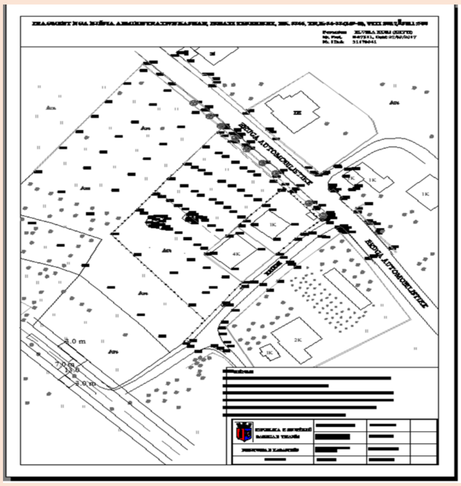

HARMONIZATION AND INTEGRATION OF GEOGRAPHICAL DATA IN A GEO-DATABASE FOR THE MUNICIPALITY OF TIRANA, ALBANIA



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ABSTRACT

Tirana Municipality lies in the central part of Albania; it is included in the Region of Tirana. Following the Territorial Reform of 2015 it is the biggest municipality in Albania in with a surface of 1,110.03 km² and with a population of 757,361 inhabitants. In the years 2007-2009 a centralized Geodatabase was built in ArcGIS 9.1 Desktop, Arcsde 9.1 in Oracle Database for the Municipality of Tirana. The data was updated until 2010, since that year the data has not been updated in the Geodatabase, the software were not upgraded. The updates were done individually in shape file format or cad without standard and data quality control. Based on the survey done in the municipality the existing Geodatabase could not be used anymore. The data and software were out of date this led to the need to create a new GIS database with different software. During the search, a geospatial database was constructed to contain layers from all municipal directories that use geospatial data or have the potential to covert in spatial data.

This paper shows the steps for the identification of these layers, methods for the implementation of these data in the Geodatabase, certain standards based on the Law on Territorial Planning of the Republic of Albania and on INSPIRE standards. At the end of this process we have a restructured, operational Geodatabase and easily accessed by internal and external users thanks to the GIS Service. The software used are PostgreSQL as a Geodatabase, QGIS as a Desktop client, and Geoserver as a Web Server. From this project we have a precise and updated Geodatabase all the users can update their data based on the role created. All the data help the development of detailed local planning and decision making by decision makers. All the employees have data updated in real time.

Keywords: *Municipality, Tirana, GIS, Geodatabase, geospatial, digital map, map standards*

I. INTRODUCTION

Developing geospatial data for different purpose as data integration and interoperability between different databases is one of main challenges toward sustainable decision making process related to spatial phenomena. Spatial planning in several levels request fully interoperable and harmonized datasets, in order decisions based on spatial analyses to be performed by using complex models of mutual relationships between spatial phenomena planned-projected in different spatial plans for the same territory. *Proceedings, 7th International Conference on Cartography and GIS, 18-23 June 2018, Sozopol, Bulgaria ISSN: 1314-0604, Eds: Bandrova T., Konečný M. 577*

The performed research is linked to the use of different spatial data in Planning and mapping in the territory of Tirana Municipality. The intention of the paper is having direct influence on the standardization of spatial data structure and infrastructure for spatial and urban planning in the municipality. Data structuring have been achieved by mathematical and conceptual reformatting of the input data, included in an integrated geospatial database.

Main goals of research are:

- Harmonizing of spatial information coming for different levels of spatial/urban plans;
- Developing a unified database with full interoperability of data from many sources;
- Geovisualization of spatial data for day to day work;
- Gathering and inputting data from different Directories and other entities;
- Use of GIS technology for geospatial analysis for spatial and urban planning;
- Creating system which will enable dynamic analyses of Geodata from different levels;
- Establishing the GeoICT system for planning/policies making - decision and sustainable development of the municipality. *Proceedings: MULTI-SCALE MAP FOR THREE LEVELS OF SPATIAL PLANNING DATA SETS FOR THE MUNICIPALITY OF VITIA IN KOSOVA Valbone Sulejmani ,Bashkim Idrizi*.

II. HISTORICAL REVIEW OF TIRANA GIS SYSTEM

The emergency needs of Municipality of Tirana, for having a ruled, controlled and managed city, made possible to start and develop the process on gathering different data in 2004 and start the process to implement this data in GIS System. For the first time was set as the basic criteria, the registration of data in a GIS system as well as facilitate and sharing data.

Tirana's role is avant-garde, because of the opportunities and comforts that gives this city and his administration, also serving as an example for other cities.

The GIS system had a limited use as it was a complex technical system and requires specialized system people to be set up on ESRI ArcGIS v 9.1. The system was up until 2007 but there were some problems. Through this system, and the information we possessed, we could not do multiple and automatic geospatial analysis in the shortest time.

Existing GIS systems cannot perform comparative analysis and dynamically whenever the zoning configuration changes for each area that needs to be studied. For example - statistics needed in relation to the population, its distribution, construction intensity, residential areas and other construction surfaces. GIS's current system functions only worked at the headquarters of the Municipality. It cannot be used in other Administrative

Units or Subsidiary Entities, while control of changes occurring in Tirana territory is done by these offices.

The GIS system cannot supply the necessary information and timely planning process Support with our specialists and with the existing database for the development of detailed local plans of Tirana cannot be realized efficiently and on time. The existing database we had in the municipality is about 8-9 years old. The programs, structures and procedures we had in the municipality have not enabled and do not allow yet a dynamic data update. Existing data on infrastructure, other municipal services related to the regulatory plan are not in the proper form in function of automatic statistics calculations. GIS and Web GIS created at that time were not based on the central database but in "shape file" or local Geodatabase which made it impossible to update the system by some users in real time and dynamically.

III. EXAMPLE IMPLEMENTATION

"GIS database" is a summary of all territorial planning documents, in accordance with the geospatial data legislation, in accordance with the principles of GIS and the individual layers of maps prepared using a digital tool. The information in the register is organized according to an integrated and multi-purpose network of local land based databases and developments in, independent and interoperable between tires. The responsible authorities shall construct, administer and maintain the database, the constituent parts of the registry, in accordance with a common geographic platform, technical platform and standards, to ensure compatibility and interaction between them and the exchange and use of the information recorded in it. There are some mandatory rule and facilities why we needed the database up and running:

- The need to have data in a unified coordinate system according to National law;
- The need to access data and information from some users simultaneously in real time;
- The legal obligation of local planning for creating GIS databases and collecting spatial information;
- To have a digital archive of New Building Construction, Detailed local Planning;
- Tirana Smart City Goal.

The GIS that we had was old and ArcGIS licenses were not update. The Oracle Database was too old and costly to buy a newer version. By doing a financial analysis, we came to the conclusion that we should go to Open Source. Since it was a system which we could create and maintain by our self with no commercial license. Using a Totally Open Source System: We used as Operating System Linux. As Database we used PostgreSQL is a powerful, open source object-relational database system with over 30 years of active development that has earned it a strong reputation for reliability, feature robustness, and performance. QGIS was used as a program to Create, edit, visualize, analyses and publish geospatial information it has a module which connects to PostgreSQL/Post GIS and manage the Database, Tables, Triggers. Import/Export data into the database.

IV. DATA CONVERSION AND MIGRATION FROM PAPER RECORDS, CAD TO GIS

We started the data gathering and collection project in the early 2017 when a new GIS Sector was created in the Municipality of Tirana which would manage all the spatial Data to support the Territory Planning. This initiative was supported and leaded by General Director of Planning and Development Territory Mr. Ditjon Baboçi. We started to collecting data from every Directory which produced spatial data or had the ability to be converted in spatial data.

At first We imported the data generated by the companies UNLAB, SBA, IND contracted to develop the General Local Plan of Tirana Municipality TR030 finished in year 2016 created in ArcGIS (*.mdb). The Urban plan consist of 3 main Layers the total package consists in 55 separate layers the Coordinate System used was UTM-34N. We started importing data from dwg/shape that we had in our computers, putting them all in one database so everyone with the right access could use them. We started standardized data after the import process for new data to be created. Beside these data we use as WMS/WMTS service as base map Layers Orthophotos from ASIG https://geoportal.asig.gov.al and sometime Open Street Map as base layers.

We started thinking of how to create a process to have fresh data created by our Directory in our database. At first we started gathering data in our General Directory of Planning and Development Territory, we began gathering data from Directory of Cadastre, Directory of Territory Planning, Directory of Control and Territory Development ("Building Permits") in cad format. These 3 Directories are the main source of spatial data. Given that for the planning of the territory the data range is different and the decision-making process is inclusive, it was reasonable to extend the data step by step both in typology and attribute.

V. DATA HARMONIZATION

Data derived from different sources means data in different standards, structure and format. The data collected went through a big process of consultation and awareness of the benefits that we would have from this system. A lot of meetings were held with specialist. All the data are passed through a topology and data check.

If the data were correctly constructed it would be imported in the database if not, it would be returned back to the Directory or Entity to fill the gaps and errors in the data.
We created some instruction for the people to create data in AutoCAD format and to maintain clean tables in Excel format later to join the data. Specific data that cannot be done it AutoCAD we created the structure for them to work directly in QGIS. Short manuals were created for the steps to use in creating data in cad format. The geographic reference of the Object was a very real problem in the Municipality some of the people used data not georeferenced to create object.

We created a base map of Tirana in dwg format with Orthophotos as an underlay layers so everyone would have a reference when creating new object. The Law of Planning Nr. 107/2014 were detailed by the Mayor of Tirana Order for the Survey done by private companies for cadastral parcel, Order 43743 Date 04.12.2017. All applicants for planning permit (or other reasons) should refer to the Order to comply with the standards in Coordinates system and GIS format for Cadastral survey of parcel of interest (for development).

It became apparent from the Cadastre Specialists to detail General cadastral plan proceeding as the Land ownership map have difference from the reality. The "E-Leje" Building Permitted System does not provide in any section of it, the spatial data as part of the documentary, but only in the digital PDF version, and this one is not georeferenced. For this reason, in 2017 the cadastral department, in the Territory Planning Directory, became a new Cadastral Directory including urban and rural cadastre.

We structured the procedure as follows. (FOR PERMISSION DEVELOPMENT, BUILDING, DESTINATION CHANGE / FUNCTION) the applicant should prepare the documents as below:

1. Fragment map of Immovable Property by IPRO, notarized (the last three months)

2. Topographic survey in scale 1: 500 according to the actual situation on the ground, coupled with the survey plan in scale 1: 2000 and Orthophotos, created by a licensed surveyor (DWG, printed and stamped with the seal of the licensed surveyor's).
3. The standard format of the answer to be used by the Territorial Planning and Development Directorate is the Document Format that you find below.

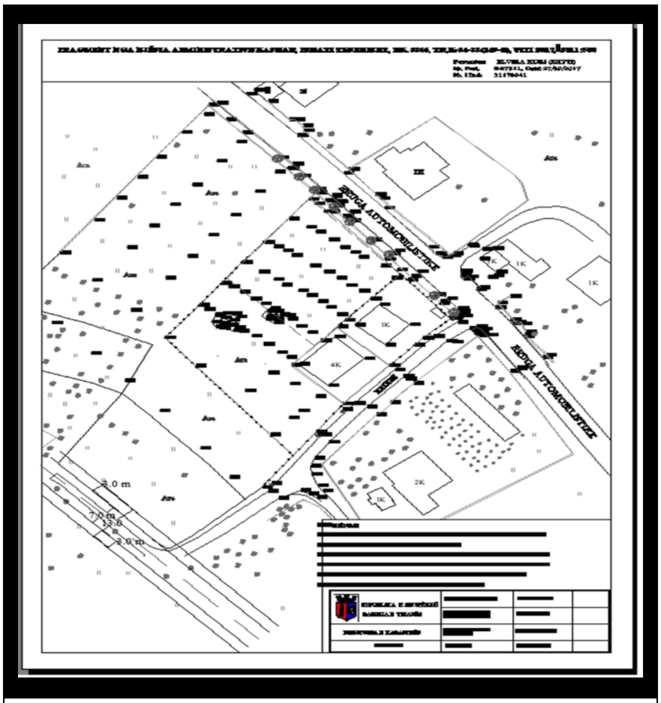

Figure 1

Structuring the *.dwg format of the The plan after compilation, 1 copy to the Plan (which is deposited in the Cadastre archive) and 3 copies on original letter paper the applicant then get the finalized document digital in dwg.

We are now in the process of drafting a new Mayor of Tirana Order for Geospatial data. This Order aims at detailing and implementing the proce-dures provided by the legislation, in place for territorial planning, with regard to applications for permits Development / Construction, updated cadastral plan, Detailed Plans Phase 1 and 2 and updates of other infrastructures, via electronic system permits, under the competence of the Municipality of Tirana survey in predefined layers and GIS format as below.

VI. DATA INTEGRATION

At The moment we have a centralized geo-database that contains data form: Cadastral, New Building Permit, Detailed Local Plan, Assets, Transportation (bicycle paths, road and railway transportation network, Traffic Light, CCTV), Co-ownership buildings, DTM, Public Art, Water Supply System, Regulatory Plan (Dataset 55 Layers), Cultural Monuments, Educational, Business taxation Land ownership, Public Work, Statistic data, JICA Project, Public work monitor, Park Recreation data, Tourism. To integrate the data between different GIS software we used Geoserver web application to create WMS, WFS service to share data in OGC standards

VII. CONCLUSION

After almost two years of the project we are instructing all Directories of the Municipality and other Entities to produce data in GIS format. To translate into legal, a Directory of Innovation and Data, was establish in May 2018 which has the responsibility of a digital archive for any data. It has two main component the Open data portal http://opendata.tirana.al/ and the GIS Sector which exchange data between them. A Procedure legislation internally was created that specify the procedure for collecting, creating, updating data in the system. An Order is being drafted to specify the standards of data creation and responsibilities for these spatial data.

This is a project that helps not only provide real-time and accurate data access, but is also an indicator of the state of the territory, where investments are concentrated.

Where are the areas that are not affected by Public Investments. It is also a good tool for measuring the performance of employees. By coordinating several scenarios, this turns into a tool for Strategic Investments.

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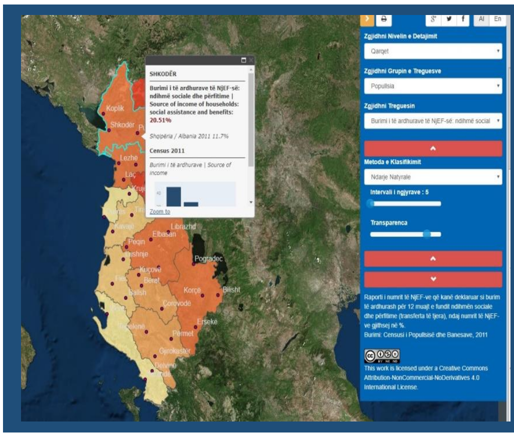
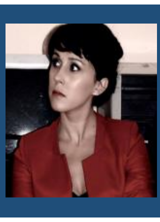
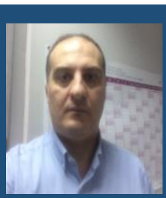


PUBLICATION OF OFFICIAL STATISTICS USING GEOSPATIAL INFORMATION AND GIS TECHNOLOGY





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ABSTRACT

The Geographical Information System provides a powerful tool for the visualization of georeferenced statistics and production of spatial data analysis. The intense economic and territorial developments of recent years dictated the importance of the integration of statistical and geospatial information in spatial decision making. The statistical service in Republic of Albania is the highest entity of the national statistical system and one of the main institution of producing official statistics and geospatial information using GIS technology. GIS can be considered as a special-purpose digital database that have the ability to perform numerous tasks utilizing both the spatial and attribute data stored within them.

In this paper, we provide some examples that show the relationships between georeferenced statistical data from census and combination with GIS features, which can provide analysis with just making simple maps. Geographic information also is used to link and geocode statistics, combining different data layers for more complex representations of statistics, to integrate the statistical data with spatial information for production of spatial analysis. So, Albanian Statistic Institute is one of the highest decision making entity for national statistical activities, especially in the setting of statistical standards and the development of concepts and methods and their implementation at the national level.

The visual impact of maps in thematic analysis facilitated the dissemination and understanding of phenomena as well as exploring new information through existing information. To support in an efficient way the users, the output can be a hard copy, digital files, or moving in direction of displaying result on a computer application through the web-GIS services.

***Keywords**:* Geographical Information System, spatial analysis, spatial data, geostatistical Analyses

I. STATISTICAL DATA AND SPATIAL ANALYSIS

GIS is a crucial instrument of implementing methods of spatial analysis, making them more accessible to a broader range of users, and hopefully more widely used in making effective decisions and in supporting scientific research. The term spatial analysis defines a set of techniques used to visualize, process or analyse data with spatial attributes. Collecting the spatial attributes (geographic location) of statistical or other data is what creates the spatial data and hence allows the spatial analysis.[8]

Cartography and GIS Sector in Albanian Statistic Institute due to the need for concerted action to promote the development of national statistics and the improvement of their comparability, promote varieties of geographical technologies, such as remote sensing, global positioning systems, etc.

This sector supports the process of integrating statistical and geospatial information, processing and disseminating national statistics, collection, analysing and dissemination of statistical information; and promoting the improvement of statistics and statistical methods in generally.

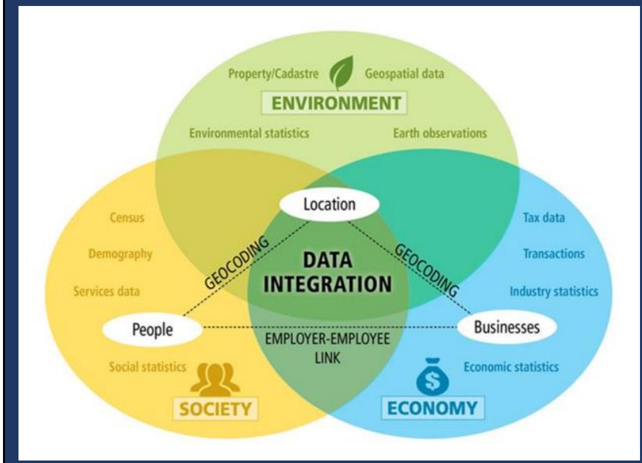

Figure 1 *Linking society, economy and environment through data integration.*

The integration of geospatial information and statistic data base support the social, economic and environmental policy decision-making, including the sub-national level. The way in which data are processes, and analysed within a GIS indicate the way that information will be used for a specific analysis or decision-making task.

Spatial data analysis is developed in two directions, like exploratory analysis (studying for patterns/relationships) and confirmatory analysis (establishing spatial process models from spatial patterns + model parameter estimation)

Albanian Statistics Institute has a good tradition of using geospatial data and integrate it with statistical data sources, mainly administrative data. It started with census maps, continued with using multiple geospatial data sources to produce land accounts, having a dynamic web tool called the Statistical Atlas and making advanced geospatial analysis. Advanced use of Earth Observation data for statistical purposes require remote sensing expertise and specialized software packages. Nevertheless, Statistics Institute has successfully been able to integrate use of observation data in publication of official statistics. During the process of Atlas Publication all qualitative data are measured and coded using quantitative methods.

GIS is applied in both quantitative and qualitative research as application of numerical analytical techniques to address geographic research questions and use of non-numerical information (e.g. conversations, interviews, questionaries). In some cases, spatial analysis has been combined with statistical techniques such as correlation

[8] https://ec.europa.eu/eurostat/statistics-explained/index.../Geospatial_analysis_at_Eurostat

(observations correlated across space) and regression analysis (incorporate correlation across space into a spatial regression model). Some of software used for Spatial Analysis of Statistical Data are ESRI's Spatial Analyst, Geostatistical Analyst, external packages when specific functionalities are missing from a GIS, Statistical packages in modelling and visualization, R and Space Stat/GeoDa, Image processing packages etc.

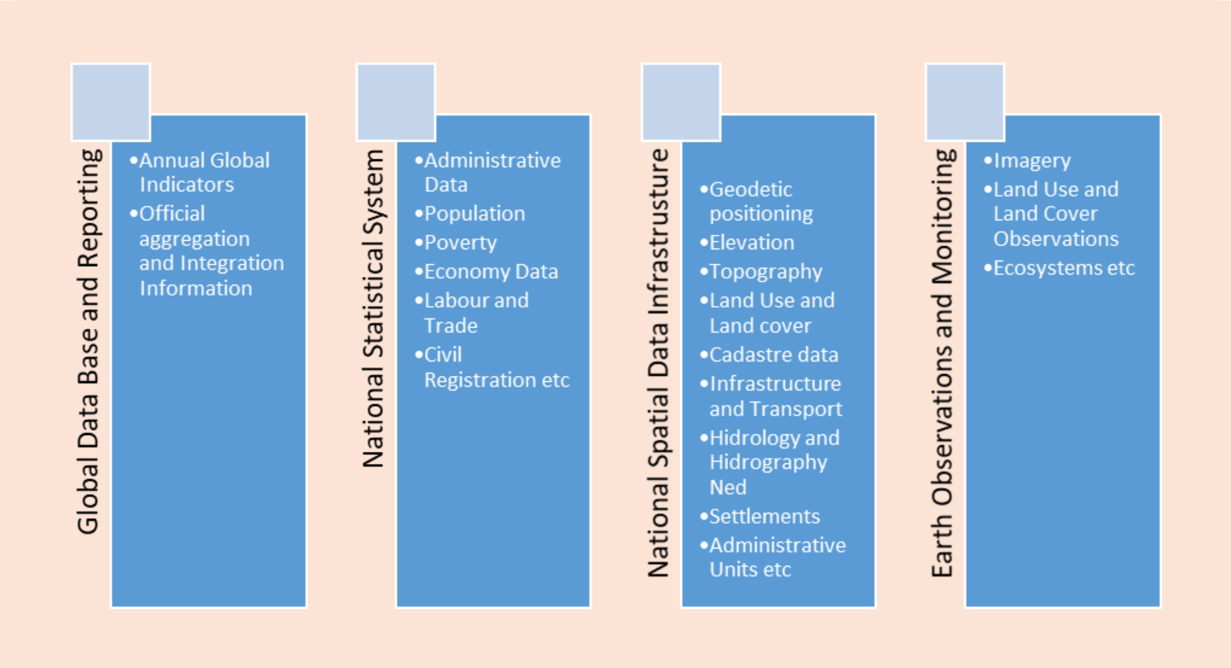

Figure 2 *The process of integrating statistical and geospatial information*

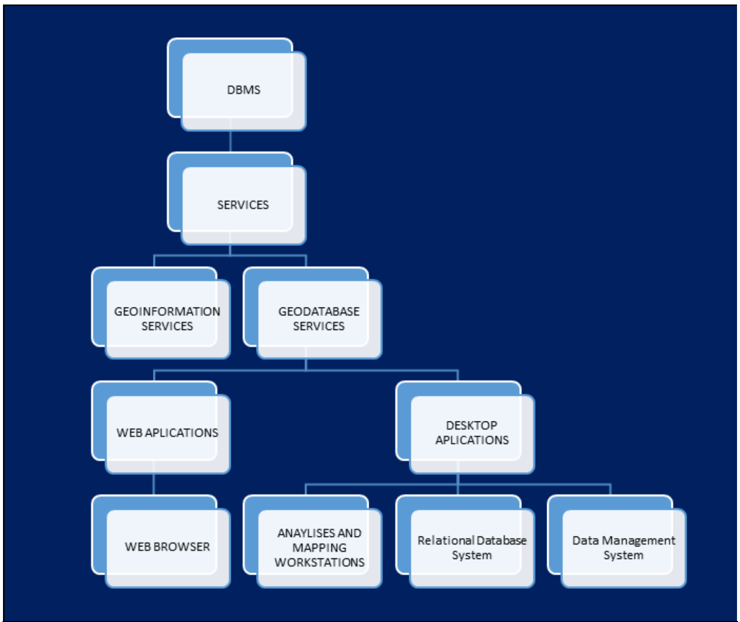

Figure 3 *A complete GIS platform supporting official statistics publication process*

Spatial Data Analysis is used for:

- Detecting possible sub-populations, outliers, trends;
- Studying relationships with neighbouring values or other spatial variables,
- Estimating model parameters from data; evaluate their statistical signicance,
- Predicting attribute values at other locations and/or future time instants
- Filtering or interpolation, etc

Methods used in mapping is the new EU urban/rural typology considers 1 km² population density grids instead of densities calculated on the areas of administrative units. Georeferenced census data and use of GIS makes possible to evaluate the level of urbanization giving a real picture. Using GIS data at the building level, allows the accurate calculation at maximal threshold of 200 meters, fixed between two buildings and application of the methods in accordance with international approaches (NUREC, UN recommendations, Urban Audit, Eurostat), in order to define the built up area as continuous.

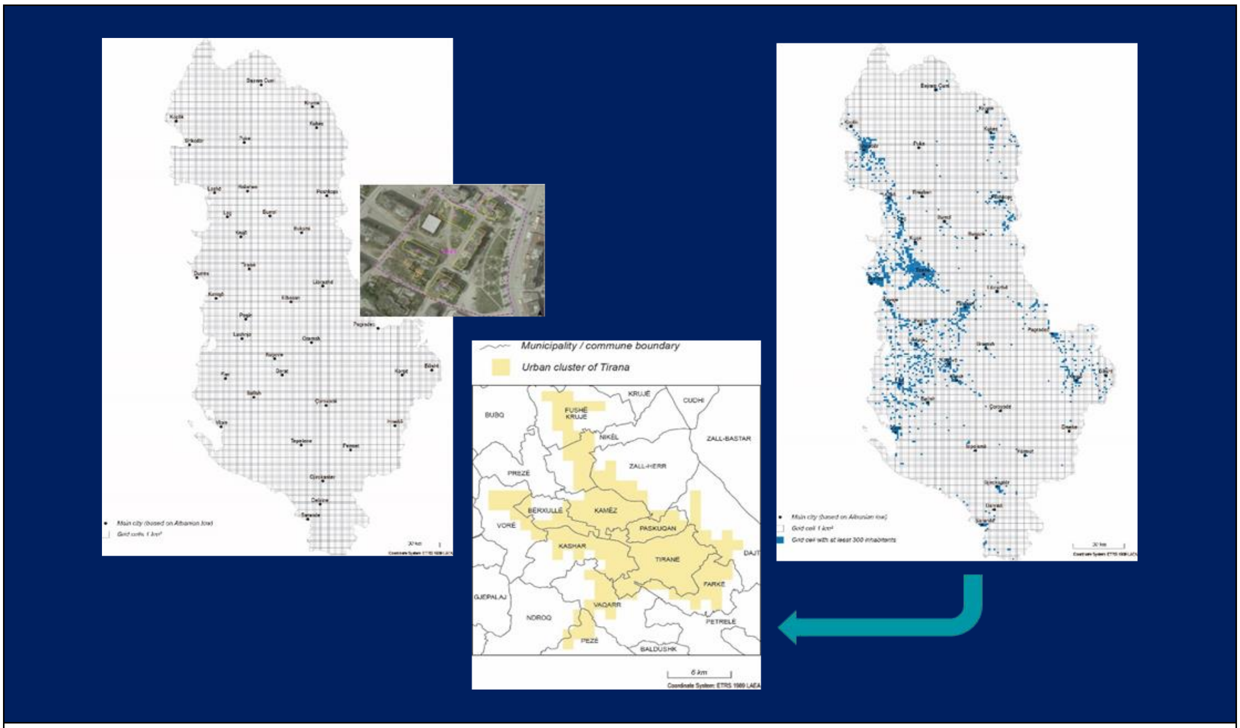

Figure 4 *EU urban/rural typology considers 1 km² population density grids, using census data and geoformation.*

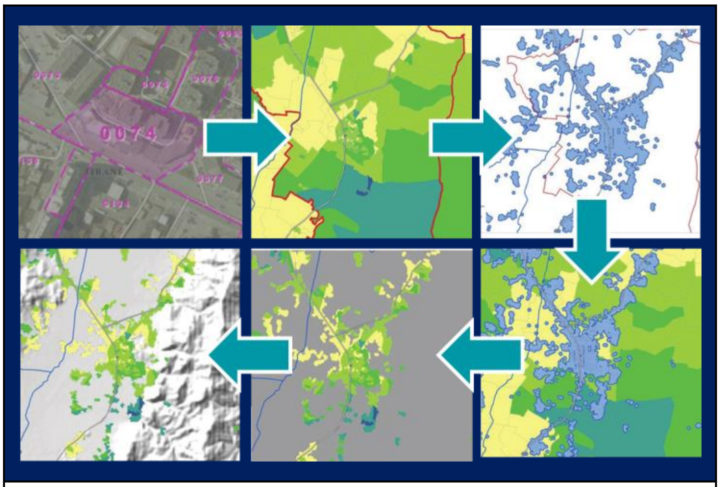

Figure 5 *Publication of the statistical data through thematic maps, represented only in continuous built up area defined.*

Statistics disseminated through choropleth maps are, more often than not, based on geographic regions developed and used by statisticians.
These geographic regions often have their genesis in population censuses where the primary purpose of these regions is to support production and release of high quality official population estimates, to manage electoral processes, regional developments, territorial management etc

Web-based GIS is the synergy between GIS and Web technologies, for the gathering, accessing and manipulating data from different sources. It is well known that Geographic Information Systems (GIS) have come to be an indispensable tool for analysing and managing spatial data and usually Web services are simply information technology assets that are often used as the basis for integration strategies that aggregate the content and capabilities in support of various processes and initiatives. Thus, GIS technology can extend and enrich those processes by providing outcomes in overall efficiency, accuracy, accessibility, and cost savings.

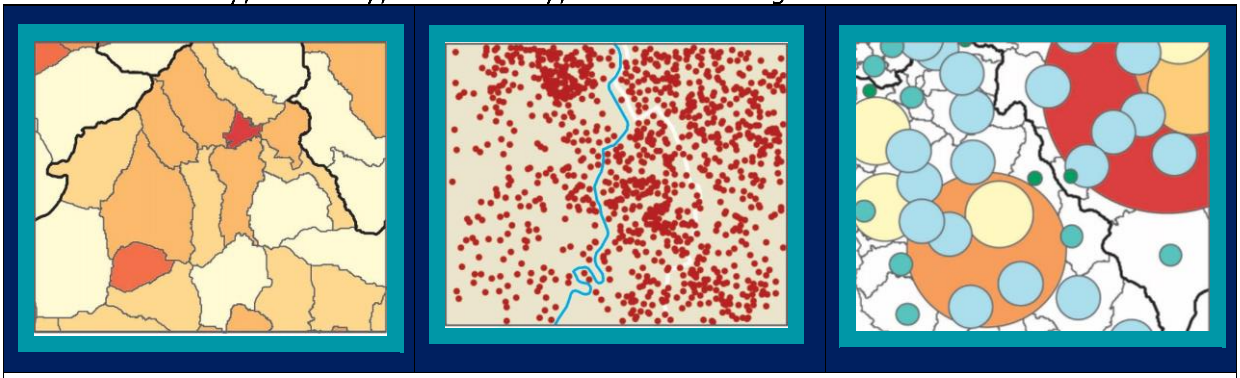

Figure 6 *Thematic maps and Atlas Publication*

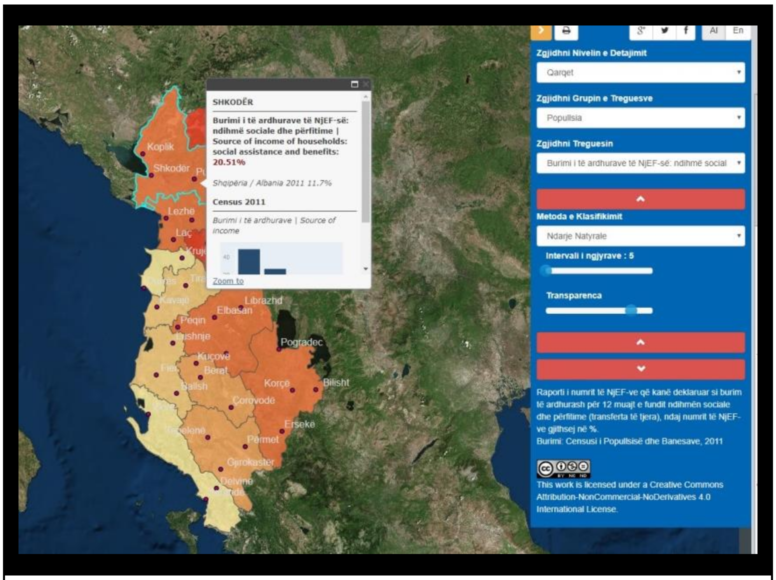

Figure 7 *Architecture and visualization of Statistical Geoportal (http://instatgis.gov.al).*

Spatial attributes can be efficiently managed using Relational Database Management System and Web-GIS can potentially make distributed geographic information available to users, which can access and work with maps and databases through a regular web browser and an integrated Viewer with a simple, user-friendly interface. Through this service is growing the communication and collaboration in decision making, effectively managing resources and datasets, improving the accessibility of information.

Web GIS portal allows the:

- Simplification and automation of data transmission and acquisition
- Operating in the system having minimal knowledge of GIS and relational database management technology.
- Sharing information and technical expertise among a wide range of users.
- “Data download” process and possibility of printing the map of interest;
- Direct access to all the meta information related to the data of interest
- Improvement of the continuous control on data flow, due to the possibility of integrating spatial analysis on demand and instruments for the automatic detection of region of interest;
- Creating reporting (creating tables, diagrams, graphs).

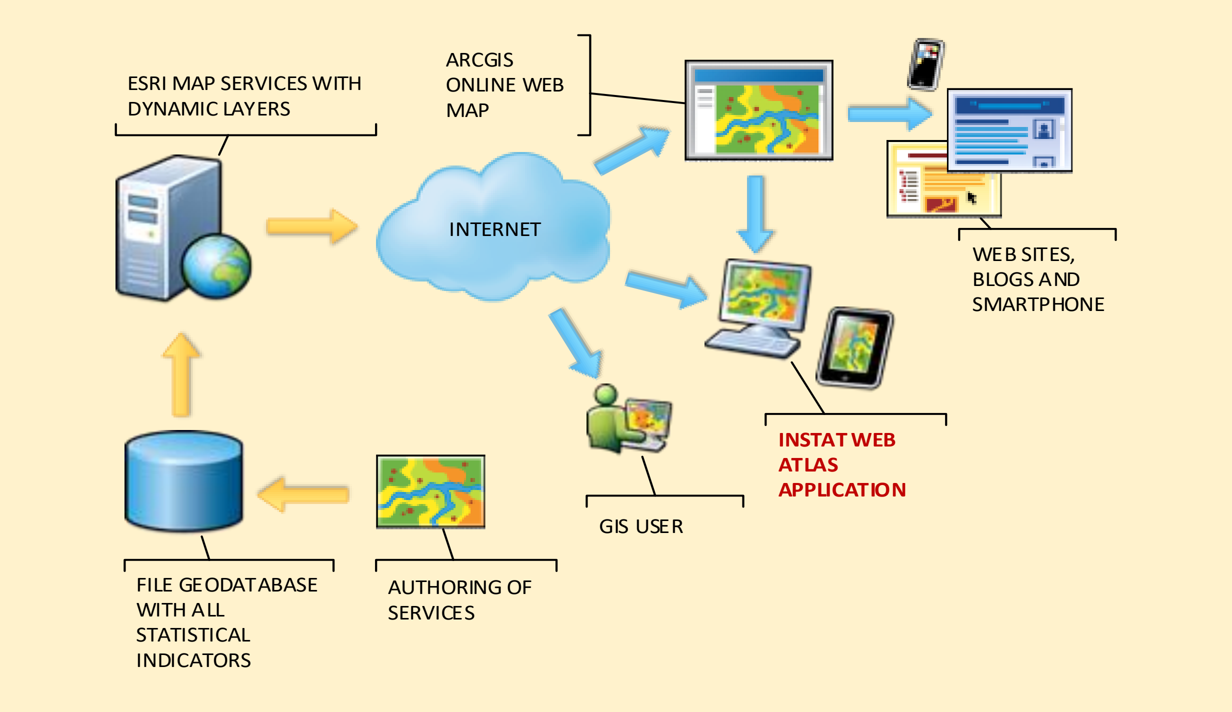

Figure 8 *Publication process of Web-GIS platform in use from official statistics*

CONCLUSIONS

Maps are the easiest understandable way of representation, because the phenomena are distributed by location in the territory. Today's scientist or decision-maker is likely to see a GIS as:

- An environment for research, rather than as a means of automating analysis.
- A tool for collecting, assembling, verifying, and editing the data; performing some analyses and presenting and interpreting the results.
- A way of selection and formulation of a problem, visualization of results, writing of conclusions; even publication through access to the Internet and the World Wide Web.

Web-GIS and Geoportals gives users an important tool to create maps as needed without the specific GIS knowledge to create, analyse and use them independently and with the various statistics available directly from their work place.

Integrating official statistical and geospatial information is one of the current promotional activities of Statistics Institute and this process is crucial for:

- regional and national decision making processes;
- measuring and monitoring sustainable development feature;
- supporting the data sharing process between institutions;
- Improving institutional collaboration between geospatial and statistical communities.

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MAPPING THE ENVIROMENTAL DAMAGES CAUSED BY TIRANA-ELBASAN HIGHWAY CONSTRUCTION


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ABSTRACT

Construction of engineering works such as highways, in addition to usefulness also bring a number of issues that need to be considered seriously starting from design stage to the stage of rehabilitation of the damaged environment. The damages that the highway bring are huge in flora, fauna, biodiversity, landscape, afforestation, soil gathering, water pollution, impact on community development etc. Moreover, the failure to access damaged areas, after their completion and their operation constitutes a serious concern for the community and nature.

The purpose of this paper is to identify and map the areas damaged by the construction of the Tirana-Elbasan Highway, creating a GIS map of the damaged areas, making recommendations for improving the situation and raising public awareness of the damage caused. The methodology used is the comparison of the existing situation with that before the highway was built. At its core is the analysis of existing graphics and satellite images, comparing changes in years, and field measurements to determine the coordinates of some control points.

To accomplish these objectives, the following steps have been taken: Identification of damaged areas on the ground; Measurements with GPS by taking the coordinates of the control point of the damaged areas; Satellite imagery of the area is received; Comparisons of images were made in different historical periods; GIS maps of damaged areas have been built. The article also provides recommendations and conclusions that may serve the community and relevant authorities to take the necessary measures to improve the situation.

Keywords**:** Highway, Cartography, GIS, Environment, Elbasan

1. INTRODUCTION

Tirana-Elbasan Highway as part of the planned A3 Highway of Albania covers the distance between the cities of Tirana and Elbasan in the shortest possible way. The technical data are as follows: The design speed is 100-120 km/h; The width of a crossing line is 3.75 m; The length of the road at the filling 18.5 km; The length of the road in excavation 17.4 km; Total tunnel length for both tubes 4.3 km; Number of overpasses 7; Number of underpasses 4. Currently, the Tirana-Elbasan highway has been operational for the most part, excluding some segments where there were problems with terrain slopes and problems with the community.

Construction of engineering works such as highways, in addition to usefulness, also bring a number of issues that need to be considered seriously from the design stage to the stage of rehabilitation of the damaged environment. The damages that the Highways bring are especially in flora, fauna, biodiversity etc. Moreover, the lack of rehabilitation of the damaged areas after their completion and operation is a serious concern for the community and nature. The actual environment situation in this region is problematic.

During the construction of the Highway, air pollution due to excavations, machinery, heavy mass explosions, and other works has been very high. Dust deposited during the years of construction of the Highway in pastures, trees, fields will take a long time to be cleansed from natural rainfall and vegetation to return to the previous state.

Because of the construction of the Highway along its entire axis, soil stocks that slip into the water resources of the area, the Erzen River, have caused water pollution, damaging the quality of water used for farming as well as for agriculture.

Damage to the landscape is very serious, especially the sliding area in Ibë, where the slope has reached all the height of the hill to its peak, risking it all to be destroyed, blocking the further work of the highway and endangering the lives of the inhabitants.

Due to massive outbreaks and erosion of the hills, forests and pastures have been severely damaged. Powders are the main cause of vegetation breakdown in this area, as well as the dumping of unnecessary soil or stocks makes it possible to damage the vegetation in this area.

Due to the degrading developments in this area, great damage has also been done to the development of tourism, flora and fauna and from a quiet and relaxed area, the Lundra and Krraba area has returned to an area where tranquillity and equilibrium natural is disturbed, accompanied with a negative impact even to the inhabitants of the area, who have lost their former tranquillity.

The purpose of this paper is to identify and map the environmental damage using GIS technology. The main objectives of the topic are: (1) Identification of environmental damage caused; (2) Carry out measurements with GPS Garmin, data processing and creation of a summary table of damaged surfaces; (3) Build a map of damaged areas with GIS technology

2. METHODOLOGY

The method used in this paper is the comparison of the existing situation with that before the Highway was built. At its core is the analysis of existing graphics, satellite images; comparing changes in years; and field measurements of coordinates of some control points. To achieve the objectives, the following steps have been taken:

1. Identification of damaged areas on the ground;
2. GPS measurements (Garmin) were performed by taking the coordinates of the control points of the damaged areas;
3. Satellite images of the area are received;
4. Comparisons of images in different historical periods;
5. GIS maps of damaged areas have been built.

The measurements are performed on the side of the Garmin Oregon 600t which features a new processor that not only enhances overall performance but also allows the screen to display higher quality maps when zoomed in. Zoom in and out is easy and smoothly functioning. The Garmin Oregon 600t is also rich in maps and can be connected to other devices such as rhythm sensors and heart rate monitors.

Data processing was carried out with the ArcGIS and BaseCAMP programs, which is a special program provided by GARMIN Company in order to facilitate the transfer and processing of data collected from the GPS GARMIN surveys on the ground. From the data we make contouring of areas and the approximate calculation of damaged areas.

After processing the information obtained from the GPS Garmin Oregon 600t on the ground, topographic material of the area and satellite images were created the GIS maps as follows: Maps of geographic position; Map of plant covering in different periods; Map of hydrographic network; Maps of transport network: Map of lithology; Map of areas of raining; Map of gathering of soil; Map of damaged areas; Map of transport network in the damaged areas

3. RESULTS

3.1. IDENTIFICATION OF DAMAGES IN THE ENVIRONMENT

From the verification in the place there are 13 areas where the construction of the highway has given its impact on the surrounding environment. The first area is located at the TEG Trade Centre and Area 13 (last) is located in the Tunnel section in the direction of Tirana-Elbasan.

In areas 1 and 2, which start from the TEG roundabout to Mullet's excavation site, a significant amount of excavation of approximately 1.5 million m3 and a reinforced filling volume of about 300,000 m3 have been required. A part of the vegetation (trees, shrubs) was cleaned in order to open the way for the project, this amount of damaged vegetation in these areas was about 210,000 m2.

Areas 3 and 4 are parts of the Highway where there is the underpass to Farkë, and the Bridge over the Erzen River. In both areas there is damage to the relief, demolition of agricultural lands, the erosion of the Erzen River waters, the deterioration of the natural equilibrium of fauna and flora, and the tranquillity of the community.

Area 5, or Sliding in Ibë is the most damaged area due to the construction of the Tirana - Elbasan highway. The beginning of the slide of the ground in Ibë occurred initially in 2004 before the highway began, and then occurred in December 2012 after heavy rainfall during the highway construction and continued in December 2014.

Although protective measures were designed after the landslide of December 2012, those failed in December 2014.

In area number 6, the Erzen River has been interrupted by extending the river bed and wearing a Gabion wall, a wall that significantly reduces the risk of corrosion of the river banks, which would lead to deterioration of the sliding situation.

Area number 7 is a hazardous area that may harm the residents in the future if no measures are taken to settle these areas. Even in this area is also affected a large area of land and field.

All the 13 areas are presented in figure 1 and 2.

Figure 1 *Presentation of areas 1 to 6*

Figure 2 *Presentation of areas 7 to 13.*

3.2. MEASUREMENTS WITH GARMIN GPS, DATA PROCESSING AND THE CREATION OF THE TABLE OF DAMAGED SURFACES

The control points taken with the Garmin GPS measurements are presented in Table 1.

Table 1 *Control Points measured with GPS Garmin*

Points	Coordinates			Points	Coordinates		
Nr	X	Y	Z	Nr	X	y	Z
25	404199	4570147	152	48	405703	4568428	127
26	404147	4570126	149	49	405810	4568410	130
27	404152	4570051	147	50	405858	4568407	132
28	404152	4570051	147	51	403978	4577697	158
29	405525	4568708	152	52	403977	4577691	159
30	405568	4568578	149	53	403958	4577714	168
31	405579	4568642	149	54	403965	4577712	167
32	405621	4568648	149	55	403973	4577699	168
33	405656	4568638	147	56	403967	4577688	169
34	405667	4568594	146	57	403978	4577697	172
35	405734	4568606	145	58	403975	4577696	171
36	405781	4568589	144	59	404182	4570170	142
37	405739	4568492	143	60	405653	4568638	151
38	405723	4568487	144	61	409200	4565750	189
39	405723	4568462	144	62	409650	4565134	268
40	405828	4568433	143	63	409646	4565095	272
41	405783	4568527	142	64	409685	4565093	277
42	409209	4565763	188	65	409694	4565106	278
43	409399	4565456	195	66	409644	4565172	264
44	409547	4565347	204	67	409644	4565173	265
45	409742	4565324	225	68	412637	4562568	417
46	405604	4568532	113	69	415023	4560922	384
47	405581	4568501	118				

Below we present the steps followed in processing the field data in the Base Camp and ArcGIS programs:

1. Opening field information and transferring data to the computer with the BASE CAMP program
2. Real time satellite imaging
3. Presentation to the position of points taken on the ground
4. Exporting Field Points to [txt] format to submit to ArcMap
5. Selecting the desired projection in the GPS program before exporting the information
6. Interpolation of the route from satellite information and image information
7. Adding information with field data to ArcMap
8. Only the provision of point-of-sight monitoring and roadside data that are covered by the GPS program
9. Presentation of monitoring points at the map of ArcMap coverage
10. Contouring of areas and the approximate calculation of areas of damaged areas

Contouring damaged areas is done by using BASECAMP and GOOGLE EARTH through building polygons. In total we have 13 damaged areas as in the figure 3 and 4.

Figure 3 *Damaged areas of the areas 1 to 6*

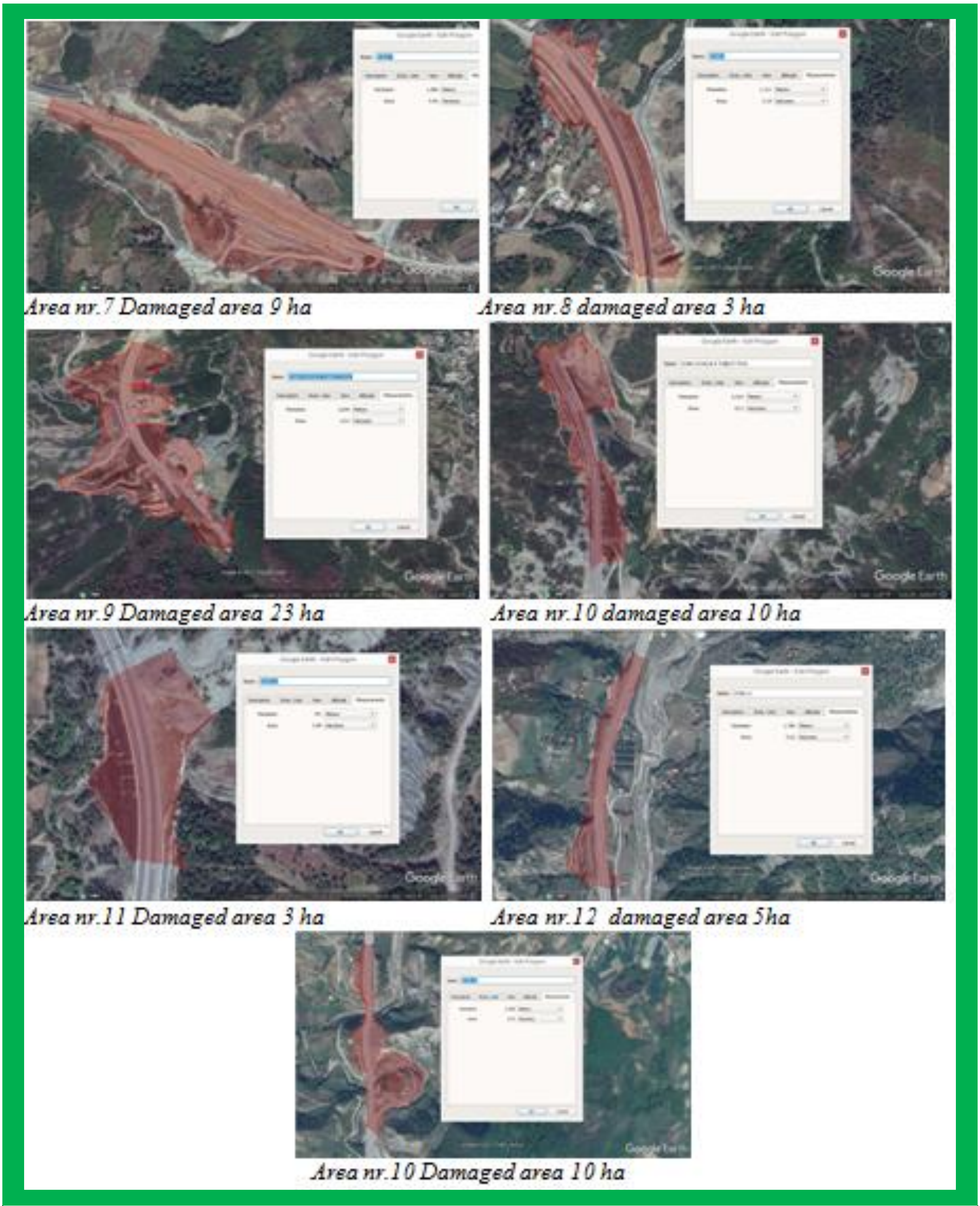

Figure 4 *Damaged areas 7 to 13*

From our measurements and data, it turns out that due to the construction of the Tirana-Elbasan highway we have a damaged area of about 170 ha, according to the table 2 below.

Table 2 *Summary overview of damaged areas*

Area	Surface (ha)
1	20
2	18
3	34
4	9
5	18
6	6
7	9
8	3
9	23
10	10
11	3
12	5
13	10
TOTAL	**168**

3.3. BUILDING THE MAP OF DAMAGED AREAS WITH GIS TECHNOLOGY

We have created some maps shown in Figures 5,6,7, using GIS technology for damaged areas.

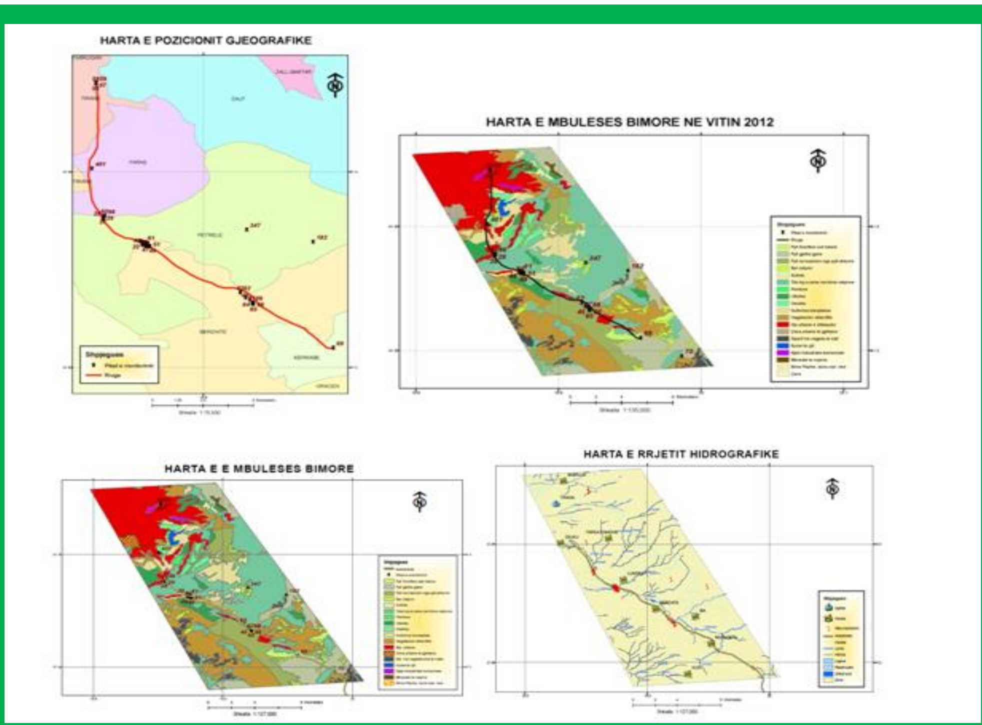

Figure 5 *Maps of geographic position;*
Map of plant covering in different periods; Map of hydrographic network

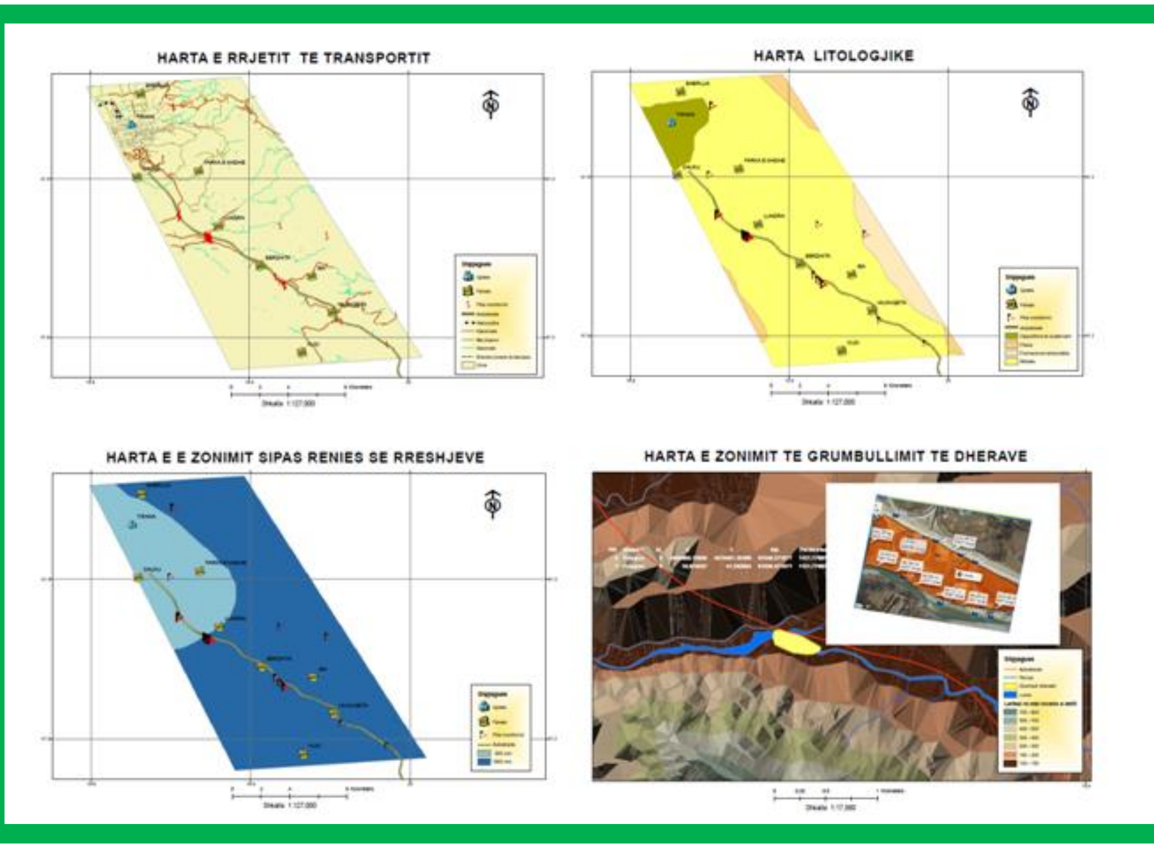

Figure 6 *Maps of transport network: Map of lithology; Map of areas of raining; Map of gathering of soil*

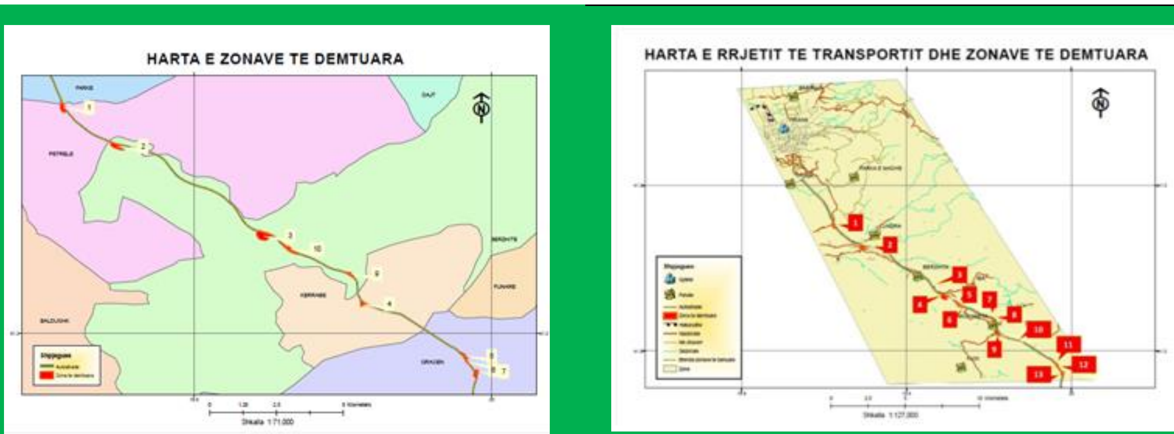

Figure 7 *Map of damaged areas; Map of transport network in the damaged areas*

4. CONCLUSIONS

1. The degree of damage to the environment due to the construction of road infrastructure in Albania is extremely high and extends across the country. These damaged areas require the taking of urgent technical and administrative measures to eliminate irreparable consequences in the future;

2. The existing legal framework for environmental protection from the constructions of road infrastructure is incomplete and the existing one is not correctly implemented and therefore does not provide for effective protection of the environment;
3. The design and construction methods of roads do not sufficiently consider environmental protection and need updates and compliance with European legislation in this area.
4. The big sliding in Ibë has shown that ignoring the geological conditions both in design and in the construction phase of the highway not only causes great financial losses but also a great risk to the lives of people living in the area.
5. Damage to the environment, water, infrastructure, forests, agricultural lands, flora and fauna on the Tirana-Elbasan highway is very high and affects an area of about 168 ha and requires rehabilitation interventions.

5. RECOMMENDATIONS

1. Considering the high degree of damage to the environment due to the construction of road infrastructure in Albania, it is recommended to take urgent technical and administrative measures to eliminate irreparable consequences in the future;
2. It is recommended by law to review the existing legal framework for environmental protection from the construction of road infrastructure.
3. It is recommended to improve the design and construction methods of roads, taking into account environmental protection and compliance with European legislation in this field.
4. In order to eliminate such natural disasters in the future, such as the sliding in Ibë is recommended to seriously consider geological studies prior to the start of the works.
5. Considering the high degree of damage to the environment, water, infrastructure, forests, agricultural lands, flora and fauna in the Tirana-Elbasan highway, it is recommended to undertake rehabilitation measures.

6. LITERATURE

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IMPROVING THE TOURIST OFFER IN HIGHLANDS OF ALBANIA AND KOSOVO, USING GIS TECHNOLOGY

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ABSTRACT

Albania in recent years can also boast of mountain tourism. This article presents a project whose main objective is to increase the capacity and competitiveness of the tourism sector in the cross-border region and economic development of the region through the promotion of its cultural, historical and natural heritage. The field of activity is tourism, highlighting the cultural, historical and natural heritage as a way of promoting economic development in the HAS area and in the Tropoja area.

The specific objective is the development and promotion of new tourist products in the mountainous areas in cooperation with the farmers of the area to offer high quality tourist services with a view to increasing their economic level. The focus areas are: in Albania: the Kukes Region (HAS and Tropoja Municipality); in Kosovo: the Gjakova, Peja, Junik and Decani regions.

The results to be achieved during this project are: Improvement of infrastructure in mountainous homes (mountain houses); Increase the capacity of the population of the area to provide quality tourism services in mountainous dwellings that will be rehabilitated; Evidencing the unique values of mountain houses, agricultural development and tourism; Construction of a tourist map using GIS technology, which will assist the orientation of tourists visiting the area.

Key words*:* *GIS, tourist offer, capacity increase, mountain houses, etc.*

1. GENERAL INFORMATION

Hasi is an ethno-geographical[9] region with very clear boundaries, surrounded almost all around the river Hasi, between the magnificent Pashtriku mountain with a height of 1989 m above sea level. To the north and east, White Drini and his branch Ereniku. In the south and west it is bordered by the province of Luma and Malesia with which the

[9] Google, Wikipedia Hasi

White Drini separates and united today Fierza Lake, while in the north-west Skatina stream separates from Butyci of the district of Tropoja. Constructed and complex geological structure, highly complex, with complex and uneven evolution; Mineral and industrial assets; Mountain shelter, with large contrasts, very fragmented, with limited opportunities for arable land, but with rich opportunities for the development of tourism, livestock, fruit trees, forestry etc; A diverse climate with a wealth of opportunities for the development of several branches of agriculture and especially of tourism;

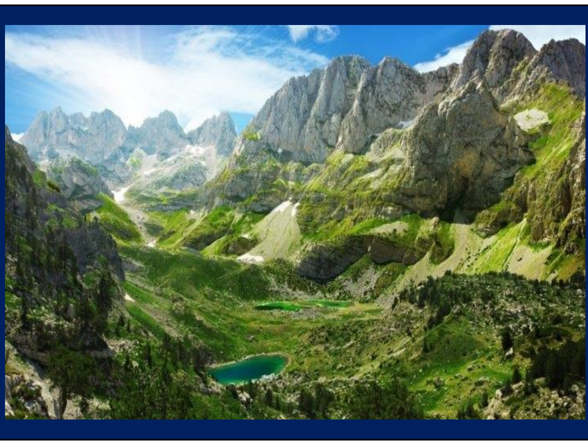

Figure 1
View of the natural beauty of the mountains

Large hydroelectric resources of great potential hydropower. Earth degraded by erosion; Varied vegetation, rich in beech forests, oak; General Features. Varied animal world, of economic and tourist importance; Small, small settlements with characteristic architecture; Rare populations mainly located in valleys and holes, with constant decline in migration. Hasi's relief comes as a result of the joint activity of endogenous and exogenous (internal and external) factors at different geological periods.

In this area there are many mineral objects, but the main one is that of Vlahna with about 3,000,000 tons of chromium reserves with 30-32% Cr_2O_3 content and in special troops with over 40%. In addition to the chromium ore, there are plenty of quartz-sulphur copper objects in the Gabri's massive captor as in the Nikolic area with about 2,000,000 tons of reserves, Golaj with 1,000,000 tons. The underground[10] assets of this region have begun to be exploited in the 1930s by Italians.

2. CULTURAL MONUMENTS

There are 30 natural monuments such as the Red Crescent Aegean and 30hectares of managed natural reserve Dr. White Drum VKM no.102, date 15.01.1996. Protected areas, with the approval of the Council of Ministers no.676 dated 20/12/2002 are: The Caving Cave, the Mazrrek Cave, the Sofar and the Dajci Cave, the Krumë Vrella, the Brrudit, the Domaj, the Harhula, the Maya and the Pisha Gjinaj.

Pashtriku Mountain, this is the most famous area of Hasi, which differs for pastures, caves, plants and rare endemic animals. It also offers beautiful landscapes, fresh air and summer destinations for tourists. It is mentioned for the forests with marked biodiversity especially in Gadhan, Cahan and Kishaj. The plateau of Dukagjini appears from above where the city of Gjakova appears between endless fields. On the other side is the Fierza lake and further the ancient city of Prizren. Mount Pashtriku lies between the four cities, the great limestone rocks give a beautiful view and to the highest mountain lies a pit called the ***Great Hurdha***. At 1700 m above sea level is ***Dragovod's Kroi*** which is distinguished for its icy water.

Hasi's relief comes as a result of the joint activity of endogenous and exogenous (internal and external) factors at different geological periods.

[10] Geological Surveys

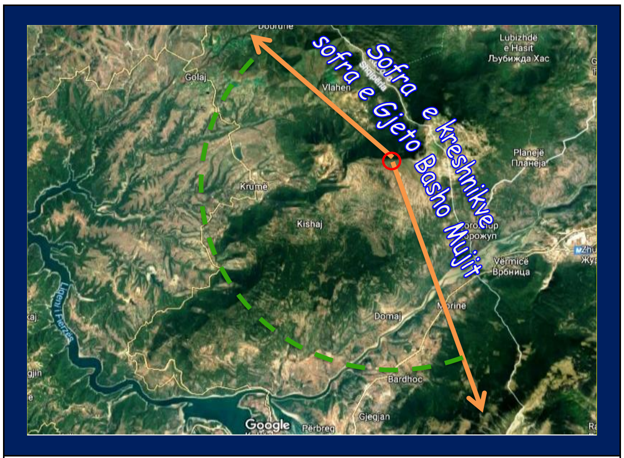

Figure 2 *The whole picture of HAS-i*

At the top of Pashtriku is the ***Good Vorri*** a very visited pilgrimage site in August. There are a number of caves surrounded by natural beauties and limestone cliffs that characterize this territory.

Here we can mention the cave of the bores a deep hollow, in the summer often there is snow, even though the temperatures are above 35 ° C. ***Women's Cave***, ***Mali i Kunores.***

The ***Dove of Pigeons*** is located on Mount Pashtriku, on the border between villages Vlaha, Dobruna and Grenica 1300 m above sea level, near the border crossing point of Guri i Bardhë. It is a karstic cave in limestone over 30 m long, 11 m wide, 5 m high where there are many wild pigeons from the name comes.

The ***Kruma Mountains*** offer beautiful landscapes and destinations, pilgrimage destinations, caves of natural and archaeological objects, climbing on the top of the town, which is the most famous tourist resort. The climbing is done by Cahani. Cave with yard is located near Kruma, 700 m above sea level. formed by the karst in limestone, is over 40 m long, 4-5 m wide, and high 8-10 m. Even without fully exploring is the Dajci cave, similar to the Dove of the Pigeons.

The ***cave that sounds in Mazrrek*** is located in Mazrrek village about 600m above sea level. Formed by the karst in limestone, it is a little known. It begins with a karstic well over 50m deep and 10-20 m wide. His name has come from the sound of stones thrown into him. The tip of the town is located near Kruma about 800m above sea level. It represents a limestone peak over the surrounding territory. There have been found remains of an old human settlement.

The ***Kruma Source (VRELLA)*** is located near Krumë about 480m above sea level. The karst spring comes to the bottom of the grove, in limestone contact. It has 600 l/sec.

Domaj's stone is located near the village of Domaj, Has 400m above sea level. Source comes into contact lithological-tectonic, limestone-terrestrial with flow rate of 300l/sec.

Brrud sources are located near the village of Brrud, 450 m above sea level. There are only two sources after the others were covered by Fierza Lake.

Gjinaj Pine is a 300 year old tree, near the village of Gjinaj, 740 m above sea level, mushroom-shaped, 20m height and 1m trunk diameter.

The ***Red Crescent Aegean*** with a surface of 12ha. It is near the village of Likeni i Kuq, 300-370m above sea level by the Lake of Fierza. It is a beech forest far below the normal height of the beech area in our country and it makes it special and very interesting. Beech trees have a height of 25-28m, diameter of trunks 35-57m and age 80-150years.

The ***Dajç Cave*** is located about 10 km east of Krumë. It is located in the Dajç neighbourhood of Mujaj village. It has been inhabited since the Bronze Age, the Iron Age and the early antiquity. This is evidenced by objects discovered in the cave such as swords, knives, pottery, etc.

3. TOURIST SERVICES

The districts of Hasi and Gjakova are unknown tourist areas, of course because of the limited investments in this area, but also the lack of attention and promotion of parts of great study importance. According to environmental statistics, biodiversity is unique in different areas and according to studies there are endemic plants in Pashtriku mountain which is a common tourist point between the two sides. Although in very small space in Has great potential for the development of green, white, water, cultural, and gastronomic tourism.

The tourist information centre or tourist information office offers tourist information for visitors visiting the country or area of the country. Tourist Information Centres aim to provide information and advice to tourists, what they have to see and do in a particular city, area or place. They can also offer bookings of various tours, visits, sell gifts in the form of souvenirs, etc.

Some may develop special events and generate marketing opportunities for tourism businesses. They can be: - A visitor centre in a special attraction or place of special interest as a landmark in a national park or a state park that provides information (such as track maps, information about camp sites, staff contacts, educational exhibitions and artefacts (for example, natural or cultural history).

Tourist Information Centre, offering visitors a location with information on area attractions, settlements, maps and other tourism-related items. Many have contributed to raising the image for the respective destinations. One of the main objectives of the Regional Tourism Strategy - West is to create conditions for the sustainable use of natural resources and cultural heritage, which will enable the promotion of western Kosovo as a tourist destination, and to improve the image of the country in general as a country of safe and attractive. It is also intended to contribute to social cohesion and the development balance in the region, as well as cross-border. Within the framework of this strategy, four (4) strategic objectives set out below are foreseen which will support the vision and purpose of this strategy.

Development of regional and cultural regional tourism through sustainable use and promotion of natural and cultural resources; Developing a comprehensive sustainable tourism infrastructure, in function of regional socio-economic development and in harmony with the environment and cultural values in the Western economic region; Building human, organizational and institutional capacities for the development of regional tourism; Increasing investments in the development of sustainable tourism and tourism businesses in the Western economic region.

4. ACTIVITIES FOR THE DEVELOPMENT OF TOURISM BY PROMOTION OF YOUR PRODUCTS

Designing a study on biodiversity of the regions in focus; Develop a feasibility study / assessment of the socio-economic context of HAS and KOSOVO regarding the focus groups' attitudes, such as young people, women and the community, towards tourism development. Creating a database of tourist offers including products, services and experiences that will be realized in the regions included in the project; Creating a database for the profile of tourists visiting Albania; Identification, marking and signalling of 5 guiding paths highlighting the natural, cultural and historical heritage of the regions in focus; Installation of 10 information points, 10 recreational points and 5 campsites.

Among other things, we can talk about creating facilities for tourists in order to enjoy nature, hospitality and local tradition; Training of farmers and small entrepreneurs for customer service, food safety and the use of environmentally friendly methods, including the use of biological heat pans; Women training for craft products marketing;

Development of study visits to exchange experiences; Selection of tourist guides; Design a Brochure on the Tourist Potential of Focus Areas.

5. USE OF GIS FOR CONSTRUCTION OF TOURISTIC ACCOMMODATIONS RELATING TO GJAKOVEN AND HASIN WITH PASHTRIK

Given the experience of using GIS in similar cases, we managed to build maps of the tourist paths of Has and Gjakova. Because of the poor infrastructure for the joint tourist point with Gjakova and Hasin we will make possible the construction of several tourist paths of average standards with the cell that every tourist should be informed and feel comfortable during their walk, Some of the steps followed by identifying the problem in the final map of the areas are as follows: (1) Collection of existing materials; (2) Determining the location of tourist trails; (3) Contact with state institutions; (4) Field of study, visits and measurements; (5) field data format in ArcGIS 10.3; (6) Build GIS maps for the tourist paths in these areas; The following are maps in the GIS of the zones.

Figure 3 *GIS Pashtriku tourist's paths map*

The tourist paths that are developed in this area are creating great opportunities for the development of the area and agro farms and apartments. Paths are proposed as follows:

1-Path Kushninë - Pashtriku peak 13.4km long (Part of Gjakova) 1986 meters with sea level. We drive from Gjakova with a half-hour vehicle to Kushnin. In Kushnin there are two alternatives: a) Direct climb to the top and b) Kushnin 431 meters above sea level - Qafa Liken 1254m/lmd - Kroni Pojates Vahen 1700m / lmd - Pashtriku May 1986m/lmd. Length of the trail total 25km walking 5:30h climbing + 3:30h. Return: there are difficulties at low difficulty level through a trail, with a glamorous flora, a panorama of Fierza Lake, and the Sarisalltikut grave. May-October period is preferred.

2- Cahan Path - Pashtriku Peak - Wattle, length 11 km Part from Hasi. Each path must be equipped with the necessary signalling at the beginning and throughout it. At the beginning of each path, a wooden panel must be placed with the corresponding map in which to indicate the desi-nation, the distance, the type of pathway, the degree of difficulty, panoramic balconies, etc.

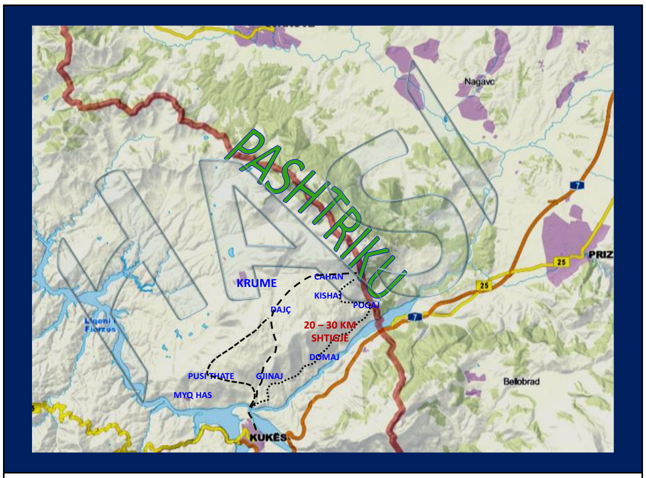

Figure 4 *Tourist trails realized in GIS*

In addition, among others, paths must be equipped with telephone lines, which can be used in emergency situations. The signage can be prepared with wood materials that do not pollute the environment.

6. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

At the end of this project in the City of Krume, there will be many benefits and permits of the environment in the field of mountain tourism, in the focus always the residents of HAS and the Kosovar side who have a common tourist point.

Recommendations

- Collaboration and action with each other to achieve a more fruitful result.
- Improvement of infrastructure in mountainous homes (flat)
- Increase the capacity of the population of the area to provide quality tourism services in mountainous homes (stanet) to be rehabilitated.
- Evidence of the unique values of mountain dwellings, for the development of agriculture and tourism.
- Increasing the capacity and competitiveness of the tourism sector in the cross-border region aiming at its economic development through the promotion of cultural, historical and natural heritage.
- Development and promotion of new tourist products in mountainous areas in cooperation with the area's farmers.
  Increase the capacities of the local farmers in providing high quality tourist services with the aim of increasing their economic level.

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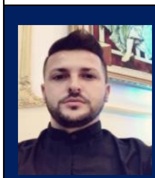	**MSc.Ideal SPAHIU** Born in Fajza, Kukes 1988. Completed studies 2011 University of Tirana, Faculty of Economics Finance branch, 2015 University of Tirana, Faculty of Philology Branch History. Work Experience: January 2007 Younger Youth (MGO) Board Member. A project supported and funded by World Learning and USAID. June 2008 Teleperformanca Tirana as an Italian operator in several projects of this company. September 2011INSTAT. Economist at Hari Lena GROUP July 2014.