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## LAND USE CHANGES ON GALICICA MOUNTAIN

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### Abstract

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This paper presents the changes of land use of Galicica Mountain (including the National Park „Galicica“), in the last 60 years. Topographic maps from the 1950s and 1970s of the 20<sup>th</sup> century were used as models, as well as Google maps from 2007. The analyses were made by using GIS (Geographic Information System) software. The maps that were used were in scale 1:50000. The goal of this research is to determine the direction of the transformation of the land, including: the reason why the changes occurred and appeared which factors affects them etc. The results determined the difference in the areas of the identified territories i.e. the direction of the transformation of the land of Galicica Mountain in three comparative periods. The area under forests increased due to the reduction of the areas under pastures and shrubs.

**Key words:** Galicica, land use, land transformation.

### Апстракт

Десподовска, А., Арсовска, Б., Меловски, Л., Христовски, С. (2013). Промени во искористувањето на земјиштето на планината Галичица. Зборник на трудови од IV Конгрес на еколозите на Македонија со меѓународно учество, Охрид, 12-15 октомври 2012 година. Македонско еколошко друштво, посебно издание 28, Скопје.

Во овој труд се прикажани промените во искористувањето на земјиштето на планината Галичица (вклучувајќи го и Националниот парк „Галичица“) во последните 60 години. За таа цел, беа искористени топографски карти од 1950тите и 1970тите години на XX век, како и Google сателитски снимки од 2007 година. Анализата беше направена со помош на GIS софтвер (географски информациски систем). Картирањето беше извршено во размер 1:50000. Главна цел на истражувањето беше да се утврди насоката во трансформацијата на земјиштето, вклучувајќи и анализа на причините и факторите на промените. Резултатите ги покажаа разликите во површината на идентификуваните подрачја т.е. насоката на трансформацијата на земјиштето на планината Галичица во трите периоди. Главната промена е зголемување на површината на шумско земјиште и намалување на површините под пасишта и грмушеста вегетација.

**Клучни зборови:** Галичица, искористување на земјиште, трансформација на земјиште.

### Introduction

Growth rates of any type of land are shown through the exploitation of the land, its structure and morphology, i.e. the transformation of the land that occurs during a certain period of time. This proves the necessity to research the evolution of the soil, which is the most important component for sustainable development of the region. (Ratnadeb & Ami,

2003). The changes and the transformation of the land are result of complex interaction of many factors including politics, economy, culture, human behavior and environment (Dale et al., 1993).

The models of exploitation of the land and the changes of the land cover are powerful tool that can be used in the understanding and the analysis of the important connections between the socio-economic processes that are in relation with the agricultur-

al activities, the evolution of the land and the strategy for management of the natural resources as well as the ways these changes influence the structure and the function of the eco-systems. (Turner and Mayer, 1991).

The transformation of the land can also influence the local and regional economies (Burchel, 1996).

Understanding the changes in the transformation of the land and how they occur is crucial since the anthropogenic activities have great impact on the environment, on the change of the hydrological cycle (Steiner F., Osterman D.A., Hicks T.L., Ledgerwood R., 1988), on the dynamics of the biogeochemical cycles (Flintrop et al., 1996), on the size and the arrangement of the natural habitats such as forests (Dale et al., 1993) and the species varieties (Costanza R. and Patten B.C., 1995).

The exploitation of the land is defined as human activity over the land (Turner et al., 1995).

Natural factors such as: relief (terrain) characteristics, geological composition, climate, hydrological conditions, pedological composition of the terrain etc. influenced the development of various vegetation where areas with forests and pastures on the Galicica Mountain prevail.

Small portion of the land on Galicica Mountain, man has adopted for cultivation of agricultural areas. Therefore, the growth of the vegetation cover is influenced by a number of social, economic-geographic, as well as socio-geographic factors.

Activities related to the exploitation of the land result in destruction of the vegetation cover (Lambin 1997). Therefore, the satellite shots very often can be used for detection of the changes in the exploitation of the land through the records of the biophysical characteristics of the terrain.

The aim of this study is to determine the direction of the transformation of the land on Galicica Mountain through comparison of the condition of the land in the 1950s, 1970s of the 20<sup>th</sup> century as well as in 2007.

### Method of work

Galicica Mountain is located in the southwest part of the Republic of Macedonia, between the Ohrid and Prespa Lake and it covers an area of 317 km<sup>2</sup>. Review of the changes of the land on Galicica Mountain has been made in 1950, 1970 and 2007. For the conditions in the 1950s and 1970s, topographic maps were used in scale of 1:50000, prepared by the Military Geographic Office (VGI) of the Yugoslav National Army (YNA). For the condition in 2007, pictures from Google Maps were used in scale of 1:5000. Forests landscapes, short bole vegetation-shrubs, arable land, pastures, stone fields, glade fields in forests, populated areas, swamps were identified.

All maps are referenced on the basis of the top-

ographic maps in scale of 1:25000 in geographic projection UTM/VGS 84 zone 34 North. The topographic basis for the terrain is prepared by the Military Geographic Office of YNA on topographic maps. ArcGIS 9.3 software is used for the processing of the data, developed by ESRI which provides recognition of colors of the identified territories on the maps. For the calculation of the surface covered with the identified territories, plan projection review was used and the obtained surfaces are calculated in hectares.

### Discussion

Transformations in the nature, in general, as well as the changes in the vegetation cover on the Galicica Mountain are strongly correlated with the natural and with the social factors as well.

Mainly, the natural factors are related to the characteristics of the terrain, geological composition, climate, hydrological conditions, pedological composition of the terrain etc. The individual characteristics of the natural factors, as well as the mutual influences, determine the development of the particular floristic systems in a certain area. According to the relatively big inclinations (large slope) of the surface and the altitude, the areas with forests and pastures prevail. Parts of these areas are used for growing cultivated vegetation and this illustrates the impact of the social factors on the vegetation cover.

In the last few decades, 23 located areas on the Galicica Mountain have been populated with 10000 habitants. Out of 38000 hectares in their function, 6000 hectares are adopted as arable areas where fields and orchards prevail.

The social factors are: physical planning, declaration of Galicica as national park, processes of social planning, emerging urbanization, emerging industrialization, late infrastructural installation and arrangement of settlements, inadequate agricultural politics, motorization and use of agricultural mechanization, cultural and educational level of population, historically illogical factors for localization and development of settlements, functionally inadequate organization of the settlements territories, migration of the population in the cities, reorientation of the population from the primary towards secondary business activities, changes in the exploitation of the energy potentials, changes in the farming practices and traditional engagements etc.

Because of these reasons, great part of these arable territories is abandoned and therefore the transformation of the land from cultivated to uncultivated begins. Due to the functional transformations of parts of the settlements dealing with agriculture (farming, orcharding, stockbreeding) into catering, tourism, trade and other service activities, part of the arable land is transformed into unproductive areas

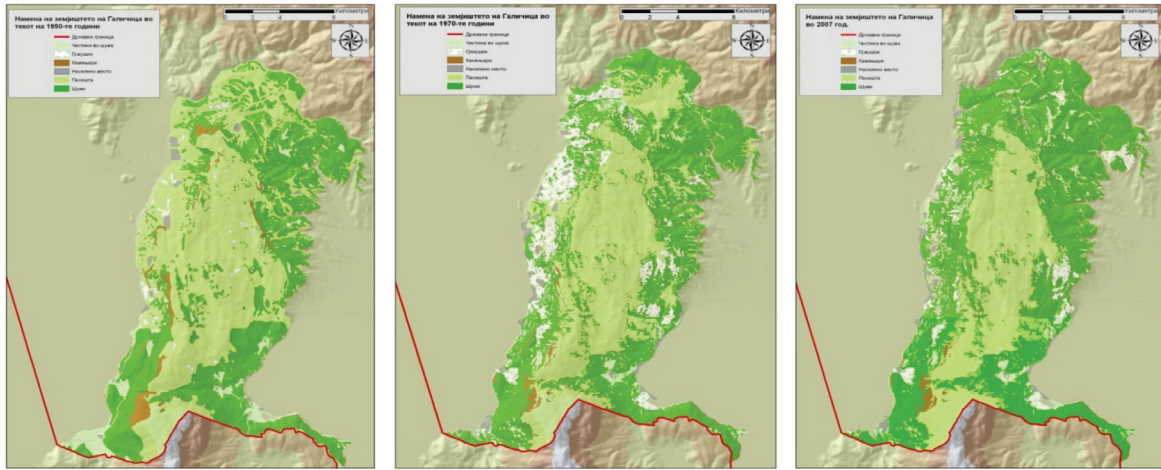


Fig. 1. Land condition of Galichica mountain in 1950's, 1970's and 2007

Results

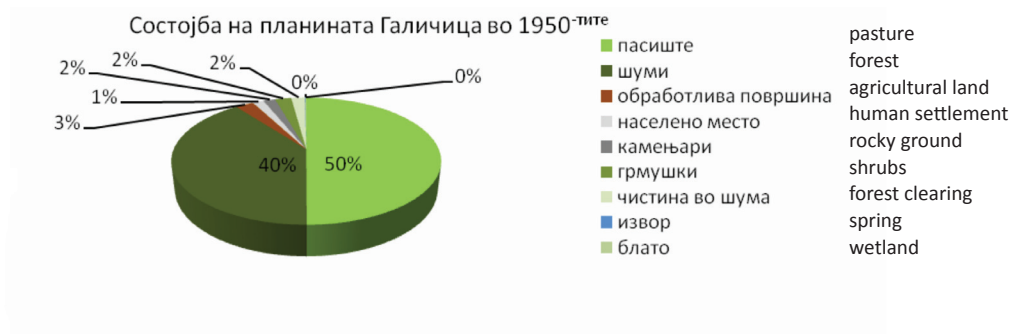


Fig. 2. Land use of Galichica mountain in 1950's (in %)



Fig. 3. Land use of Galichica mountain in 1970's (in %)



Fig. 4. Land use of Galichica mountain in 2007 (in %)

(houses, buildings, yards, religious objects, graveyards etc.). Examples for this are the settlements in the coastal region of Lake Ohrid, such as Konjsko, Peshtani, Trpejca and Ljubanishta which today are oriented towards tourism, trade and other service activities. In these settlements even though the number of population is increasing, still the arable areas are transforming into unproductive. The situation in the Prespa Region is different than the Ohrid Region. The population number in Oteshevo, Leskoec, Petri-no, Preljublje, Stipona etc., is drastically decreasing because of the migration of the population towards cities and abroad. In these settlements the transformation of the cultivated areas into unproductive is result of the migration and the abandonment of the arable fields.

From this information it can be concluded that the impact of human on the transformation of the land on Galicica Mountain is expressed through the increased pressure in the coastal area of Ohrid and Prespa Lake, and the pressure of the population inside the mountains is significantly reduced and mainly concerns the tourist recreational visits of individuals and small groups.

The obvious differences in the changes of the land on Galicica Mountain in the compared three periods can be noticed in Figure 1. Furthermore, the percentages of presence of the identified areas are shown in Figure 2, 3 and 4.

It was noticed on Galicica Mountain that the areas of pastures are decreasing from 50% in 1950s, to 24% in 2007. This is a result of the abandonment of the cattle breeding as a basic activity and reorientation towards catering and tourism, as well as the migrations of people from rural settlements to the cities. The land under forests is increased from 40% in the 1950s to 58% in 2007. This is mostly as a result of the succession of the land itself, more specific as a result of the growing of the shrubs into forest. The area under shrubs decreased from 14% in 1970s to 5% in 2007 due to the succession. Royatos et al. (2003) brought similar conclusions for the Pyrenees in Spain where the fields under forests increased due to the ingrowth of tree species on the abandoned arable areas. Specific problem arises from the organized pressure within the National Park Galicica where under the plan for protection and management of the park in many occasions (perhaps due to irregular cut, but certainly with alleged spacing or cleaning the fields) an exploitation of the forests is made (Маркоски, 2011). As a result, it is possible the percentage of land under forest to be variable, but the most important thing is that this percentage increases successively in the three comparative periods.

During the preparation of this research, we faced unclearities of the topographic maps from 1950s

of the 20<sup>th</sup> century. Throughout the marking of the maps difficulties were faced in the recognition and marking the areas, part of this research. While at Google Earth maps the shadow that appears on the photos can be noticed as a downside, depending on the angle of the satellite shoots.

## Conclusion

According to the results from the researched area, it can be concluded that the land cover of Galicica Mountain from the 1950s until 2007 has significant changes. The areas under forests are increased whilst the areas under short bole vegetation – shrubs and areas under pastures are reduced. The reasons why these changes occurs are the succession of the land itself, the migration of the population from the countryside to the cities, the abandonment of the cattle breeding and reorientation towards catering and tourism, but also the climate factors all around the globe should not be forgotten.

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