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GEOMATICS

MAPPING INDOOR AREA USING FREE ANDROID APPLICATION PATH GUIDE

BEST STUDENT PAPER

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ABSTRACT

Indoor navigation is the term we encounter every day. Whether the space is used for the traffic of people and goods, such as airports, railway stations, industrial plants, large business buildings, world fair, congress centers, or indoor areas that people visit with personal motives, for example, museums, shopping malls and so like, the goal is the same: to know where someone or something is located in that indoor area, and how to get a desired destination.

Navigation using GNSS became standard techniques nowadays, but GNSS signals reception in indoor environments is difficult or impossible. However, other positioning technologies can be used when needed by automatic positioning. Some of these technologies are based on radio signal, such as Wi-Fi, Bluetooth or RFID, while others relay on other positioning methods (dead reckoning, maps, etc.). Students of the Master program at the department of Geodesy and Geoinformatics of the Faculty of Civil Engineering in Sarajevo investigated the possibilities of mapping enclosed areas using the free Android application Path Guide. In this paper results, conclusions and proposed guidelines for further actions in order to create an autonomous indoor navigation system at the Faculty of Civil Engineering in Sarajevo are presented.

Keywords: *Indoor navigation, Indoor Positioning System (IPS), Radio Frequency*

1 INTRODUCTION

This paper examines the technology which has been ascending in importance in recent years – indoor navigation. Since the GNSS is considerably used in navigation from point A to point B, and it has greatly facilitated people's movement and orientation, the question arises if there is an equivalent to GNSS that is possible to use in indoor spaces. Namely, due to limitations in the form of weak signal spread in buildings, and introduction of multipath, GNSS is not suitable for usage in indoor spaces. This means that an alternative solution is necessary. There are many technologies being considered as adequate, including acoustic, dead reckoning, those based on RF, such as Wi-Fi, Bluetooth etc. This paper considers the Path Guide application.(Lemmens 2013)

Path Guide is a research project of Microsoft Research Asia, which according to researchers "provides full indoor navigation service "plug and play" which doesn't require maps or any other additional equipment" (PathGuide n.d). Application in conceived in a way that users use their smart phones to collect data through sensors and form routes based on data. There are three simple steps to start using the Path Guide.

User records sensory data with his device during the assigned "walk" inside an indoor object. Geomagnetic characteristics specific for a location, drawn from sensory data, are further combined with user's walks (example: steps, twists, ups/downs) to create a reference mark. (Google play store 2017)

The reference mark is then pushed to cloud, where other users can browse for it for navigation. Once the reference mark is downloaded, Path Guidecompares and synchronizes current sensor readings with the reference mark and takes the user in real time from the starting location to the end destination. (Google play store 2017)

Path guide can be used in many scenarios. For example, users like shop owners can record paths from different mall entrances to their shops and share them with public. These paths can be browsed for by any future buyer. Moreover, user can record a path and follow it backwards to the starting location. For example, in a new garage you could record a path from the parking spot to the elevator, and then follow it backwards to find your car. (Google play store 2017)

The application uses the data from sensors previously installed in smartphones, such as accelerometer and magnetometer. A "person" visits a location in an indoor space and records the path in an application which pushes sensory data together with the walks of Cloud users. Every other user can now follow that path to arrive to a desired destination. (Google play store 2017)

With more users following the same path, more additional data is collected, and the overall user experience is improved. Besides that, users can add text, audio and photographs as path annotations for more information. (Google play store 2017)

2. METHODOLOGY AND DATA

Chosen location was the main building of the Faculty of Civil Engineering in Sarajevo. Four groups were assigned to use the application installed on different smartphones. Table 2.1. shows mobile devices used, together with sensors they possess. Every group was assigned a different floor of the building. Mode of operation was as follows: a group member creates a route or collects the data on a certain part of the building, after that other members of the group try to navigate and locate a certain "point" using the data provided by their colleagues, all with the help of the Path Guide

application. The end product should be enabling of the indoor navigation throughout the whole building of the Faculty of Civil Engineering in Sarajevo. However, we did not quite arrive to the end project since the application does not offer indoor navigation in a desired way.

Table 1 *Mobile devices and sensors they possess*

Mobile devices	Sensors
Samsung A5 (2017)	Accelerometer, Gyroscope, Compass, Barometer, Proximity sensor
LG Q6	Compass/Magnetometer, Proximity sensor, Accelerometer, Ambient light sensor and Gyroscope
Samsung Galaxy S4	Temperature/Humidity Sensor, Accelerometer, Barometer, Gesture Sensor, Proximity Sensor, Geomagnetic Sensor, Gyro Sensor(GSMArena 2018)

As one example of work done in this area, pedestrian dead reckoning was considered in Beauregard and Haas (2006) with the use of walking speed and displacement estimation in terms of the number of steps taken by a person. The number of steps taken was sensed by an accelerometer worn by the individual during the walk from the known location to an unknown location. A neural network was used to train a model for estimating the number of steps based on the accelerometer readings. The accuracy was within 10 m after a 1 km walk.(Karimi 2015)

3. PRACTICAL USE OF THE APPLICATION

The first step when using the application is calibration of the sensors. The process of calibration is done through movement of the phone in the shape of the number 8. The application is then ready to be used. Then we go to the starting point, launch the application and select between the two modes of operation. (Figure 2.1) We selected the mode that enables us to take a person to a certain point of interest.

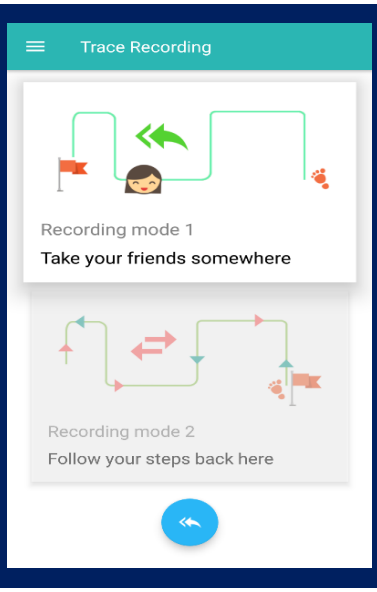

Figure 1
Modes of route record

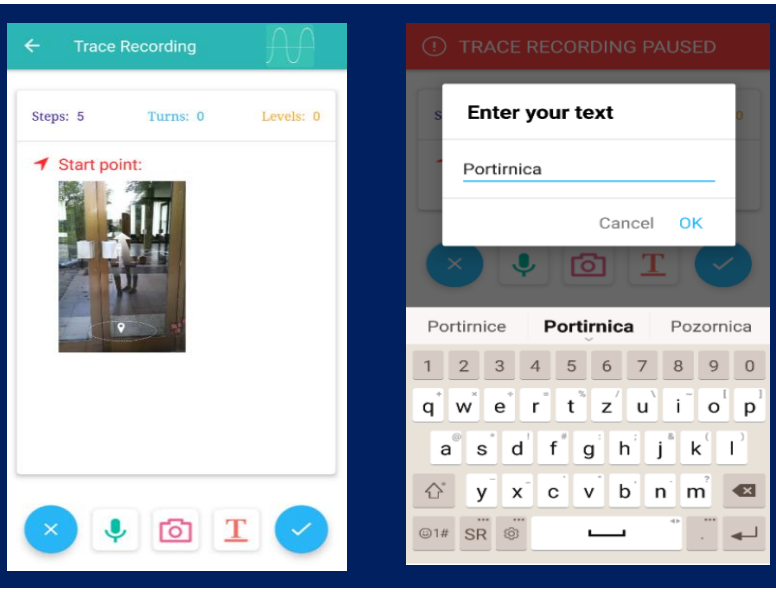

Figure 2
(a) Starting point; (b) Input of text remark

After that the user needs to take a photo of the starting point (Figure 2.2 (a)). After that the user can move and the device will count the steps taken and register changes in movement direction. Besides that, the user has a possibility of inputting annotations, such as text (Figure 2.2 (b)), or photos of different locations. Input of annotations is done at the location of the place the remark considers. If the two annotations are too close to each other, the device won't allow the second remark input, and the application will inform the user. (Figure 2.3 (a))

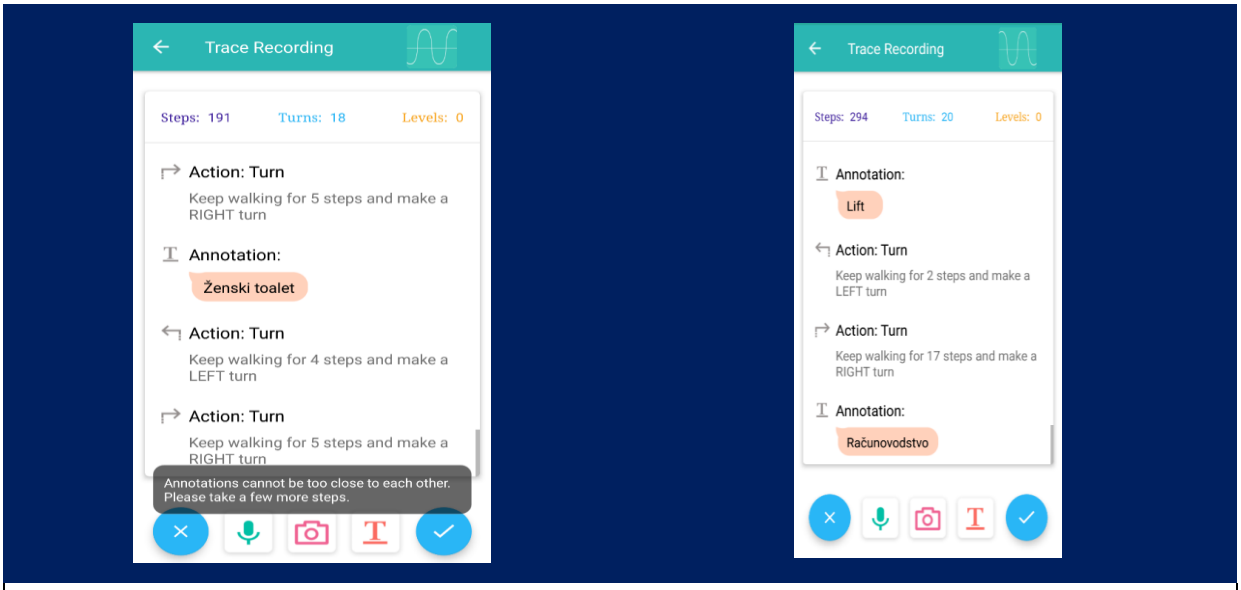

Figure 3 (a) *Annotations too close;* (b) *Route during the recording process*

Figure 3 (b) shows how the route appears on the screen during the recording process. Previous directions of movement and inputted annotations are given, as well as the number of steps taken and number of changes in directions. The application also gives user an indication of the floor he's placed on.

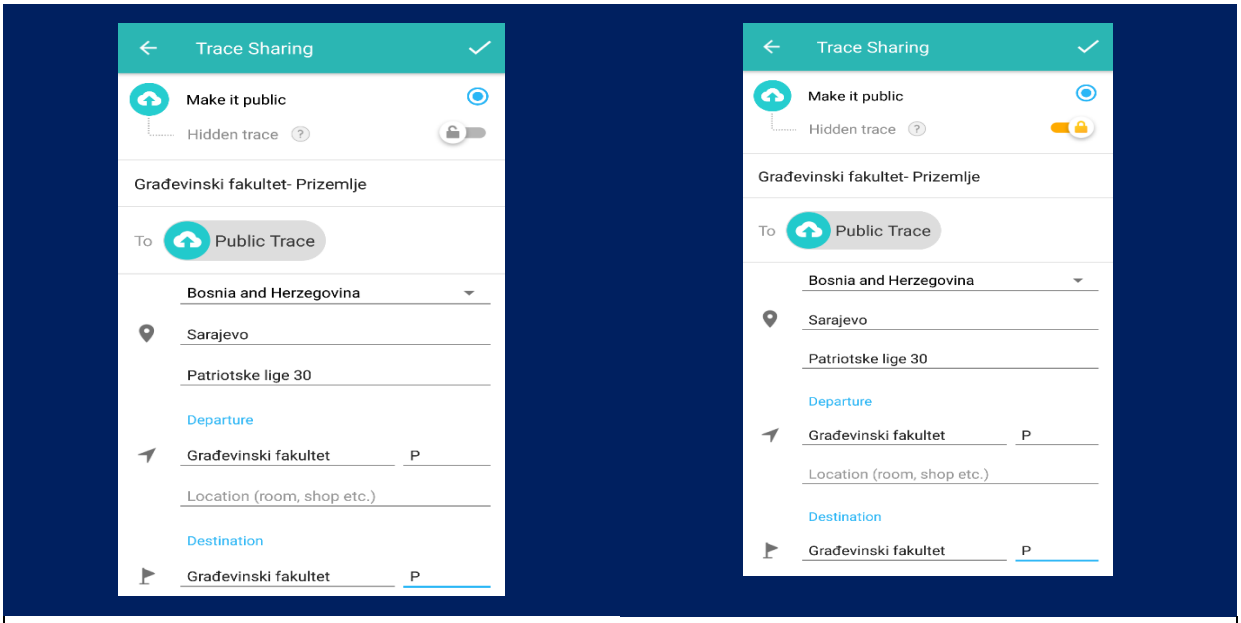

Figure 4 *Project data and privacy setting*

When the recording process is finished, the user confirms he's done with the record, and the application shows a window (Figure2.4.) in which we input the data on the space recorded and privacy settings. Some of the fields are mandatory, so the project cannot be saved before inputting this data. After that the project uploads (Figure 2.5. (a)), and since we selected the "hidden trace" option, offers a link through which the user can share his route (Figure 2.5 (b)).

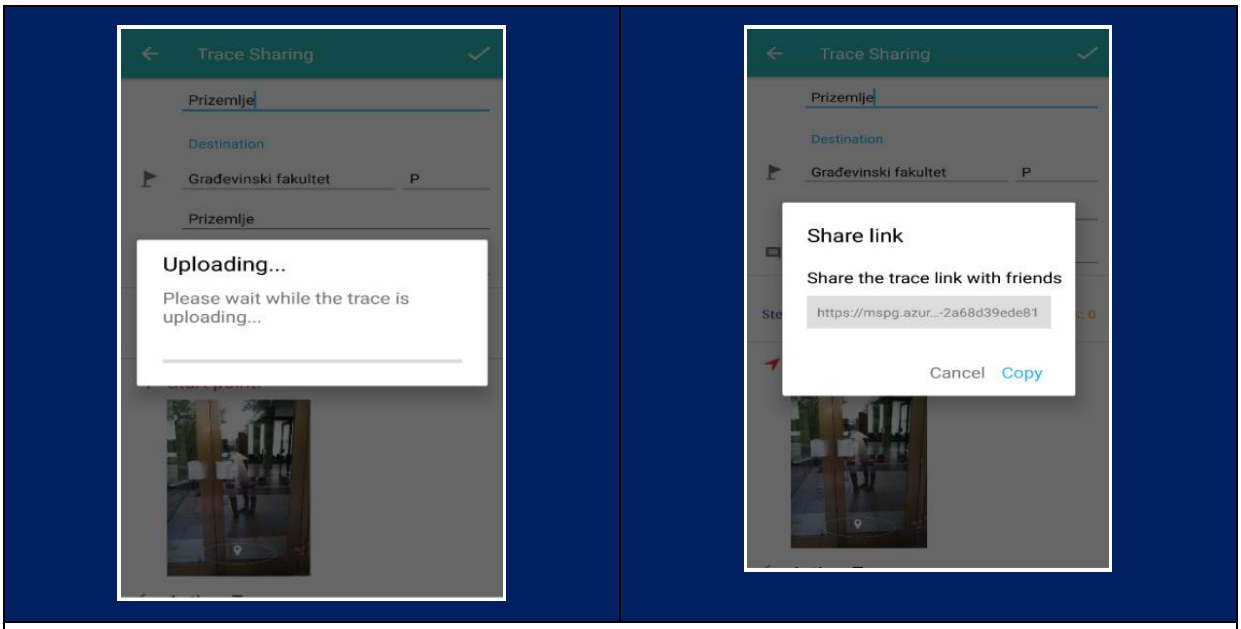

Figure 5 *(a) Project upload (b) Link for route sharing*

After we created and saved the project, we tested it by active using.

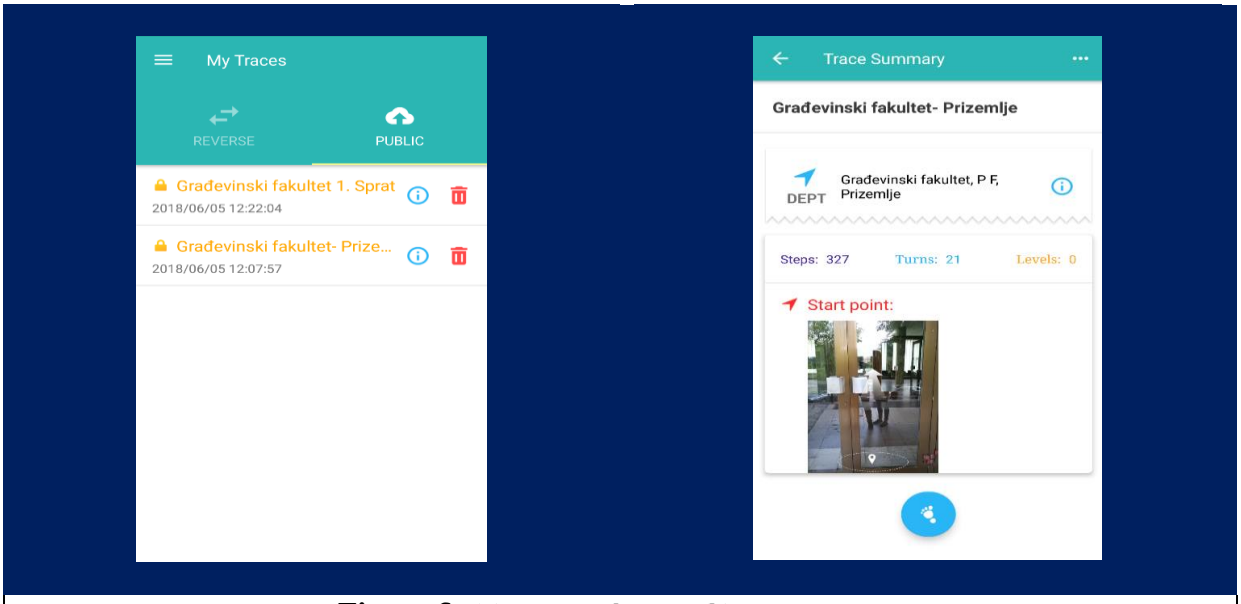

Figure 6 *(a) Route selection (b) Starting point*

If we want to use the project on the same device where we saved it, the user selects My Traces option and chooses desired a route (Figure2.6. (a)). If we're using the project on a different device, the user chooses the link. After that he selects the starting option. The application then directs the user to the starting point, namely the location that is on the photo (Figure 2.6. (b)). After that the application tells us in which direction

to go and how many steps to take to arrive to the destination. (Figure 7. (a)). If the user does not follow the application directions, the application informs him (Figure 2.7. (b) and offers direction to a certain point.

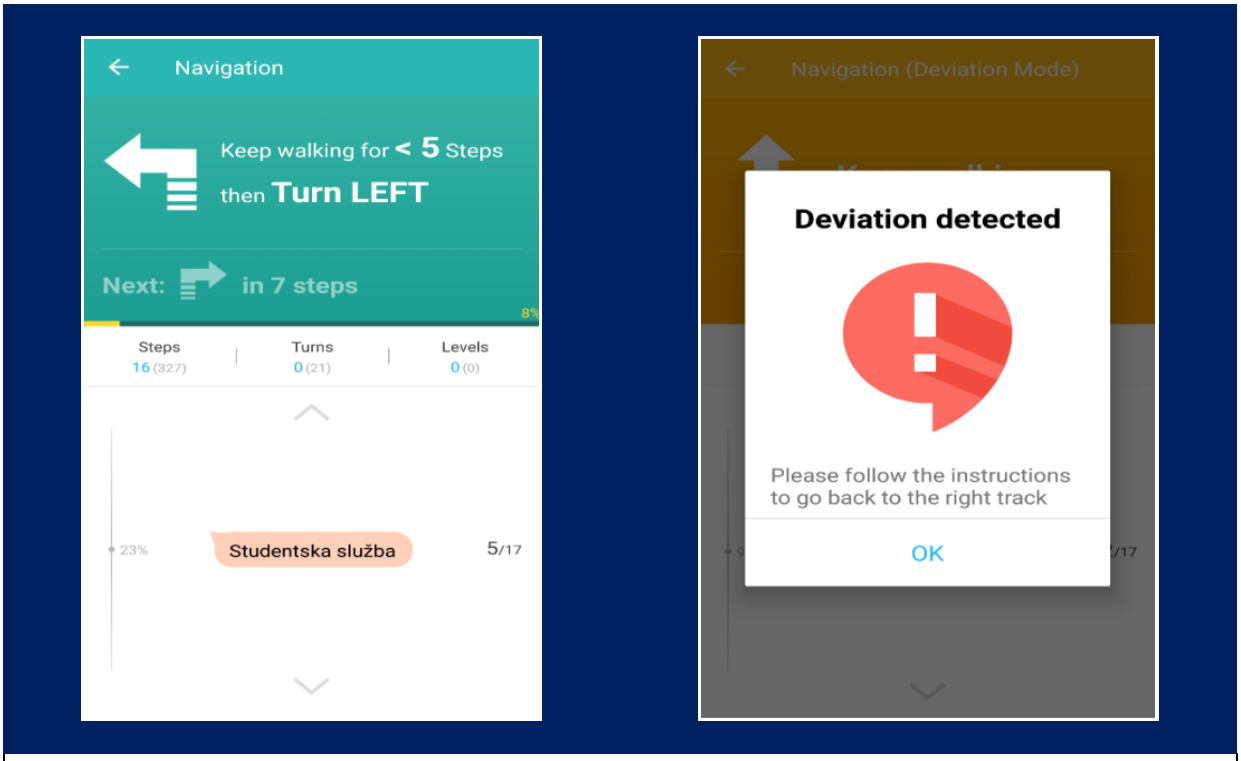

Figure 7 (a) *Navigation through the application;* (b) *Informing of a certain deviation in movement*

4. RESULTS AND DISCUSSION

This paper aimed to examine the possibilities and efficiency of Path Guide application. When testing the application at the first floor of building of the Faculty of the Civil Engineering in Sarajevo, we noticed that the application does not offer a possibility of a selection of a certain room to which we want to arrive, that is, if we want the map to take us to a desired room, we need to pass all the other rooms previously mapped. Here we conclude that we cannot go directly to a desired room. If we try to go directly to a desired room without using the map, the application will show a warning sign. This confirms an imperfection we already mentioned. Besides the first floor, students did a tour of the second, third and ground floor, since the paper aimed to enable the usage of this application, and by the same token, indoor navigation in the whole building of the Faculty of Civil Engineering in Sarajevo.

5. CONCLUSION

Considering this paper aimed to test the possibilities of this application as a navigation tool in indoor spaces, the conclusion that follows is in accordance with this aim. By using the application, we found that the initial idea is well thought, that the application functions properly with the given possibilities, and that sensors give values with acceptable deviations. However, there are different remarks for certain parts. Namely, as shown in pictures, during the map recording we opened a project and then walked from a point to a different point, whereby we made and saved remarks along the path. In the end we saved the project and shared the link with our colleagues. When we tested the map, we noticed that if we wanted to come to a certain point which is

relatively close to the starting point but was recorded as the last one in the route, the application navigates the user to walk the whole route before it finally takes you to that point. Solution for this situation is to individually record every route from the starting point to the interest point, and save every one of them as a different project. This is very time consuming and impractical, and moreover the user would have to browse for, or use, a different link for every interest point. Another imperfection, or a lack, is the fact that there is a minimum number of steps necessary to take from one to another remark, otherwise the user cannot select the option to input more remarks which he is informed about through the application. Last imperfection is the fact that at one point we cannot input both photo and text remark about whatever we want to map, but rather the user has to choose between the two options. Mentioned imperfections could be compensated with the implantation of suitable sensors in the smartphones, or by modification of the program code based on which this application was made and functions on.

6. REFERENCES

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7. AUTHOR'S BIO

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EVALUATING OF COASTAL EROSION ALONG ALBANIAN ADRIATIC COAST

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ABSTRACT

Coastal erosion is one of the most dynamic processes and has become a serious phenomenon along the Albanian Adriatic Coast (AAC). Combination of many factors such as waves and wind action along the coastline, sea level rise, reduction of fluvial sediments as consequence of dam construction, exploitation of riverbed etc., has caused extensive erosion along the AAC. In some part of the coastline, erosion phenomenon is very strong and the sea water has advanced from hundreds to thousands of meters toward the land.

The AAC area, so far is considered as major source of economic development, agriculture tourism and infrastructure, thus evaluating and predicting coastal erosion and future assessment is a very important issue. The undertaken work focuses on analyzing the dynamics of coastal erosion along the AAC, using spatial temporal data and taking the advantages of Geographic Information System (GIS) technology and methods. The data used, have been generated from a variety of spatial and temporal data source, such as historical maps, digital orthophoto and field measured data, for a time interval from 1870-2015. With historical shoreline data input, the erosion and deposition rates can be estimated by overlaying, using GIS tools and the rate of coastline erosion and future assessment can be calculated by Digital Shoreline Analysis System (DSAS) and Linear Regression Rate (LRR).

Keywords: *Coastal erosion, GIS, Shoreline*

1. INTRODUCTION

The progress of GIS (Geographic Information System) technology has facilitated the development of some applications for shoreline change analysis. Besides some traditional computation from modeling, GIS also support effective methods for monitoring shoreline position. Using the tools of GIS, the rates of shoreline change would be quickly determined for a regional area. Through the input data from extracted shoreline information from historical maps, as well as by orthoimagery, GIS tool can be used to calculate long-term shoreline change rate. This method is very effective because it would save time and costs [1]. To analyze shoreline evolution and its trends, it's needed to have a definition of the term "shoreline". Having in consideration the dynamic nature of this boundary, the definition should consider the shoreline in two dimensions, a spatial dimension and temporal one. In this work, the shoreline position was defined as the water line at the time of the mapping because the study area has been considered to be located in a micro tidal environment [2]. Detection techniques vary depending on the data source and the chosen shoreline definition. With historical shoreline data input, the erosion and deposition rates can be estimated by overlaying using GIS tool. The rate of shoreline change can be calculated by DSAS (Digital Shoreline Analysis System), an extension for ArcGIS. DSAS is a digital shoreline analysis tool that can be used to compute rate-of-change statistics for a time series of historical shoreline data which is developed by United States Geological Survey (USGS) [3].

2. STUDY AREA

According to the many researches, results that geomorphologic classification of the AAC comprises two principal major zones: 1-Adriatic coastline of Periadriatic depression in the central and northwestern part of Albania, where there are three different segments: a) accumulative segments, which represent main part of the coastline, b) erosive segments, and c) submerged littoral areas, where is observed marine transgression toward the mainland. The Adriatic coastline dynamics is conditioned by geological setting of the western side of Albanides, the neotectonic developments, the dynamics of the sea level as well as by the solid material discharge from Albanian rivers network to the Adriatic Sea. Periadriatic depression consists of Miocene to Plio-Quaternary premolasse, molasse and late molasse deposits, which cover transgressively most of the Apulia-Sazani Foreland and partly the Ionian-Kruja-Gavrovo orogeny nappe.2-Erosive coastline of Ionian tectonic zone in the southwestern part of Albania (**Figure 1**).

3. DATA SOURCE AND METHOD

To map and evaluate shoreline dynamic we have used different type of spatial data source: Topographic maps of year 1918, based on Bessel ellipsoid and Gauss-Kryger projection, at scale 1:75 000 with scanning resolution 7.5 m; Topographic maps of year 1937, based on Bessel ellipsoid and Bonne projection, at scale 1:50 000 with scanning resolution 5m; Topographic maps of year 1985, based on Krasovsky ellipsoid and Gauss-Kryger projection, at scale 1:25 000 with scanning resolution 2.5 m; Orthoimagery year 2007, spatial resolution 0.35 m, based on WGS 1984 ellipsoid and UTM projection. Field survey data year 2014.

The rate of evolution of shoreline has been calculated between two successive data, as well as the net rate of erosion over all the time period of the survey. The workflow process of calculation of Net Shoreline Movement (NSM) and End Point Rate (EPR) is completed using Digital Shoreline Analysis System (DSAS).

NSM represents the distance between the oldest and youngest shorelines. If this distance is divided by the number of years elapsed by two shoreline position between the earliest and latest measurements (i.e, the oldest and the most recent shoreline) the results is EPR. The EPR parameter shows the mean annual rate of shoreline movement. The major advantage of the EPR is its ease of computation and minimal requirements for shoreline data (two shorelines).

4. RESULTS AND DISCUSSION

At the mouth of the Buna River there is a land advancement towards the sea, thus dominating the accumulation phenomenon, if we consider all the period of study, but in recent years there is a dominant phenomenon of erosion. Between 1985 and 2015, an area of 51 ha is eroded with dimension of 2300 m long and an average width of 220 m, with an average advancement of 7.4 m/year.

The shoreline advancement ranges from -7 - (-8) m / year to the eastern side of the Buna River Delta up to + 10- (+12) m / year, near Velipoja.The Segment from Velipoja to the Rëra e Hedhur beach with a total length of about 14 km is characterized by erosion phenomenon where according to the calculations it results that: for the time period 1870 - 2015 the advancement of the shoreline moves in the interval 50-250 m at an average rate of 0.3 m/year-1.7m/year. This advancement towards land continues and so far has been eroded an area of 133 ha, with an average rate of 0.95ha / year.

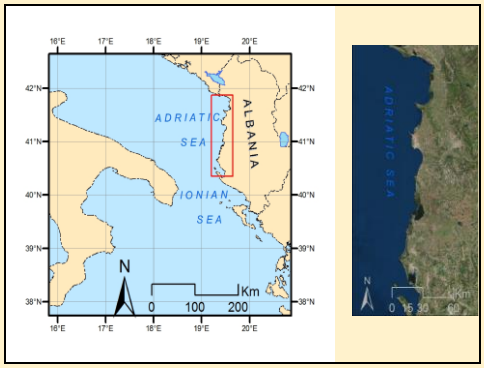

Figure 1 *Study Area*

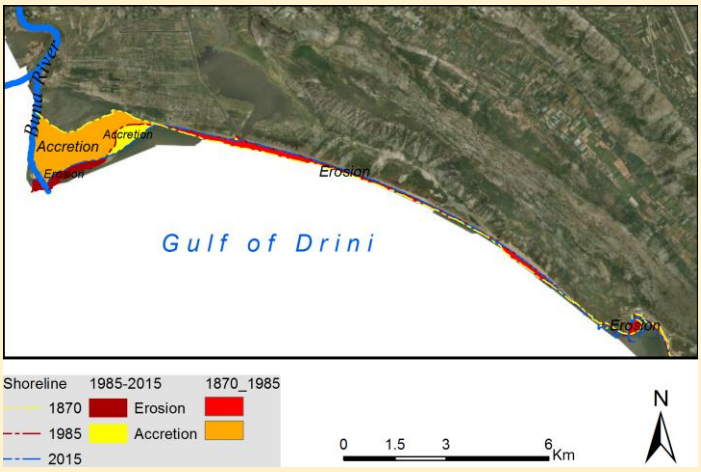

Figure 2 *Erosion and accretion at shoreline's segment Velipoje-Shengjin*

Evolution of the shoreline [Coastline segment from Buna river (North) to Rodoni cape (South)] shows that strong dynamic of sediments during the last years has caused a large advancement of the shoreline, increasing the surface of littorals on the North side of delta of Drini river but a strong erosion is evident in the south of the delta.

The segment of coastline from seaport of Shengjin to the delta of Drini River with a length of 9 km shows advancement of the sea towards the land with a rate of 1-2m/year. It is evident that, excluding the time interval between 1937 and 1985, erosive processes are predominant [5].

The shoreline segment [Coastline segment from Rodoni cape(North) to the seaport of Durres (South)] shows e strong erosion in the delta of Erzeni river with e rate of 8-12 m/year but also it is evident the process of accretion in the South of the delta as a result of alongshore sediments transportation (Figure 3).

The shoreline segment between the Drini and Mati rivers, belonging to the Tale's beach with a length of 3200 m is generally in equilibrium in a slight advancement toward the sea approximately 1m /year during the period 1985-2015, while for the whole period considered 1870-2015, the average advancement is 1.9 m / year. In this part as a result of the accumulation, a surface area of 155 ha is created, with a length of 5500 m and an average width of 280 m. On the northern side of the Mat River Delta, a 6.9-km long shoreline segment advances toward the land with an average intensity of 12-14 m per year and so far has eroded a surface of 80 ha (1985-2015). Also at north side of the Ishmi River Delta in the same period is eroded a strip of land with a surface of 46 ha with length alongside the shoreline line 2450 m and average width of 187 m. In this segment of the shoreline, the annual average advance rate is 6 m/year, while the maximum value reaches up to 10 m (Figure 4).

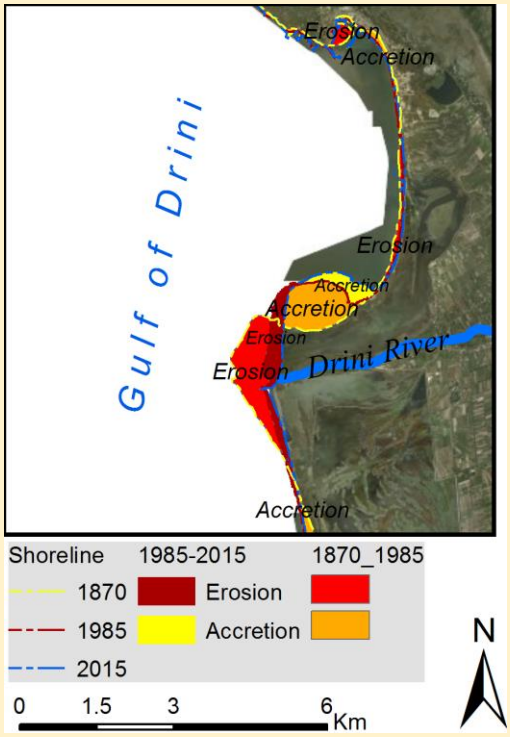

Figure 3 *Map of erosion and accretion at Delta of Drini River*

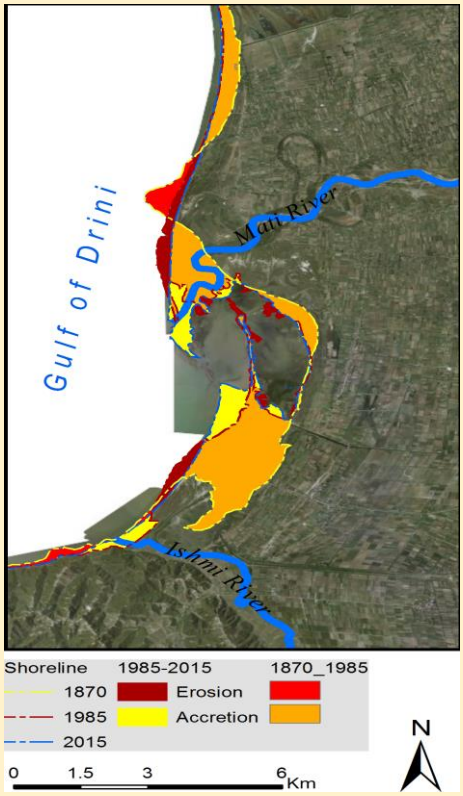

Figure 4 *Map of erosion and accretion at Delta of Mati River.*

From the analysis of the change of accumulated and eroded surfaces in the Drini Bay it results that erosion intensity tends to increase in the period 1985-2015. The data show intensification of the erosion phenomenon in the last period 1985-2015, from 9.85 ha of land benefited in one year as a result of accumulation (1870-1985), in the years 1985-2015 this indicator decreases to 0.04 ha and in recent years the balance is negative.

The bay of Lalësi includes the area from the Cape of Rodoni to the Bishti i Palles. Starting from the Cape of Rodon to Hamallaj with a length of 6.5 km is observed the accumulation phenomenon, which is stable in time. This part of the coastline advances to the sea with an average intensity of 2.7 m per year and a maximum of 6m / year (Figure 5). The total accumulated area for the time period 1985 - 2015 period is 89.6ha.

The shoreline of Lalesi bay from Rodoni cape (north) to the Bishti i Palles (south), shows e strong rate of erosion at the Erzeni River delta, with e rate of 8-12 m/year but accretion process is predominant in the south of the Erzeni River delta, as a result of alongshore sediments transportation (Figure 5).

Erosion phenomenon is observed at Erzen's river mouth, which has a strong erosive dynamic over the years being constantly drawn to the ground. From the comparison of the measurements of the distances of the mouth of the Erzeni river, it results that the river progressed to the sea during the period 1870-1980 at 935.2 m, at an average rate of 8.5 m per year and for the period 1980 to 2015 it was retreated to the land with 1115.6 m or on average 35 m/year.

The shoreline segment from Durres to Cape of Lagjli shows strong erosion rate in the south part of it, where a segment of the shoreline with e length of 12 km is under strong erosion rate. The rate of erosion in this segment varies from 3-5 m/year (Figure 6).

Figure 5 *Map of erosion and accretion at Gulf of Lalëzi*

Figure 6 *Map of erosion and accretion at Gulf of Durres*

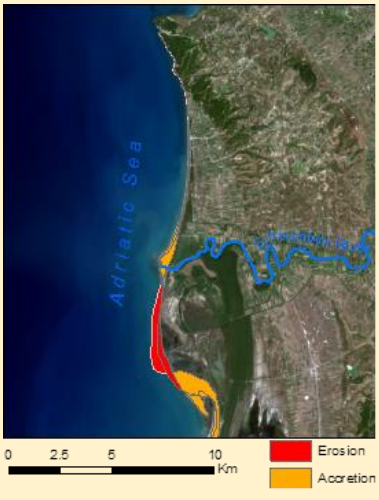

Figure 7 *Map of erosion and accretion at delta of Shkumbini River*

The shoreline segment from cape of Lagjli to Shkumbin's delta shows strong advancemenrt rate in the south part of it, where a segment of the shoreline with a length of 12 km is under strong erosion rate. The rate of erosion in this segment varies from 3-5 m/year (Figure 7) This shoreline segment with a length of 18 km is suplied by sediments of the river of Shkumbin and for the entire period considered has an advancement of the shoreline with intensity that change. In the last 30 years the old delta is in erosion procces as results of displacement of the new delta in the distance of 4250 to the north side of the old one's. In the period 1985-2007 has been eroded a total surfaceof140.4 ha.

5. CONCLUSIONS

Coastline Dynamics is a process that is influenced by both the internal geodynamics of the earth and its geology, but also by the external kinematic processes such as: Wave and wind action, climate change, accumulation and sedimentation process etc. The shoreline from the Buna estuary to the Rodon's Cape represents

changes in some of its segments, especially in the area between the Buna and Velipoja, where the phenomenon of erosion with an average intensity of 7-8 m / year at a distance of 2 km, for the period 1985-2014, while in recent years the intensity has a tendency of fast growing up to 20 m / year. The phenomenon of erosion is also present in the shoreline segment Vilun lagoon -Rana e Hedhur, where there is an average retreat ranging from 0.3-1.7 m / year.

Another segment where the erosion phenomenon is observed is 1 km south of the Shëngjin seaport to the lagoon of Kune where the average intensity reaches 1 m per year.

At the mouth of the Drini river at two sides, erosion phenomenon is very evident. The intensity of advancement in the Drini estuary is on average 8 to 9m/year. In the Tale's beach there is a slight advancement of land toward the sea with intensity at 2m/ year at a length of 5.2km. In the Gulf of Lalzi at a length of 6.5 km, there is observed the accumulation phenomenon, which is stable on time. This segment of the shoreline advances to the sea with an average intensity of 1.7 m per year and a maximum of 2.6 m/year. The total area for the whole 1985-2015 period is 88 ha. The erosion phenomenon is observed in the Erzeni River estuary, which has an intense erosive dynamic over the years being constantly drawn to the ground. For the period 1980-2015 it is drawn to the land with 1141.6 m or an average of 32.6 m per year. This phenomenon is a consequence of the reduction of Erzen River's solid flow budget as a result of the inexperienced use of river inertia in its bed, especially after 1990. South after the erosion zone we have an accumulated area with surface of 142 ha.

6. REFERENCE

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CREATION OF DATA SPECIFICATION FOR GEOSPATIAL INFORMATION IN ALBANIA ON THE THEME "GEOLOGY"

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ABSTRACT

The development of technology and the demands of groups of interest for standardized digital geospatial information are increasing daily. The necessity for referred geospatial information, according to a Referencing Coordinating System and European Standards, through a national GIS system, requires a decision making of national and institutional importance.

ASIG (State Authority for Geospatial Information) is the institution that administrates, implements, and maintains the National Spatial Data Infrastructure (NSDI). It is calculated that 80% of decision-making by public or private institutions use geospatial data with a well-organized structure that enables efficiency. Thus standardization of geospatial data by topic is one of the main objectives of implementing the NSDI in Albania.

This is a complex task for the standard and the harmonization of geospatial data, which can be a good opportunity for professional awareness. This study shows in detail the methodology for the creation and implementation of data specification for geospatial information in Albania on the theme: Geology, adoption of the technical specification of the INSPIRE directive as well as the importance of ASIG as an institution that builds and maintains NSDI in Albania.

Keywords: *Geospatial Data, GIS, ASIG, INSPIRE, NSDI*

1. GEOSPATIAL INFORMATION AND IT'S IMPORTANCE.

Geoinformation today appears as a key element in decision-making, data exchange and communication processes. Increasing of life demands and technology development has contributed to making the elements of geoinformation compulsory in a modern society. The current country development stage requires high-quality geospatial information, optimum resource management, and efficient definition of solutions that will ensure sustainable development. Geospatial information involved in a common infrastructure provides many opportunities to improve public services while at the same time eliminating duplication of data and inconsistency. The State Authority for Geospatial Information (ASIG) has begun its activity to establish the Geospatial Data Infrastructure in Albania, in line with all European initiatives and trends. The purpose of the strategy is to create the most appropriate infrastructure, providing support for a sustainable development accompanied with economic growth and efficient services. ASIG is committed to carrying out the lead role in developing the strategy and implementation plan related to it which is responsible for the creation of the NSDI's National Geospatial Data Infrastructure which represents an integrated geospatial data system that enables users to identify and use geospatial information obtained from various sources at local and national level inclusively. ASIG's main role is leadership, development and promotion of joint infrastructure and a genuine cooperation approach with responsible public authorities and other stakeholders.

ASIG is responsible for the establishment of the State Standards for the Technical Specifications of Geospatial Information in Albania for each of the themes defined in the law [Article 11 of Law no. 72/2012], in accordance with European standards (INSPIRE Directive), concrete case topics: Geology where geospatial technical standards for the creation of NSDI, the topic Geology in Albania has been adapted to the technical specifications of the relevant topic in the INSPIRE Directive. Standards should be created for the following fields: Metadata, in this field the directive defines the standards on how metadata should be. This standard is unique and applicable to all institutions or third parties that will implement this directive and Specification of data - standards for technical specifications of data set out the basic rules of implementation of the NSDI in Albania with the purpose of its use by public authorities responsible for collecting the processing and updating of geospatial information, to achieve a unified and accurate understanding of geospatial data and services, in order to realize their interoperability. These standards are defined for all geoinformation topics [Article 11 of Law no. 72/2012] in accordance with the INSPIRE Directive.

2. INSPIRE DATA SPECIFICATION FOR THE THEME GEOLOGY.

INSPIRE is based on the infrastructures for spatial information that are created and maintained by the Member States. To support the establishment of a European infrastructure, Implementing Rules addressing the following components of the infrastructure have been specified: metadata, interoperability of spatial data sets and spatial data services, network services, data and service sharing, and monitoring and reporting procedures. In the INSPIRE context *Geology* could be seen as a reference data theme as it provides information for several themes[DS-D2.3]: Mineral resources, Natural Risk Zones, Soil, Energy resources, and it has a specific relationship with one of the most important natural resources, water, through groundwater bodies contained in aquifers. Geomorphology describes the Earth‘s present-day surface, and the processes creating its geometry. Geological data are used in various domains requiring knowledge

of the surface and underground geological environment: detecting geo-hazards; ensuring the safe disposal of wastes, nuclear wastes, carbon capture and storage; ensuring the safe construction of buildings; providing information for environmental planning; providing information for natural resources exploration; vulnerability of the underground to contamination; providing indicators for climatic change; providing construction material and minerals. For groundwater and aquifers uses are: water supply (water abstraction); groundwater resources (water availability); providing base flow for rivers, wetlands; protecting ecosystems dependent on groundwater; groundwater quality and quantity assessment; transboundary groundwater management.

Geological information provides basic knowledge about the physical properties and composition of the geologic materials (rocks and sediments) outcropping at the land's surface and forming the underground, and about their structure and their age. It also provides knowledge about aquifers, i.e. subsurface units of rocks or sediments of sufficient porosity and permeability to allow either a significant flow of groundwater or the abstraction of significant quantities of groundwater. Knowledge about landforms is also provided. The main product delivered by geologists for the users is a geological map which is the result of an interpretation of the observations and measurements made on rocks and sediments, on and under the surface. Because the rocks forming the subsurface are visible or accessible only on very small parts of the surface, the outcrops, geologists have to interpret these observations and measurements to group rocks in geologic units, and to connect other information observed locally to identify the general geological structure. Boreholes are another important source of information for interpreting the subsurface geology. These can provide a stratigraphic and lithological log, analogous to a vertical geological map, and can also be used to gather samples and make measurements of various properties at depth. All this information is interpreted to make geological maps. The landforms (geomorphologic features) are often indicated on general geological maps, and are detailed on specific, applied geomorphological maps. *Geology* characterized according to composition and structure. Includes bedrock, aquifers and geomorphology [Directive 2007/2/EC].

3. THE GEOLOGICAL DATA MODEL CONTAINS

Geologic Features with Geologic Events, Geologic Units, Geologic Structures, and Geomorphologic Features. The geometry of these features is described in Mapped Features, and is included in geological maps and profiles in the form of points, lines and polygons. Mapped Features and Boreholes can be bundled in Collections, Thematic Class for reclassifying GeologicFeatures as some thematic class for thematic maps, the lithology of rock units, the processes of Geologic Events and their environments and ages, the types of Shear Displacement Structures and Folds, Borehole details, such as location and purpose.

The types to be used for the exchange and classification of spatial objects from data sets related to the spatial data theme Geology are defined in the following application schemas. Geology application schema provide basic geological, hydrogeological and geophysical knowledge on an area, with an agreed set of attributes. The application schemas specify requirements on the properties of each spatial object including its multiplicity, domain of valid values, constraints, etc.

4. APPLICATION SCHEMA GEOLOGY AND UML OVERVIEW

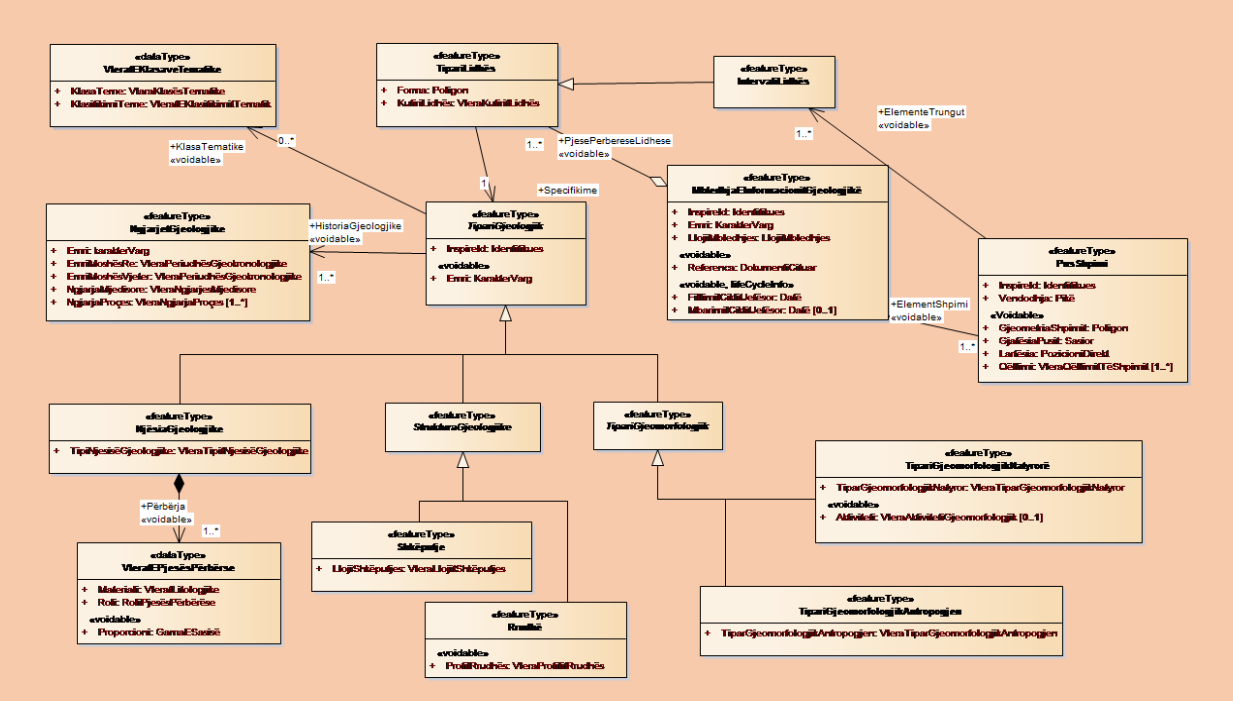

Figure 1 *UML class diagram: Overview of the Geology application schema*

Figure 1 shows only the spatial object types and their relationships. It does not include data types and code-lists. The properties are not visible but are shown in the following figures, which describe the main parts of the Geology data model.

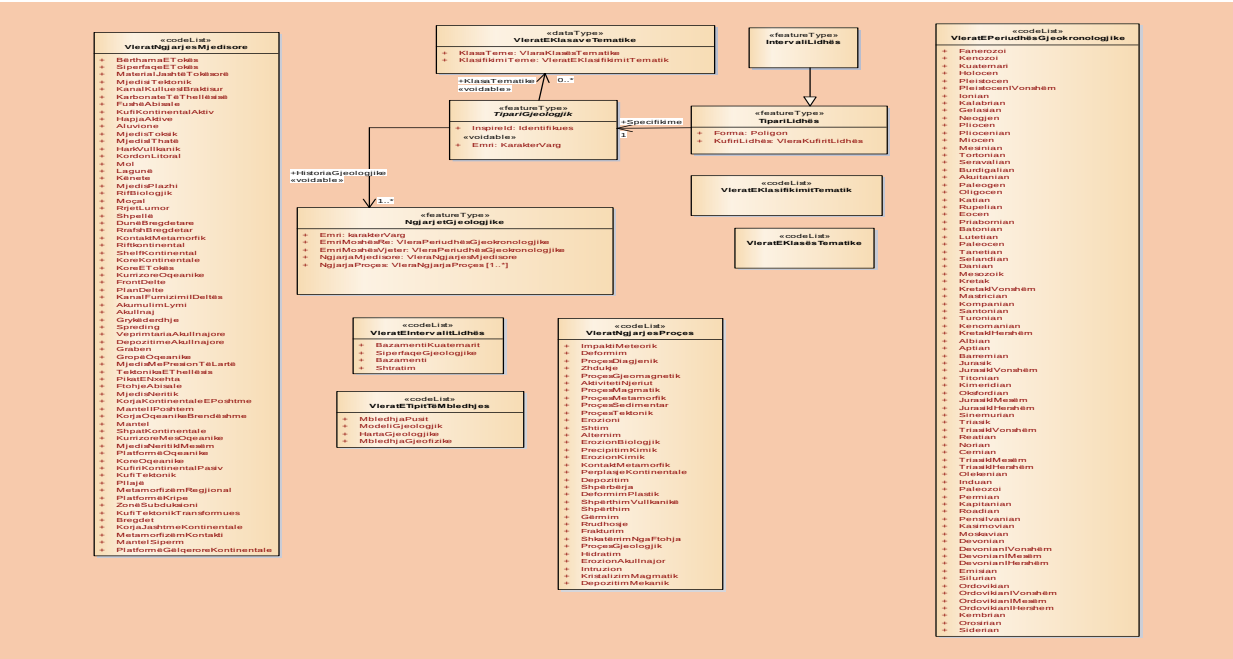

Figure 2
UML class diagram: GeologicFeature, MappedFeature, GeologicEvent, ThematicClass

MappedFeature and *GeologicFeature* are central classes (spatial object types) in the model. A *MappedFeature* provides a spatial representation of a *GeologicFeature*. The *specification* association from *MappedFeature* to *GeologicFeature* allows only one Geologic Feature to be represented by any Mapped Feature. As well as standard geological maps the model allows the description of thematic maps using the *themeClass* association to *ThematicClass*. A thematic map in this context can be considered as a reclassification of the GeologicUnit in terms of some thematic property, for example reclassifying Geologic Units in terms of their susceptibility to compaction or their potential as a source of aggregate. A theme should have a name and be constrained by a codelist of class values for that theme but as each theme will have different classes, and it is likely different classification systems will have been used by different data providers, it is not possible to mandate any particular codelist of theme class values in the specification.

The abstract *GeologicFeature* class represents a conceptual geological feature that is hypothesized to exist coherently in the world, and includes as sub-types the main information classes in the model. The implemented Geologic Feature instance acts as the "description package". There are three sub-types of *GeologicFeature* in the data model: *GeologicUnit, GeologicStructure and GeomorphologicFeature.* A *GeologicEvent* is defined as an identifiable event during which one or more geological processes act to modify geological entities. Geological age is modelled using *GeologicEvent* – the age of some geological event occurring. A *GeologicEvent* should have a specified geologic age and process, and may have a specified environment.The *geologicHistory* association from *GeologicFeature* to *GeologicEvent* describes a sequence of one or more Geologic Events which together describe the age or geologic history of the GeologicFeature. Commonly GeologicFeatures will have a geologicHistory comprising only one GeologicEvent, which represents the formation of the GeologicFeature.

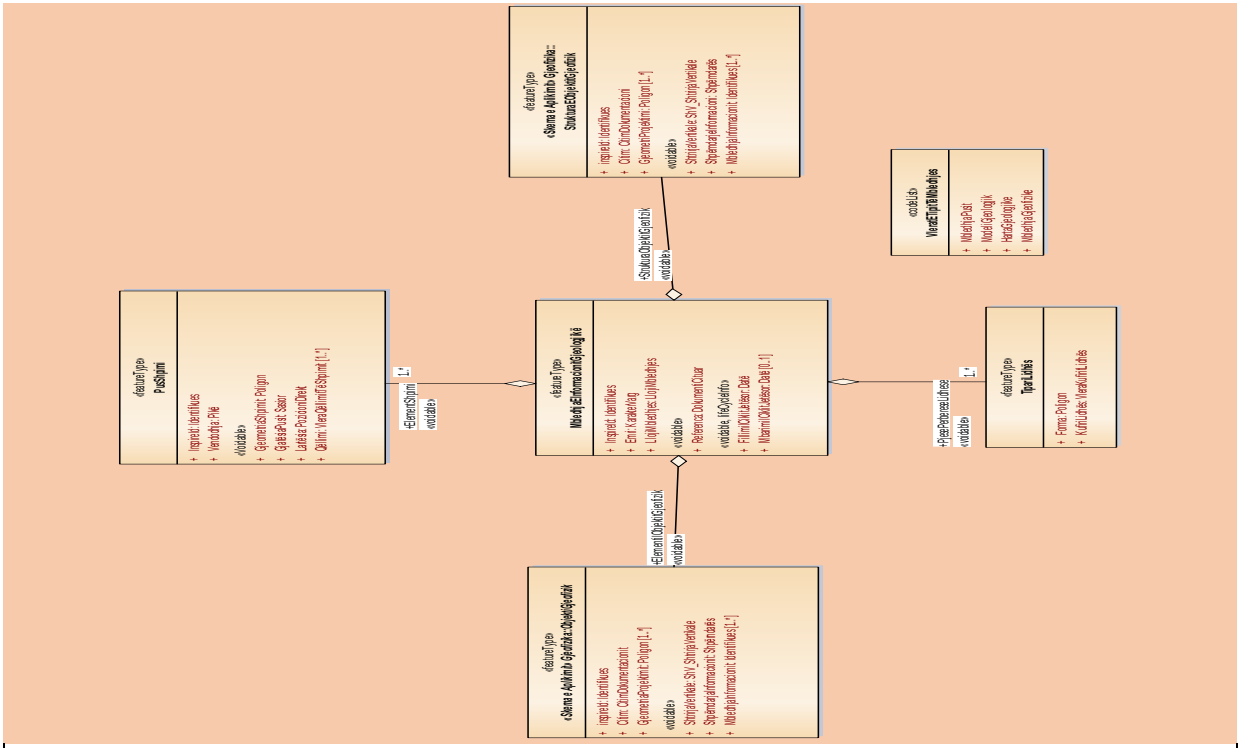

Figure 3 *UML class diagram: GeologicCollection*

A *Geologic Collection* is a named or identifiable group of geological or geophysical objects. Geologic objects are commonly grouped into collections such as geological maps, thematic maps, groups of geophysical measurements or models of the same type etc, which are familiar to many user communities. The Geologic Collection class allows the delivery of a package of objects that go to make up one of these familiar collections.

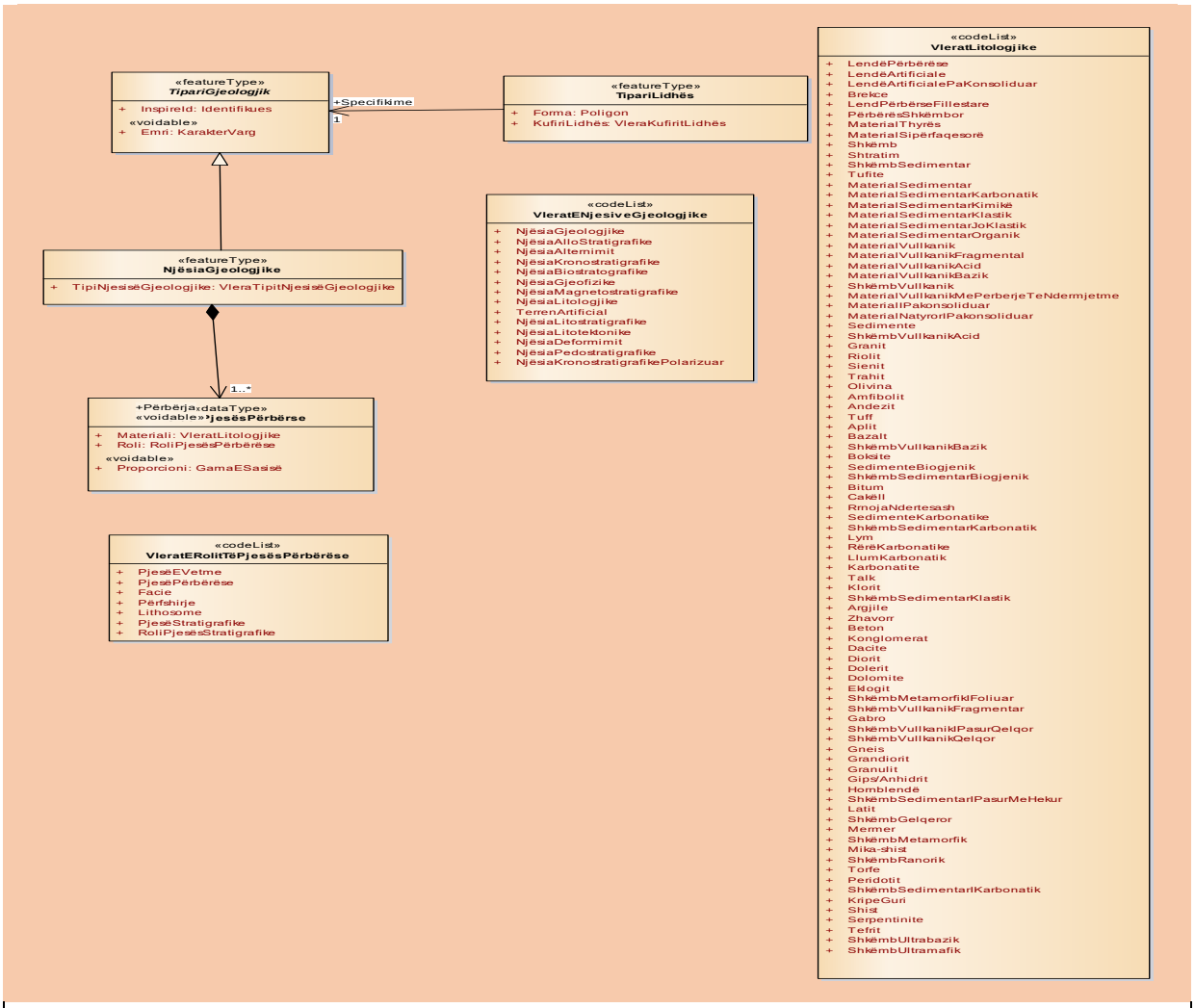

Figure 4 *UML class diagram: GeologicUnit*

GeologicUnit represents a body of material in the Earth whose complete and precise extent is inferred to exist. Spatial properties are only available through association with a *MappedFeature*.

The *composition* association from *GeologicUnit* to *CompositionPart* allows the lithological description of the Geologic Unit. The composition of a Geologic Unit can be made up of several Composition Parts, for example where there are lithologically distinct components interbedded.

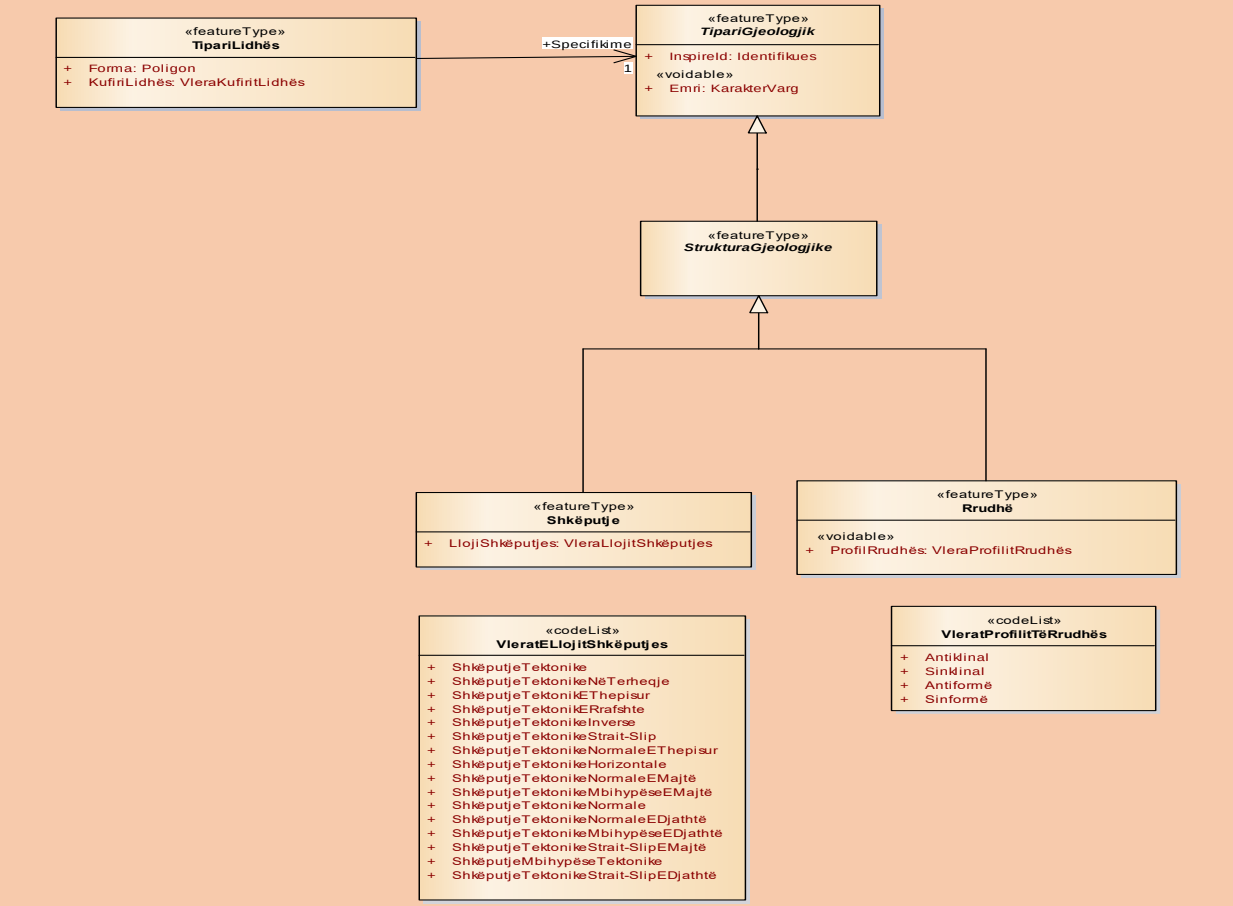

Figure 5 *UML class diagram: GeologicStructure*

Geologic Structure is defined as a configuration of matter in the Earth based on describable inhomogeneity, pattern, or fracture in an Earth Material. The identity of a Geologic Structure is independent of the material that is the substrate for the structure. The two types of GeologicStructure in the data model are ShearDisplacementStructure and Fold.

ShearDisplacementStructure includes all brittle to ductile style structures along which displacement has occurred, from a simple, single 'planar' brittle (fault) or ductile surface to a fault system comprised of tens of strands of both brittle and ductile nature. *Fold* describes one or more systematically curved layers, surfaces, or lines in a rock body. A fold denotes a structure formed by the deformation of a Geologic Feature to form a structure that may be described by the translation of an abstract line (the fold axis) along some curvilinear path (the fold profile).

5. RESULTS

This standard creates a structural model of data according to the directive INSPIRE and the referring system Geodetic Framework "KRGJSH2010", which provides, collection and offers this information according to the article 11 of Law no. 72/2012 "On the Organization and Functioning of the National Infrastructure of Geospatial Information in the Republic of Albania".

Below (Fig.6, 7) in a systematic way and illustrated with the geological map of Tirana is shown the way of harmonization of the existing data according in this standard.

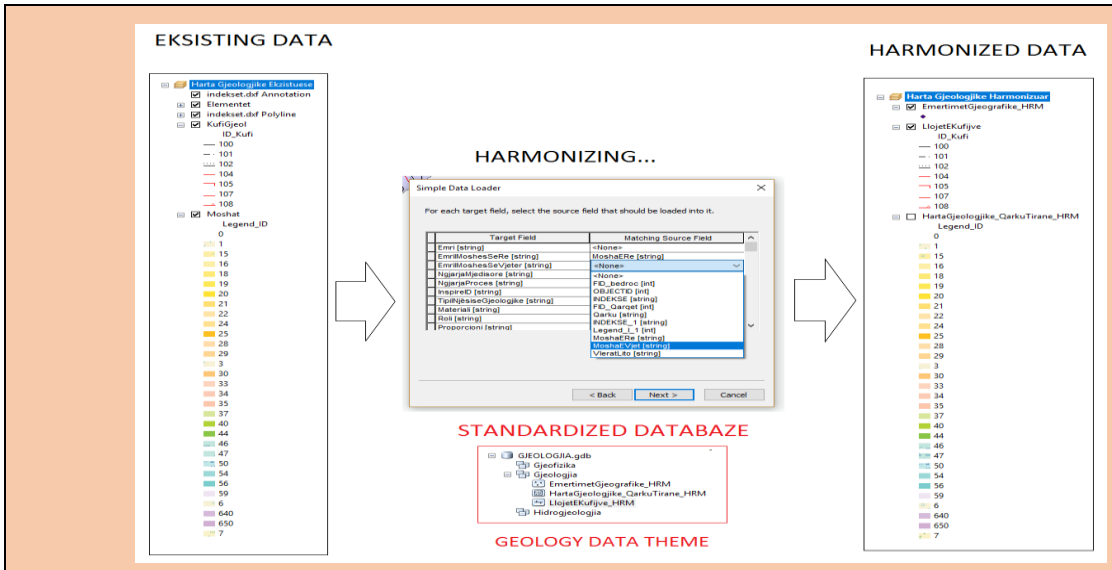

Figure 6 *Harmonization of Geological map of Tirana*

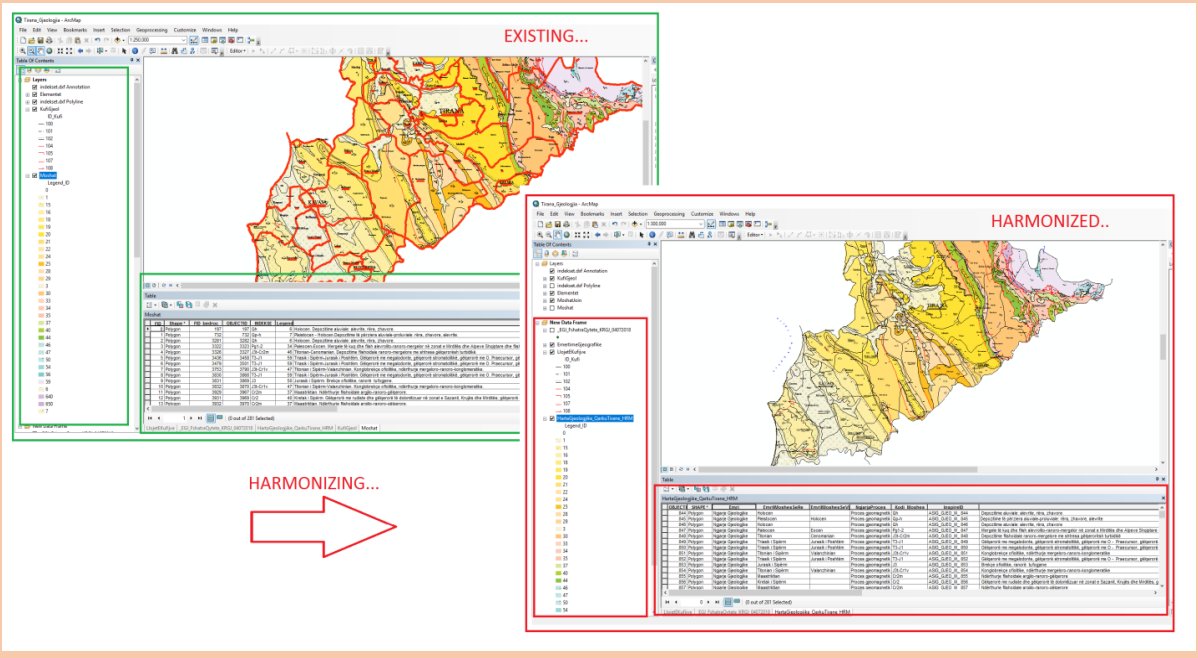

Figure 7 *Harmonization of Geological map of Tirana*

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CREATION OF DATA SPECIFICATION FOR GEOSPATIAL INFORMATION IN THE IMPLEMENTATION OF UAVS LASER SCANNING TO ENHANCE LAND SURVEYING

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ABSTRACT

Territorial management requires the most possible up-to-date mapping support of the status quo. Required surveys can exploit several technologies: ground-based GPS, Terrestrial Laser Scanning (TLS), traditional topography, or, in the case of wider areas, airborne photogrammetry or laser scanning. The use of Unmanned Aerial Vehicles (UAVs) for surveying is now widespread and operational for several applications, quarry monitoring, archeological site surveys, forest management and 3D modeling for buildings, for instance. UAV is increasingly used by land surveyors especially for those kinds of projects. Laser scanners are used more and more as surveying instruments for various applications. With the advance of high precision systems, capable of working in most real-world environments under a variety of conditions, numerous applications have opened. In the field of surveying laser scanners opened a new dimension with data capturing. The new terrestrial laser technologies, integrated with positioning and photographic sensors, allow fast survey and spatial representation both for single building units and for whole urban districts. The large amount of 3D collected data provides an enrichment of the basic geometric knowledge, usually provided by cartographic vector or raster representation.

***KEY WORDS*:** Land Surveying, UAV, Laser Scanning, Photogrammetry, Point Cloud, 3D Model.

1. INTRODUCTION

Land surveying is one of the oldest professions on earth. The purpose of many surveys nowadays is to create a 2D plan that a land surveyor and his client could use to obtain a building permit. Innovation in topography and land surveying is aimed at acquiring more data with higher accuracy. Computer developments were a key change in tharegard. Nowadays, utilizing drones could lead to another quantum leap in the surveying profession. With the development of smart cities and BIM technologies, it will probably become easy to create a 3D model of a terrain utilizing UAVs and exporting it to a 3D Geographic Information System (GIS). Up until now, for construction sites, 2D plans have been required to get reliable measurements quickly. Topographic plans are widely used in a variety of applications and at various sites. These plans involve several levels of accuracy depending on the client's needs. Usually projects that require crucial safety conditioning for construction, such as high-speed railways, landing strips, investigating building deformations or tunnel inspections require plans with high accuracy, where just a few millimeters (mm) of deformation are highly significant.

In some countries land surveyors' signature has a legal value. Their tasks involve ensuring the accuracy of a plan and making sure that the landmarks are assigned to the right place. They use topographic instruments to realize the plans. This involves a broad number of applications from private properties to major public infrastructures, roads and network management, for instance. For many topographical surveys, the data are acquired with a total station. The instrument can be used to measure horizontal and vertical angles as well as the slope distance from the object to the instrument. The redundant measures with total stations allow accuracy to within millimeters to be achieved. Furthermore, their automatic operation enables more data to be acquired in a limited period. Over one day a land surveyor can acquire up to 2000 points. Since the process is repetitive it can easily involve errors. The survey then must be georeferenced using different techniques based on the nature of the terrain and the available instruments. Usually, the most efficient technique used is a global navigation satellite system (GNSS) receiver with a real-time kinematic (RTK) network. This allows control points to be obtained with a precision of about 2.0 cm. Once the field survey is completed, the data are transferred to CAD software to generate the plan. Even though codification in the field enables automatic drawing, it usually involves some errors, and the post-treatment process usually takes several hours to obtain the final product.

Various studies have been conducted on using UAV images and photogrammetry for cadastral surveys (Kurczynski, 2016) over large areas and with a precision of 5–10 cm. Kim et al. 2014 examined the effectively of UAV for land monitoring to analyze and detect disaster areas. They evaluated the accuracy of the digital maps generated from UAV images. They found that the mean error, if only GPS/INS data used, is about 10 m, whereas if ground control point (GCP) used, the mean error is about 10 cm. Jin et al. 2009 reviewed a theoretical development of UAV in several implementations fields. They recapped the common problems associated with UAV remote sensing. They also provided information on the orientations of future research about it. Rui-sheng et al. 2006 suggested a new methodology of utilizing UAV images to enhance government decision making related to the land use survey.

They found that the implementation of UAV image in land use survey is viable, low-cost and promising. Jones IV et al. 2006 proposed characteristics of small UAV to be suitable for management and research tools. They used wingspan UAV to investigate its usefulness for wildlife research applications. Brutto et al. 2014 performed a study on cultural heritage area utilizing different UAV systems. Two different datasets were acquired one for archeological site and another for land art site. They developed 3D model and ortho-images with high level of details. In addition, they conducted some tests to investigate the accuracy of images orientation and 3D models. Tscharf et al. 2015 presented an automated processing pipeline utilizing various images platforms. The

developed framework allows for geo-referencing of UAV imagery based on GPS measurements and ground control points (GCPs). The framework also allows for developing enrich 3D models. Grenzdörffer et al. 2008 indicated that the micro UAVs with light weight are much flexible and weather independent compared to standard ones. They are useful for forestry and agricultural applications. They stated that the current potential photogrammetry for direct georeferencing has not fully exploited. This can be attributed to the manufacturers of UAVs whom are not aware and familiar with the spatial needs of photogrammetry and GIS data acquirement. The aim of this study is to evaluate the potential of UAVs for much smaller areas and with the best precision possible.

2. UNMANNED AERIAL VEHICLE (UAV)

According to (Küng, 2011), the developments of UAVs in recent years along with the improvements in Structure from Motion (SFM) software and computer vision enhanced the production of photogrammetry. They made it accessible with centimetrical precision even with bad positioning systems onboard the aircraft. This precision is approximately within the same range as the existing technologies for most land surveying purposes. Application requiring millimetric precision is still out of the range of possibilities for UAVs. UAVs are becoming more and more affordable, and the ultralight and user-grade cameras on-board also offer very good resolution for low-altitude photogrammetric work. Moreover, UAVs are becoming easier to use with automated flight planners and automatic obstacle detection. The most common applications and operations associated with UAVs are: stockpile measurements and quarry monitoring, precision agriculture, infrastructure inspection, forest management, coastal erosion studies and other environmental and archeological projects (Fernandez and Gutierrez, 2016), (Goncalves and Henriques, 2015) and (Stöcker, 2015). UAVs are extremely efficient for these applications, particularly for quarries, since they provide high precision with less time and safe conditions (Arango and Morales, 2015). The utilization of UAVs by land surveyors is growing nowadays. They mostly use it for large open sites and for volumetric measurements (Gonzales-Aguilera, 2012). Therefore, one of the most significant questions that is raised is related to the suitability and capability of UAVs for all sites, and whether utilizing UAVs will dispense of the traditional surveying techniques (R. El Meouche et al. 2016).

The virtual laser scanning (VLS) is a new technology according to which, in a relatively short time and 'affordable' price we collect / capture a large amount of data on a given area of treatment. Consequently, the process of data acquisition can be faster and cheaper than traditional field surveying while allowing us to obtain a more comprehensive/complete information, based on which we can significantly reduce the generalization in the treatment process.

In fact, by using virtual laser scanning, which is realized with the complementary use of GNSS system with a small, radio-controlled UAV (in our case Octocopter and the UAV Bramor) and a powerful Digital Camera with high resolution or definition we fill out the 'gap' between field geodesy and the classical procedures of photogrammetry. This process allows us to obtain accurate spatial data and high resolution aerial images of areas of different sizes - from a few hectares to several square kilometers (depending on the UAV and the required precision of the results), which are used to produce photogrammetric 3D point cloud, a digital surface model (DSM) (if necessary, a digital terrain model (DTM)), and precise digital orthophoto (DOF) – spatial resolution of 1cm.

This technology is also growing competition to Aero laser scanning (ALS) or. LIDAR, and so-called mobile laser system (MLS), mainly on account of relatively rapid implementation and the relationship between costs and ensured high accuracy of the final result!

3. THE EQUIPMENT

In this work, we (Geoces, 2017) used the following equipment: (1) Bramor RTK UAV with GNSS and INS; (2) GPS Leica 1200; (3) GNSS Trimble R2 and R8

4. IMAGE ACQUISITION PROCESS

The image acquisition process is probably the most complex part of field operations. It involves a lot of parameters that have a major influence on the results. Moreover, it is not easy to come back and acquire new data due to logistical problems such as flight authorization and weather. To obtain the best images, the camera should be calibrated by setting its parameters on the ground. The best images for photogra-mmetry are the sharpest and with a maximum of texture.

Figure 1 *Bramor RTK and GNSS Trimble*

Usually it is required to set the ISO before the flight and leave the shutter speed and diaphragm opening to function automatically. To examine and evaluate camera calibration one must take a picture of the site, including many bright and dark zones, while moving. Once you have obtained a picture that is sharp and has no burnt or underexposed area, the camera can be loaded onto the drone. There are several factors influencing a flight plan, including the desired resolution, the area to be covered and the height variations over the terrain.

The expected resolution has a direct impact on the height of flight. The area to be covered determines the number of flight lines. Moreover, the variation of height of flight influences the overlapping values between images. The resolution, pixel size or GSD is the size of the projected pixel on the ground. It is directly dependent on the sensor's size and height of flight. As far the terrain is not entirely flat, thus this value is an average of the different pixel size in the model. For instance, a GSD of 1.0 cm means that the pixels on the image represent 1.0 x1.0 cm on the ground. The resolution will dictate what is possible to achieve. Indeed, it dictates the accuracy which is possible to vectorise objects on an ortho-photo, thus defining the possibilities for realization of engineering and infrastructure projects (Kulur 2016). In this study the vectorization was realized on the point cloud. If it is not possible to fly automatically, someone with experience can manually take the pictures indicating the trajectory to the pilot. Nowadays, post-processing software is powerful and efficient enough to work with a set of pictures that is not completely perfect.

5. WORK PLAN - PROCESS OF CAPTURING SPATIAL DATA

The operator makes the plan of the flight before going on the field with a special program (Figure 2), where the parameters of the size of the area, the height of the flight, the desired forward and side overlaps between aerial photographs, camera angle, vessel speed, etc. are given. Before the field measurement the limitations for flying in this zone and possible obstructions in the air must be verified. If possible, the observation is carried out in a suitable weather when the wind is not too strong; it is not raining and lighting conditions allow triggering of shots with a short exposure time.

6. GROUND CONTROL POINTS ACQUISITION PROCESS

To obtain the best resolution possible it is necessary to use ground control points. Previous works (Eling, 2015) show that on-board georeferencing allows a 5-cm precision at best. These could be in shape of white crosses utilizing a 100*100 cm white plastic cross template (R. El Meouche et al. 2016). They must be placed as homogeneously as possible on the site to obtain the best referencing on the whole model. Then a closed traverse with the total station must realize using the center of each cross as the summit of the polygon. A closed traverse is a traverse that begins and ends at the same point or that begins and ends at points whose position has been previously determined. In both cases the angles can be closed geometrically and the position closure can be determined mathematically.

To ensure proper positioning accuracy and georeferencing of the captured data it is necessary to determine control points at the surface area of the field (with conventional or GNSS geodetic methods). For control of the final accuracy of the model itself we conduct land survey over the entire area with traditional methods of determining ground control points - GCP (homogeneity of the model). For this project, we have established and signalized almost 130 GCP in the required coordinate system (UTM 34N).

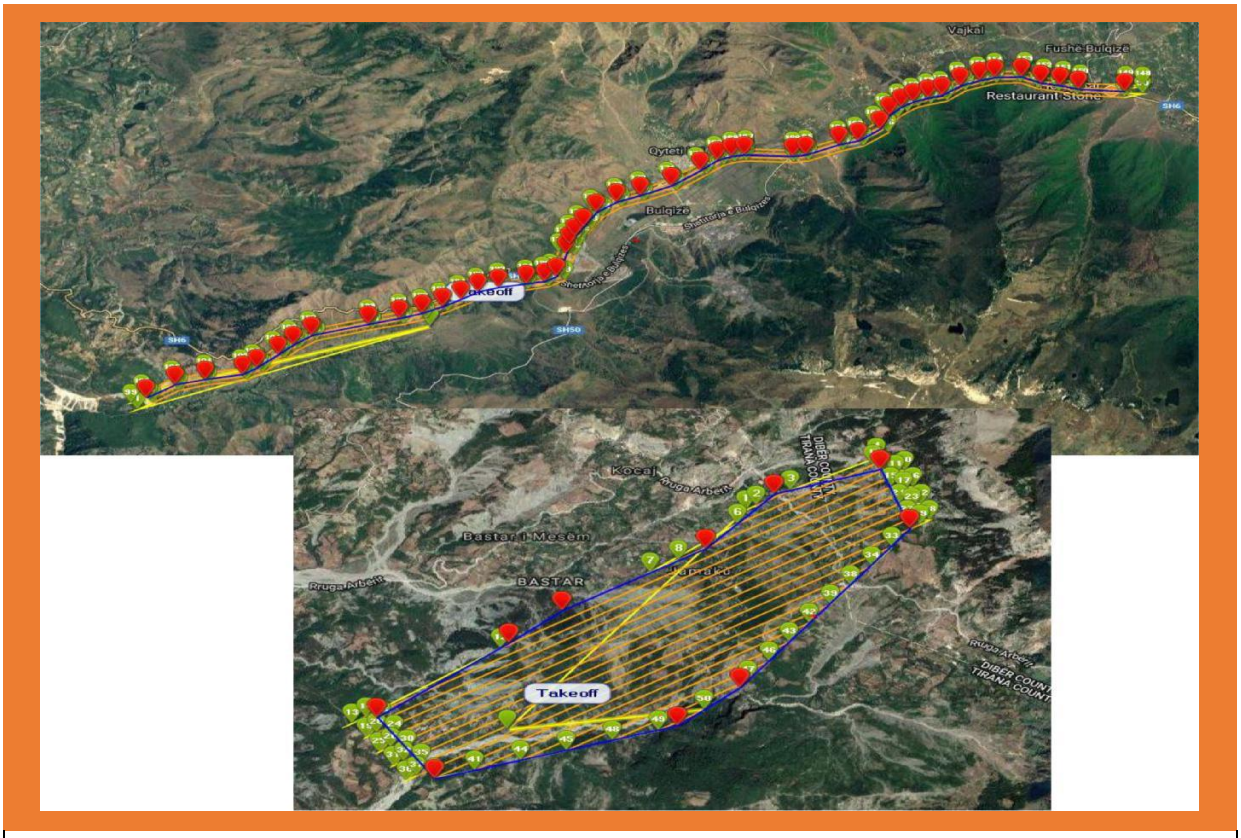
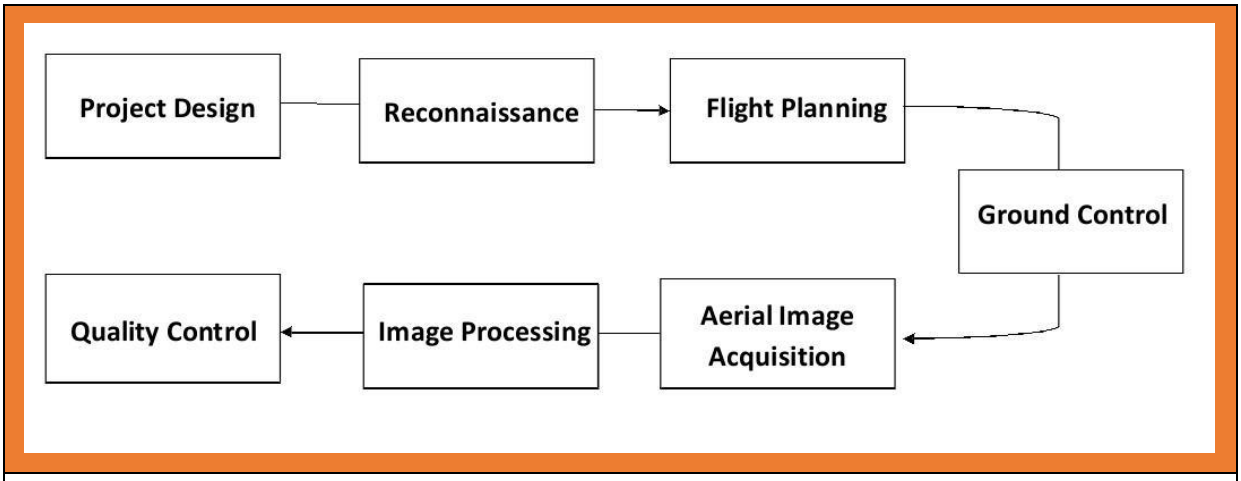


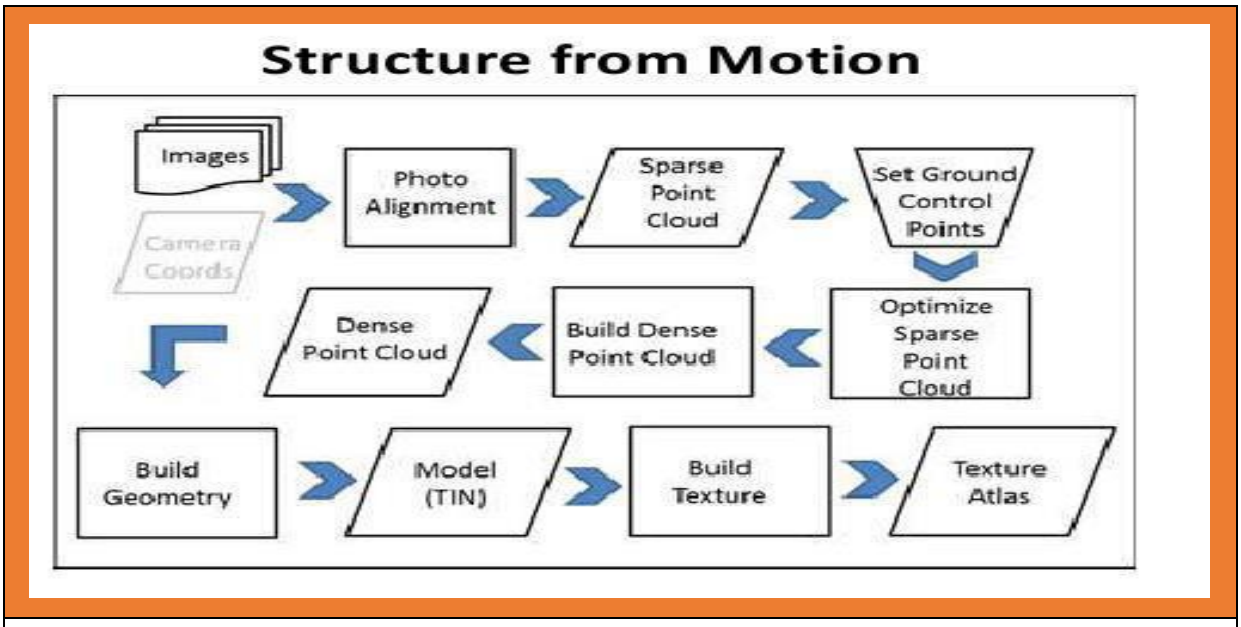
Figure 2 *The flight plan*

Based on the simultaneous use of UAV, and the system of virtual laser scanning (VLS) we obtain high accuracy spatial data on the ground by the method of remote sensing (contactless measurements). So, we can capture / measure millions of points (up to 100 million points and more) to define a realistic terrain (3D model) at any given time 'reading'. This produces a large amount of information about the area or the present facility (3D coordinates of each point and information on the color,

georeferenced image area processing in HD), underpinning further processing in the office within a specific software package (3DSurvey, Agisoft Photoscan, MeshLab, AutoCAD, Geos, Virtual Surveyor, etc.).



- **Field data acquisition**
- **The processing of data in the office**



7. RESULTS

The result represents many georeferenced photos properly treated by a specific software package, and the treatment area represented by the cloud of points (3D point cloud) based on which we can produce accurate 3D models of areas or facilities. The great advantage of this technology is that, as a by-product we obtain still georeferenced/geo digital orthophoto (DOF), in high resolution (in this project approx. 3-

4 cm), which is used as a lining to the aforementioned point cloud, and thus obtain the final product – a realistic 3D model of the area or facility.

8. DISCUSSION

The potential capabilities in terms of precision are only restricted by the resolution of the image. Therefore, any level of precision could be reachable with the right type and number of ground control points. However, the problem associated with high image resolution is related to the computing power needed, since an increase in resolution means a major increase in the data volume. However, it is not possible to say that UAVs can replace the work of land surveyors, since several problems appear with the use of a UAV. For instance, vegetation is the first obstacle that hinders generating a plan. The second obstacle is related to the complex and various process involved in working in urban areas with UAVs.

9. CONCLUSION

The main aim of this research was to determine whether UAVs can be operated at any type of site, particularly small ones (privately owned). To achieve that, two plans were created for the same site, one using traditional techniques and the other using UAVs. Afterwards the results of both were compared. The UAV plan was not complete enough to be fully exploitable because of the existence of a large amount of vegetation. But at the end, the results in terms of precision are acceptable, since the level of precision only depends on pixel size. So, to create more accurate models, the challenge seems to be more the amount of data needed to manage and the acquisition speed of ground control points. Indeed, the level of precision reached can be achieved with a total station.

However, this level cannot be reached using an RTK GNSS receiver. In certain conditions and with the latest developed technologies, a precision of about 1.0–2.0 cm (announced by the constructor) may be reachable. Utilizing a total station, the model can be created with more precision. The error that resulted during GCP measurement is directly influences the quality of the model. Using GCP with low quality RTK measures will alter the model. Moreover, the vegetation problem already identified also impacts the quality of the generated model. Really, without it, a good plan can be extracted and the parts that are well exposed can be Vectorised seamlessly with high precision. However, the vegetation covered most of the important areas at the site of interest and made it impossible to issue a plan that could be deliverable. These points show how the technique is promising; just some missing key innovations are required to be fully efficient for that kind of site. One of these innovations is developing intelligent landmarks that can interact with the drone. The other innovation that may lead to facilitating this type of measurement is normalizing the process for land surveyors and drone operators to work together. Such a process would allow the land surveyor to have easy access to safe flight and quality data. The land surveyor flying the drone will lead to depletion and loss of his time in planning the flight in considering several issues: weather conditions and administrative work, for instance, while the drone operator can plan these tasks while respecting the land surveyor's requirements in terms of resolution and overlap.

10. ACKNOWLEDGEMENTS

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Arber Koci: born on 1983 is an Geodetic enginner**.** He finished his studies on Polytechnic University of Tirana on 2007. He''s work experience includes Geodetic engineer at the "Gjoka KOnstruksion" l.t.d. He worked in national projects as: Construction of Elbasan-Cerrik road, LOT II; Construction of HPP Okshtuni and Dam; Construction of F.K. PARTIZANI stadium; Construction of "Rolling Hills" road, Zone B2.

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INFLUENCE OF MODERN SPATIAL DATA CONCEPTS AND DATA COLLECTION TECHNOLOGIES ON ECONOMIC DEVELOPMENT

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ABSTRACT!

One of the characteristics of modern globalized World is extensive usage of spatial information. This usage is presently defined with the concept of Spatial data infrastructure (SDI) as a basic platform and number of application concepts like Smart cities, Intelligent transportation systems, Precise farming or Smart environment. All those concepts rely of the fact that today modern technologies are capable to provide sufficient amount of accurate, reliable and timely spatial data about phenomena on the Earth. Among those modern technologies most promising and recently growing in use for data collection are global navigation satellites systems (GNSS) and Earth observation (EO) technologies from space. Implementation and usage of mentioned factors, SDI, GNSS or EO is influencing economic development. Existing GNSS systems (American GPS and Russian Glonass) connected with mobile communication infrastructure enable completely new approach to the navigation and positioning, providing location for any object on the Earth's surface instantaneously, influencing numerous business sectors. With the modernization of existing and setting up new systems like European Galileo and Chinese Beidou2 systems, influence of GNSS technologies on economy will further grow. Complementary to GNSS, fast development in space technology has boosted EO from space providing daily enormous amount of spatial data. Commercial and especially public satellite services, like those provided through European Copernicus program boosted usage of satellite images and other measurements giving to geoinformatic industry new frame and meaning.

Influence of SDI, GNSS and EO on economy has been investigated in many studies showing their great potential for economic growth. Still, there are many open questions what are the areas and where are the limits of economic growth when synergetic influence of SDI, GNSS and EO is observed. There is great potential in their synergetic implementation, but it is also visible that there are several challenges present. Among challenges, lack of skilled professionals, now and in future, and educational capacities able to deliver new profile of specialists and educate present ones, are recognized as critical. In order to investigate joint potential of SDI, GNSS and EO on economies in the region and threats coming from main obstacles research has been conducted in frame of several projects (SYNERGY, BESTSDI, EO4GEO) in past five years using four countries (Bosnia and Herzegovina, Croatia, Serbia and Slovenia) as test sample. Beside the known influence of INSPIRE and GNSS itself investigation has been launched about synergy and synergetic influence of those two developments on spatial data providers, mainly surveying and geoinformation companies, and spatial information users, mainly governmental bodies and public agencies and combined with EO influence. For this purpose, two surveys have been conducted in mentioned four countries simultaneously among two target groups, data providers and users, and gathered data analysed. Analysis results are then used to estimate effects of educational challenge on development of geoinformatics industry.

Keywords: *Spatial data, Infrastructure, GNSS, Copernicus, SYNERGIE, BESTSDI, EO4GEO*

1st Western Balkans Conference on GIS, Mine Surveying, Geodesy and Geomatics, Tirana 3.-4.10. 2018.

Influenece of modern spatial data concepts and data collection technologies on economic development

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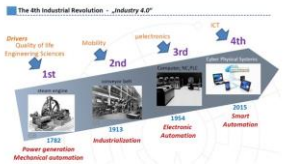
Faculty of Geodesy University of Zagreb

Present view to the future



- Today we are at the beginning of a Fourth Industrial Revolution entering the Digital Era
- We do not know duration of this process or its final results
- Space and nano-technology, robotics, bio-technology, artificial intelligence, ...
- Deep and far-reaching change
- Tremendous impact on economic and social development

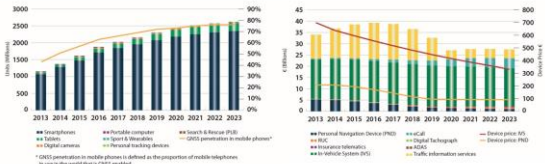
Plume of fourth industrial revolution

- Digital technology
- Technology dealing with information
- Especially spatial information/spatial data
- New technologies from space (GNSS and EO) and in situ (micro- or nano-electro-mechanic sensors, UAV's) provide necessary spatial data
- New concepts emerging about the use spatial data: SDI, ITS, Smart cities, Precise farming, BIM, ...
- Key issue: effectiveness of usage of spatial data
- Ultimate goal: spatial data in function of any kind of management

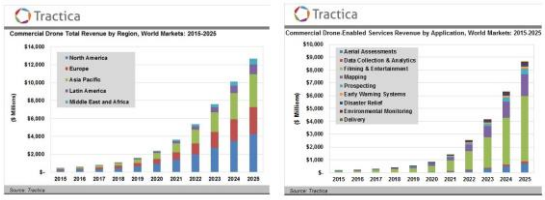
Earth observation market

- From 2007 to 2016, 181 EO/non-meteorology satellites were launched; the cost to develop these satellites generated US$ 17.4 billion in manufacturing market revenues.
  Over the next decade more than 600 EO satellites (50kg+, non-meteorology) should be launched to support EO applications. Nearly fifty countries are expected to launch satellite capacity, and over half should be from the private sector; this is expected to generate over US$ 33 billion in manufacturing market revenues.

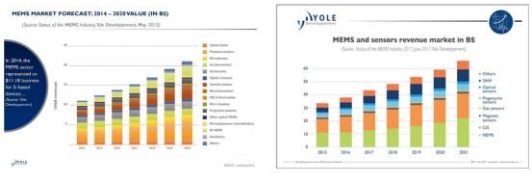
GNSS market



UAV (drone) market



MEMS market



Intelligent systems market

- The **Global Precision Farming Market** is valued at US4 3.18 billion in 2016 and is expected to reach a value of US$ 7.09 billion by the end of 2022, growing at a projected Compound Annual Growth Rate (CAGR) of 12.1% from 2017 to 2022.
- The **Global Intelligent Transportation Systems Market** was valued at US$ 20.3 billion in 2017 and is projected to reach US$ 30.92 billion by 2025, growing at a CAGR of 5.0% from 2018 to 2025.
- In 2017, the **global Intelligent Airways Transportation System** (IATS) market size was 12.4 billion US$ and it is expected to reach 29.0 billion US$ by the end of 2025, with a CAGR of 11.3% during 2018-2025.
- The international **building information modeling** (BIM) market, valued at US$ 2.7 billion in 2016, will reach US$ 11.7 billion by 2022, with a CAGR of 21.6% between 2016 and 2022.

Smart cities market

- The market has been segmented into 4 major focus areas: transportation, utilities, buildings, and smart citizen services.
- Rapid Connectivity, fast telecommunication provision, growing population, and hyper-urbanization are the major driving factors for the market.

Major challenge

- Modern spatial data based concepts and data capture technologies have great impact on economy and human welfare.
- All presented concept and technologies will further grow on high rate
- Estimation is that 65% of children entering primary school today will work in completely new job types that don't jet exist!
- But there are challenges which could become significant obstacles. Challenges identified as critical are:
  - lack of skilled professionals, now and in future and
  - lack of educational capacities able to deliver new specialists and educate present ones

Law of disruption – technology develops exponentially while social, economic and legal systems change incrementally! (Downes, L; 2000)

Challenge

- Mentioned challenge clearly indicates need for new knowledges and skills for professionals challenging educational system to provide education and training and offer new educational profiles on all levels of education scale!

From teacher?!

Machine learning engineer

Up to ... what?

Influencer (Social media manager)

5.12.2018. 12

Learning and skills

- Key contributor to society and economy.
- Fundamental transformation needed for future.
- Traditional approaches can't cover present and future needs!

European response

- EC has recognized the problem of changing needs in education and has launched Ereasmus+ program.
- Actions inside Key action 2: (centralized activities): Knowledge Alliances, Sector Skills Alliances, Capacity building in field of higher education and Capacity building in field of youth
- We participate in:
  - Sector Skills Aliances project EO4GEO (2018-2021) – goal to support a strategic approach („Blueprint") to sectorial cooperation on skills in field of geoinformatics
  - Capacity Building in field of Higher Education project BESTSDI (2016-2019) – goal to develop new curricula in filed of Spatial Data Infrastructure for academic study programmes

BESTSDI project results

Multiple surveys conducted – status and requirement analysis done.

Analysed content of 220 geo-courses in 5 partner countries at 15 faculties:

Connected with SDI/INSPIRE content	No of courses
SDI/INSPIRE central course topic	1
SDI/INSPRE web-services included	2
SDI/INSPIRE are partial course topic	5
SDI/INSPIRE data model included	5
Specific SDI/INSPIRE topics inculded	10
No SDI/INSPIRE topics included	197

User requirement survey distributed to 919 stakeholder (see structure) with 186 replys:

Zemlja	Odaslano upitnika	Odgovoreno upitnika	Rata odgovora (%)
Albanija	84	24	27
BiH	290	30	10
Hrvatska	125	69	55
Kosovo	45	15	33
Makedonija	50	20	40
Crna Gora	111	5	5
Srbija	214	23	11
Medijan	*111*	*23*	*27*
Prosjek	*131*	*27*	*22*

- 39% gov. and public admin.
- 4% NMACA's
- 18% academic stakeholders
- 26% companies
- 7% professional assoc. and NGO's
- 1% chambers and network assoc.
- 4% other

BESTSDI project results

- Project SDI curriculum defined.
- Content of SDI curriculum, course structure and adaptation rules defined.

Building blocks of new SDI curriculum

Summary

- Developing new geoinformatics competences and skills represent great challenge!
- There is gap between need for new competences and skills (now) and ability to introduce education for them in academia (5-10 years).
- Resulting in present gap between supply and demand.
- Number of projects are running on this topic, among them BESTSDI and EO4GEO.
- Projects should contribute to reduction of gap in field of SDI and geoinformatics.
- Beside challenge, projects are also opportunity for involved academic institutions to modernize themselves and profile as institutions fostering development and excellence.

AUTHORS BIO

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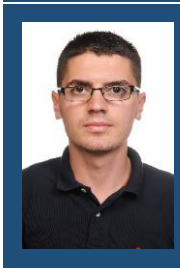
THE USAGE OF THE OPEN SOURCE SOFTWARE AND SATELLITE IMAGERY FOR DETECTING FLOOD AREA



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ABSTRACT

This paper presents the usage of GIS and satellite images, especially as an example is treated the phenomenon of Shkodra's flooding where the worst damages happened and there are also treated the localization of flooding phenomenon in general that had happened in Albania during March 2013. For Shkodra city were used the satellite images Landsat (Nasa), which have a resolution of 30m and for the localization of flood affected areas all over Albania were used Modis (Nasa) images, which have a lower resolution, but cover a larger area.

Quantum GIS program is used as the basic software, which is an open source program that contains even easily installed packages called Plugins that we can use depending on our necessities. The images were processed by using NDVI (Normalized Difference Vegetation Index) algorithm, via Semiautomatic Classification Plugin, which is a package that can be installed through QGIS (Quantum GIS). This technology gives us the opportunity to process the images in a very short time by using Remote Sensing. This paper presents the way of processing these images in the program, and also other possibilities that satellite images offer us in a large variety of important issues such as earth covering, climate, emergencies etc.

Keyword: GIS, Flood, Quantum GIS, Open data source

1. INTRODUCTION

March of the year 2013 brought a lot of problems in floods, as a consequence of lots of rainfalls in all over Albania. The most problematic areas were in the crossings and estuaries of big rivers, such as in Shkodra, Fieri, Vlora, etc. The most problematic city was Shkodra, where a lot of villages were flooded almost completely and water reached even the level 2-3m in some areas. Based on television and newspaper writings the figures of floods were varied, and sometimes with a big difference from one another. That is how this survey was conducted, starting with satellite images, which fortunately were carried out and belonged to that period. For Shkodra survey were used satellite images Landsat7ETM+. Furthermore, in this survey were concluded all the areas of

Albania evidencing the problematic areas, for which were used Modis satellite images that have a low resolution, but cover a larger area.

2. THE USAGE OF SATELLITE IMAGES LANDSAT 7ETM+ (ENHANCED THEMATIC MAPPER PLUS) FOR THE SURVEY OF FLOODS IN SHKODRA

For this survey were chosen satellite images Landsat 7 because they used to have a higher resolution compared to other free images that cover the flooded surfaces in Shkodra in that time. These images belong to 10 march of 2013 at 09:35AM, uploaded in the official page of USGS (United States Geological Survey) on the link: https://earthexplorer.usgs. gov/, where you have to be registered for getting services. For processing of these images was used QGis (Quantum Gis), which is an open source program that can easily be downloaded online (https://qgis.org/en/site/forusers/download.html). The main function of this program is Gis, but we can install even other packages inside this program, called pluggin Semi-Automatic Classification, which is used for satellite images processing and can be used depending on our needs. Specifically, pluggin Semi-Automatic Classification was installed that is used for processing satellite imagery. Within this pluggin we download images from the Usgs portal by placing bands that we want to process in our case Bands 3 and 4.

Table 1 *(Landsat 7 Etm+ Bands used for survey)*

Band	Wavelength	Useful for mapping
Band 3 - Red	0.63 - 0.69	Discriminates vegetation slopes
Band 4 - Near Infrared	0.77 - 0.90	Emphasizes biomass content and shorelines

The algorithm used for images processing is Normalized Difference vegetation Index, on condition that after processing, the image would be with values 0 and 1, based on the presence of water.

where((("#NIR#" - "#RED#") / ("#NIR#" + "#RED#")) < 0. 1. 0) @NDVI (1)

Since the downloaded image had problems which are some strips that cause interruptions in the raster image, manual digitalization was necessary. Based on the vector data with the Qgis program, we analyze the surface area by classifying by area

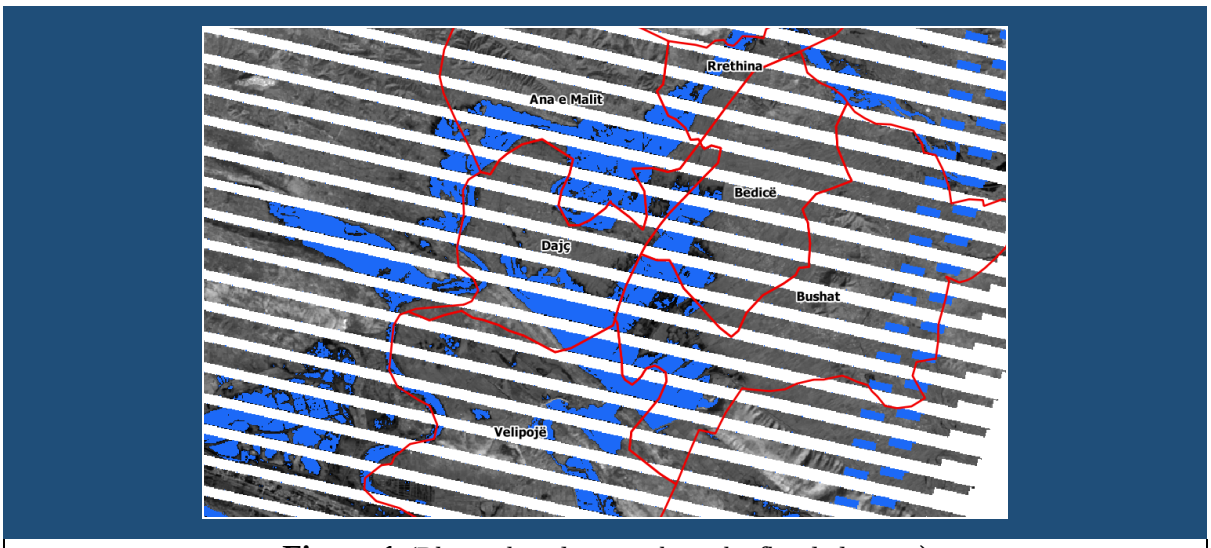

Figure 1 *(Blue colored areas show the flooded zones)*

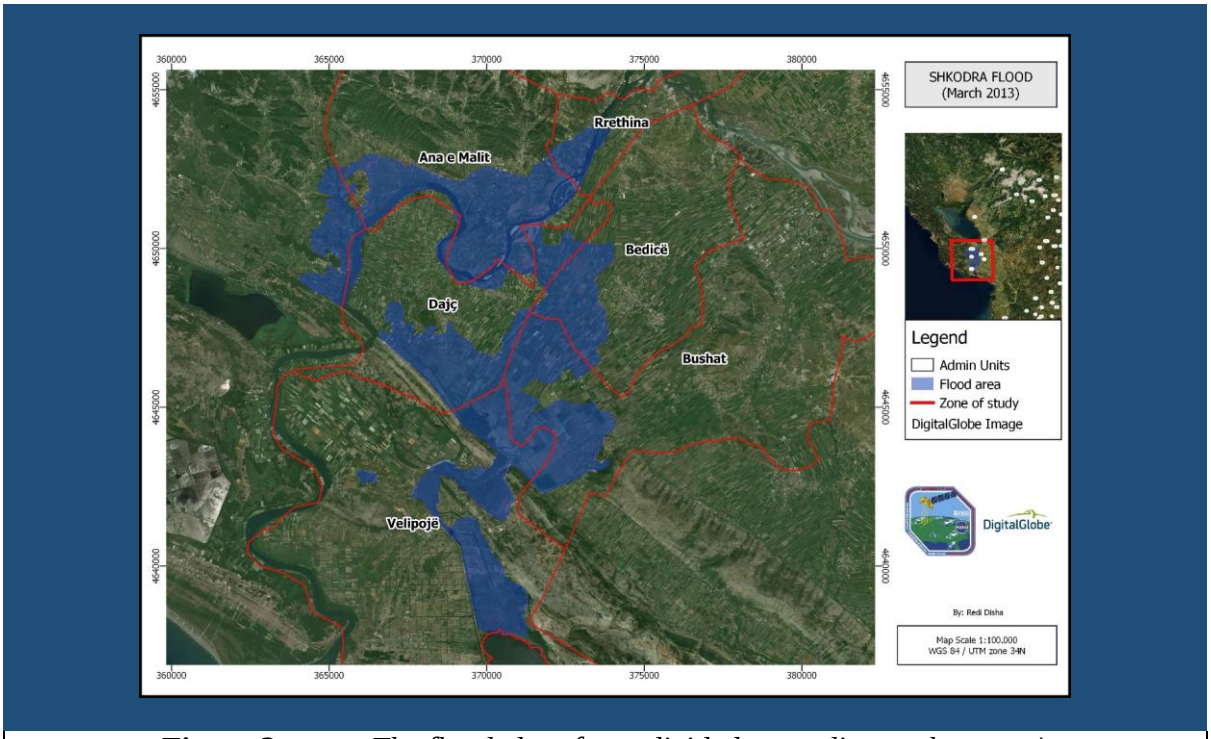

Figure 2 *Map1(The flooded surfaces divided according to the areas)*

***Table 2** (Flooded surfaces counted)*

Zone	Area (Km²)
Bushat	13.195
Dajç	10.625
Velipojë	9.537
Ana e Malit	14.705
Berdicë	6.613
Rrethina	2.058

By having available the parcel of the Dajc village we get to do the analysis on the parcels affected by the floods so it resulted from 1800 of 6266 parcels in total.

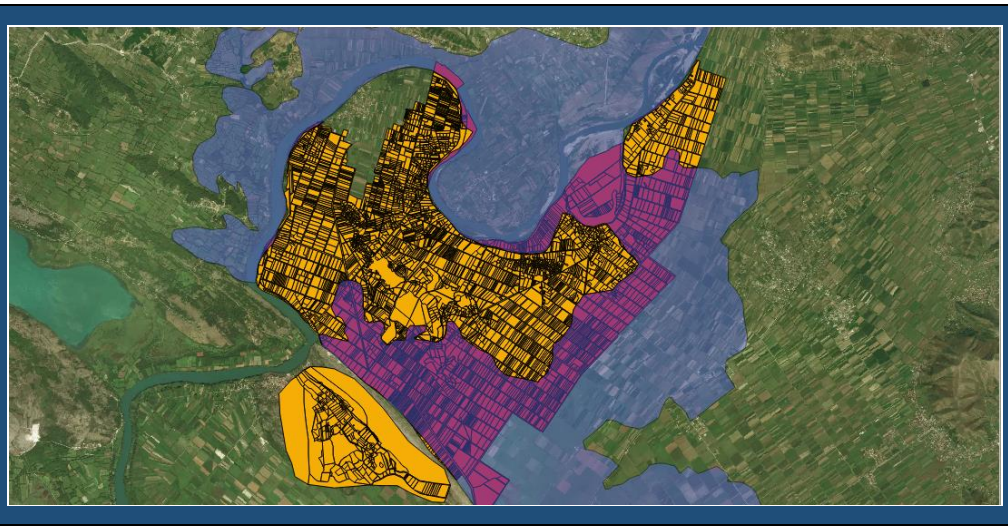

Figure 3 *The flooded parcels in Dajci areas*

QGis program offers us the possibility to create even models based on DTM (digital terrain model) which can be downloaded in Usgs portal for free. The shape file of the buildings can be downloaded for free too, in Osm (open street map).

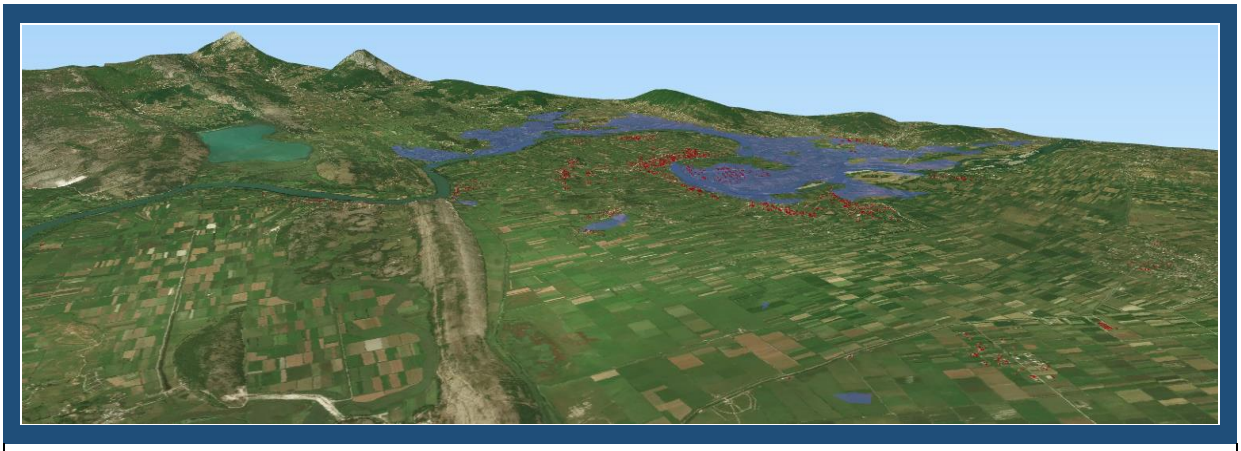

Figure 4 *3D model of floods in Shkodra*

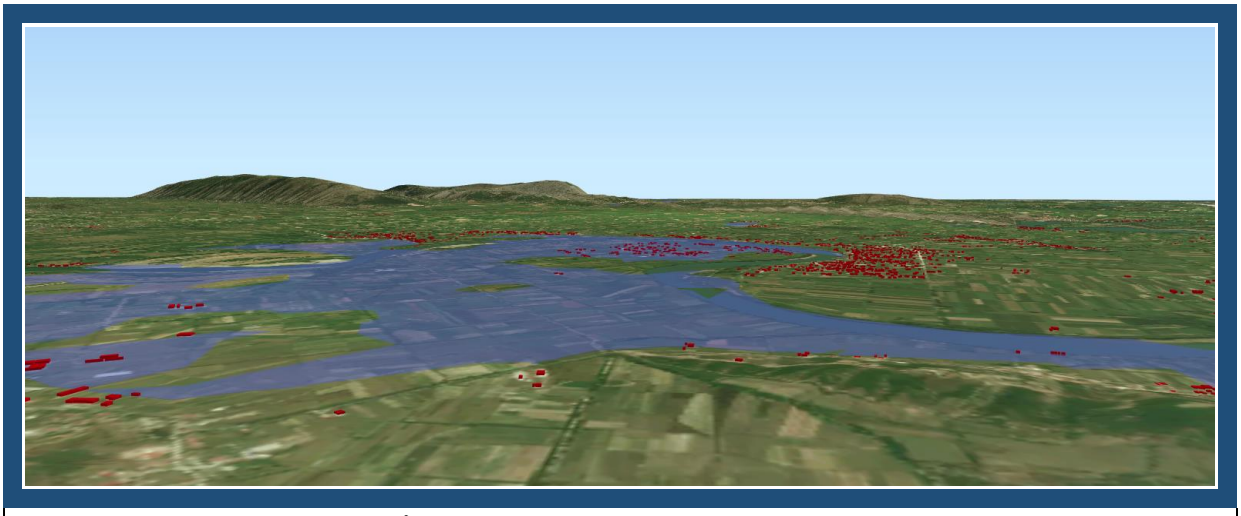

Figure 5 *3D model, buildings included*

3. THE USAGE OF MODIS(NASA) SATELLITE IMAGES FOR EVIDENCE OF FLOODED AREAS IN WEST ALBANIA

Satellite images Modis give us a better opportunity for large surfaces surveys, but they have a low resolution, which is 150-200m. Problem in this case were the clouds that had covered a large area in the moment that the images were taken. There are algorithms and frequency bands that can reduce clouds impact. In this case they are not used because we were interested for west Albania, where clouds covering did not seem to be a problem.

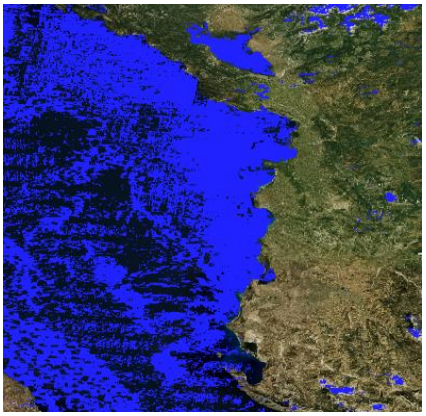

Figure 5 *Modis image processed by algorithm*

The algorithm of image processing is the same mentioned above, including the processing program. The raster image, processed, can be found even online on internet at the link below:

http://qgiscloud.com/redi/redi/

4. CONCLUSIONS AND RECOMMENDATION

The usage of remote Sensing in the evidence of flooded areas resulted efficient because in a short period of time was possible to make calculations and analyze for flooded areas, and all these were possible by using images and programs open source.

4.1. Recommendation

Recent years are made a lot of steps forward related to satellite images and open source programs. Sentinel satellite images give us the opportunity to process images of a resolution 10-20m, which is a relatively high resolution, taking into consideration that it can easily be downloaded for free. These kind of images can be used for floods, plants classification, fires, climate, natural disasters etc., which can be processed in so much more professional open source programs such as Snap (Sentinel Application Platform).

This program can be used for image processing sentinel 1 and 2. Furthermore there are a lot of other agencies and programs that offer the possibility to upload and process satellite images for free.

5. LITERATURE

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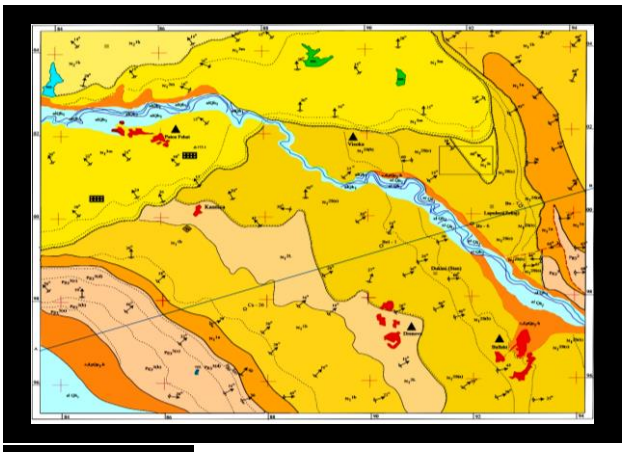
AUTHOR'S BIO

Redi Disha, born on 21.08.1996 in Tirana, Albania. currently is a student at Faculty of Geology and Mines for Geomatics engineering, actually a scientific master, graduated in bachelor's degree for Geoinformatic engineering at the same faculty. During the years of study, he has conducted parallel practices in private and state institutions (construction companies, topographic studios and municipality). He is passionate about GIS (Geographic Information System) and has completed independent studies in this field

SEISMIC REFRACTED AND SURFACE WAVES USED TO STUDYING OF LANDSLIDES
(A CASE STUDY)



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ABSTRACT

*The applied Seismic methods, today, have an important role in theoretical and applicative studies widely used, which are done through studying the spread of natural and provoked seismic waves in the rocky ground. There are different types of waves and through seismic methods, the spreading velocity, the acceleration of rock particles, amplitude and energy, frequency, phase and spectrum characteristics are determined. Seismic studies use the natural seism-acoustic impulses (**passive seismic**) and artificially provoked waves (**active seismic**). Depending on the geological task, the frequency band of the signal varies from (1÷1000) Hz. Landslides are among the most destructive geological forces in nature, causing billions of dollars in damage annually.*

Here, we describe a recent massive landslide in district of Ballsh. Through this study, the issue of evaluating the shear waves velocity V_S and layer thickness h, has been reached.

Keywords: Landslide; Seismic refracted waves processing (SeisImager2D); Multichannel Analysis of Surface Waves (MASW) processing (SurfSeis2).

1. INTRODUCTION

The purpose of this scientific research is focused on giving the correct layer configuration of the studying area and their physic-mechanical parameters, focusing on the evaluation of main parameters of seismic waves spreading, which are the longitudinal and shear wave velocity, V_P and V_S respectively. Reflected and refracted seismic wave's methods has been widely used in geological and geophysical studies, but in geotechnical studies besides them, the Multichannel Analysis of Surface Waves (MASW) continues to be used. Multichannel Analysis of Surface Waves (MASW) is a low

cost method, but it's limited to accuracy with regard to other methods and especially the seismic ***refracted*** wave's method, although one of its restrictions is connected with the complexity of inversion problem for this method, which can lead in a non-unique solution. In fact, this method is considered an additional tool for studying the properties of Earth layers.

2. METHODOLOGY AND ANALYSIS

The seismic observations were made with the refracted and surface wave's methods. A schematic display of the field geometry acquisition of surface waves (MASW), and seismic refraction methods are shown in figure [1, 2]. The processing of seismic data was made with *SeisImager2D* and *SurfSeis2 (MASW)* software, figures [3, 4], *(Roma V., 2003; Silo V., et al 2012; Silo E., et al 2016).* The area in which seismic measurements were performed to study the landslide, is located within oil fields area, figure [5], *(Bandilli L., Silo V., et al, 2004).* Seismic measurements were made along the profile (1-1) with a length of 915m, figure [6]. Geological deposits participating in the geological construction of this zone are those of Serravalian ($\mathbf{N_1^{2S}}$). Three lithological packs are divided, (a, b, c), fig. [7, 8]. The first two packs, (a, b), are characterized by the presence of sandy layer and lithothamnic limestone.

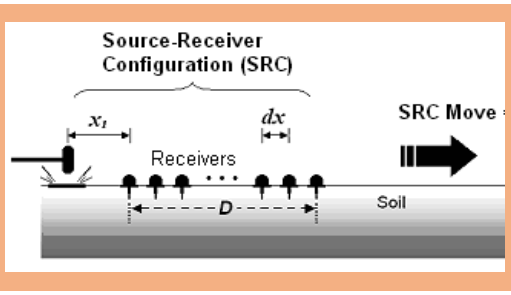

Figure 1 *Active MASW method.*

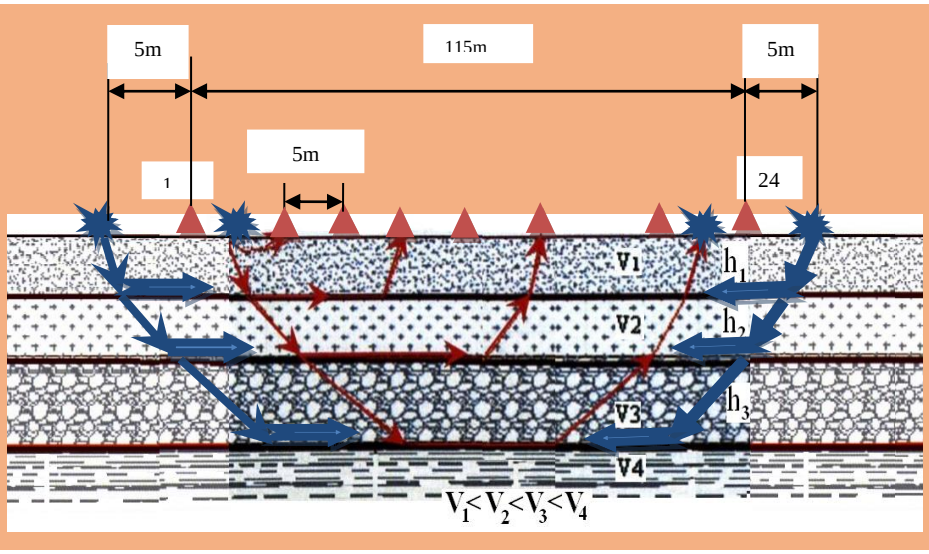

Figure 2 *A schematic display "Seismic Refraction Method".*

The (c) pack, is mostly composed of clays and rarely sandstone, is placed on top of (b) pack, composed by more consolidated layers, viewed from the physic-mechanical parameters point of view and as such is more disposed to slide. In the region, the Tortonian deposits (**N_1^{3t}**), are represented by sandstone separated by clays, placed transgressively over (c) pack of Serravalian.

Quaternary formations (Q) are of different genetic types. Besides eluvial deposits present in the region, there are colluvional and delluvional deposits. Colluvial, delluvial and prolluvial deposits, (c, d, p**Q_{p3-h}**), are spread in the hilly sides and in streams, with relatively small thickness, but more visible in the sides of Gjanica River, figure [7]. They are composed of clays, with a thickness approximately 3÷6 m. The lower Holocene (al. **Qh_1**) is composed of alluvial terraces deposits of Gjanica River, with a thickness up to 3÷5 m. The upper Holocene (al.**Qh_2**) represents the deposits of Gjanica river bed, with a thickness of 3÷4 m.

This zone is located in the screening neck of the carbonate structures of Ballshi and Visoka, which according to the seismic profile interpretation, the possibility of separation of them by a tectonic fault that closes eastward, is not excluded. This fault, including the others in the region, may activate, causing microseismic tremors that stimulate the sliding phenomenon in the region, figure [8], *(Gjoka M., Silo V., et al, 2004); (Bandilli L., Silo V., et al, 2004*).

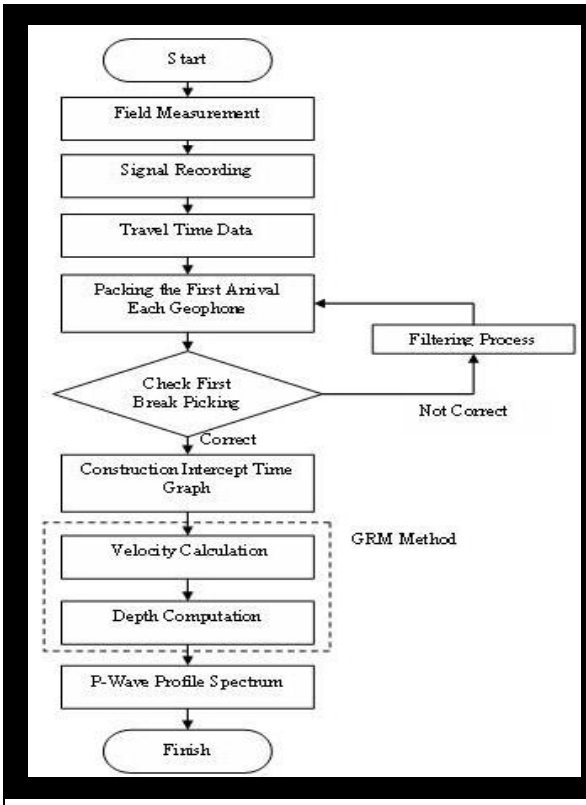

Figure 3
Flow chart of seismic Refracted Waves processing (SeisImager2D).

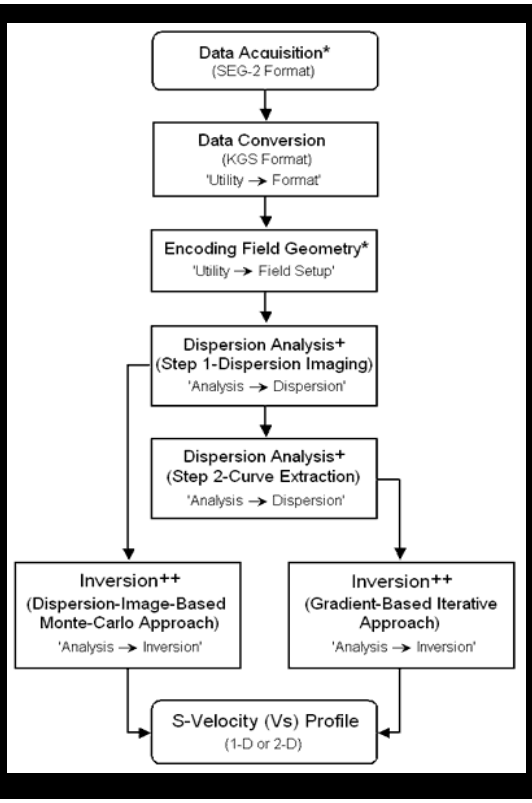

Figure 4
Flow chart of Multichannel Analysis of Surface Waves (MASW) processing (SurfSeis2).

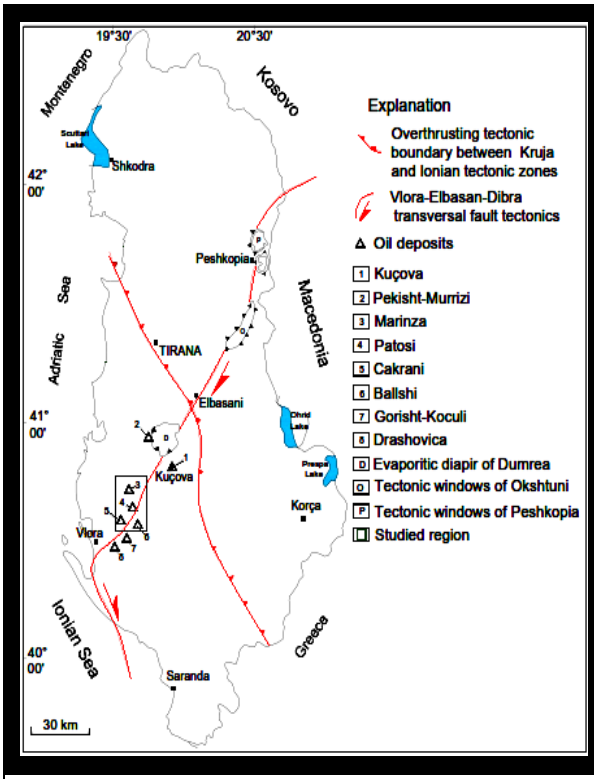

Figure 5
Geotectonic position of the studied region

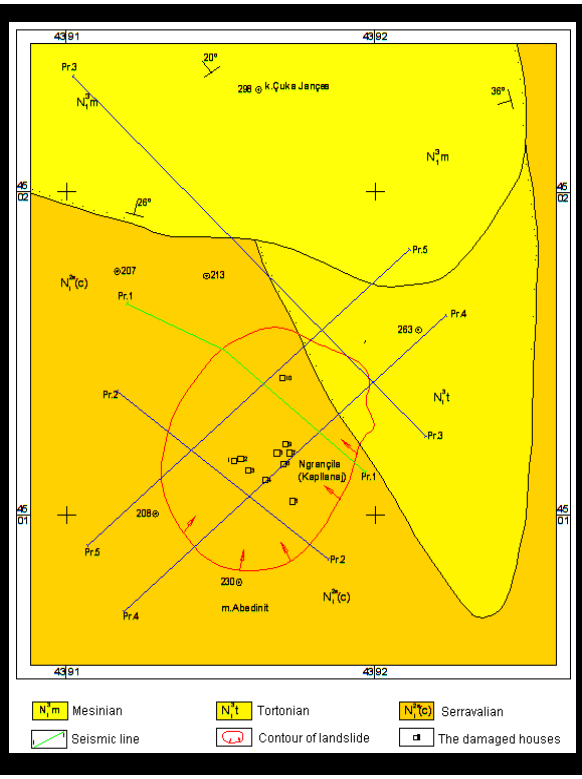

Figure 6
Seismic profiles layout in the studied area

As a result of this complicated structural and tectonic construction expressing a high geodynamic level, the region has been characterized by a frequent seismicity comprising all classes of earthquakes. Seismic activity is a product of tectonic faults, which acts sometimes like thrusts and other times like normal faults, whether they are caused from the regional compression field or Dumrea evaporite massive stresses. Note that Fieri district is included in one of the powerful seismic zones of our country, with a maximum magnitude of earthquakes, M_{max}=7.0, *(Sulstarova E., et al 2000).*

In figure [9] are given in the form of tomography, the evaluation results of layer thickness depending on depth, obtained from the processing of seismic refracted waves with the ***SeisImager2D*** software according to the flow chart figure [3] and the velocity of transverse waves (V_S) with depth, obtained from the application of surface waves processing software ***SurfSeis2 (MASW)***, figure [4], *(Silo V. 2005; Silo V., et al 2012; Silo E., et al 2016).* The evaluation of transverse waves velocity Vs ware made in the pickets: (115m, 175m, 295m, 415m, 535m, 660m, 775m, 900m).

From the interpretation in complex of these results, is noted that the application of refracted seismic waves method, has evidenced very clearly the plane of sliding layers, that in the result, are shown with the colours from reddish to open orange and respectively with a velocity of longitudinal waves (V_P) that varies 350÷670 m/sek, and thickness (5÷12) m. The thickness of sliding layers is noted clearly also through the evaluation of transverse waves velocity (V_S) in some pickets of the profile, figure [9].

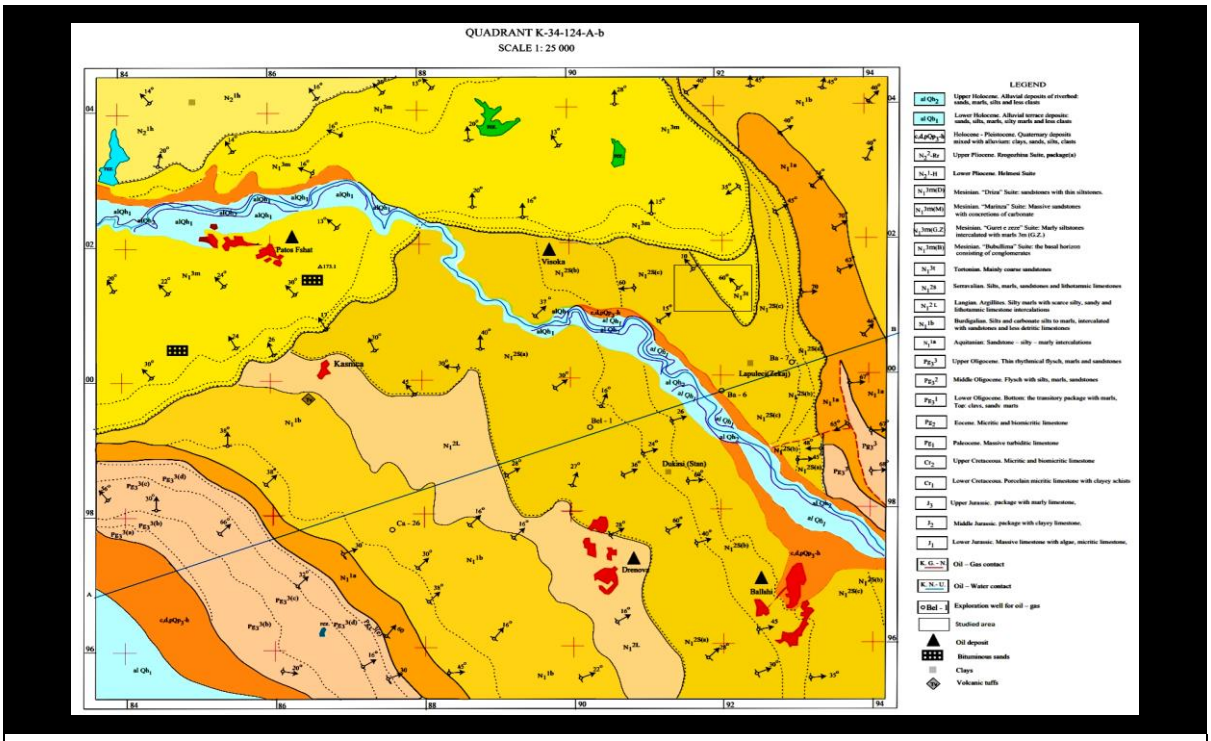

Figure 7 *Geological map of the sliding zone Ngraçie-Ballsh*

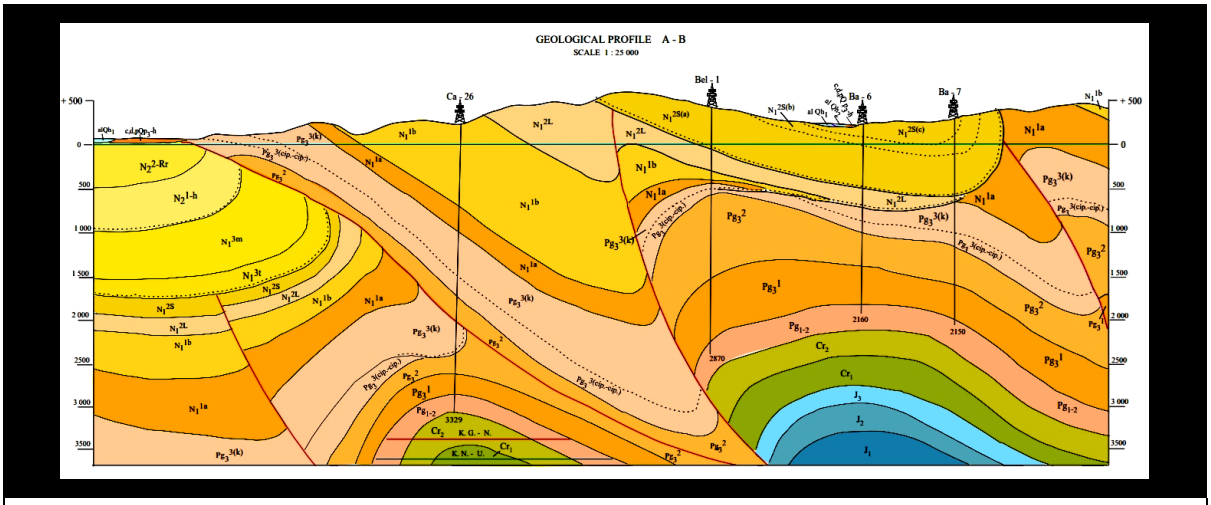

Figure 8 *Geological profile A-B, figure 7*

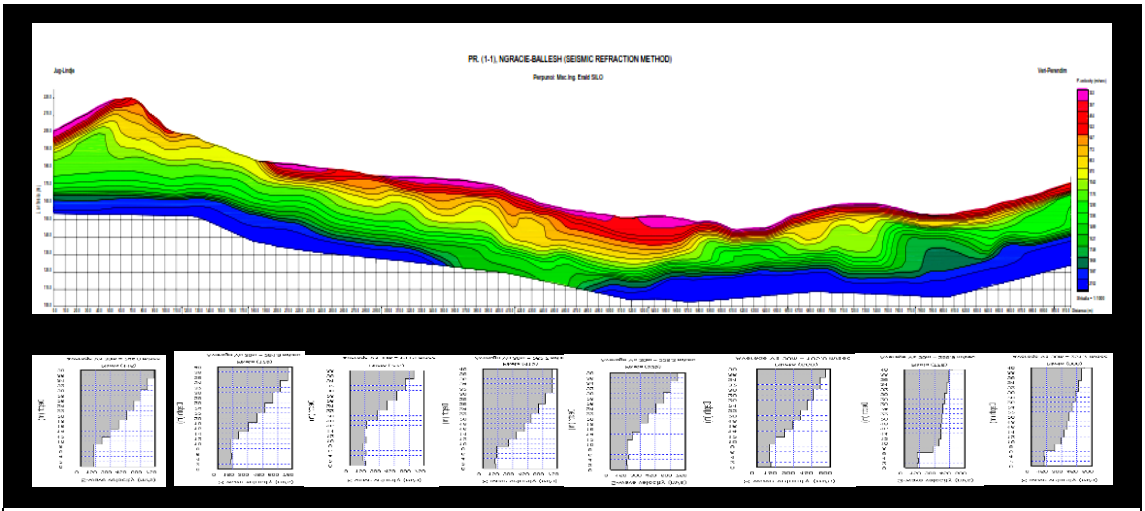

Figure 9 *Presentation in the form of tomography, of layer thickness evaluation results depending on depth, obtained from refracted seismic waves processing with the "SeisImager2D" software and velocity evaluation of transverse waves (V_{S30}), through surface waves, using the "SurfSeis2" (MASW) software, Pr.(1-1) Ngraçie-Ballsh, (Silo E., et al 2016).*

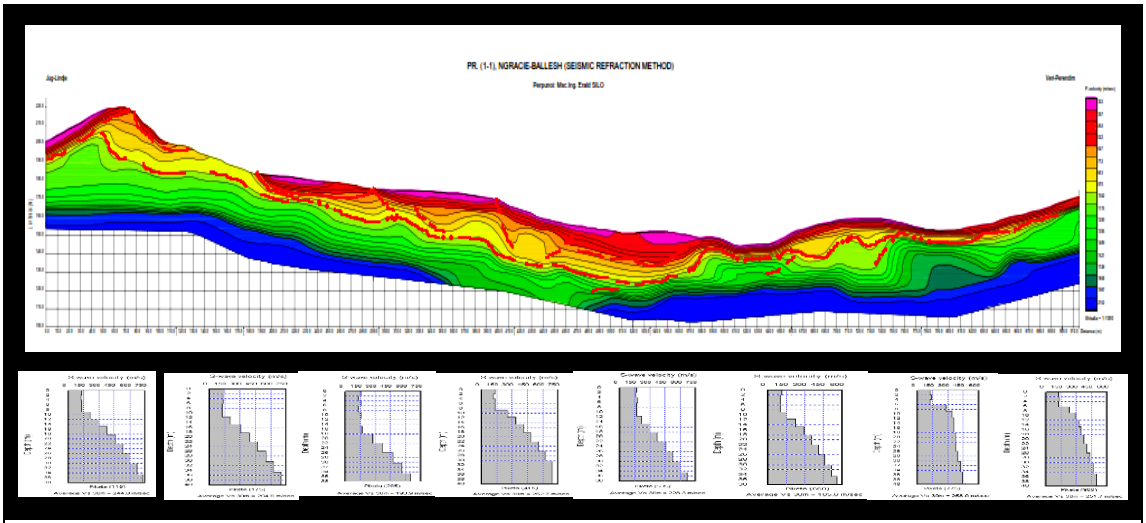

Figure 10 *Interpretation of the main plane of slide, associated with micro-faults, based on the interpretation of seismic data, processed with "SeisImager2D" and "SurfSeis2" (MASW) software, Pr.(1-1) Ngraçie-Ballsh, (Silo E., et al 2016).*

The transverse waves velocity, evaluated to the depth of 30m, resulted in the range Vs_{30}= (185÷295) m/s, which, faced with International Building Code-2003, is classified in the class D, table [1], and according to the Euro code 8, in class C, table [2]. In the depth of 12m, the velocity of Vs resulted in the range Vs= (140÷155) m/sec, which is classified in class E, that means we have to do with soft rocks, *(Silo E., et al 2016)*.

Table 1- *Soil classification according to International Building Code-2003*

Soil category	Geotechnical description	Transverse waves velocity Vs_{30}, (m/s)	Standard Penetration Resistance, N (blows/30 cm)
A	Very strong rock	>1500	N/A
B	Strong rock	760 < Vs ≤ 1500	N/A
C	Very compressed rock with combination of soft layers	360 < Vs ≤ 760	N>50
D	Compressed rock	180 ≤ Vs ≤ 360	15 ≤ N ≤ 50
E	Soft rock	<180	N<15
F	Rock with low sustainability		

The slide is evidenced inside the geological formations of Serravalian N_1^{2s}(c), which belongs to the lower sandy-clay pack, while in the eastern part, belongs to the Tortonian formations, which in geotechnical aspects, represent softy rocks, with weak physical-mechanical properties. From the results of the work with the seismic refracted waves method and the evaluation of shear waves velocity (V_{S30} method), the sliding plane and its configuration along the studied profile is revealed, through the change in layers relief configuration and the change of physic-mechanical properties in the sliding body. Note that the results of the two seismic methods support each other, making possible a very qualitative interpretation, figures [9, 10]. Inside the sliding zone are located 13 residential objects. As a result of the landslide, they have undergone irreversible deformation in their base structure and the surroundings, making them not habitable and the surrounding environment hard to recover for living purposes.

Table 2 - *Classification of soil type according to Euro code 8*

Soil	Geotechnical description	Vs_{30} (m/s)
A	Very strong homogenous deposits	>800
B	Very compressed gravels or sand deposits, or high sustainable clays, characterized by a gradual improvement of mechanical properties with depth.	360÷800
C	Averagely compressed gravels or sand deposits, or averagely sustainable clays.	180÷360
D	Deposits with granular material, from not to slightly compressed, or with light to average sustainability.	<180
E	Deposit composed of alluvial layers, with values of Vs similar with the type C or D lying over a basement with strong material with Vs>800m/s.	
S1	Deposits composed by, or that include clays with low sustainability, with high level of plasticity (IP>40) and water content.	<100
S2	Soil deposits that are exposed to liquefaction, from clays or any other soil category that cannot be classified in the types above.	

3. CONCLUSIONS

Through this study, the issue of evaluating the shear waves velocity V_S and layer thickness h, has been reached. For achieving this objective, attention has been paid to refracted and surface seismic waves. Through processing of surface seismic waves with the "MASW" software, the velocity values of seismic shear waves (V_S) has been determined, which are shown on velocity profiles, and consequently also the type of soil, with respect to the national and European technical rules.

Soil characterization, from seismic point of view, requires as a necessary element, the recognition of the shear waves Vs velocity profile, of Earth's layers in the working place, at least to the depth 30m.

In the studied area, the landslide is evidenced inside the geological formations of Serravalian N_1^{2s}(c), which belongs to the bottom clay-sand formations. In figure [9] are shown in the form of tomography, the results of layer thickness evaluation with dependence to depth, gained from the processing of refracted waves with the software ***SeisImager2D*** and also shear waves velocity (V_S) with dependence to depth, achieved through the application of the processing software of surface waves ***SurfSeis2 (MASW)***.

The velocity of surface waves, evaluated up to the depth of 30m, has resulted in the range: Vs_{30} = (185÷295) m/s, which in turn, faced with the International Building Code-2003, is classified in the class D, and according to the Euro code 8, in class C. In 12m depth, shear waves velocity resulted in the range: Vs = (140÷155) m/s, classified in class E, according to which we have to do with soft rocks.

From the results of the work with the seismic refracted waves method and the evaluation of shear waves velocity (V_{S30} method), the sliding plane and its configuration along the studied profile is revealed, through the change in layers relief configuration and the change of physic-mechanical properties in the sliding body, figure [10]. Note that the results of the two seismic methods support each other, making possible a very qualitative interpretation.

Due to the approximation made during the ***dispersion*** *and* ***inversion*** *procedure, the results received from* ***surface waves may not give a unique solution****. They must be used in combination with other seismic methods, and especially with the seismic refracted wave's method.* Thus for characterizing correctly the layers near Earth's surface with non-invasive methods, there must be used at least two seismic methods, the ***refracted and surface waves methods***.

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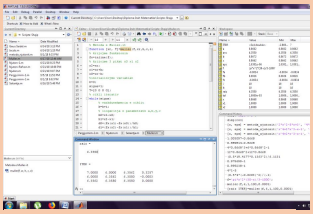

THE RATE OF CONVERGENCE USING MATLAB

OF THESE THREE NUMERICAL METHODS: NEWTON'S, MULLER'S AND SECANT'S METHOD

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ABSTRACT

Different methods have been created for solving algebraic equations. Methods that are being added and improved as a result of the contribution of many researchers dealing with them day by day. With the rapid evolution of technology, especially the information processing machines most commonly known as PCs, these methods are becoming more and more usable and applicable to solving everyday problems. These and other methods have provided a great deal of analysis to many of the problems that arise in everyday life. Today we see that computers are everywhere, and everywhere behind them are numerical methods or so-called iterative-methods.

Below we will briefly take a look to the theoretical part, to three of these methods by analyzing one by one. Then, for each method, a corresponding m-file was designed to simulate these methods on Matlab by solving real-life problems, equations. Given that a model is consistent, it is not feasible to apply any method to a problem without testing the size of the time and iterative steps which form the discrete approximation of the solution of the given problem. That is, convergence testing is a required component of any modelling study. At the end of the paper we will come up with some conclusions, conclusions drawn from the comparison of methods to each other, highlighting the advantages and disadvantages of each method (the pros and cons). And finally, the tasks for the future are highlighted so what can we improve or where the next study will consist of.

Keyword: Convergence, iteration, Secant, m-file.

1. Introduction

The three numerical methods that we will compare together are: Newton's method, Muller's and Secant's method. From the theory we know that: A numerical method or iterative method is said to be of order p or has the rate of

convergence p, if p is the largest positive real number for which there exists a finite constant $C \neq 0$ such that

$$|e_{k+1}| \leq C|e_k|^p \tag{1.1}$$

In other words, we can say in numerical analysis, the speed at which a convergent sequence approaches its limit is called the rate of convergence. Important for us is to use a method that converges very quick, it doesn't take much time. (1) The rate of convergence of Newton's method is 2; (2) The rate of convergence of Muller's method is 1.84; (3) The rate of convergence of Secant's method is 1.62

2. NEWTON'S METHOD (THE TANGENT METHOD)

This method is considered a very important method for solving algebraic equations. The idea of this method is that the next point x_{n+1} will be found with the help of the tangent's equation. The next point comes from the intersection, of the tangent taken at x_n point and the horizontal x-axis. The equation of tangent to the curve $y = f(x)$ at point x_n is as follows:

$$y = f(x_n) + f'(x_n)(x - x_n) \tag{1.2}$$

Graphically the idea is illustrated below.

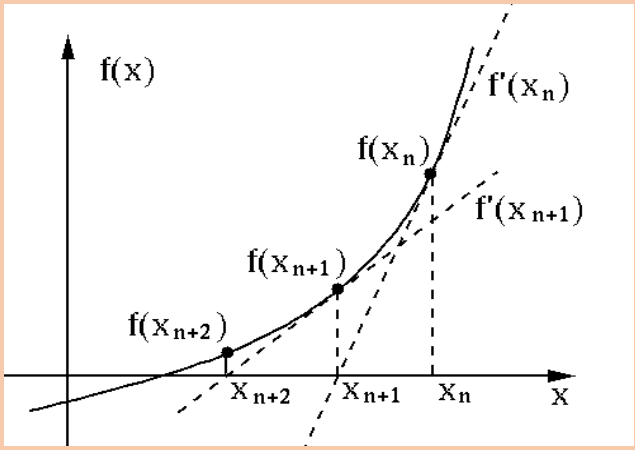

Figure 1 *Tangents taken at* x_n, x_{n+1}, x_{n+2} *points*

Example 1
It is given the below function:

$$f(x) = 2x^2 - 5x + 3.$$

For initial approximation $x_0 = 0$ we run the following program:

The program, the m-file written in Matlab.

```
function [ x, eps ] = Newton_method(f, df, x0, tol, nmax)
%
% Newton's method
% Root finding using Newton's method
% Inputs:
% f – the function
% df – derivative of the function
% x0 – first approximation
% tol - tolerance
% nmax – max number of iterations
%
```

```
% output:
% x – the root
% eps – error of the last iteration
%
% example:
% [x, eps] = Newton_method('2*x^2-5*x+3', '4*x-5', 0, 0.5*10^-5, 10)

if nargin == 3
tol = 1e-4;
nmax = 1e1;
elseif nargin == 4
nmax = 1e1;
elseif nargin ~= 5
error('Newton's method: wrong inputs!');
end
f = inline(f);
df = inline(df);
eps = tol+1;
it = 0;
while (eps >= tol) && (it <= nmax)
x = x0 - (f(x0)/df(x0));
eps = abs(x-x0);
x0=x;
it = it+1;
fprintf('\n i=%i, x=%f, eps=%e', it, x, eps);
end
end
```

After the run the output looks like below.

```
>> [x, eps] = metoda_njutonit('2*x^2-5*x+3', '4*x-5', 0, 0.5*10^-5, 10)

 i=1, x=0.600000, eps=6.000000e-001
 i=2, x=0.876923, eps=2.769231e-001
 i=3, x=0.979699, eps=1.027756e-001
 i=4, x=0.999238, eps=1.953897e-002
 i=5, x=0.999999, eps=7.612212e-004
 i=6, x=1.000000, eps=1.158910e-006
x =    1.0000
eps = 1.1589e-006
>>
```

So the root of the function is $x = 1$.

3. RATE OF CONVERGENCE METHOD

Now we will see if the order of convergence will comply, based on our calculations, with the theoretical one $p = 2$. We will use the 3-rd and 4-rth iteration.

$$x_n - \alpha = h_n$$
$$x_3 - \alpha = h_3 \rightarrow 0.979699 - 1 = -0.0203$$
$$x_{n+1} - \alpha = h_{n+1}$$
$$x_4 - \alpha = h_4 \rightarrow 0.999238 - 1 = -0.000762$$

The following conditions must be met for the above values.

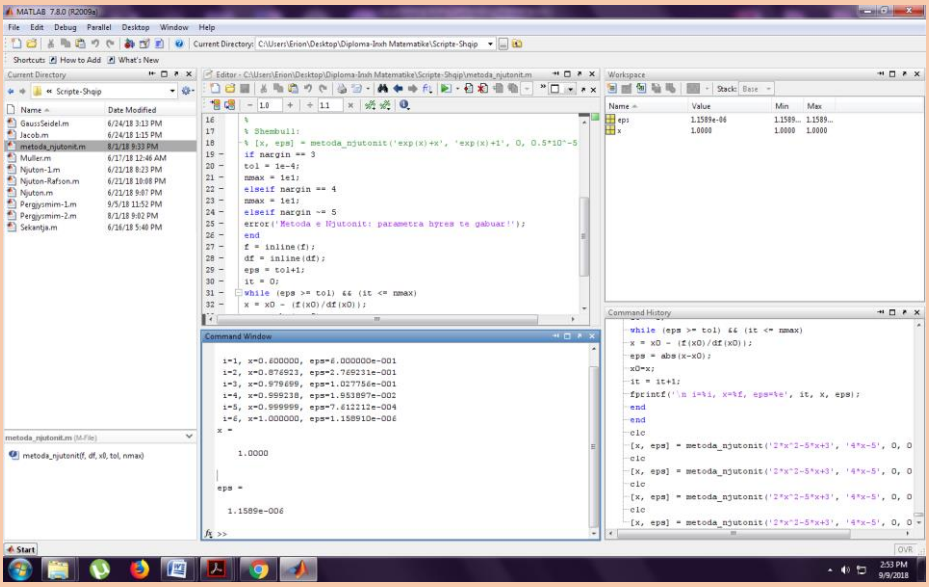

Figure 2 *Screenshot from workspace on Matlab.*

$$h_{n+1} = \frac{\frac{1}{2} f''(\alpha) \cdot h_n^2}{f'(\alpha)}$$

$$f'(1) = -1$$
$$f''(1) = 4$$

$$\frac{\frac{1}{2} f''(\alpha) \cdot h_n^2}{f'(\alpha)} = \frac{0.5 \cdot 4 \cdot (-0.0203)^2}{-1} = -0.000824 \approx -0.000762 = \mathrm{h}_{3+1} = \mathrm{h}_4$$

So what we conclude is that they are almost the same.

4. SECANT METHOD

The equation to which obeys this method is the following one:

$$x_{n+1} = x_n - \frac{x_n - x_{n-1}}{f_n - f_{n-1}} f_n \qquad (4.1)$$

for n=1; 2; ....

From the above equation we see that calculating the next value is necessary knowing 2 initial approximations x_0 and x_1. They can be assumed or can be calculated with another method before.

This method can be considered as a variant close to Newton's method. This method replaces the derivative part with an approximation.

In the same way we start from the base formula of the method. It is the one below:

$$x_{i+1} = \frac{x_{i-1}f(x_i) - x_i f(x_{i-1})}{f(x_i) - f(x_{i-1})} \quad (4.2)$$

Let assume that 'y' is the root of the function $f(x)$, which means that $f(y) = 0$.
For different steps we have:

$$\begin{aligned} x_{i+1} &= y + e_{i+1} \\ x_i &= y + e_i \\ x_{i-1} &= y + e_{i-1} \end{aligned} \quad (4.3)$$

The function values at the above points x_i, x_{i-1} are calculated:

$$\begin{aligned} f(x_i) &= f(y + e_i) \\ f(x_{i-1}) &= f(y + e_{i-1}) \end{aligned} \quad (4.4)$$

The above expressions replace in the base formula and take the following:

$$y + e_{i+1} = \frac{(y+e_{i-1})f(y+e_i) - (y+e_i)f(y+e_{i-1})}{f(y+e_i) - f(y+e_{i-1})} \quad (4.5)$$

Expressions $f(y + e_i)$ and $f(y + e_{i-1})$ are decomposed according to the Taylor series and replaced in the above expression. So we have:
$y + e_{i+1} =$

$$= \frac{(y + e_{i-1})[f(y) + e_i f'(y) + \frac{e_i^2}{2} f''(y)] - (y + e_i)[f(y) + e_{i-1} f'(y) + \frac{e_{i-1}^2}{2} f''(y)]}{f(y) + e_i f'(y) + \frac{e_i^2}{2} f''(y) - f(y) - e_{i-1} f'(y) - \frac{e_{i-1}^2}{2} f''(y)}$$

After the reductions the above expression looks like:

$$e_{i+1} = \frac{(e_{i-1}e_i^2 - e_i e_{i-1}^2) f''(y)}{2(e_i - e_{i-1}) f'(y)}$$

After factoring the expression $(e_i - e_{i-1})$ we have:

$$= e_i e_{i-1} \frac{f''(y)}{2f'(y)}$$

(4.6)

In order to find the rate of convergence it's necessary to make the following replacements.

$$e_{i+1} = K e_i^m, \quad e_i = K e_{i-1}^m, \quad e_{i-1} = \left(\frac{e_i}{K}\right)^{1/m}$$

By replacing above equations take:

$$e_{i+1} = e_i \left(\frac{e_i}{K}\right)^{1/m} \frac{f''(y)}{2f'(y)} = e_i (e_i)^{1/m} \frac{f''(y)}{2f'(y) K^{1/m}} \quad (3.7)$$

Comparing the above expressions take:

$$K = \frac{f''(y)}{2f'(y)K^{1/m}}$$

$$e_i{}^m = e_i(e_i)^{1/m} = e_i{}^{1+\frac{1}{m}}$$

By solving against m the equation $m = 1 + \frac{1}{m}$ we take that $m = 1.62$.

$$e_{i+1} = (e_i)^{1.62} \frac{f''(y)}{2f'(y)K^{0.62}}$$

Finally, the rate of convergence is 1.62.

If we compare the 2 methods with each other, this one with the Newton's method we will see that the Newton's converge more quickly. However, the Newton method requires for each step calculation of its function and its derivative f' while the Secant method only requires calculation of the function f.

The m-file that we have run in Matlab is:

```
function secant_method(x)
x=2
err=f(x);

while abs(err)>1e-10
    disp(x)
    res=fprimeapprox(x);
    if abs(res)<1e-5
        disp('Derivative close to zero. Perturbing state by 1e-2')
        x=x+1e-2;
    else
        x=x-f(x)/fprimeapprox(x);
    end
    err=f(x);
end
result = x
err = f(result)
 function out = f(x)
out=(x-1)*(x-3)*(x-5)*(x-10);
 function out = fprimeapprox(x)
del = 5
out=(f(x+del)-f(x-del))/(2*del);
```

5. MULLER'S METHOD

Unlike the Secant method that uses two initial approximations, this method uses three approximations and builds the respective parabola passing through them. The successor approximation is found as the intersection point of this parabola with the x-axis.

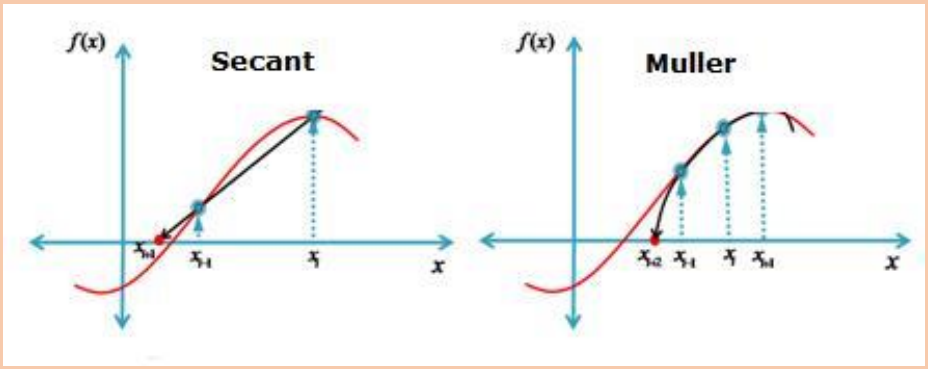

Figure 3 *Secant and Muller's method*

The function is given:

$$f(x) = \frac{\pi x^2(30 - x)}{3} - 1000$$

The m-file written and executed in Matlab is shown below:

```
% Muller's method
function [xr, T]=muller(f,xr,h,c,e)
% create the function
fx=inline(f);
% 3 points: x0 x1 x2
x2=xr;
x1=xr+h;
x0=xr-h;
%variables
k=0;
sigue=1;
T=[0 0 0 0];
% iterative cycle
while(sigue)
    % continue with cycle
    k=k+1;
    % calculation of a,b,y,c
    h0=x1-x0;
    h1=x2-x1;
    d0=(fx(x1)-fx(x0))/h0;
    d1=(fx(x2)-fx(x1))/h1;
    a=(d1-d0)/(h1+h0);
    b=a*h1+d1;
    c=fx(x2);
    % calculate the raiz
    raizd=sqrt(b*b-4*a*c);
    % the value
    if abs(b+raizd)>abs(b-raizd)
       den=b+raizd;
    else
       den=b-raizd;
    end
    % calculation of derivative
    dxr=-2*c/den;
```

```
    xr=x2+dxr;
    % ..........
    sigue=abs(dxr)/xr>e||k<c||abs(fx(xr))>e;
    % ......
    x0=x1;
    x1=x2;
    x2=xr;
    % ........
    T(k,:)=[x0 x1 x2 fx(xr)];
% the end of cycle
end
% convergence
if k==c
   xr='No converge';
end
```

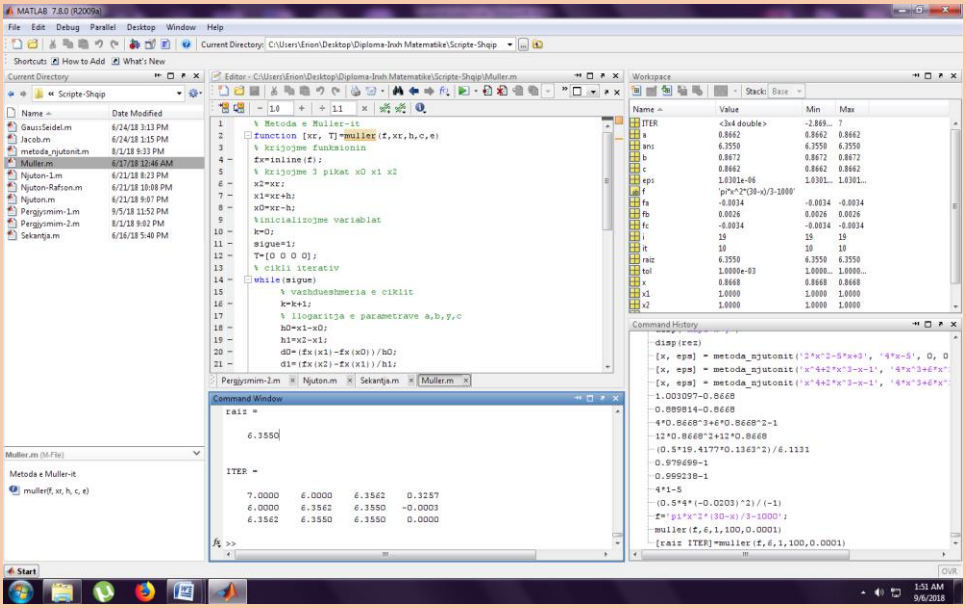

Figure 4 *Screenshot from workspace on Matlab*

Muller's method is usually used to find the zeros of arbitrary analytic functions such as polynomials. The rate of convergence of this method is 1.84.

6. CONCLUSIONS

[1]. Since the Newton's method has the order of 2 so the highest value from the two others (Muller p=1.84 and Secant p=1.62) it means that the time it converges is fewer than the others. It converges more quickly.

[2]. The main disadvantage of the Newton's method is that if we do not take a good approximation at the beginning it has the possibility to not converge.

[3]. If we compare Secant method with the Newton's method we will see that the Newton method requires for each step calculation of its function and its derivative f' while the Secant method only requires

calculation of the function f. So this is an advantage of Newton's method.

[4]. Muller's method compares to Secant method converge faster. It needs less time till the result. An disadvantage is that needs for three initial approximations.

[5]. The main task for the future scientific work is to design a table or a diagram where to be included all the methods (not only these three) and in percentage to appreciate any advantage or disadvantage of them.

7. REFERENCES

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AUTHOR'S BIO

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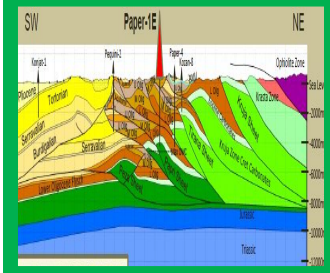

PETROLEUM PROSPECT IN ALBANIA AND RISK OF PETROLEUM EXPLORATION IN SHPIRAGU REGION

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ABSTRACT

The discovering and exploiting of new oil & gas reservoirs during last decades, has been from the substantial successes of Albanian researches. Geological survey was faced with very complicated structures, traps, reservoirs, the various oils & gas types, great depths as well as the absent of up-today technology, not forgetting "urged exploration directions". Despite, all above difficulties, the Geological Oil Survey has been successful. Up to 1944 year, the oil production has been about 235 000 t/a. After this year up to date, with investments made by Albanian state, Petroleum Albanian Geologists, have discovered many reservoirs enabling producing 50 Mt. of oil and 12 billion cubic meter gas." Indicated reserve ready for exploration, requiring up to date technology are no less than 4 times against produces ones.

Comparing the country's annual production with the price of a ton of oil in the world market result that country's revenue is of billions' dollar's rank. Nevertheless, during '90s, the oil output has declined tremendously, being with the lowest levels during 65 years (except 1943 year). At any rate due to the price increase, the incomes must have been at the level of US $ 50 Mt./a. Based in old and new documents, published in Albania and abroad, are brought very important data and great possibilities generating oil & gas sector, especially today in the terms of collaboration with oil international market.

Actually, oil & gas technology is suffering deep crises. The crises are expressed with a general declining of exploration from known reservoirs, in the reduction and destroying of scientific geological infrastructure as well as production. It must be emphasized also the massive departure of oil geologists from this sector and abroad. Due to the reduction of productive wells up to 50%, the current output compared to 1 Mt. year, has dropped drastically.

All above situation, closely related with the relevant privatization strategy that could have managed this important sector. This situation is turned to be a heavy burden on the shoulders of petroleum industry related inhabitants relying totally in this sector as well as on small oil & gas consumers. The response for the absent of results of foreign companies in Albanian territory could be the partition of petroleum prospects as well as neglecting of Albanian Geological expertise in oil & gas exploration. These are a lot of new ways enabling the revitalization and renovation of petroleum sector as well as its derivative industries.

These still exist human resources that despite the small state's investments can overcome current situation. Based on geological features, it has been concluded that the Ionian zone is a petroleum system. In the carbonate section, there are seven levels of source rocks, who are involved in the oil window. Phases of hydrocarbon migration occurred during the Serravalian to Pliocene-postpliocene time (Prifti & Muska, 2013). Consequently, oil and gas fields are discovered in reservoirs of limestone, while the sandstone reservoirs are superimposed on eroded limestone.

Keywords: *Geology, Petrol, Risk*

1. HISTORY OF EXPLORATION

To date, exploration and production in Albania, mainly has focused on shallow carbonate formation (1500 to 3500m), that produce oil and gas condensate in thrust structures: Visoka, Gorisht-Kocul, Ballsh-Hekal, Cakran-Mollaj and Finiq-Krane. All these oilfields belong to Kurveleshi belt, which is the most complicated part of the Ionian zone. The Balkan region has proven oil reserves totaling about 345 million barrels. Of that 198 million barrels located in Albania (AKBN, 2012).

Intensive exploration effort during 1989 yielded new Delvina oilfield (condensate and gas). This was the first oilfield discovery in subthrust (Fig. 5) (Velaj et al., 1998). Current production from two existing wells in this oilfield (Del-4, Del-12) is 700 Mcf/d of natural gas and 47 barrels/day of 62.5 API condensate. In this time was discovered and the Karbunara oilfield beneath the Kremenara anticline (Fig.5). Kanina-1 drilled (5362m) in Tragjasi anticline (Çika anticline belt), discovered beneath it an anticline structure in subthrust (Fig. 5) and have proved hydrocarbons in the system: 163m oil leg found, but not flow (16-20 API, low porosity 0.019%).

The wells Vlora-10 and Vlora-11 have attacked one anticline structure on subthrust, beneath the over thrust of Ionian zone (Fig. 5), and have flowed the small amount of oil and gas in the surface (Velaj, et al, 1999; Velaj, 2001). On December 2001 the Occidental Company (OXY) declared Shpiragu discovery, after drilling and testing of the Shpiragu-1 well in subthrust, beneath the overthrust of Berati anticlinal belt (Figs. 5, 20). Shpiragu well proved light oil (370 API) from fractured carbonate reservoir of Upper Cretaceous-Eocene. The data that are available (deep well Dumre-7, Shpiragu-1, Shpiragu-2, etc., and seismic works), show that Shpiragu anticline structure extends in north beneath the overthrust of Dumre diapir (Fig. 10) and in the south with Molishti structures etc. (Fig. 20). There has been limited exploration to date, but with the advances in three dimensional technology and deep well drilling are created the all the possibilities for intensive exploration of Albania thrust-belt, which is with high perspective. The Shpiragu-2 well reached total depth of 5547 meters in late June (2013), and the Company has completed setting the production liner.

The rig has been released and will be mobilized to the Molisht-1 drill site upon completion of road and lease construction, where the depth to top of carbonate reservoir estimated to be about 4500 to 4600m. Stimulation and testing equipment rig up will begin once the drilling rig is off the Shpirag-2 lease. The Company intends to test between 350 to 400 meters of the target carbonate zone. In the same time two other drilling place are along the Shpiragu thrust sheet (Petromanas Energy Inc, 2013).

The content of this paper is based on the latest data obtained by deep wells (Shpiragu-1, Shpiragu-2, Dumre-7, and Kanina-1. Delvine-4, Ardenica, etc.), a considerable volume of 2D seismic with high quality and all the complex of studies (geochemical, stratigraphic, tectonics, etc.), to throw light on prospects of the oil and gas exploration in Berati anticlinal belt and in all External Albanides. The conclusions of the article are available for exploration and in External Hellenides (Greece) and Montenegro.

The eastern part of the Ionian zone, including Permeti syncline and Berati anticline subzones (Shpiragu region), has not followed the same history of geological development. This sector has changed into a mainland after the end of flysch deposits of the Upper Oligocene (Pg_3^3). The source rocks in this area have not been subjected to a new stage of maturity as in the western part of the Ionian zone.

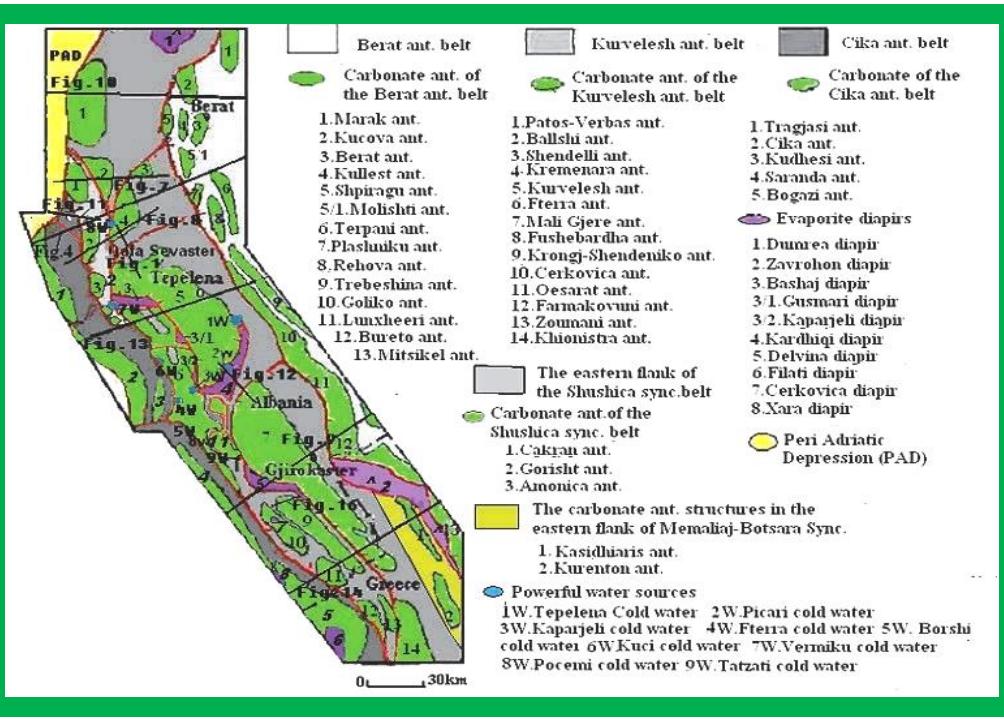

Figure 1 *The schematic tectonics map of the structures in the Kurvelesh anticlinal belt and surrounding regions (Velaj 2015)*

Oil seeps have actually been found in carbonate, flysch and molasses sections. Traps of oil have been discovered in molasses section (Kuçova oilfield). Grude oils were migrated from eroded lime stones of Kuçova anticline and from tectonic plane of Shpiragu anticline. Also were taken positive results during petroleum research in carbonates section (Shpiragu anticline).

Under hydrocarbon composition, grude oils of Shpiragu – Kuçova region have aromatic nature, and not included in normal petroleum. Looking at the complex data I judge that eastern sector (Shpiragu region) of the Ionian zone represents another petroleum system. The stage of maturity of source rocks and tectonically phases after upper Oligocene time (Pg_3^3) have an important role. So source rocks maturity may have reached the peak of oil generation therefore were not able to generate condensate. That is why at 5000m depth are not met condensate and increases the risk of petroleum research in this region.

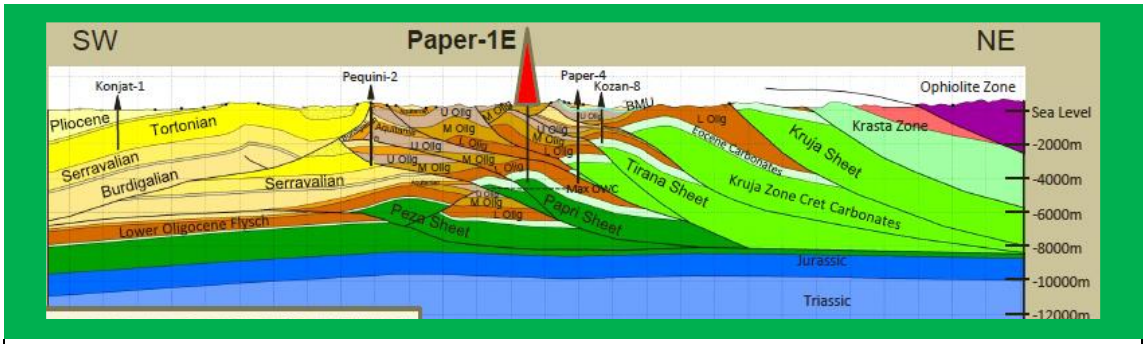

Figure 2 *Petroleum prospect in Papri region*

2. RISK ASSESSMENT OF PETROLEUM PROSPECTS

Petroleum exploration is a risky process. Three elements risk this process (mentioned above): (1) Source rocks; (2) Reservoirs; (3) Trap.

Source rocks are met by Shpiragu-1 well (levels from Late Triassic to Early Cretaceous). Their quantity and quality should not differ greatly from those studied in other sectors of the Ionian zone. Berat subzone anticline has returned to the mainland at the end of the upper Oligocene era, it has hampered further maturity of the source rocks. Their maturity has continued in the west sector where basin continues subsidence (rocks of Miocene section are deposited). So source rocks maturity may have reached the peak of oil generation therefore were not able to generate condensate. That is why at 5000m depth are not met condensate and increases the risk of petroleum research in this region. Primary migration of hydrocarbons from rocks occurred directly after returning to the mainland after the Upper Oligocene. We can call earlier migration that occurred in the Ionian zone.

Natural reservoirs are carbonate section and proved in oilfields. Their characteristics greatly influence by cracks system. Regarding the time, the formation of reservoirs there is no study. Generation of hydrocarbons in source rocks creates high pressure and their migration more easily implemented during plans of tectonic faults. This has led to the formation of the bituminous sandstones of flysc deposits. So I think the cracks system of carbonate has not been developed in the Late Oligocene. This has oriented hydrocarbons migrate to plans of tectonic blocks.

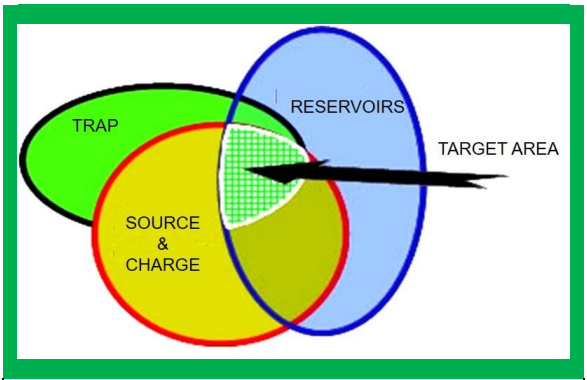

Figure 3 *Combined of geological features*

Anticline trap is not an authentic as they of Gorishti, Ballsh Cakran (which have their origins during sedimentation), but a tectonic block formed after the upper Oligocene time. This block has met the conditions for hydrocarbons trapping. The anomaly of oiltrap goes up 400m on the roof of limestone, thus not reflected to the surface. The above three elements create a small target surface area thereby increasing the risk of petroleum research in this region.

This was proved by the testing conducted in Shpiragu-2 well showed the presence of oiltrap without gaseous cap, but the sharp decline pressure of the well is characteristic of a low-energy oiltrap.

3. RISK OF PETROLEUM EXPLORATION IN SHPIRAGU REGION

Petroleum exploration in the area of Shpiragu discovered oil at a depth of about 5000 meters (website: www. Petromanas.com), where the fluid type is not the same as in the west of the Ionian zone (in this depth it should have been condensate and wet gas). This prompted us to repeat the interpretation of geological setting and some geochemical parameters. The north part of Berati subzone is constructed by these units:

- The Diaper of Dumre;
- The Tectonic blocks of Berati anticline belt.

Diaper's Dumre is placed in the continuation of the northern anticline structures of Berati belt. Dumrea evaporate formation is of age earlier than the Upper Triassic, or the Permo-Triassic. The explosion of Diaper has occurred on the western part of Maraku anticline (northern structure of Berati belt) where there was greater intensity, expressed as the most advanced westward diapir. The current form is performed after the Pliocene tectonic phase. This has been confirmed by seismic studies and the drilling of the well Dumre-7. The Berati anticline belt, consisting of two tectonic blocks called "thrust sheet Berat" and "thrust sheet Sqepuri" (Figure 1). The change in orientation of the Berati anticline belt about West-East is a result of the impact of the Dumrea diaper (Bandilli *et al.*, 2002). This unit should continue to upper part of diaper body.

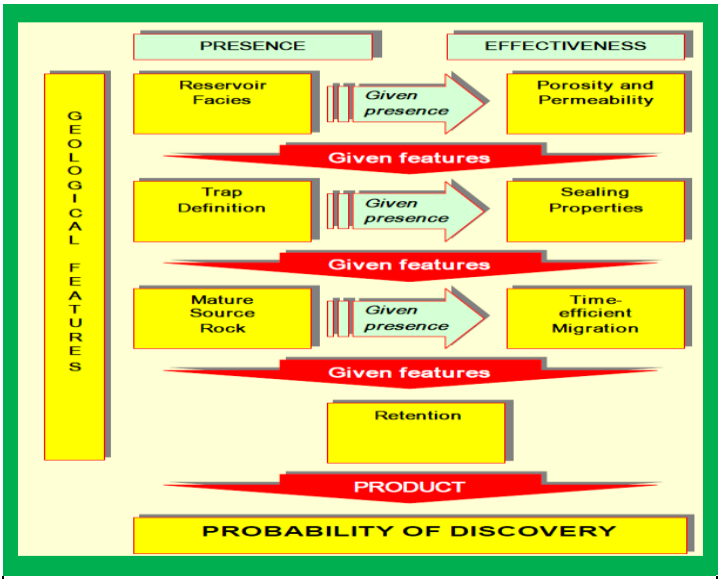

Figure 4 *Combination of geological features (The Coordinating Committee for Coastal and Offshore Geoscience Programmes in East and Southeast Asia, 2000)*

3.1. Geological section crossed by Shpiragu wells.

In western and southern periphery of diaper are located oil seeps, Kuçova oilfield and Rase-Pekisht oilfield. Shpiragu wells have been penetrated two tectonic units: the upper block and the lower block of the Berati subzone.
Operating company interprets lower block as part of the Kurveleshi subzone.

I think the lower tectonic block is separated from the Kurveleshi subzone, otherwise we would have condensate in Shpiragu trap. Shpiragu-1 well has gone completely carbonate section of Ionian zones where the source rocks levels have been identified. Geological sections of wells are given in the below tables.

3.2. Oil seeps

The Berati anticline belt meets four types of oil seeps. Bituminous sands of Messiniane deposits belong to Driza formation. They are located on the east side of the Ballagati syncline in Kuçova, in Murriz (between Kuçova and Rase) and Karthnek (northern of Rase-Pekisht oilfield).

Photo 1
Shpiragu-1well on west side of Kullësi anticline

Bituminous sandstone in flysch deposits of lower Oligocene in Zhapokik village occurs (south of the city of Berat). Traces of oil seep are met in the flysch deposits of the lower and middle Oligocene in in Osmanzeze village (field observations) and fresh oil at the place of the well Osmanzeza-4. Meanwhile the oil seep in limestone section of Cr-Pg is met in the Komar anticline (south of Zhapokika). The traces of oil seeps in Osmanzeze are recent, while the others are biodegraded. The presence of oiltraps is a reality, such as Kuçove-Arez and Rase-Pekisht oilfields, where oil has migrated from carbonate section.

3.3. Shpiragu oiltrap

Based on information of "Petromanas" company oil trap is found in the Shpiragu structure about 5000 m depth. After 17 month drilling period Shell and Petromanas Energy Inc (PMI) announced that their first drilled well Shpiragu 2 resulted with flow rates of 1,500 to 2,200 barrels per day of oil equivalent (800 to 1,300 barrels per day of 35 to 37-degree API oil and 2 to 5 mmcfd of gas) observed during the test period. PMI and Shell also believe they have identified an 800-meter oil column in fractured carbonate reservoirs at the Shpiragu structure, but were only able to test 400 metres due to drilling setbacks (www. Petromanas.com*).* By correlation with other grude oils, oils of Shpiragu is lighter, although large depth of their occurrence. Oiltraps of Kuçova –Arez and oiltrap of Shpiragu (only one sample) differ from other oils as aromatic hydrocarbon content is high, these are not the normal oils that has defined the science of petroleum geochemistry.

Based on the hydrocarbon composition of the grude oils (Prifti & Muska 2013), can be classified as follows: (A) Heavy oils; (B) Normal oils; (C) Light oils; (D). condensates.

The current oils' properties reflect the combined effects of the respective source rock kerogen characteristics, source rock thermal maturities at the time of hydrocarbon expulsion, oil migration phases and local bacterial degradation/water washing. These features reflect the trends of reduced sulphur content and density of oils (or increasing of API) towards the depth, with the exception of the oil shows. Exclusion from the trend makes oil of Shpiragu, at first glance looks like we are dealing with oil show. This tradition so far at this depth (5000m) should have condensate or wet gas. This is explained

with only one interpretation*: **anticline of Berati belt (Shpiragu region) represents another petroleum system.***

Table 1

Geological section crossed by Shpiragu-1 well	
Depth (m)	Geological section
0-217	Flysch (Pg_3)
217-265	Transition unit (Pg_3)
265-413	Eocene (limestone-Pg_2)
413-485	Paleocene (limestone-Pg_1)
485-1220	Limestone-(Cr_2)
1220-2090	Limestone-(Cr_1)
2090-2515	Limestone-(J_3)
2515-2710	Limestone-(J_2)
2710-3394	Limestone-(J_1)
3394-3465	Limestone-(T_3)
3465-4909	Flysch (Pg_3)
4909-4930	Transition unit (Pg_3)
4930-5087	Limestone-(Pg_2)
5087-5150	Limestone-(Pg_1)
5150-5333	Limestone-(Cr_2)

The main problem to be discussed is whether carbonate section has been fulfilled to the reservoir during and the late of Upper Oligocene. This time coincides with the return of Shpiragu region in the continent.
In cases that are not created optimal conditions of the reservoir, then the main migration routes are stratification plans and vertical tectonic faults.
Supernormal geostatic pressures were created around the source rocks. The tectonic faults are the main migration routes of hydrocarbons (bituminous sands are formed in Zhapokike, belonging to the lower Oligocene).

When carbonate section meets reservoir condition, porous and permeable carbonate rocks, fractures and faults, are potential reservoir rocks, especially in bio clastic packages of carbonate section. These levels are the best reservoirs. Vertical migration routes are more preferred because the difference of geostatic pressure is higher. Migration distances depend on the size of the east part of Ionian basin. Secondary migration of hydrocarbons is carried out according to the Gussow's principles where lighter oil (35 to37 API) replaces heavier oil toward on shallow traps. So lighter oil of Shpiragu trap replacing heavier ones to another trap.

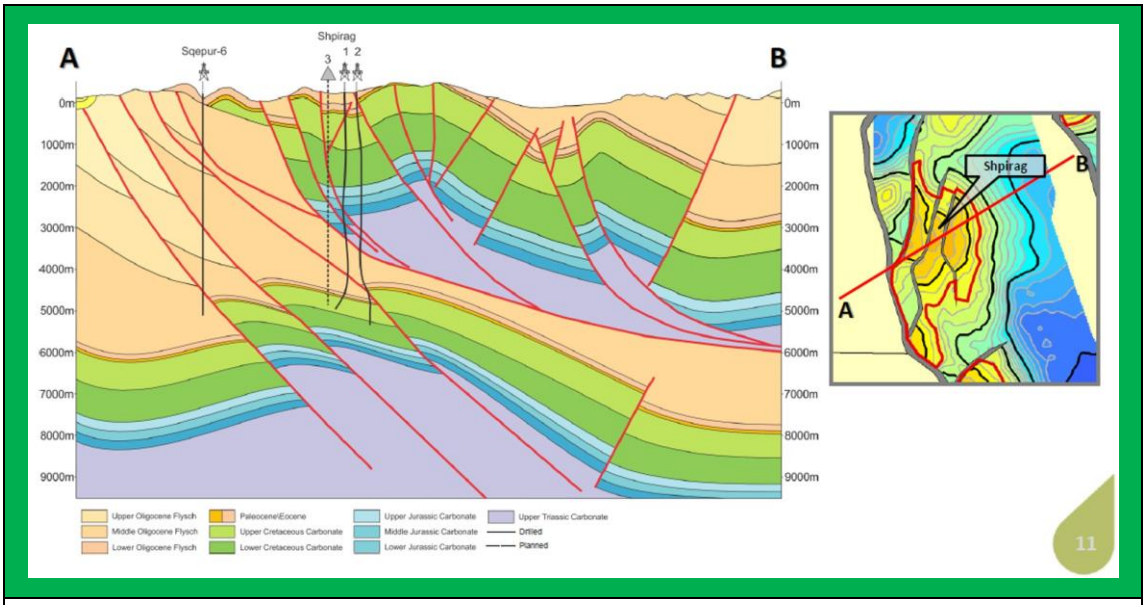

Figure 5

Cross section on Shpiragu antincline [***Source**: www.petromanas.com, modified by Prifti*]

Liquid hydrocarbons during migration are closely linked to the level of maturity of source rocks. Migration of oil with dissolved gas is a characteristic of the formation of oil traps. Related to the quantity of dissolved gas; oil migrated in liquid phase with low amounts of dissolved gas. This fact has conditioned the formation of Kuçova, Rase-Pekisht oil fields. Crude oils of Berat anticline subzone are more aromatic than other oils, the only exceptions are crude oils of Rase-Pekisht oilfield. Aromatic nature of crude oils is conditioned by some factors:

- On the origin of the organic matter of source rocks. Organic matter of terrestrial origin increases content of aromatic hydrocarbons in crude oils;
- Short Distance of source rocks to reservoir (Rondeel, 2001);
- Grude oils distributed in limestone section before trapping.

These are the main reasons affecting the hydrocarbon composition of crude oils. While crude oil of Rase-Pekisht oilfield is mainly methano-naphthenic after migration path in sandstone reservoirs is long and is committed natural chromatography. Time of formation of traps in the eastern part of Ionian zone is the earliest. Anticline forms of carbonate section available in the field should be similar to those in depth. Post Miocene tectonic phases have changed tectonic plan, setting up structures towards the south. This causes a reduction of spill point and reform of oil traps stimulating tertiary oil migration.

4. CONCLUSIONS

Source rocks of carbonate formation (T_3-Cr_1) are met by wells drilled in the region. They have entered the oil window and have the ability to generate liquid hydrocarbon from the Upper Oligocene time. New stage maturity of source rocks has been activated during the diapirism phenomena.

Primary migration started after Upper Oligocene. Quality and stratification of source rocks favour primary migration of the oil phase.

Oil traps in carbonate section are formed before the Miocene time. Changes in the tectonic plane during and after the Plioene time, have reformatted oil traps in carbonate reservoirs.

The aromatic nature of crude oils should be linked to organic matter of the source rocks and to the short distance of migration from source rocks to the reservoirs. The lown gaseous factor in Kuçova oilfield is related to the maturity of the source rocks, who have generated light oil but not condensate and hydrocarbon wet gas.

The eastern part of the Ionian zone (Shpiragu region) represents another petroleum system with high risk of petroleum exploration.

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PHYSICO-CHEMICAL CHARACTERIZATION OF THE NATURAL WATER FROM THE VRIZI'S SOURCE

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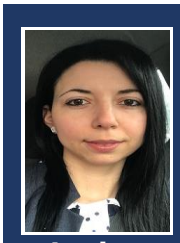
Lorina LIÇI


Enkela NOÇKA

Abstract

Water natural source of Vrizi flows from a karst limestone of Jurassic, and it is located close to Delvina city in the south of Albania, is supplying drinking water all population of this city. The water flow from this natural spring it is varied from 30 – 450 l/s, and a mean value at about 80 l/s. For physic-chemical characterization of the natural water, the samples were taken at the source of Vrizi, exactly in two different days. The first day has been a normal day with quiet weather while the second day of sampling has been with heavy rainfall in the last months, especially of January. Measurements have been performed with a special instrument Multiparameter HI 9828, which represent a multi-parameter system based on a multi-sensor sensor to measure all the parameters needed to evaluate water quality by pH, dissolved oxygen value and%, conductivity, temperature, specific weight without need to recalibrate the system whenever the parameters are measured. Up to 12 parameters can be displayed on the device screen, can be stored on the device memory and if they are connected to a central computer, their graphics are displayed.

The results obtained from the multiplicity parameter pool can be seen that there is a change in the parameter values caused by rainfall of the second day. Except this, disturbing in the values derived is pH, which is clearly distinguished by the fact that it gives the spring water its basic character after it has passed the rate of a pH ~ 7 -7.5 for drinking water, resulting from carbonate rocks, which are mainly represented by limestone and dolomite different, high-order and highly carstyfied, but it is not excluded the possibility of impact of the clay solution of drilled wells (during drilling in these wells there were many losses of this solution).

Keywords: *Natural spring, water characterization, (BOD_5), (COD), instrumental analysis, CV*

1. INTRODUCTION

Water natural source of Vrizi flows from a karst limestone of Jurassic, and it is located close to Delvina city in the south of Albania, is supplying drinking water all population of this city [1-3]. The water flow from this natural spring it is varied from 30 – 450 l/s, and a mean value at about 80 l/s. For physic-chemical characterization of the natural water, the samples were taken at the source of Vrizi, exactly in two different days. Measurements have been performed with a special instrument Multiparameter HI 9828, which represent a multi-parameter system based on a multi-sensor sensor to measure all the parameters needed to evaluate water quality [4-5] by pH, dissolved oxygen value and%, conductivity, temperature, specific weight without need to recalibrate the system whenever the parameters are measured. The results obtained from the multiplicity parameter pool can be seen that there is a change in the parameter values caused by rainfall of the second day. Spectrophotometer UV-VIS has shown values that can be considered acceptable and within the permissible norms for drinking water.

Figure 1 *Two source outflows from non-functioning plugs that flow to the Sight Light*

On the other hand, for determining of Biological Oxygen Demand (BOD_5) measurements were made for both samples where at 164 ml of solution were added 2 particles of sodium hydroxide NHP 600 and 3 drops of nitrification solution, NTH 600 which were left for 5 days in silencing to get results for BOD_5. Both samples yielded the same result, converted yields BOD5 = 10 mg / l. As for the other important parameter as Chemical Oxygen Demand (COD), was used the instrument CR2200 and the respective results have been 0 for both samples in mg / l while the limit values are 10-150 mg / l, and for the day first of sampling the absorbance was 4.184 while for the sample 2 was 4,377 respectively. The results of physico-chemical characteristics of the analyzed samples are presented in the form of graphs and tables.

Figure 2. *The pipeline system that conveys water from the source to the chlorination tank*

2. MATERIALS AND METHODS

For physic-chemical characterization of the natural water, the samples were taken at the source of Vrizi, exactly in two different days. The first day has been a normal day with quiet weather while the second day of sampling has been with heavy rainfall in the last months, especially of January. Measurements have been performed with a special instrument Multiparameter HI 9828. Spectrophotometry UV-VIS is used to determine the absorbance and the Cl, P, Fe, NO_2, NO_3 and NH4 content (mg/l). Also, is determine the Biological Oxygen Demand (BOD_5) and Chemical Oxygen Demand (COD), by the instrument CR2200.

Figure 3 *Apparatus HI 9828 and apparatus CR2200*

3. RESULTS AND DISCUSSION

The results obtained from the multiplicity parameter are shown in table 1.

Table 1 *The results from the multiplicity parameter*

Unit		Day 1, sample	Day II, sample
[DO ppm] oxygen	dissolved	6.40	5.10
[pH] acidity	alkalinity &	8.28	8.21
[pHmV] millivolt	electrical loads in	-73.8	-70.5
[temperature	°C]	12.72	12.84
[mbar] pressure	atmospheric	1034.8	1033.7
[MΩ *cm] resistance	electrical	0.0021	0.0022
[µS/cm] conductivity		480	457
[µS/cm A]		368	352
[tds ppm] solids	dissolved	241	229
[salinity	sal]	023	0.22
[ORP] potential	oxidative-reducing	-13.3	-22.8
[DO %] oxygen %	dissolved	50.7	47.5

The results obtained from the multiplicity parameter pool can be seen that there is a change in the parameter values caused by rainfall of the second day. Except this, disturbing in the values derived is pH, which is clearly distinguished by the fact that it gives the spring water its basic character after it has passed the rate of a pH ~ 7 -7.5 for drinking water, resulting from carbonate rocks, which are mainly represented by limestone and dolomite different, high-order and highly carstyfied, but it is not excluded the possibility of impact of the clay solution of drilled wells (during drilling in these wells there were many losses of this solution).

The graph below shows the values derived from the experimental work with the Spectrophotometer, the value of the elements in mg/l for the first and second day samples and the absorbance values measured.

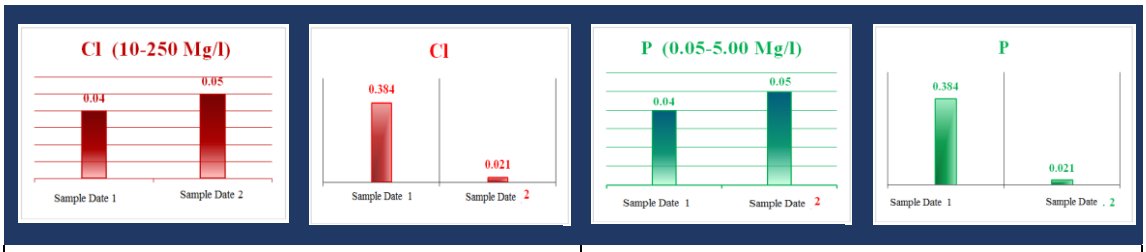

Figure 4 *Cl values in mg/l and absorbance*

Figure 5 *P value (mg/l) and absorbance*

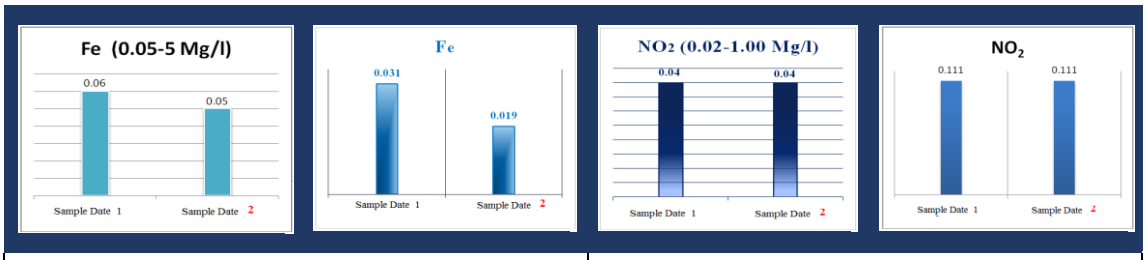

Figure 6 *Fe (mg/l) value and absorbance*

Figure 7 *NO_2 value (mg/l) and absorbance*

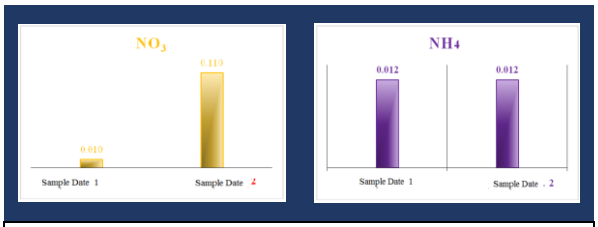

Figure 8 *NO_3 and NH_4 absorbance (mg/l)*

Spectrophotometer UV-VIS has shown values that can be considered acceptable and within the permissible norms for drinking water.

On the other hand, for determining of Biological Oxygen Demand (BOD_5) measurements were made for both samples where at 164 ml of solution were added 2 particles of sodium hydroxide NHP 600 and 3 drops of nitrification solution, NTH 600 which were left for 5 days in silencing to get results for BOD_5. Both samples yielded the same result, converted yields BOD5 = 10 mg / l.

As for the other important parameter as Chemical Oxygen Demand (COD), was used the instrument CR2200 and the respective results have been 0 for both samples in mg / l while the limit values are 10-150 mg / l, and for the day first of sampling the absorbance was 4.184 while for the sample 2 was 4,377 respectively.

4. CONCLUSIONS

The results obtained from the multiplicity parameter pool can be seen that there is a change in the parameter values caused by rainfall of the second day. Except this, disturbing in the values derived is pH, which is clearly distinguished by the fact that it gives the spring water its basic character after it has passed the rate of a pH ~ 7 -7.5 for drinking water, resulting from carbonate rocks, which are mainly represented by limestone and dolomite different, high-order and highly carstyfied, but it is not excluded the possibility of impact of the clay solution of drilled wells (during drilling in these wells there were many losses of this solution).

Spectrophotometer UV-VIS has shown values that can be considered acceptable and within the permissible norms for drinking water.

Biological Oxygen Demand (BOD_5) for both sample was, BOD5 = 10 mg / l. The Chemical Oxygen Demand (COD), for the first day the absorbance was 4.184 while for the second sample was 4,377 respectively.

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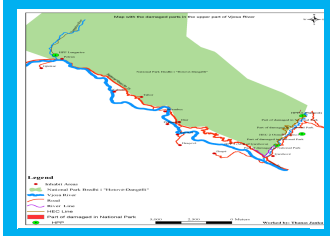

ENVIRONMENTAL IMPACT OF HYDROPOWER IN ÇARSHOVA TRIBUTARY OF VJOSA RIVER A CASE STUDY

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Abstract

Albania is a rich country in water resources which enable the production of renewable energy from hydropower plants. The subject of this paper is focused on the environmental impact assessment of the hydropower (HP) plants in Vjosa river, Çarshova tributary, Albania. Environmental impacts, their significance and duration have been identified. Vjosa river is the last free-flowing river in Europe being the cradle to thousands of livelihoods. The ecological damages in river system functions are observed and analysed.

The paper aims to identify and map the impacts (in land, water body and ecology) caused by the construction of small hydropower plants in the Çarshova tributary of Vjosa river. Field observations and measurements of coordinates of different points were made to construct maps with the damaged areas at the National Park "Bredhi Hotovës-Dangëlli" and water body analyzing impacts on aquatic life. The environmental threat of HP and the climate changes, increase the ecological vulnerability of the river system and especially damage endemic species.

As a conclusion, water deviation and dam construction are revealed actually as the greatest threat to the river, endangering ecological assets and functions of the river system as well as the eco-tourist potential of the area. Stopping of all anthropogenic interventions and exploration of all the ecological capacity found as growing concerns. In fragmented parts of HP's construction, communication corridors should be constructed to allow the movement of many species.

Keywords: environmental impact assessment; hydropower plant; map. GIS, Vjosa river, Çarshova tributary

1. INTRODUCTION

The Vjosa river originates in Epirus in the north-west of Greece and flows up crossing the border between Greece and Albania. It has a length of 270 km of which 192 km lies in Albania and its basin covers an area of 6702 km² including 4552 km² on the Albanian territory. The Vjosa runs on into the Adriatic Sea.

Figure 1 *The Vjosa river basin (IGEWE, 2005)*

The Vjosa River Basin, influenced poorly by anthropogenic impact, can serve as a large-scale natural shelter and an important laboratory for the whole of Europe. Because of its natural flow, sediment transport and unique biodiversity, the River Vjosa is a special model of the international system for these reasons: The complex morphological dynamics of the river corridors and Studies that help the coordinate assessment of river interventions and can be as an international benchmark for climate change research. [1]
Scientific publications about Vjosa and its biodiversity are very limited and a few studies are carried out so far. Anthropogenic interventions combined with the impact of climate changes make the vulnerability of the Vjosa basin much higher. But the peculiarity of this basin is mainly threatened by the construction of HPPs but also by climate change.

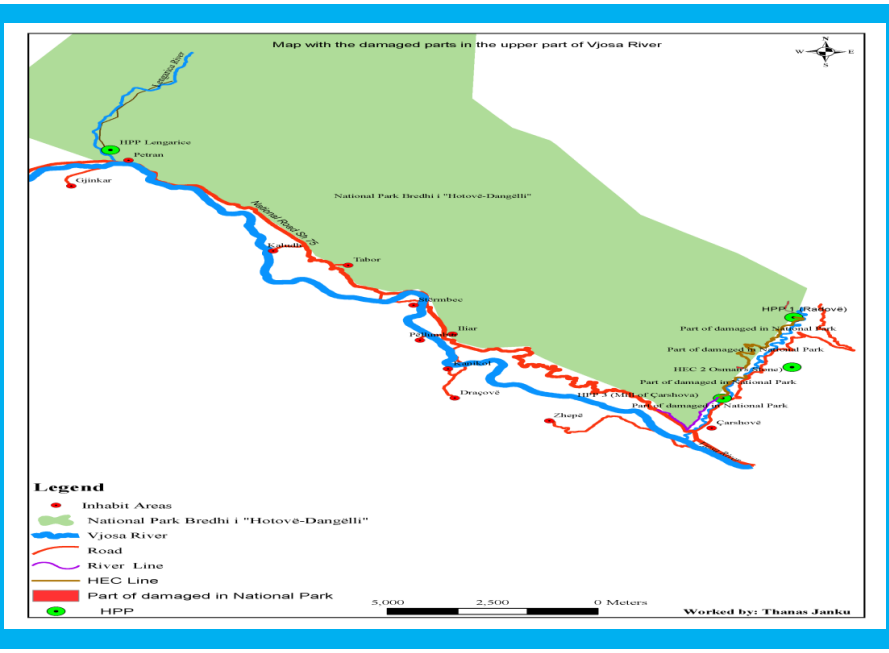

Figure 2
Çarshova tributary, main flow of Vjosa river and National Park 'Bredhi Hotovës –Dangëlli"

In the study, only the Çarshova tributary was considered, on which some small HPPs with deviation were constructed. On that tributary these HPPs have implications for the whole river of Vjosa and its entire basin.

2. METHODS AND TECHNIQUES

It is used the holistic approach according to which any anthropogenic interventions in the Vjosa river tributaries have consequences in the tributaries themselves and consequently in the Vjosa river. The method is based on the paradigm determined as driving force-pressures-state-impact-response. In terrain were carried out the coordinates' measurement (in Gauss –Kruger system) of interventions or alterations that have affected the abiotic environment due to the construction of the HPPs at the Çarshova tributary.

3. RESULTS AND CONCLUSIONS

Vjosa is a natural ecosystem almost untouched. It is one of the last "wild" rivers across the continent.The scientists believe this river can be considered as a white page. Knowledge about biodiversity, hydrology and sedimentological régimes exists but not in details. In its basin there are endemic species and protected area. Water diversion and dam construction projects are currently the greatest threat to the river, endangering ecological assets and functions carried out by the river system. The damage of ecological values and functions performed by the river system puts at risk a great eco-tourism potential of this area. The construction of HPPs with deviation on the Çarshova River has damaged the ecosystem of this river. The Radova HPP has damaged an area in the Natural Park "Bredhi Hotovës-Dangëlli". The construction of the water diversion channel has unrecoverable damaged an area of 36142 m^2. The results in GIS are shown in Figure 2.

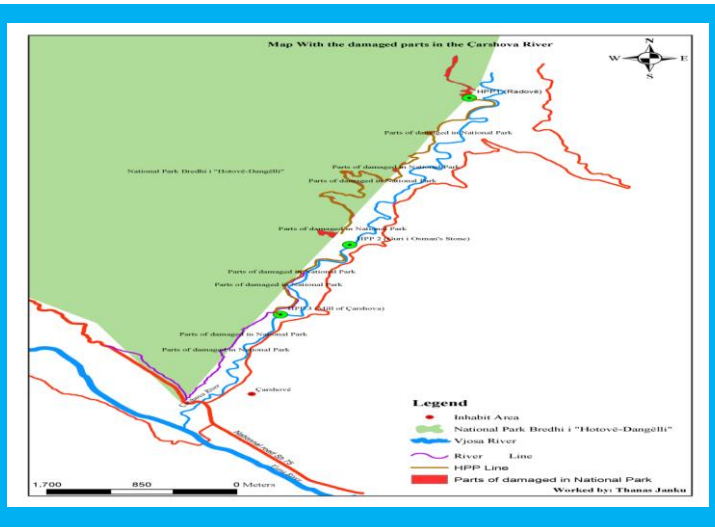

Figure 3 *The map of interventions in the Vjosa river, Çarshova tributary, 2018*

The channel construction (of 5034 m, Figure 2) of water deviation in the HPP "Guri i Osmanit" has unrecoverable damaged an area of 78681 m^2 (Figure 2) in the Natural Park "Bredhi Hotovës-Dangëlli" (Protected Area - Category 2). "Guri i Osmanit" HPP has reduced an area of 92,000 m^2 (Figure 2) and caused the fragmentation of the Natural Park "Bredhi Hotovës-Dangëlli". During the summer season when the streams in the Çarshova River are minimal, to keep the HPPs in operation, all river water flows into the deviation channel and consequently, Çarshova River is dried and water life is completely damaged. The "Mulliri i Çarshovës" HPP has unrecoverable damaged an area of 3423 m^2 (Figure 2) in the Natural Park "Bredhi Hotovës-Dangëlli". The irrigation channel (line with violet color in Fig 2), which serves for the anthropogenic agricultural activity in the region, was built in the Natural Park "Bredhi Hotovës-Dangëlli". damaging unrecoverable an area of 1163 m^2 (Figure 2). The deviation of water for both HPP and irrigation (working alternately) reduces mainstream flow to 30%. The damage sustained by the construction of HPPs and the expected damage bring great changes to the ecological environment.

Stopping of all anthropogenic interventions and exploration of all the ecological capacity found as growing concerns. The damage sustained will be even greater considering the climate changes that are expected to change the hydrological regime of rivers.

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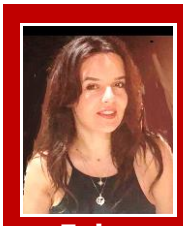
THE LEGAL AND CARTOGRAPHICAL PROPERTY PROBLEMS IN ALBANIA AND THEIR IMPACT ON THE VALUE OF THE REAL ESTATE MARKET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ABSTRACT

Immovable property registration in Albania has been a difficult process, recounted with many cartographic and legal problems. All these problems have also given an impact on the real estate market such as land and buildings, which make up the most valuable assets for each state and every individual. For a potential investor, real estate is attractive first because it offers capital growth in the long run and secondly because real estate is a good barrier to inflation.

The ultimate goal of any immovable property valuation process is to determine the market value and the cartographic and legal problems encountered in their registration and registration have had an impact on their valuation process because real estate is considered as unity of land -building and market value is a function of participation in both components.

Usually, assessors pay more attention to the impact of market factors and somewhat neglect or take into account each one in their own opinions the impact of building factors, this article gives an overview of the cartographic, legal and technical factors, their impact in market value as well as giving recommendations for the future.

Keywords: Property; Registration office; Property valuation; Cartographic, Legal, and Technical factors.

1. PURPOSE AND OBJECTIVES OF THE STUDY

The aim is to provide a methodology of incorporating technical factors, building factors, in the process of determining the real estate market value under the concrete conditions of this market in Albania.

The specific objectives of this study are:

a- Show how the building's age affects the market value;
b- Show which are the technical factors of the properties that affect the market value;
c- Examine how the technical factors influence the market value;
d- Show the ways of involving technical factors, building factors, in the process of determining the value.

The essence is to address the issues and problems above, focusing mainly on the relationship between the quality of buildings as an indicator of technical factors and the market values of commercial properties in the Albanian market, specifically in the city of Tirana.

2. FIELD OF STUDY

The city of Tirana, the capital of Albania has a surface of 42 km2, a population of 765,000 inhabitants. The city of Tirana is the largest city of Albania and the country's largest economic, administrative, political, industrial, media, academic, social and cultural center. Tirana is located just 17 km from Mother Teresa Airport, the only international airport in Albania, the most important link between Albania and the rest of the world so far. Even in the real estate sector, the city of Tirana is the most important. Apart from the fact that this city has the largest number of buildings, it has the largest and most quality buildings in the country. The real estate market in Tirana is a consolidated and stabilized market.

3. IMMOVABLE PROPERTY AND ITS FUNCTIONS

Wealth is all that can be mastered. Immovable property is defined as the land and all the permanent natural and human improvements related to it, including the air and the right of minerals. Owning an immovable property means not only possessing physical property, but also gaining certain legal rights for the continuance of its peaceful use and redistribution.

3.1. Classification of immovable properties

Immovable property is diverse. Each property is unique in terms of location, type, size, physical condition, etc. Immovable property can be classified based on different criteria, example ownership, use, size, etc. The value of a property depends on the usefulness it offers, and the latter is primarily related to the function that the property performs, so the main classification to identify and group real estate is done based on their uses. The two main categories used to classify immovable properties are: residential properties and non-residential properties.

Residential properties are all properties that are used or are suitable for use as residences. These properties provide shelter for individuals and / or families. These may be property for a single family (homes, villas), or for some families (apartments).

Non-residential properties are divided into several sub-categories**:** Commercial properties include offices and retail space (shops). We find both properties either as individual units, or grouped into the so-called Business Center and Shopping Center.

We can rarely find and combine two or more types of properties into a single building, where there can be commercial and residential parts, giving the building a multifunctional character. It is a distinctive feature of the new post-90s construction in Albania, the combination of the first floor units of service and trading with upper floors residential apartments.

Industrial properties are constructions used for light industry and heavy industry as well as spaces used as warehouses. The characteristic of these properties is the fact that they fit very hard or not at all for other uses. Hotels and motels vary depending on the size and facilities available. They can be located near the motorways, near the facilities and tourist areas. Other amenities such as swimming pools, restaurants, golf courses, etc. can be offered in these properties.

Recreational and leisure assets include highly specialized uses such as holiday homes, sports complexes, etc. Institutional properties are properties used by particular institutions, such as government agencies, schools, hospitals, etc. Usually they are designed for a specific purpose and cannot easily fit for other uses. The latter are mainly state property.

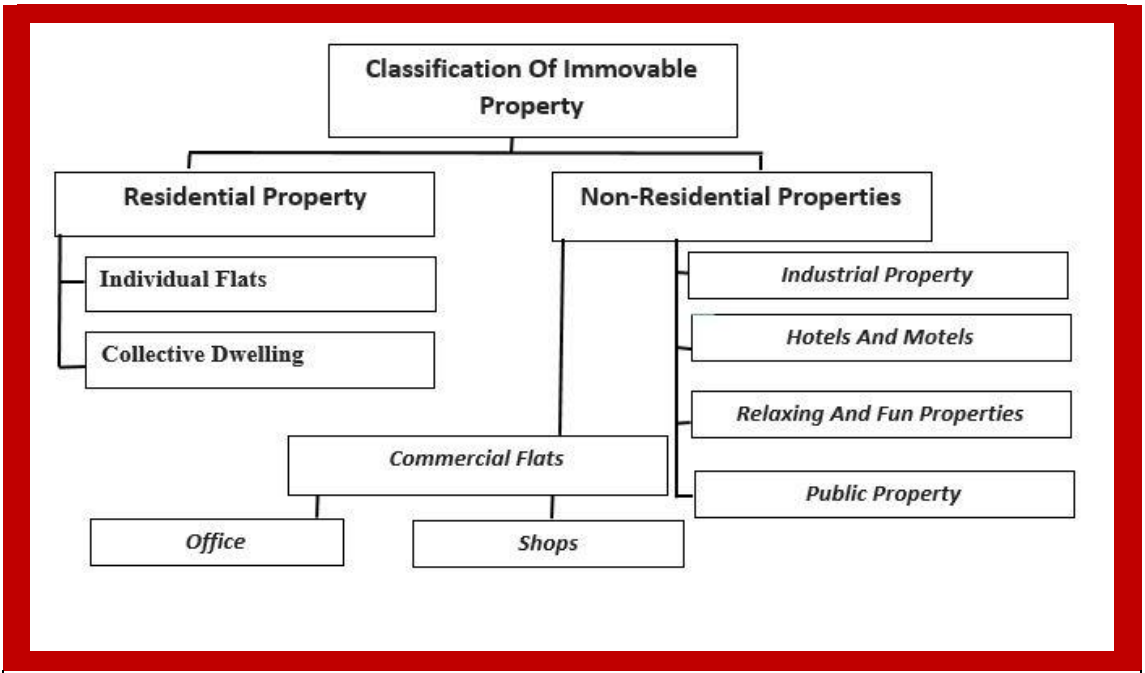

Figure 1 *Classification of immovable properties*

4. LEGAL FRAMEWORK FOR THE REGISTRATION OF REAL ESTATE

The basic legislation for registration of the real state is at following stages:

- Law no. 7843 dated 13.07.1994 "On the Registration of Immovable Property" was approved by the People's Assembly and was signed by the President of the Republic of Albania, by Decree no. 907.
- The final drafts of the Asset Registration Register (s), the relevant certificates, and the methodological guide for filling the Card have been prepared.

- Materials have been assembled, and drafts for land lease and land acquisition and sale legislation have been prepared.

5. CREATING MAP OF WEALTH INDICATORS AND SHEETS

Creating the map of wealth indicators and shhets is at following stages:

- The fieldwork for updating and surveying the preparation of asset index maps for 81,466 hectares of agricultural land, or 51% of the 1994 plan in 24 districts, should be completed. Of these, for pilot districts, field work was carried out for 24,670 ha, or 40% of the plan. Kavaja is lagging behind, but Berat, Gramsh, Korça, Shkodra have worked well.
- Basic maps have been prepared on a scale of 1: 2500 for approximately 200 villages, and the Institute of Land Surveying and the Military Institute of Topography on others.
- Work contracts with 120 land surveyors were conducted in 15 districts, and with the Institute of Land Surveying and the Military Institute of Topography.
- Aerial photography has been conducted for a 4000 km2 field zone in which there are three pilot districts, and NMP / SRPP is working to use this for the preparation of indicator maps.
- In accordance with European Community rules, a number of contracts with foreign companies have been signed for equipment that will improve the work of surveying and mapping.
- A pilot experiment was carried out to evaluate the new GPS-related procedures from a Grenville Barnes team.
- Formatted and tested format for the Card or registry page for each asset, to ensure its applicability to various privatization programs.
- Asset and owner listing procedures have been compiled and tested.
- Procedures for the operation of registration offices, as well as procedures for the first registration are prepared.
- An example for a database of computerized information registration systems has been prepared.
- Identification and analysis of documentation confirming the right of private property ownership in order to integrate such documents into the new system in support of the Law "On Immovable Property Registration".

6. PROBLEMS FACED BY PROPERTY IN THE LEGISLATION, REGISTRA-TION, MAPPING AND TRACKING THE TERRAIN

6.1. Legislation and Registration Problems

Different laws and acts have contradictions between themselves. They hinder the registration process substantially. *For example*:

The concept of land is not the same in Laws 7501 and 7698. Law 7501 privatized agricultural land, but in TAPI (*Property Certificate*) for these lands a division of land is included. Law 7698 provides for the return of land to the former owner, or its compensation to a high level. Consequently, there are conflicts between the "landowners" of the rocks designated under the actions of Law 7501, and the "owners" established by the Compensation and Compensation Commissions operating under Law 7698.

Agricultural lands within the village border line should be "in use" according to Law 7501, but in fact they are assumed to be owned by farmers. Agricultural lands within the boundaries of the inhabited area of the village are returning from the Return Commissions. Thus, again, according to the privatization document there are often two legitimate and different owners for the same asset.

The Civil Code, which the Parliament approved a few weeks after it had previously approved the SRPP Act, has some contradictions with the registration law. The Civil Code establishes the SRPM administration under the Ministry of Justice, while the SRPP Act has SRPP administered by a Chief Registrar who has the status of the Cabinet.

Land allocation by commissions according to the provisions of Law 7501 is accompanied by errors and non-durability which require SRPP field teams to engage in clarifying land rights rather than just registering these rights. This means that field work is moving slower than initially envisaged, but this also means that information in the records will be a more accurate reflection of what actually exists, than it would be otherwise in the absence of a careful review of the work of the field.

A number of privatization bodies and commissions have been involved in the privatization process. This makes it difficult to collect documents.

Since 1993, the operation at Mortgage Offices has enabled the registration of privatization and alienation documents of urban property and some village houses. Information in these offices should be transferred to the SRPP. This has been difficult due to poor equipment and limited staff of Mortgage Bureaus.

6.2. Problems of surveying and mapping

Lack of an urban cadastre creates problems for starting the Asset Recording because mapping of urban property boundaries should be done entirely by field teams rather than updating existing data (such as the case for rural property).

During the privatization of agricultural land in the village, privatized parcel maps did not do well, or at all. This means that field teams often lack this information. Cadastral Offices should have done this job but were unable to do so. Consequently, field teams contracted by NMP / SRPP have a large workload that needs to be done and which requires additional time and expense.

The technical level of some specialists and coordinators does not meet the requirements of the Project and the relevant Regulations.

The districts have not provided office equipment for field teams, which have delayed the preparation of the charts of the registry indicators.

NMP / SRPP and the Military Institute of Topography (ITU) have not yet signed an agreement for making valid air photography for use in SRPP. This is partially due to the late arrival of contracted photogrammetric equipment. This is even more complicated by the problems of the Ministry of Defense about the use of photogrammetry.

Existing urban area maps have not always been available for NMP. The central maps of the inhabited villages are also missing. The technical condition of the existing village migration maps is poor.

The limited resources of the Ministry of Agriculture and Food, defined by the Council of Ministers as the Ministry of Supervision for NMP, and the lack of a Civil Awareness Agency and a State Aggregation Agency hamper the work and development of an effective strategy. NMP / SRPP has failed to complete the preparation of charts of indicators because topographic maps are in the hands of the bodies of the three ministries.

It is the purpose of the Action Plan strategy and NMP to create a civil mapping agency for the urgent provision of proper mapping information to the

entire public. However, this aspect needs to be revised, and a special sub-project needs to be created.

It is essential that NMP presents some complementary activities within the Action Plan:

- Detection, mapping and use of new technologies,
- Digitalization of maps,
- Creating an effective and coordinated GIS with other institutions,
- Collection and management of information in the Census System,
- Creation of a Geographic Information System for Civilian Purposes and the stimulation of privatization of land surveying,
- Collaboration with teaching and application institutions, especially with Polytechnic University, ITU, STI.

7. CONCLUSIONS

The market value of an immovable property depends on a complex of factors, which can be divided into market factors and self-property factors. On the other hand, property factors, since the property is a joint-building unit, can be divided into soil factors and building factors. Buildings are of different ages and no doubt that age is one of the main factors of the building that affect the value of the property.

It is expected that older properties will be rated less, as well as depreciated, but not necessarily, as the depreciation rate is a function of age but also the function of the building's qualities. Depreciation of the building in terms of value reduction is related to the physical disadvantages that the property suffers, as well as its qualities:

Configuration (space and ease of management, ceiling-height elevations), interior specifications (internal finishes, M & E services), external specifications (external finishing, property access), etc. Despite the actual age of a building, what affects value is the beneficial economic life and its remaining economic life. The shorter the economic life, the higher the life cycle costs and consequently the lower the value of the property.

The more qualitative a property, the less cost it takes during its life cycle, the higher the net income resulting from the property and the greater the value. For property users a good property is an aesthetically priced, functionally efficient and low-cost property during the life of its use. Efficiency in functionality means flexibility in use and ease of adaptation. The study of the impact of the building on the value of the real estate market turns into a study of the impact of technical factors on the building's qualities.

The first steps for the implementation of this Action Plan were taken in 1994. The priority is the creation of a Real Estate Registration System for the documentation and protection of private and public rights over immovable property.

In the process of creating this system, the field teams are revising and correcting mistakes in privatization programs, while at the same time providing local inputs within this process, so that the vast majority of ownership conflicts can be ended before registration is allowed. Initial activities have also been undertaken to develop the institutional base for strong and socially responsible markets for wealth in the future, while legislation is being prepared for the protection of the natural environment and the effective development of land in and around urban areas.

However, considering the large volume of work that has been done on the field, the Project has had a good start. Moreover, the concepts and procedures as well as the institutional creation of the land market that have been created in

Albania may be of interest to other states that are engaged in the transition of market-oriented economies.

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7. AUTHORS BIO

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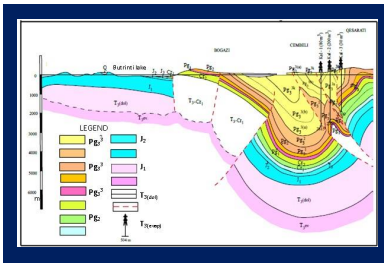

HYDROGEOLOGICAL FEATURES OF BUTRINTI REGION

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ABSTRACT

The Butrinti region includes all area extending from antique city of Butrint to the Pavllo river bed in southern side and Ionian Sea westward. The geologic-geophysical complex studies performed in above mentioned region confirm that the Pliocene-Quaternary deposits overlie on old carbonate ones of Jurassic and evaporates of Triassic age. The tectonics of the region is very intensive. The normal faults of great amplitude are continuously the evaporate body from depth to the surface giving it a diaper view. The relief of this region presents lower quotes than the sectors around it.

The geological feature combined with that of morphological ones, makes evident a particular hydrogeology phenomenon. There are water sources of different flow and hydrochemistry characteristics. These differences are result of complicated geological features and lithological particularities of evaporate deposits at the surface of tectonic plan. Some of water sources are presented from mineral waters. Content of anniones, cations and microelements (general mineralization) are more than 1500 mgr./ml. Besides the archaeology particularities, the Butrinti region is also completed by particular hydrogeological characteristics. The application of a complete project for the study, will make clear the using of them in a large spectrum in future.

Keywords: Water source, TDS (Total dissolved solids), Evaporite, Tectonic, Lake

1. INTRODUCTION

The region under study is located south of Albania near the ancient town of Butrinti. This region is mainly of a field and hilly relief. The field part extends south and southwest of Butrinti town in elevations of up to mover the sea level. The hilly part circumvents the field part in elevations up to 250m over the sea level. Different geological studies made in Butrinti region individualize it as a region of unprecedented natural and geological phenomena where the combination of geologic, morphologic and climatic factors finds a perfect harmonization related naturally with the presence of Ionian Sea, Butrinti Lake,

Bufi Lake, Bistrica and Pavllo rivers. In centre the ancient town of Butrinti is located.

Another particularity present in the region of surface waters and the perfect configuration of the seashore line. These natural features are considered usefully and through light and increase the certainty to make investments for the development of the refrastructure and tourism in this region of Albania. Our region, along with the advantages briefly mentioned above, is to present the existence of underground water resources of considerate rates in Butrinti region, this being the object of this material.

2. GEOLOGICAL FRAMEWORK

The relief around the *Butrint Lake* is 200m high above sea level to west, Ksamil Peninsula, and more than 300m high to the east. The lake of Butrint has an oval shape, N-S trending and it is around 7km long, more than 3km wide and 21.5 m deep.The *Vrina Plain* is about 40 square kilometres, encompassing a large expanse of land on the opposite side of the Vivari channel and composed mainly by Quaternary alluvial and lagoon sediments, gravel, sand and clay layers (Fig. 1).

Histories of terrestrial erosion, near-shore sediment redistribution, times, magnitudes of sea level fluctuations, subsidence and compaction, land-sea interaction are just started to be studied [2]. Stratal discontinues are common in Vrina plain, providing objective targets that divide the geological record of the shallow water deposits.

The territory concerned comprises units of very diverse geological makeup (fig.1). The Butrint area is consisted mainly of the Ionian formation and partly of the Pliocene- Quaternary sediments of the Butrint graben. The stratigraphic section of the *Ionian Zone* begins with evaporitic Permo - Triassic to the Middle Liassic; it took the shape of a neritic platform, when neritic carbonates accumulated. From the late Liassic to the Eocene inclusive, the Ionian Zone was a pelagic basin and during this time interval pelagic limestone were accumulated. From the early Oligocene to the start of the Middle Miocene, the flysch sediments occur. The Ionian limestone's and flysch formation builds up here an anticline structure, northeast to south - east, from Saranda to Konispol town.
The Butrint graben is consisted of Pliocene - Quaternary sediments. The marine Pliocene sediments around 200 m thick overlie evaporates in Vrina Plain and outcrop in Vrina, Xara and Mursi hills (N_2).

The Quaternary sediments outcropping on Vrina and Vurgu plains are consisted of alluvial and lagoon deposits, about 80-m thickness. Two fundamental geological features are presented: tectonic and subsidence phenomena. The extensional tectonics was still active in the Quaternary; When Lake Butrint was formed. The above - mentioned local extensional during the Pliocene-Quaternary was conditioned by evaporate tectonics (Çela et al. 1983).

The neotectonic structure of ancient Butrinti is consisted of horst-graben structure, E-W trending. The acropolis hill represents a horst structure, while the low city is located on plain graben terrain, to south of the first. A normal fault, which borders from the south the acropolis hill, passes towards the east at the theatre, conditioning land subsidence of scene and orchestra places and flooding them by water.

3. THE METHODS APPLIED

Butrinti region is considered to be fully scanned from the geological of view point. The first detailed geological survey began after 1976 we could mention here the survey studies at a scale of 1:50.000 which together with stratigraphic and tectonic (Prifti et al. 2004 hydrogeological studies made possible the compilation of detailed geologic maps. At the same time the different wells. Drilled in the region as well as the complex studies run present Butrinti region as one of complicated geological structure with developed tectonics (Fig.2).

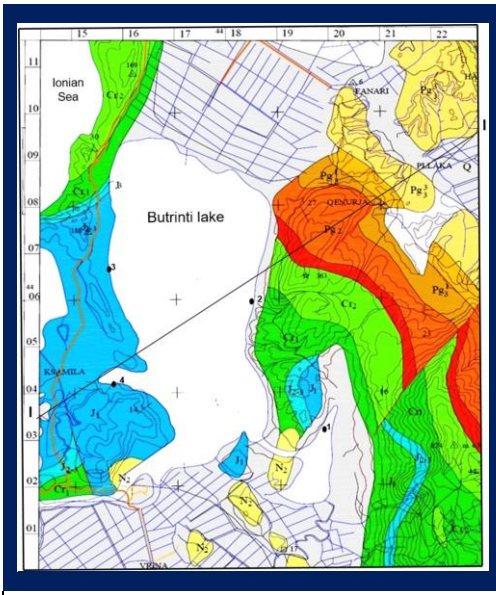

Figure 1
Geological map of Butrinti area

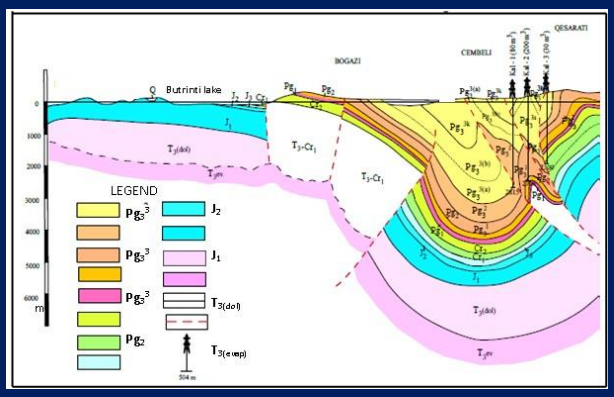

Figure 2
Geological profile I-I on Butrinti lake

Tab. 1 *Chemical composition of water from water sources and Butrinti lake*

Water Samples	TDS (g/l)	Residues (g/l)	Aniones (g/l)				Kations (g/l)			Water Type
(Source waters and water of Butrinti lake)		Dry	HCO_3	CO_3	Cl	SO_4	Na +K	Ca	Mg	
Source water-1	7,963	7,963	3200	-	1.220	0.10	1.09	0.98	0.20	Cl-
Source water-2	3,299	3,299	1200	-	1.100	0.22	0.83	0.20	0.34	Cl-
Source water-3	9,1639	9,1639	189	-	4.9	0,65	2,85	0,12	0,28	Cl-
Source water-4	4,9277	4,9277	183	-	2.5	0,35	1,42	0,10	0,15	Cl-
Area of Butrinti	24.32	24.3	170	12	1.708	1.7	7,77	0,27	0.76	Cl-
8 meters depth	33.779	33.7	195	-	1.952	2.7	1,08	0,41	1,18	Cl-
18 meters depth	34.057	34.057	464	-	4.636	2.1	1,088	0,41	1,19	Cl-

Based on these studies, we have got the availability of detailed tectonic and geologic maps that show a quality deciphering of surface rocks, the distribution and the relations between them. The information acquired from the bottom through drilled wells and from geological surveys have increased the quality of geological interpretations from the depths. Along with these studies, there have been continuously carried and surface hydrogeological surveys (lit...) as well as hydro geochemical analyses of source waters and of waters identified underground from drilled wells.

4. RESULTS AND DISCUSSION

We could say that we have identified and mapped the location of underground, water sources and have determined their precise tectonic and geologic position. (Fig.2). The up to now results of the surface geological and hydrogeological studies and of these wells show that the location of these sources are found along the tectonic contact of limestone rocks with the evaporates ones. So, we could say that the waters have got the same origin and following the mineralogical analyses, they are similar to one another, they are waters of the contact type. We should say that there are limestone rocks of I-Cr around the tectonic contact which rocks have got high porosity and fractures and as such they serve as reservoirs and allow the circulation of surface waters which in the case of Bufi Lake do not affect the increase in mineralisation.

We have evidenced two zones of strong water sources, one in the area between other along the bed of river in the deltaic part of it near Ionian Sea. As an object of our study, we have individualized the water source north of Bufi Lake (Fig. 1). The graphic materials presented are considered adequate to show the origin of this source. From the observations made, if results of a rate of more than 50.000 l/hour. Its water is clear and of salty taste. The water rate is stable during the year, no affected by the rains. Its elevation is 7m over the sea level. Water temperature is about 12-14°C, similar to the temperatures of other waters of this type found south of Albania (Prifti & Marku, 2005).

The hydrochemical analyses are given in Tab.1 with a chloride content of up to 4 gr/l that shows a lower salinity than the sea water. It should be stressed that this strong source of stable rate has created and mountainously feeds the Buff lake which together with Butrinti lake form an inner water complex that could serve for water sports within the investments system in the future for the development of infrastructure and tourism. It should be stressed that those analyses have been made certain years ago. Nevertheless, they evidence the richness of these waters in microelements. Anyway, these analyses cannot be considered complete to express the level of current requirements because other detailed complementary analyses that should be carried out could evidence other distinctive characteristics of this source would make possible the multi-purpose use of those waters including the curative one.

5. METAMORPHISM OF WATER

Hydrochemical properties of water in source waters and drilled wells are conditioned by origin (infiltration, sedimentation), water and rock relationships which depend on the hydrodynamic regime of the water basin. So there is a close subordination between the hydrochemical composition and the hydrodynamic regime. This subordinate expresses the Na / Cl ratio and the content of ions and cations (Total dissolved solids). Rainfall water does not have chlorides. In the basin of the water is realized the enrichment of water with chemical elements (Prifti & Marku. 2005).

The content of chlorides increases by the digestion of chloride minerals. Also sedimentation waters are rich in chlorides. With the increase in depth, the gradual growth of the chlorides occurs until the impact of the infiltration water is reduced where the chlorides have high content and the waters are metamorphized. So the decrease in the Na / Cl ratio indicates an increase in the degree of metamorphism. When this ratio has the highest values of the unit we are dealing with clefts. Based on the metamorphism report and the total dissolved solids correlation, we get the following conclusions:

[1]. Oilfield Finiq-Kranese wells and wells that around it site are metamorphized as wells Fitore, Kalcat-2 and Borshi-1 / s wells
[2]. The Butrint Lake Waters are metamorphic.

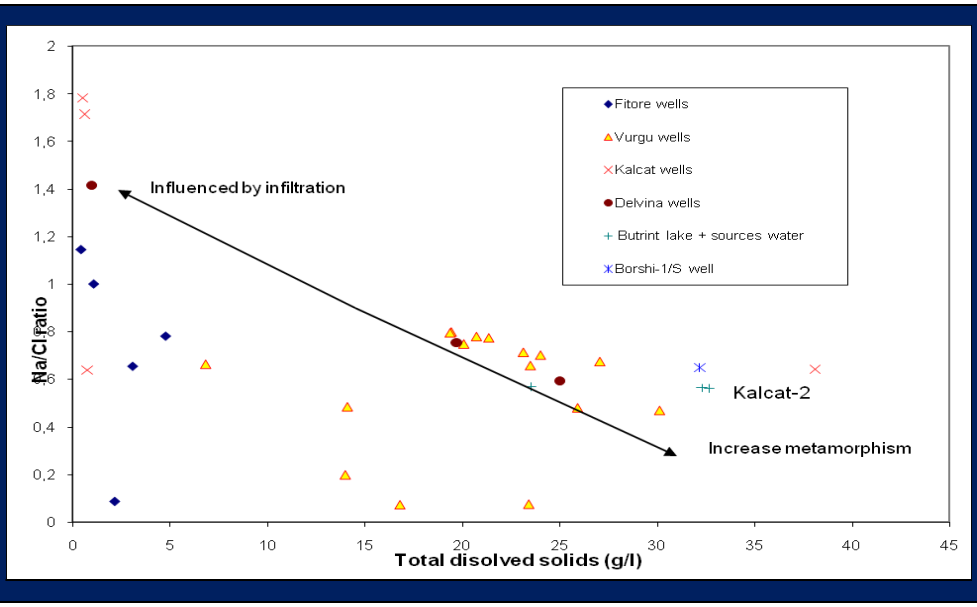

Figure 3 *Rate of metamorphism of natural water in Butrinti area*

Butrint Lake represents the regional base for the discharge of the carbonate basin waters of the Saranda region. Source waters and water of Butrinti lake are also associated with the presence of sulphuric acid (H_2S). Surface resources are divided into two groups:

- Pure-water springs. Typical types of infiltration, have low chlorine content and total dissolved solids are less than 0.3 g/ l (Fig.3).
- Metamorphosed water sources. Total dissolved solids ranges from 0.1 to 0.5 g/ l

The origin of metamorphic waters is mainly that of new and old infiltration with impacts of deep water and a longer time of interaction of water with rock that has led to the digestion of chloride minerals (Shtrepi et al. 1976).

6. CONCLUSIONS

- Butrinti region has got a geologic structure of complex tectonics which favours the surface springing of underground waters;
- The hydrogeological analyses show a high mineralisation and microelements content. These characteristics have been conditioned by two factors;

- They are water sources originating from underground closed environments;
- They are related to the tectonic contact of limestone deposits with the evaporitic ones. The passage of water from the feeding area to the drainage allows the solution of halogen rocks in the water;
- The fresh water source which is located near the brackish water source is the result of infiltration waters in limestone deposits where the feeding area nearly conforms with the drainage area;
- East and southwest of Butrinti town, there are certain water sources related so the tectonic contact;
- The waters of these sources are similar and have got the same characteristics. The rates are more than 50.000 l/hour.
- The waters source of the lake is a strong source of the chloro-calcic type, clear and of stable rate around the year with a temperature of 12-14°C. The elevation is 7m. The presence of SO_4 anions shows a long timely contact of those waters with the halogen deposits such as gypsum and anhydrides.

We briefly submitted in this material the presence of underground waters in Butrinti region which presence goes to increase the values of Butrinti region at the advantage of the clarification and promotion of the demand for future investments for the development of infrastructure and tourism.

7. LITERATURE

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