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ESTIMATION OF HOURLY TEMPERATURES FOR THE SOUTHEASTERN PART OF ALBANIA

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Abstract

Knowing the daytime temperatures observed during the day and night is very important in the field of agriculture or environmental assessment of buildings in terms of heating and cooling systems, etc. This article aims to track the results of work done on certain contemporary methodologies on estimating hourly temperatures based on minimum and maximum daily air temperatures as the only source of information in most meteorological sites. The information obtained is valid for areas where there are no automatic stations, meanwhile it makes available all that existing database with those type of data. Many of now days methodologies used for estimating "Chill units" or heating and cooling degree hourly and days above or below certain temperature thresholds require as inputs the values of air hourly temperatures. This assessment was made for the southeastern area of Albania

Key words: Hourly temperatures, minimal and maximal air temperatures, chill units, hourly and day degrees.

Introduction

For different reasons and objectives, especially on the field of agriculture and calculating energy demand of building are necessary the knowledge about the hourly air temperatures and their ongoing during the night and the day. For such purpose in this paper is presented a summary of the work done, aiming to compose and get like final output, such important information useful on those cases, where are missing the data from automatic weather stations, but making useful only the data base on daily minimum and maximum data of air temperatures.

Material and Method

The methodology used for such purpose is referred to many authors, which try to get the best and finalize a most appropriate curve of ongoing of hourly air temperatures, that can fit and be similar as much as they can with that natural ongoing, reflecting the weather condition, the sun rise and sun

set, the latitude of the area, and as well as theweather evets. Of course, these methodologies have evaluated also the errors and how accurate can be such type of approach to fulfill the level of specific requests. Naturally, it emphasized also the fact that in same case the data missing from automatic weather station creating gup and difficulty, but also the elaboration of such data base coming from automatic station needs more work to be controlled, verified and elaborated. Another important fact is that normally each country and area normally have a large data base coming from classical meteorological stations, that means daily minimum and maximum air temperatures than hourly temperatures. These models are constructed to generate the hourly air temperatures based to daily minimum and maximum temperatures. The use of such data outputs is needed to simulate the development of insects, plants, to calculate chill hours and chill units dur winter season, etc., etc. Starting with Richardson (1974) that propose a simple model using a straight line with 12 hr between maximum and minimum temperatures, which has some limitations, later on time other methodologies proposed and realized by different authors took in consideration also the daylength. McFarland (1987) provide another model using a modified sine function with idea that such curve of daytime temperature should follow the daily solar cycle. Dale E. Linvill note that: "The nighttime temperatures cooling curve, however, is not as simple. Cooling depends on many factors, including moisture content of the air, cloud cover, and soil heat flow." He uses a logarithmic nighttime cooling curve. Other authors Parton and Logan (1981) have used an exponential cooling rate, Eckersten (1986) provide a sine-sine exponential model improving the results. McCann (1985) used a sine-sine-sine model to represent the heating and cooling curves.

The main assumption for all analyzed models consists at the fact that maximum and minimum air temperatures are observed at regular intervals. But, in reality, sometimes thanks to movement of atmospheric fronts, the 24-hr maximum and minimum temperatures are observed before or later in time compare to the normal moments of observations, that are for the maximum temperatures during the afternoon hours and minimum temperatures that occurs near the time of sunrise.

Generally, in meteorological books is accepted that 2 hr after the solar noon is observed the maximum air temperature and the shape of the temperature curve follows the daytime solar cycle. The ongoing of such wave part of 24 hr total cycle is presented by the equation [1];

$$T(t) = (T_{max} - T_{min}) * \sin[(\pi * t)/DL + 4)] + T_{min} \quad [1]$$

where: T(t) is the temperature at the time (t) after sunrise, Tmax is maximal temperature, Tmin is minimal temperature and DL – daylength (in hours)

The night-time cooling, starting at sunset follow another type of curve and get the end (the minimum absolute value) at the moment when is verified the maximum of loose of energy from surface of earth (by longwave surface radiation at 8-10μ) or in other words when "Net radiation sunrise occurs ≈0.5 hours after astronomical sunrise, because the outgoing radiation is not balanced by incoming solar radiation until this time"[1].

For night-time cooling temperatures the equation [2] proposed by Linvill is:

$$T(t) = T_S - [(T_S - T_{min})/Ln*(24-DL)] * Ln(t) \quad [2]$$

where T(t) is temperatures at time t≥1hr after sunset and T_S is the sunset temperature obtained from equation [1].

Different authors propose other formula for the evaluation of daylength (DL), but in this study it is used a model proposed by NOAA, that of course in conformity with all respective lows, calculate the sunrise, sunset and DL for every day and for any geographical latitude.

In following, on the figure Nr.1 is presented the ongoing of hourly air temperatures for one day, generated by the composed model, using as inputs the data of minimum & maximum temperatures, sunrise and sunset data for a specific geographical place.

The composed program includes a NOAA module, that helps to calculate sunrise and sunset referring to latitude, longitude, time zone and the year. Part of that is presented on the figure Nr.1 by using the data of Korça meteorological station. On the figure Nr.2 are presented some output of sunrise and sunset data useful for other following formulas used for generating hourly temperatures. Figure Nr. 3 reflect how change the frame time based to daylength the calculation of day and night temperatures.

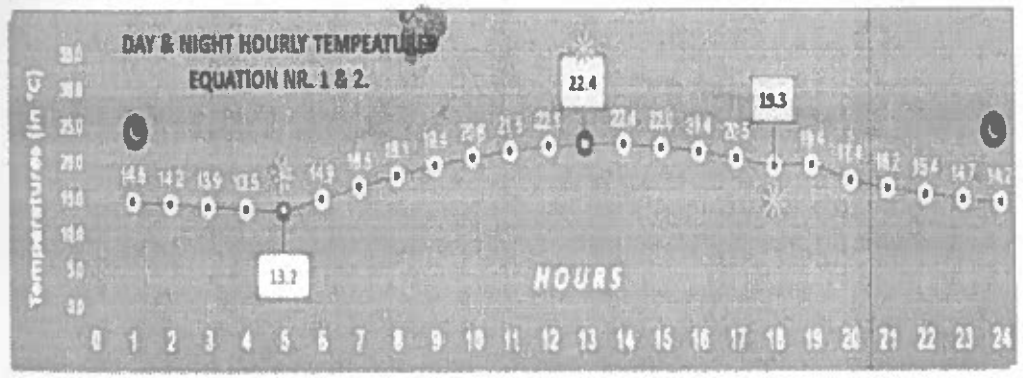


Figure Nr.1. - Hourly air temperatures generated for day September 6, 2018 for Korça meteorological station.

Figure Nr.2. - Part of the module in excel for calculating the sunrise and sunset referring to longitude, latitude,time zone and the year.

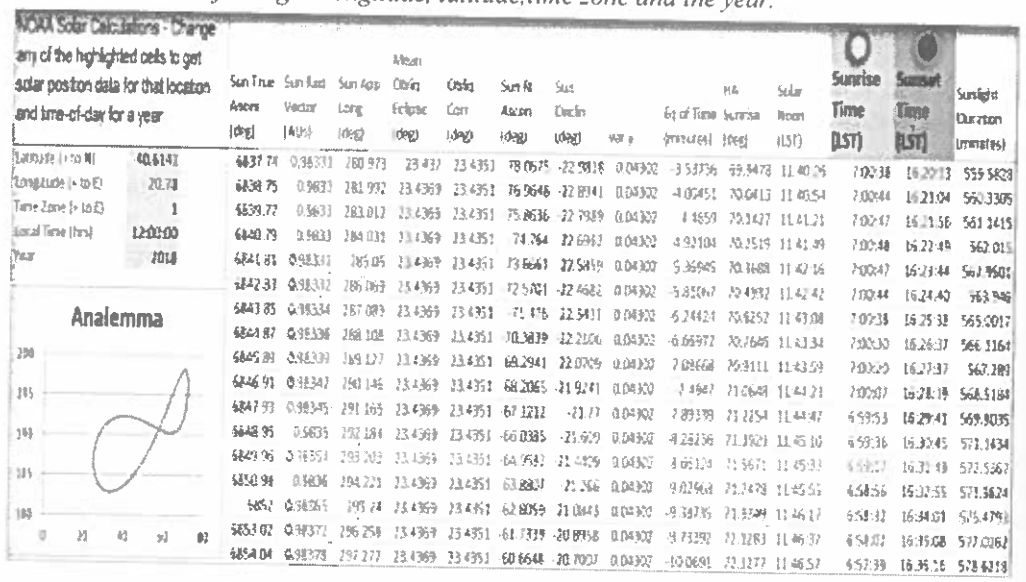
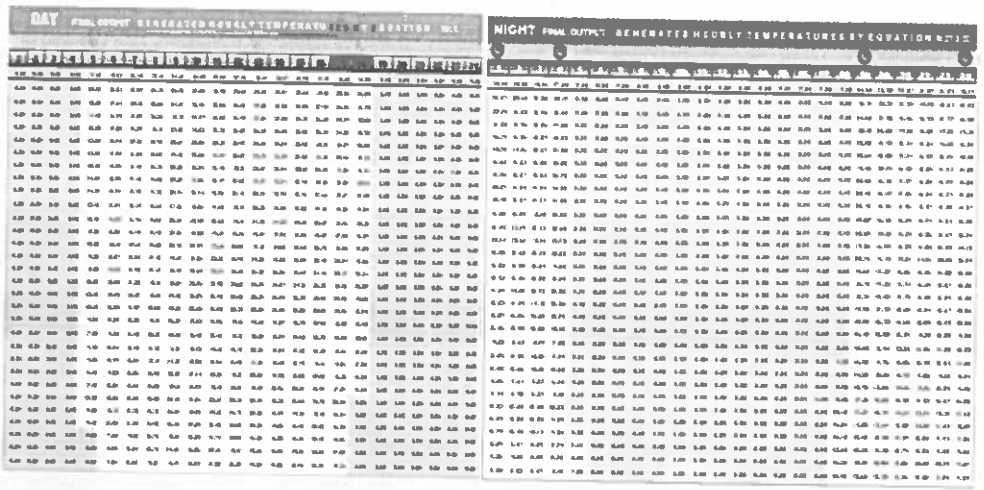


Figure Nr.3. - Part of the composed module in excel for calculating the daily (on the left) and night (on the right) temperatures, reflecting also the daylength referring to the day of the year.



Result and discussion

This program calculates the hourly air temperatures based to data inputs for a seri of data of one year starting from 1 September until 31 August. At the figure Nr.4 is presented a part of hourly temperatures generated for Korça

meteorological station for the period September 1, 2017 until August 31, 2018.

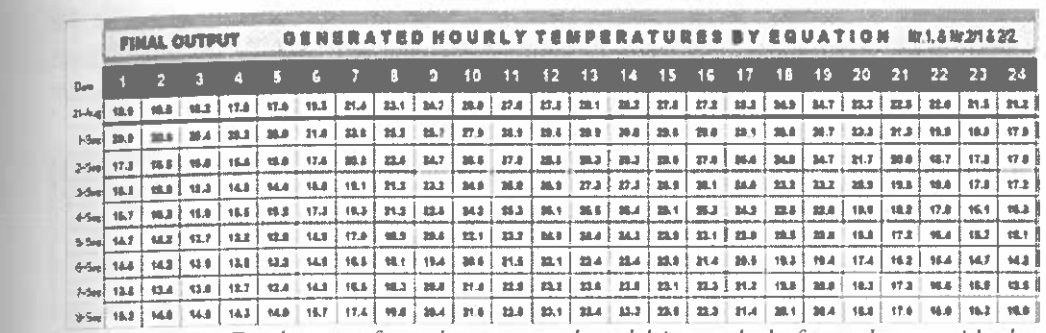


Figure Nr.4. – Final output from the composed model in excel platform, that provide the hourly temperaturesbased to minimum and maximum daily air temperatures.

The data seri that has to be provided to the model (like inputs) in fact starts from 31 August and ends up to the September first or two of the next year, because it is in need to have data about the sunset of 31 August and maximum temperature of that day to generate the night temperatures for the day September first, and as well at the end it needs for the day September 1, (for generation of late evening / night temperatures of August 31), the minimum temperature and sunrise of following day September first. This type of year (period of time) is very useful for calculating different index that describe the winter cool period, like chill unit, sum of air hourly temperatures under or above a certain threshold, average temperatures during the day or the night and also for the rest of the year(the hot period) for other indexes. In mean time by using this type of year, it facilitates also the data elaboration by taking into consideration the added one day created by the leap year. The package of input data for that program include: 1 → the year (starting point for example: 1 Sept 2017), 2 → name and level above the sea (in m) of the meteorological station, 3 → Geographical latitude and longitude of the place and time zone, 4, 5, 6 → the Seri of data for one year, which should include the period from 31 August of starting year until the September 2 of the following year, (for ex: 31 Aug 2017 ÷ 2 Sept 2018). The package of meteorological data includes in itself 4 → the daily maximum and 5 → minimum air temperatures and 6 → daily precipitation, which has to be pre-elaborated in the right format, controlled, verified and checked for any error, fulfilled any gups, etc., in conformity with the WMO standards. On that context another file was prepared to produce such type of data, that easy after above-mentioned procedures can fulfill the framework sheet of data entry for generating the hourly

temperatures. On the figure Nr.5 is presented a view about the data entry procedure (step by step) that on the right part include one year data for the period 31 Aug. 2020 until 2 Sept. 2021 (vertical columns), following on the right with other couple of year 2019/2020, 2018/2019, 2017/18, and so on until the 2000/2001.

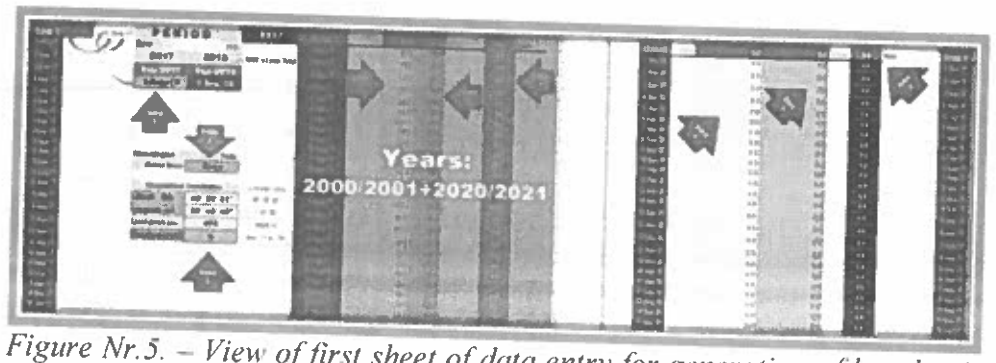


Figure Nr.5. – View of first sheet of data entry for generation of hourly air temperatures.

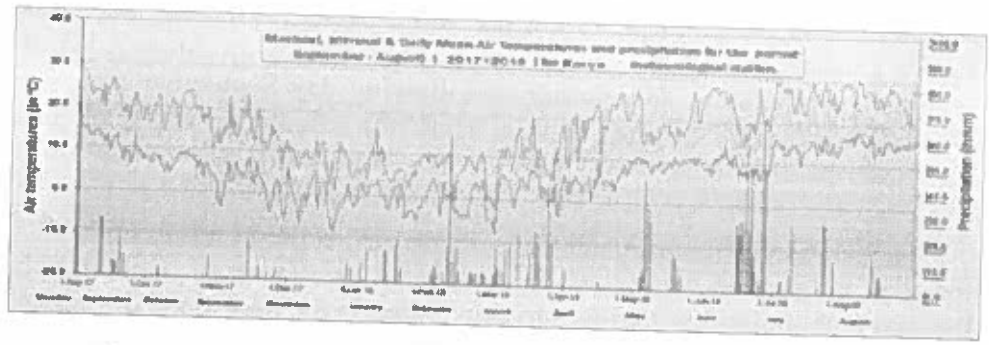


Figure Nr.6. – The generation of graph for daily data of minimal, maximal and mean air temperatures and precipitation for the period 1 September until 31 August of each year.

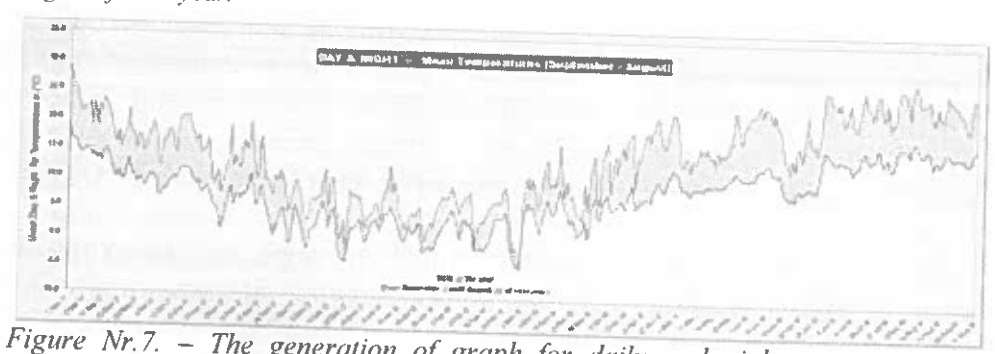


Figure Nr.7. – The generation of graph for daily and night average of air temperaturesfor the period 1 September until 31 August of each year.

This program provides information in graphs for a better presentation of the daily minimum and maximum ongoingof air temperatures and precipitation as they are presented on the figure Nr.6 or day & night average values (figure Nr.7), mean monthly temperatures, sometimes needed for specific modules used for fast estimation of chill unit.

Conclusions

This program is very useful to generate 8760 hourly air temperatures for each normal year (8784 for leap year). Also, it is very easy to link or transfer the output hourly data to other module/software for calculation of other indexes like "Chill Unit", sum of degree hours or days, day and night average temperatures, etc. It provides hourly data for up to 20 years, but it is open to increase the number of years without any restriction. In the context of limitation have to be noted that such program is tested and provide the right outputs only for latitude between 0 degree (equator) up to 65 degrees of North hemisphere.

Reference

[1] "Calculating Chilling Hours and Chill Units from Daily Maximum and Minimum Temperature Observations" *Dale E. Linvill - Agricultural Engineering Department, Clemson University, Clemson, SC 29634.*

[2] "Climate change and shifts in dormancy release for deciduous fruit crops in Germany" *Frank-M. Chmielewski1,*, Klaus Blümel1, Ivana Pálešová2. 1-Agricultural Climatology, Faculty of Agriculture and Horticulture, Humboldt- University of Berlin, Germany 2 - Department of Natural Environment, Technical University Zvolen, Slovakia. CLIMATE RESEARCH-Clim Res Vol. 54: 209–219, 2012 doi: 10.3354/cr01115.*

[3] "Estimating chilling duration from daily temperature extremes and elevation in Israel" Robert Aron[1], Zipora Gat[2] – 1. *Department of Geography, Central Michigan University, Mt. Pleasant, Michigan 48859, USA; 2. - Division for Agricultural Meteorology, Israel Meteorological Service, Bet-Degan, 50-250 Israel. CLIMATE RESEARCH - Clim Res: 125-132, 1997.*

[4] "The Physiology of Chilling Temperature Requirements for Dormancy Release and Bud-break in Temperate Fruit Trees Grown at Mild Winter Tropical Climate" - *Abayneh Melke. Journal of Plant Studies; Vol. 4, No. 2; 2015. ISSN 1927-0461 E-ISSN 1927-047X Canadian Center of Science and Education.*

[5] "Estimating daily positive Utah chill units from maximum and minimum temperatures"- G.C. Linsley-Noakes[1],M. Louw[2], P.Allan[3]. *1- S. A. Breweries Hop Frams, P.O.Box1498, Geroge, 6430 South Africa, 2 – Stellenbosch Institute for Fruit Technology, S. Africa, 3 – Dep. Of Horticultural Science University of Natal, Pietermaritzburgs, Africa. J.S.AFR. Hort.ECI. 5 (1) 1995.*

[6] "New algorithm for generating hourly temperature values using daily maximum, minimum and average values from climate models". *DHC Chow[a] BSc BEng PhD MCIBSE MASHRAE and Geoff J Levermore[b] BSc ARCS PhDDIC CEng DMS FCIBSE MASHRAE. a - Division of Built Environment, Sheffield Hallam University, UK. b - School of Mechanical Aerospace and Civil Engineering, University of Manchester, UK.*

THE EFFECTS OF CLIMATE CHANGE ON THE ADAPTATION OF THE NATURAL JUVENILITIES OF THE ORIENTAL BEECH (*FAGUS ORIENTALIS* LIPSKY)

(Bartın-Kumluca Case Study)

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ABSTRACT

Oriental beech (*Fagus orientalis* Lipsky.), of which a significant portion of geographical distribution is mostly in Turkey. It is an economically and ecologically important species. According to UNDP (2019), Turkey is included among the "countries at risk" that are highly vulnerable to climate change. Global climate change will rise to occasion with the rise of temperatures and a decrease in precipitation in the Mediterranean Basin. It is important to ensure the continuity of pure and mixed forests of oriental beech and the establishment of new forest areas. For this, successful regeneration and rehabilitation work is needed. In this study, the effects of climate change on the natural juvenilities of oriental beech were investigated. For this purpose, according to the random sampling method; 10 sample areas in the regeneration area (25x40 m) during the years of 2017-2021, some quantitative characters, such as total seedling height, root collar diameter, the shoot length in last year, number of leaves, number of buds, leaf width, and leaf length, were measured periodically and also were evaluated with climate characteristics by multiple correlation analysis. In this context, the highest values of seedling death in natural juvenilities of oriental beech occurred in 2020 (7,3 units/m^2), 2019 (6,2 units/m^2) and 2017 (5,7 units/m^2). It has been determined that there is a positive correlation between the highest temperature values detected in the research area and natural youth losses at the level of 99% confidence in these years. January-March, the natural juvenilities losses (3.5 units/m^2) occurring in 2021 were mostly caused by low temperatures as a result of correlation analyses, it was determined at a 95% confidence level. According to the results of multiple correlation analysis, during the 5 years, the most effective climate variables on growth parameters, respectively, the average temperature of the vegetation period (between April and October), the number of frost days, the highest temperature, the lowest temperature, and the prevailing winds was determined.

Key words: Oriental beech, Climate change, Growth, Adaptation

1. INTRODUCTION

Demand to fossil-based natural resources that is used for years has increased every year because of rapid industrialization and high population growth and these resources have come deplete point. Also it is reported that deficit between supply and demand amount of products obtained fossil-based natural resources will increase to 55-65% as of 2050 (IEA, 2020). In this context, resources that can naturally renew themselves come to the forefront for energy production. Considering within the framework of this projection, forests, which are the most important natural and self-renewing resources of the world, come into prominence. The future of forests, which have a dynamic structure in a certain ecological balance with their unique ecosystem characteristics, is under threat today due to the negative effects of many biotic and abiotic factors, especially excessive and unplanned utilization. At the beginning of these threats is global climate change, which is the most important environmental problem of today. Thus, it is stated that natural forest resources in different geographical regions of the world will decrease by 20-40% in the next ten years, depending on the effects of global climate change (Baker et al., 1993). Climate changes should be taken into account in order to realize the sustainable management of products and functional services provided from forest resources and this important natural resource pass it on to next generations in a healthier and higher quality way. Accordingly, there is a need for successful rejuvenation and rehabilitation studies by taking into account the species and the dynamics of pure and mixed stands created by these species in different ecological conditions. In this context, it is aimed to reveal the effects of local micro-climatic conditions, especially on juvenilities dynamism after after the natural rejuvenation studies carried out in this area in this preliminary research which was carried out for 5 years (2017-2021) in forest of pure oriental beech (*Fagus orientalis* Lipsky.) in the Bartin-Kumluca region.

2. MATERIAL AND METHOD

2.1. Material

The research area is the pure oriental beech stand (Stand type: Knd_1) with a size of 12 ha in the 35 numbered compartment of Bartın-Kumluca region. The pure oriental beech rejuvenation area, which constitutes the research material, is located in the Western Black Sea Sub-Euxin region according to the classification made in terms of plant sociology. The oriental beech natural regeneration area, which constitutes the research area, is 12 hectares and 635 m altitude and is located on the north-facing and upper slope. The soil structure in the area is generally deep and the soil texture is sandy-clay-mud and the structure is clastic soil. According to the soil profile opened in the area, the soil reaction (pH) varies between 7.3-8.5. Additionally, dominant wind direction in the area is west. Also natural regeneration studies were started in 2016 with the insemination cut in the oriental beech on the grounds that there was an abundant seed year in the region. In addition, a total of 356 m^3 final yield cut was taken from the area and the closure was brought to the level of 0.5-0.6 (Anonymous, 2020). There is a dead cover layer in the field in the form of raw humus, the decomposition rate of which is at a good level. There is rhododendron as weed with medium density and in clusters in the gaps of the stand (Şekil 1).

2.2. Method

Random sampling method was used in the area in order to determine the effect of the climatic factors prevailing in the region on the natural juvenilities of the oriental beech. According to this method, quantitative characters such as total height, root throat diameter, shoot length in the last year, number of leaves, number of buds, leaf width and leaf length were measured periodically between 2017 and 2021 in 10 research areas with 25x40m. These measurements were tried to be evaluated by means of multiple correlation analyzes together with climate data. According to the random sampling method, 10 research areas with a size of 25 x 40 m were selected from the natural regeneration area in the distribution that best reflects the stand actual conditions and the current ecological situation at the same aspect and elevation level. It was measured that length and root collar diameter of oriental beech were measured yearly by using the grid system 2017-2021 during 5 years in these areas. It was tried to determine the effects of the natural juvenilities of beech on the adaptation and development of the field with the climatic factors and the measurements obtained. The climate data of the Bartın Meteorology Station used in the research were obtained from the General Directorate of Meteorology. The

data obtained were compared to variance analysis, Duncan test, and multiple correlation analysis. The analyses were made by the SPSS statistic packet program.

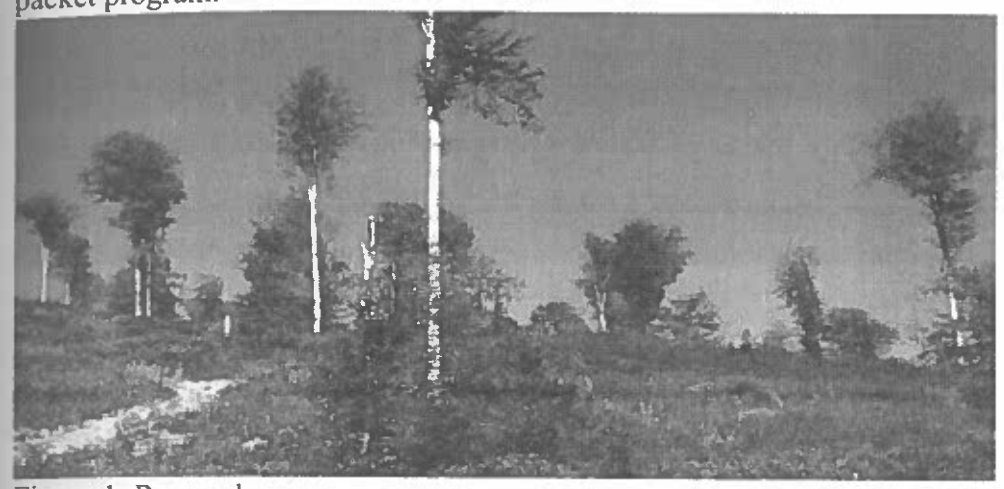

Figure 1. Research area

3. RESULTS AND DISCUSSION

3.1. The Adaptation of Beech Natural Juvenilities to Climate Change

Adaptation of natural oriental beech juvenilities was researched with counts carried out in this region. Accordingly, as a result of the variance analysis applied to the average lost juvenilities values per square meter due to the natural drying out in the natural beech juvenilities at the annual level, it was determined that there was a statistically significant difference at the $P<0.05$ confidence level between the years. In this context, the Duncan test at $P<0.05$ confidence level was used to determine the homogeneous groups regarding the average juvenilities losses per square meter in beech natural juvenilities over the years (Table 1).

Table 1. Average loss values occurring in Natural Oriental beech juvenilities over the years and Results of Duncan Test

Year	Average loss values of natural oriental beech juvenilities (pcs/m^2)	Homogeneous groups
2017	5,7	a
2018	5,5	a
2019	6,2	b
2020	7,3	c
2021	6,1	b

According this, in the research area, the highest average loss per square meter was experienced in 2020 with 7,3 units, due to the prevailing climatic

factors in natural oriental beech juvenilities, while 2019 and 2021 followed this year with 6,2 and 6,1 losses. In this regard, there has been no sufficient number of researches and evaluations on oriental beech in Turkey in relation to climate limits for many years. However, European beech (*Fagus sylvatica* L.), which has similar silvicultural, biological and ecological characteristics with eastern beech, has very detailed research studies on this subject. As a matter of fact, it was determined that the highest losses in European beech natural juvenilities due to the effects of global warming occurred in 2018, 2019, and 2020, especially in the lower and middle elevation beech forests in the last ten-year period in a study carried out in Poland (Bugno-Pogoda and Durak, 2021). On the other hand, it is emphasized that there may be significant negative effects and losses in natural beech juvenilities and young beech stands due to global warming, especially in the 2015-2023 period in European beech forests in a modeling study for Central European beech forests (Czucz et al., 2011In the light of this information, it is possible to say that there is a very important similarity between the loss periods of the European beech juvenilities and the loss periods of the oriental beech, which constitutes the research object It has been determined that there is a linear relationship (R^2=0.987) between the annual highest temperature value and the amount of decrease per square meter of natural oriental beech juvenilities at $P<0.01$ confidence level in consequence of the correlation and regression analyses to specify the relationship between the climatic elements that are effective in these losses and the natural oriental beech juvenilities. In a study carried out in the European beech forests in the eastern Alps, it was determined that the unexpected increases in the annual highest temperature values in beech juvenilities cores have very negative effects on primary and secondary forest establishments (Di Filippo et al., 2007). Only in 2021, the losses in natural juvenilities of oriental beech unexpectedly showed a positive correlation at 95% confidence level with low temperatures in the period covering January-March. These sudden low temperatures that occur periodically have caused significant problems and losses in the in the vitality of beech juvenilities which is a slow-growing species in the field. It is reported that this situation is mostly caused by the damage of the beech root system because of freezing in the upper soil layers (Leuschner et al., 2001).

3.2. The Development of Oriental Beech Natural Juvenilities

Correlation analyze was made between the data obtained height and root collar diameter measurements made on the natural juvenilities of the beech

for 5 years in the research area according to the random sampling method. It was determined that the most effective climate variables on growth parameters are the average temperature (R^2=0.996), the number of frost days (R^2=0.994), the highest temperature (R^2=0.991), low temperature (R^2=0.985) and prevailing wind strength (R^2=0.982) in a 5-year period between April and October, which is the vegetation period. The number of long-term studies in Turkey between juvenilities dynamism of oriental beech and climate variables on growth parameters are not enough. For this reason, necessary comparisons were performed by making use of the researches made in European beech, which has similar characteristics. According to this, it was determined in a study conducted in Southern Germany that the low temperatures especially in the vegetation period and the frost hazard that occurred in the European beech affected both the adherence of the juvenilities in the field and their development irreparably (Dittmar et al., 2006). In another study carried out on European beech populations located in the Mediterranean temperate climate zone, it was determined that sudden temperature rises in or outside the vegetation period were effective both on the highest temperature parameter and especially on the monthly average temperature parameter. It is emphasized that this situation negatively affects the development of European beech juvenilities and causes their distribution as populations with limited distribution (Tegel et al., 2014). As a result of the comparisons made with the findings obtained from the results of this research, it can be stated that sudden changes in the climate variables determined during the vegetation period have negative effects, especially in terms of development performance, in the European beech natural juvenilities, as well as in the oriental beech juvenilities. This situation shows itself as a negative and diminishing effect on young individuals of tree species as well as in all living populations, as a natural consequence of global climate change.

4. CONCLUSIONS

It is important to ensure the sustainability of the oriental beech forests, which is one of the important primary forest tree species in Turkey and has a wide geographical variation, and to regeneration the old forests whose administration period has expired. These regeneration practices have a strategic importance considering their direct and indirect effects on forestry both in our country and in the world. It is inevitable that the oriental beech will be adversely affected by the effects of global climate change due to the oriental beech which is known especially mother of forest has extreme and

sensitive in terms of biologic and silvicultural characteristics. Forest institutions where the oriental beech which low growing especially in the early years and need upper and side shield until it gains its biological independence, by natural or artificial methods, should be determined correctly. Natural regeneration works should not be carried out of the optimum forest establishment regions in order to eliminate the negative consequences of extreme climatic conditions in regions outside the optimal deployed area of the species. In addition, it should be closely monitored variables of the annual maximum temperature values, average high and low temperature values of the vegetation period, frost days and prevailing wind intensity in terms of especially juvenilities of the oriental beech adsorption on field and it's growing in regeneration areas via mobile meteorology station. This study, which has the quality of preliminary evaluation and covers only a 5-year period, should be extended to longer years and more current data should be obtained.

REFERENCES

Anonymous (2020). Detail Silviculture Planning of Kumluca Range Directorate, Bartın.

Baker, B.B., Hanson, J.D., Bourdon, R.M., Eckert, J.B. (1993). The potential effects of climate change on ecosystem processes and cattle production on US rangelands. Climatic Change, 25: 97-117.

Bugno-Pogoda, A.; Durak, T. (2021). Climate and Management Factors Underlying Changes in Beech Forest Herbaceous Layer Plant Communities in the Polish Eastern Carpathians. Forests, 12, 1446. https://doi.org/10.3390/f12111446

Czucz B, Galhidy L, Matyas C (2011) Present and forecasted xeric climatic limits of beech and sessile oak distribution at low altitudes in Central Europe. Annals Forest Science 68:99–108

Di Filippo A, Biondi F, Cufar K, de Luis M, Grabner M, Maugeri M, Saba EP, Schirone B, Piovesan G (2007) Bioclimatology of beech (*Fagus sylvatica* L.) in the Eastern Alps: spatial and altitudinal climatic signals identified through a tree-ring network. Journal of Biogeography 34:1873–1892

Dittmar C, Fricke W, Elling W (2006) Impact of late frost events on radial growth of common beech (*Fagus sylvatica* L.) in southern Germany. European Journal of Forest Research 125:249–259

IEA (2020). Monthly OECD electricity statistics: Data up to January 2020, (statistics report – December 2020), https://www.iea.org/reports/monthly-oecd-electricity-statistics

Leuschner C, Hertel D, Coners H, Buttner V (2001) Root competition between beech and oak: a hypothesis. Oecologia 126:276–284

Tegel W, Seim A, Hakelberg D, Hoffmann D, Panev M, Westphal T, Buntgen U (2014) A recent growth increase of European beech (*Fagus sylvatica* L.) at its Mediterranean distribution limit contradicts drought stress. European Journal of Forest Research 133:61–71.

SCIENTIFIC ANALYSIS OF THE RAINFALL SITUATION DURING THE FLOOD OF JANUARY 2021 IN THE REGION OF SHKODRA

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Abstract

Rainfall during January 2021 brought various problems with floods in some parts of the territory of Albania. Shkodra region is historically affected by such as natural phenomena. Based on the database of the National Meteorological Monitoring System and satellite sources from the international satellite platform with which the Institute of Geosciences cooperates and has exclusivity for their use, the analysis of the precipitation situation for January 2021 for the region of Shkodra has been done. The use of this database is carried out in compliance with several standards set by the World Meteorological Organization, analyzing various indicators, their intensities and distribution characteristics in time and space during January 2021. Use of Geographic Information Systems further deepened the study by graphically bringing the geographical distribution of the various indicators taken under analysis. Furthermore, in this scientific material a special review is made of the common and different features of the previous floods in the region of Shkodra with that of January 2021. Hydrometeorological estimates and forecasts prepared by IGEO are part of the use of civil emergency infrastructure, assistance to government bodies managing the relevant consequences. Studies of this nature, in addition to the scientific elaboration and the practical element, arouse the curiosity of researchers in the field and even more in raising the awareness of public opinion that the climate is an asset of our country.

Keywords: Precipitation, floods, meteorological events, GIS, climate change.

Introduction

Rainfall with high intensity during January 2021 brought many problems and floods in the whole country but especially in the region of Shkodra. This situation is the subject of study, in-depth scientific analysis and drawing some important conclusions for reducing negative impacts in the future. In this article are summarized and reflected graphically and through maps, applying GIS and other computer programs, a series of indicators on rainfall, their intensity and distribution in space on a national scale and separating Shkodra region, observed and processed according to WMO standards.

Particular attention is paid to extracting those distinctive features and common to other similar phenomena observed in the past. The increase in the occurrence of floods in recent years is closely related to the impact of climate change on the regime and character of rainfall. Schematic representation of these phenomena through graphs and maps is an added element in the scientific analysis of this article.

Rainfall in January 2021 in the region of Shkodra.

January 2021 was characterized by a series of atmospheric fronts that conveyed an unstable situation on a regional scale, resulting in cloudy and rainy weather. This is a very different fact from other previous flood situations. In addition to this fact, it is very important to note that when treating and analyzing the precipitation of January 2021 in relation to the flood situation, it must be said that they were followed after a week of precipitation, also intense in December 20201.

Following in the Figure No. 1 & 2 are given two maps with the situation of precipitation and their anomalies in the country for the month of January 2021, which clearly shows a special situation with precipitation and the highest anomaly in almost all of Albania and especially in the region of Shkodra.

[1] *"Scientific analysis on the precipitation of January 2021 and the floods observed in Albania" P Zorba, E ÇOMO, G ÇELA. Extreme Nature Phenomena and Security Issues. Security Academy. May 2021. page 107.*

Figure No.1 – The distribution of precipitation during January 2021

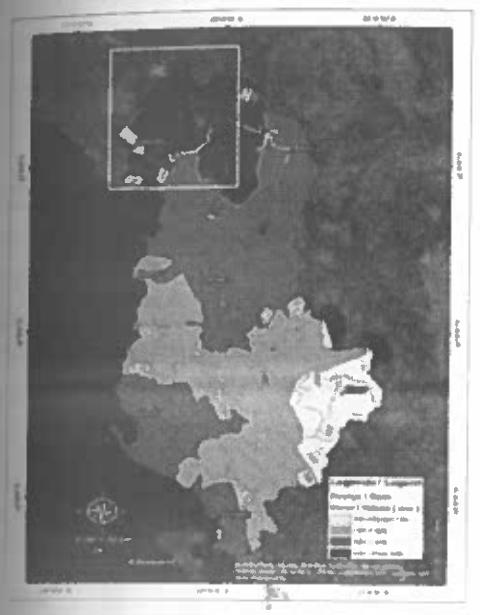
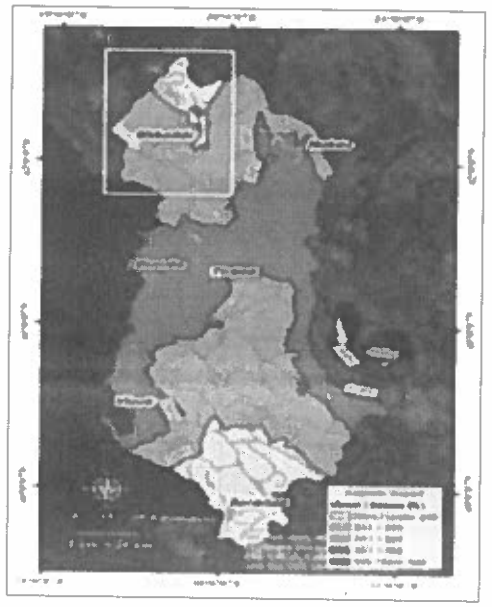


Figure No.2 – Rainfall anomaly in (%) for January 2021



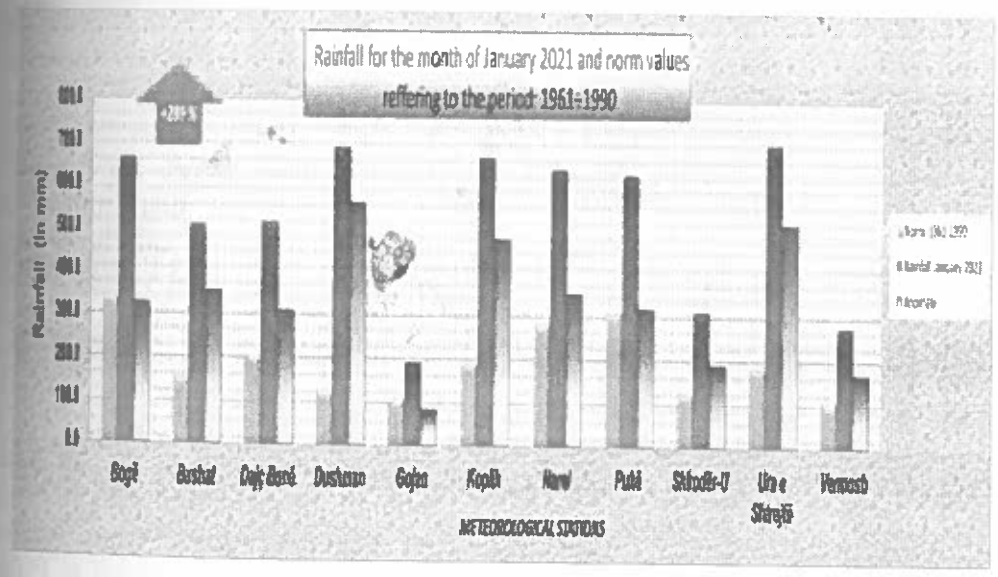
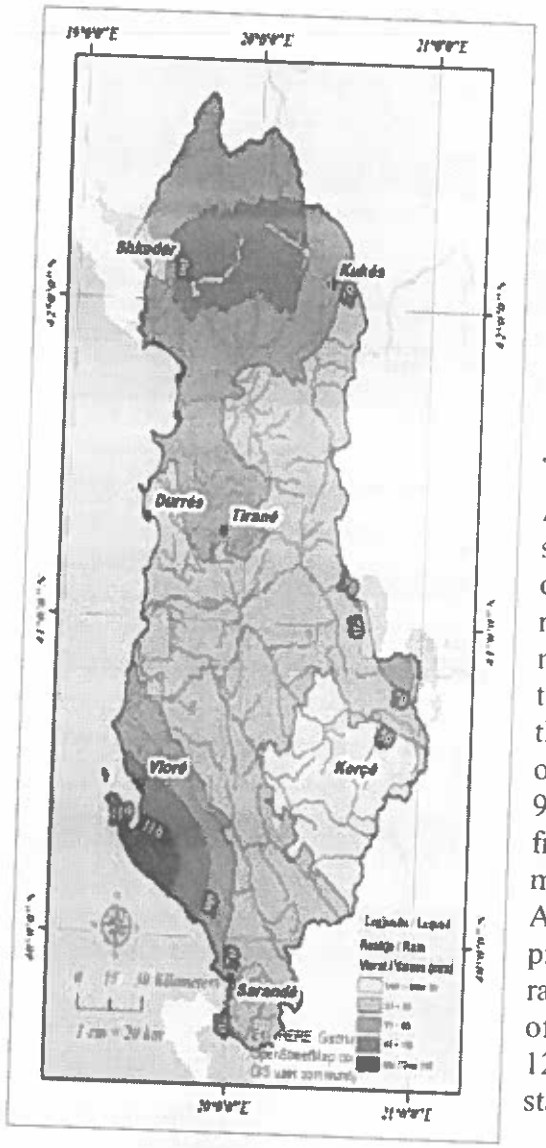


Figure No.3 – Rainfall for the month of January 2021 and norm values referring to the period: 1961÷1990.

Analyzing the situation of precipitation and anomalies in percentage in the respective maps for January 2021 there is an oblique report from which it is obvious that the largest amount of precipitation in the area of Shkodra region but if we refer to anomalies for this area is in values lower than the southeastern region of Albania. The cause is found in air masses with low pressure baric centers originating in the eastern part of the Mediterranean region.



Regarding the precipitation values for the meteorological stations of Shkodra region, in figure No.3 are reflected respectively the amount of precipitation of January 2021 together with the norm values and the respective anomalies.

Figure No.4 – The maximum 24-hour precipitation (in mm) during the month of January 2021

Another important indicator of the scientific analysis of the situation of long rainfall is the maximum rainfall of 24 hours. At the national level, figure No.4 shows the geographical distribution of these precipitations and the region of Shkodra stands at values above 90 mm with an increasing gradient from west to east where the mountain massive of the western Alps is located. Graph No.5 presents the values of 24-hour rainfall for meteorological stations of Shkodra region, from where 123.9 mm were measured at Puka station.

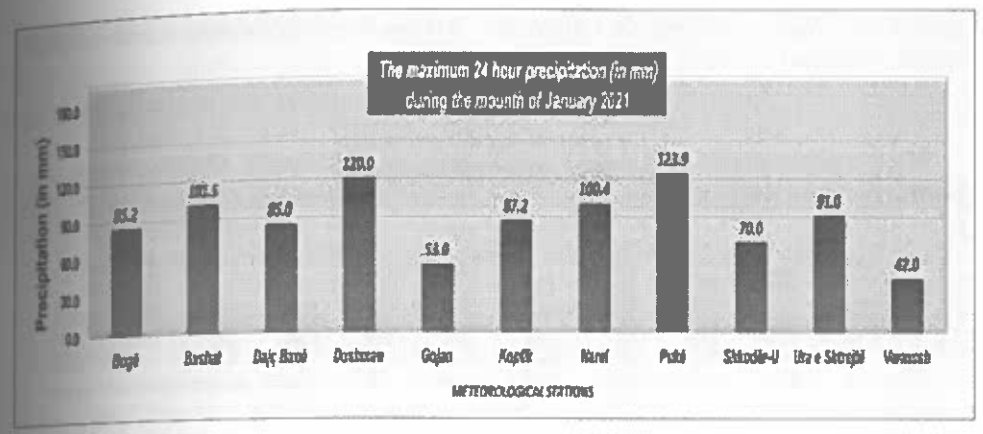


Figure No.5 – The maximum 24-hour precipitation (in mm) during the month of January 2021 for some meteorological stations of January 2021 for the region of Shkodra.

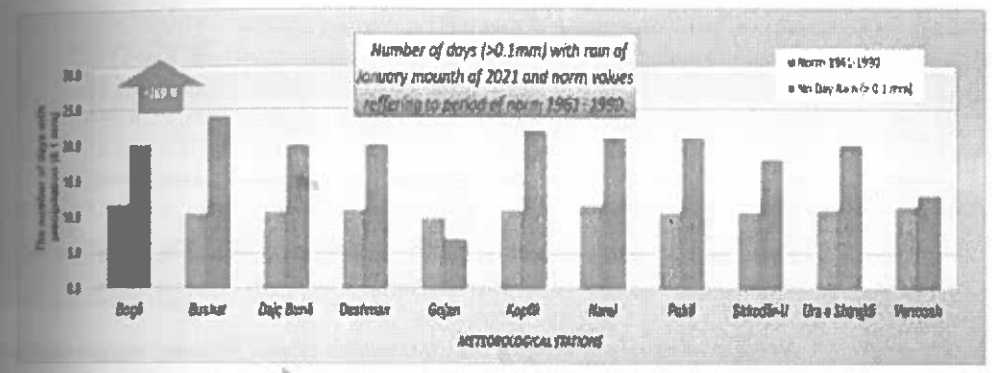
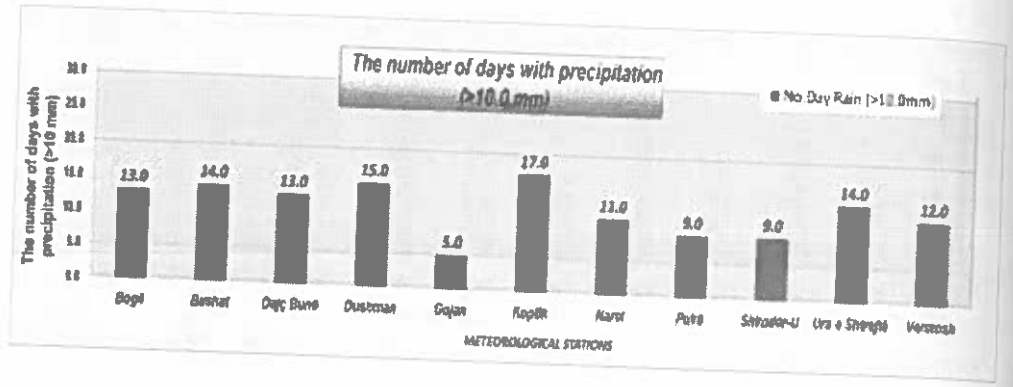


Figure No.6 – Number of rainy days above the 1.0 mm threshold for some meteorological stations of January 2021 for the region of Shkodra

Analyzing the situation of precipitation and anomalies in percentage in the respective maps for January 2021 there is an oblique report from which it is obvious that the largest amount of precipitation in the area of Shkodra region but if we refer to anomalies for this area is in values lower than the southeastern region of Albania. The cause is found in air masses with low pressure baric centers originating in the eastern part of the Mediterranean region. Regarding the precipitation values for the meteorological stations of Shkodra region, in figure No.5 are reflected respectively the amount of precipitation of January 2021 with the norm values and the respective anomalies. In the following, figures No.6 and No.7, respectively, show the values of the number of days with more than > 10 mm rain and in figure nr. 7 number of days with more than 20 mm rain.

Figure No.7 – Number of rainy days above the 10.0 mm threshold for some meteorological stations of January 2021 for the region of Shkodra



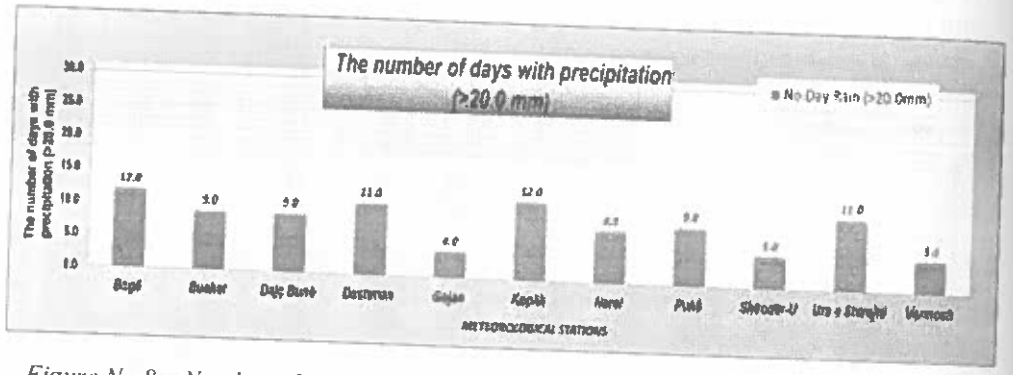


Figure No.8 – Number of rainy days above the 20.0 mm threshold for some meteorological stations of January 2021 for the region of Shkodra.

Conclusion

The rains of January 2021 for the Shkodra region were characterized by the presence of a large number of values over 289% against the norm. This situation was accompanied by floods in many of the plain areas which brought various problems. Regarding the rainfall anomalies in the Shkodra region, although they were not the highest in the country, the problems due to the relevant physical-geographical conditions were more pronounced there. Consequently, the importance of such scientific work lies not only in the scientific analysis of atmospheric events, it is an aid to civil emergencies and relevant authorities. Also, this article is a good information base for field researchers, interest groups, students and can also arouse the curiosity of passionate people about natural phenomena.

Reference

1. Monthly Climatic Bulletin No.49, 2021, Tirana, UPT - IGJEUM.
2. Grup autorësh, "Atllas Klimatik i Shqipërisë", IHM, Tiranë, 1984.
3. Grup autorësh, "Klima e Shqipërisë" –IHM, Tiranë, 1972.
4. Grup autorësh, "Veçoritë klimatike dhe hidrologjike të Ultësirës Perëndimore", Hidmet, Tiranë, 1985.
5. Isidorov G. Cvetko, "Klima e Shqipërisë"- ISH, DSHH, Tiranë, 1955.
6. Mandili, T. "Klima dhe kulturat bujqësore", Botim i shtëpisë së propogandës bujqësore, Tiranë, 1975.
7. Zorba Petrit, ÇELA Gazmir, "Vlerësimi i Treguesit Klimatik Turistik për Ultësirën Perëndimore të Shqipërisë", Buletini Mujor Klimatik Nr.31, 2019 Tiranë, UPT-IGJEUM.
8. Zorba Petrit, Mehmeti. Ilir, Çomo Elvin, Hoxha Elsuida, "Weinberger Chilling Hours model applied for Korça area – Albania, as a source of information for winter period and the determination of the fulfillment of biological needs of some orchards", Buletini Mujor Klimatik Nr.43, 2020, Tiranë, UPT-IGJEUM.
9. Zorba Petrit, Çomo E, Çela G, "Scientific analysis on the precipitation of January 2021 and the floods observed in Albania", Extreme Nature Phenomena and Security Issues, Security Academy, May, 2021.
10. Zorba Petrit, "Energjia e erës në Shqipëri", Buletini Mujor Klimatik Nr.14, 2018, Tiranë, UPT-IGJEUM.
11. Zorba Petrit, "Klimatologjia", albPAPER, Tiranë, 2009.

SOIL QUALITY OF THE MODERN APPLE ORCHARD GROWN UNDER DIFFERENT NPK FERTILIZATION APPLICATION SYSTEMS

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1) ABSTRACT

In enhancing agricultural productivity, one of the most important determinants is to choose the best fertilizer application system. Among different application systems, fertigation can have multiple benefits on the yield and quality of crops since it can significantly reduce costs and increase the profitability. However, inadequate, excessive application of fertilizers through fertigation and irrigation may lead to soil degradation and deterioration of soil fertility, resulting in a change of some physical and chemical parameters of soil. Thus, the aim of this study was to compare the effect of fertigation and conventional fertilization on the soil chemical characteristics.

The experiment was designed to determine the effect of two different ways of fertilizer application (through two treatments: drip irrigation system-fertigation and classical way) and three different doses of NPK fertilizers on chemical parameters of chernozem soil type, in a modern apple (Red Jonaprince variety) orchard. From each treatment, bulk soil samples were taken for the determination of soil pH, mineral nitrogen (N), readily available potassium (K_2O) and phosphorus (P_2O_5). Samples were collected in the spring, before fertilizer application, to determine the initial soil condition and in the autumn, at the end of the vegetation period.

The pH in H_2O when the highest dose of fertilizer was applied by fertigation had a significantly lower value compared to the control, while in classical fertilization all three doses implicated a decrease of pH value compared to the control. The results showed that different doses of fertilizers significantly affected the content of N, K_2O and P_2O_5. Furthermore, the obtained results were strongly affected by meteorological conditions, because in some months the application of irrigation was not necessary, due to a large amount of precipitation. To conclude, these results could serve as an indicator for further analysis of soil impact on yield and quality of apple fruit.

Key words: apple, irrigation, fertilization, fertigation, NPK fertilizers.

INTRODUCTION

Apple fruits are used for various purposes: as table fruit (fresh, all year round) and as a raw material for industrial processing (production of juices, jams, dried fruits, compotes, vinegars, etc.) **(MIŠIĆ, 2004)**. Apple fruit contains 10 to 19% of dry matter; sugars 6.6 - 15.5% of total (whose structure is dominated by reducing sugars - glucose and fructose) and acids 0.4 - 0.8% of total **(NIKETIĆ-ALEKSIĆ, 1988)**. The content of mineral substances in apples is up to 0.4%, especially high is the content of potassium (280 mg / 100 g K; 26 mg / 100 g Na; 16 mg / 100 g Ca; 9 mg / 100 g Mg). 2003). Apple fruit contains up to 0.8% pectin, 0.025 to 0.27% tannin, 0.03 mg / 100 g vitamin B1 (thiamine), 0.02 mg / 100 g vitamin B2 (riboflavin), 0.3 mg / 100 g of vitamin B3 (niacin), 10 mg / 100 g of vitamin C, a significant amount of carotene, anthocyanins, amino acids and other biologically important substance-active components **(VRAČAR, 2001)**. In Serbia apple production is practiced on 23737 ha and is on the second place in terms of area, right behind plums **(KESEROVIĆ, et al., 2014)**.

Fertigation is irrigation with solution or suspension of fertilizers in the water. Fertigation enables significant savings in fertilizer use and reduces losses of nitrate forms by leaching (Mmolawa & Or, 2000). Fertigation can be reported in a variety of ways, and is most commonly performed through drip systems and rainwater systems. Fertigation is mainly done with nitrogen fertilizers due to the time of watering and the behavior of NO_3-N in the soil. The most commonly used nitrogen fertilizers for fertigation are: urea $CO(NH_2)_2$; ammonium nitrate (NH_4NO_3) and ammonium sulfate $(NH_4)_2SO_4$.

2)MATERIALS AND METHODS

The experiment was set up in a one-year-old apple orchard, of the Red Jonaprince variety, in the experimental field of the Department of Fruit Growing, Viticulture, Horticulture and Landscape Architecture on Rimski Šančevi, on chernozem-type of soil. To establish the influence of nutrient

doses **(Table 1)** and types of nutrient application (fertigation and classical method), samples were taken at the beginning of vegetation, before nutrient application, as well as in autumn, at the end of vegetation. Samples were taken manually, using a probe, at three distances from the dropper (0, 15 and 30 cm) and at four depths (0 - 10 cm, 10 - 20 cm, 20 - 30 cm and 30 -40 cm).

Table 1. Total applied doses during the vegetation period (April-September) (kg/ha)

kg/ha	N	P_2O_5	K_2O
N1P1K1	50	30	60
N2P2K2	100	59,8	100
N3P3K3	150	80,6	140

Nitrogen, phosphorus and potassium were applied in the form of AN, MAP and KNO_3 fertilizers. During the research, the following parameters were studied: the amount of mineral nitrogen in the soil, the amount of available potassium in the soil, the amount of available phosphorus in the soil and the reaction of the soil (active and substitution acidity).

The soil analysis were performed in the laboratory for testing the soil and fertilizers at the Faculty of Agriculture in Novi Sad. Standard methods have been applied to determine the chemical properties and content of nutrients. Active and substitution acidity were determined by potentiometric method, with the help of a pedometer. The amount of readily available phosphorus (mg P_2O_5 / 100 g) was determined by the Al method **(EGNER & RIEHM, 1958)** with a reading on a spectrophotometer, and the readily available potassium (mg K_2O / 100g) was also determined by the AL method with a reading on a flame photometer. Determination of mineral nitrogen in the soil (NH_4 + NO_2 + NO_3) -N) was done according to the **BREMNER (1965).**

In data processing was used software Statistics. Analysis of variance was performed according to the split-plot model based on average means. The comparison of mean values was done using the LSD test.

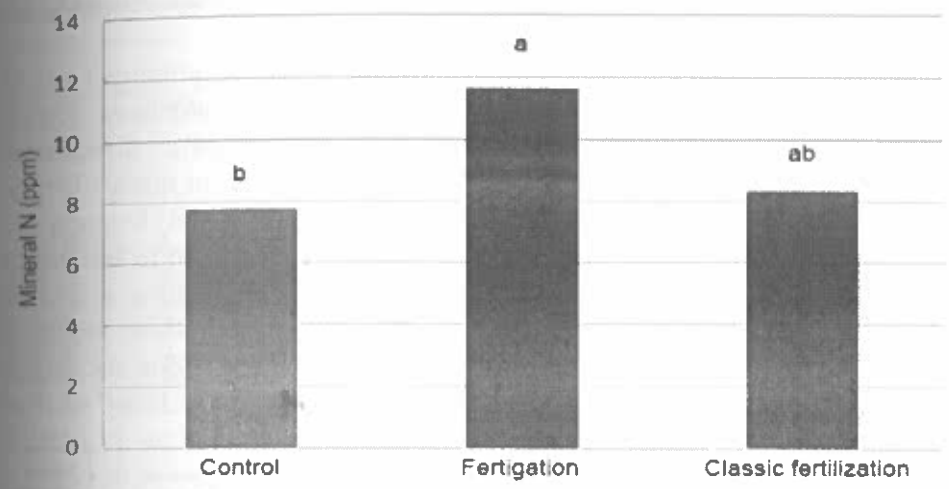
4) RESULTS AND DISCUSSION

4.1. The amount of readily available nitrogen in the soil

At the beginning of the vegetation season, the measured amount of mineral nitrogen differed in all applied treatments **(Graph 1).** The largest was on

the plots where the application of fertigation was planned (11.61 ppm) and the smallest on control plots (8.31 ppm N). Statistical significance was between the average values of nitrogen on the control plots and the plots intended for the application of fertigation.

Graph 1. The amount of mineral form of nitrogen in the soil at the beginning of vegetation at a depth of 0-40 cm (ppm)



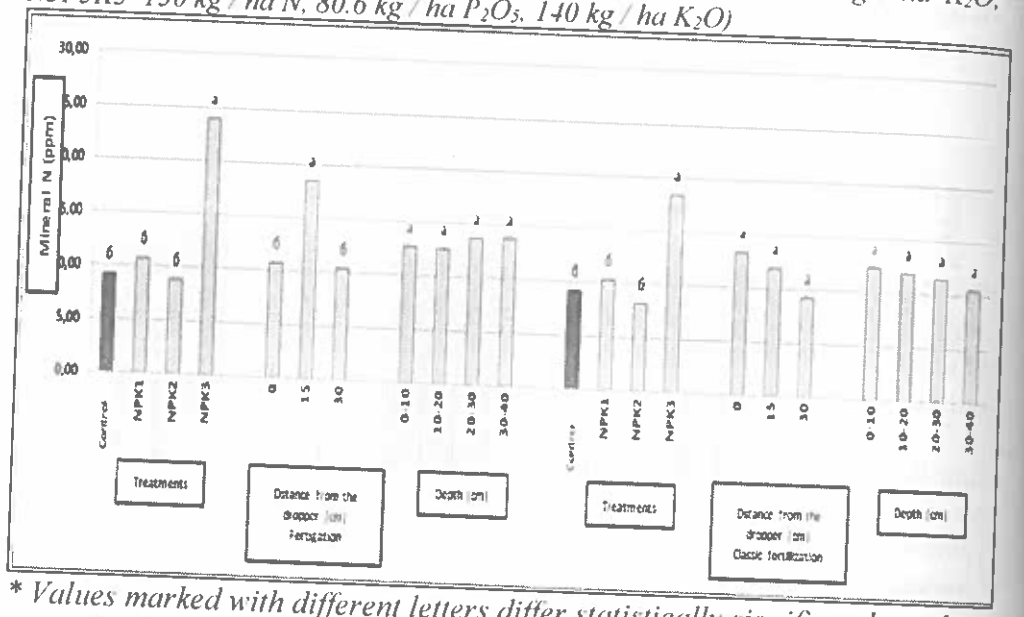
At the end of vegetation, the highest concentration of readily available nitrogen was with the highest dose of fertilizer (N3P3K3), on both applied treatments (classical fertilization and application of fertigation), and was statistically significantly different from control and all applied doses of NPK fertilizer (N1P1K1 and N2; 2). The amount of mineral form of nitrogen in the soil, when the highest dose of fertilizer applied with fertigation (N3P3K3), was 61.48% higher compared to the control, 54.97% higher than the first treatment (N1P1K1) and 62.85% higher than the second (N2P2K2).

The amount of mineral form of nitrogen in the soil when applying the classical method of fertilization, at the highest dose (N3P3K3) was higher by 49.84% compared to the control, respectively 53.86% and 55.27% compared to the other two smaller doses of NPK fertilizer (N1P1K1 and N2P2K2, respectively). Also during fertigation, when applying the highest dose of NPK fertilizer, a higher concentration of readily available nitrogen

was measured, compared to the same dose of fertilizer (N3P3K3) in the classical fertilization method (23.96 ppm and 18.40 ppm, respectively).

Graph 2. Amount of mineral form of nitrogen in the soil at the end of vegetation (ppm)

(Control without fertilizer application; N1P1K1–50 kg / ha N, 30 kg / ha P_2O_5, 60 kg / ha K_2O; N2P2K2–100 kg / ha N, 59, 8 kg / ha P_2O_5, 100 kg / ha K_2O; N3P3K3–150 kg / ha N, 80.6 kg / ha P_2O_5, 140 kg / ha K_2O)



** Values marked with different letters differ statistically significantly at the level of 5% ($p < 0.05$)*

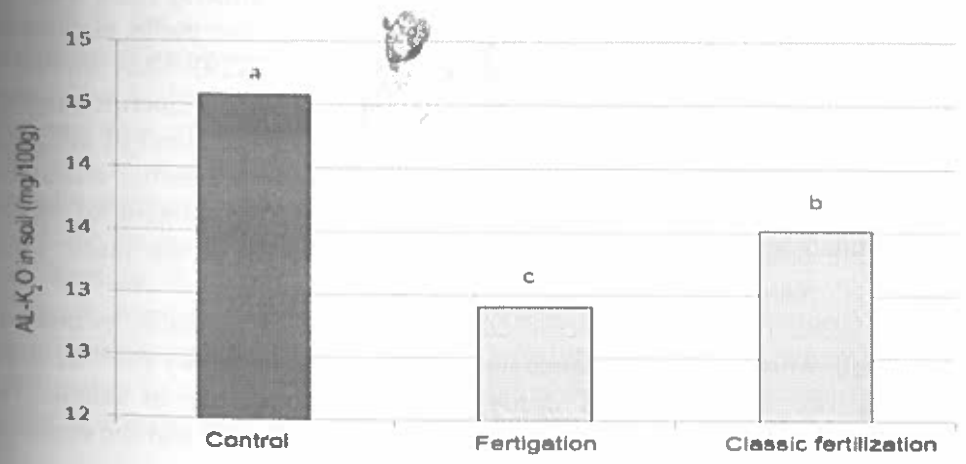
In relation to the distance from the drippers, the highest concentration of mineral nitrogen was at 15 cm, and was statistically significantly higher in relation to the distance of 0 cm and 30 cm, while in the classical application of fertilizers an even distribution of mineral nitrogen was established.
Approximately the same values of easily accessible nitrogen concentration were found at all four examined depths, in both applied treatments (classical fertilization and fertigation).
Increased concentration of readily available nitrogen in the soil was also obtained by **GE, et al. (2018)** who studied the influence of fertilization with mineral fertilizers and a combination of mineral fertilizers and organic fertilizers on soil pH, organic matter content, C / N ratio and concentration of easily accessible macroelements (N, P and K). The obtained results are

in agreement with the results of **SUN, et al. (2020).** The mentioned authors, by studying the influence of different doses of nitrogen fertilizers on soil characteristics (microbiological activity, organic matter content, content of easily accessible elements) found that the use of nitrogenous mineral fertilizers increases the content of easily accessible nitrogen in the soil, but did not find a statistically significant difference between different applied doses of nitrogen fertilizers.

4.2. The amount of easily accessible potassium in the soil

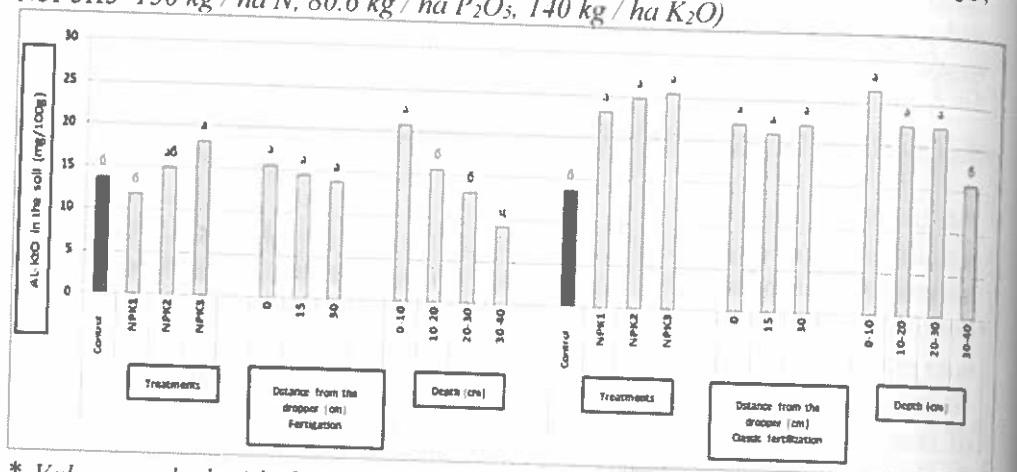
At the beginning of the vegetation, it was found that the concentration of readily available potassium was on all experimental plots **(Graph 3)** heterogenic. Statistically significantly higher values were found in the control variant in relation to the plots on which the application of treatment was planned (fertigation and classical fertilization).
At the end of the season, it was found that fertigation increased the amount of readily available potassium in the soil in all variants, except for the first treatment with the lowest dose of fertilizers (N1P1K1). A statistically significant difference was found between the highest administered dose, on the one hand, and the control variant, and the least administered dose (N1P1K1), on the other hand (Graph 4). During classical fertilization, the concentration of the easily accessible form of potassium increased statistically significantly with all three applied doses of fertilizer (N1P1K1, N2P2K2, N3P3K3).

Graph 3. Amount of easily accessible form of potassium at the beginning of vegetation at a depth of 0-40 cm (mg K_2O / 100 g of soil).



Graph 4. Amount of easily accessible form of potassium at the end of vegetation (mg K_2O / 100 g of soil)

(Control-without fertilizer application; N1P1K1–50 kg / ha N, 30 kg / ha P_2O_5, 60 kg / ha K_2O; N2P2K2–100 kg / ha N, 59.8 kg / ha P_2O_5, 100 kg / ha K_2O; N3P3K3–150 kg / ha N, 80.6 kg / ha P_2O_5, 140 kg / ha K_2O)



** Values marked with different letters differ statistically significantly at the level of 5% ($p < 0.05$)*

The results obtained with the application of fertigation are in agreement with the results of **GE, et al. (2018)** who studied the impact of long-term application of different combinations of fertilizers on soil properties and the content of easily accessible nutrients. They also found that on the control variant, where no fertilizers were applied, there was a decrease in the content of easily accessible potassium in the soil, and that on the plots where treatment was applied (different types of fertilizers) there was an increase in easily accessible potassium. Our results are partly consistent with the results in the study obtained by **SUN, et al. (2020).** They applied 5 different doses of nitrogen fertilizers and in addition to microbiological activity and organic matter content. They also studied the effect of different doses of mineral fertilizers on the content of easily accessible elements. When applying the first three doses of fertilizer, the content of easily accessible potassium increased, reached its maximum at the fourth dose (352 g N / plant), and then began to decrease.

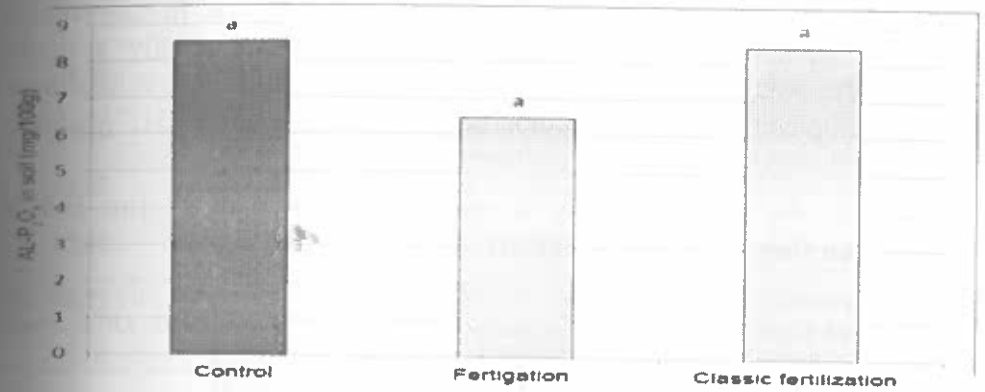
As the dose of fertilizer increased, the amount of available potassium increased, which is in accordance with the results obtained by **PENG, et al. (2008).** The distribution of easily accessible potassium in relation to drippers was the same during the application of fertigation and the classical

method of fertilization and with the depth of the sample, the concentration of easily accessible potassium decreased in both applied treatments. During fertigation, the amount of readily available potassium was lower by 48.98% at the first dose of fertilizer, 39.55% at the second dose of fertilizer and 28.26% at the third dose of fertilizer.

4.3 Amount of readily available phosphorus

At the beginning of vegetation, the content of easily accessible phosphorus in the soil, on all plots (control, where fertigation is applied and where classical fertilization is applied) was uniform and there was no statistically significant difference between the average values of easily accessible phosphorus **(Graph 5).**

Graph 5. Amount of easily accessible phosphorus at the beginning of vegetation at a depth of 0-40 cm (mg P_2O_5 / 100 g of soil).



At the end of the vegetation, when applying fertigation, the highest value was when the highest dose of NPK nutrients was applied. The amount of readily available phosphorus in this variant was statistically significantly higher in the control application and in relation to the first two doses of fertilizer **(Graph 6).** In the second treatment (classical method of fertilizer use), the highest value of easily available phosphorus was found at the second dose of fertilizer (100 kg / ha N; 59.8 kg / ha P_2O_5; 100 kg / ha K_2O), and was statistically significantly different from the control. The results obtained in the classical use of mineral fertilizers are in accordance with the results of **SUN, et al. (2020).** Namely, these authors also observed an increase in readily available phosphorus with an increase in nutrient doses to one limit, when a gradual decrease in the concentration of readily available phosphorus began. Also, the results we obtained when applying fertigation (increase in readily available phosphorus with increasing dose of NPK nutrients) are consistent with the results of **GE, et al. (2018)** who also

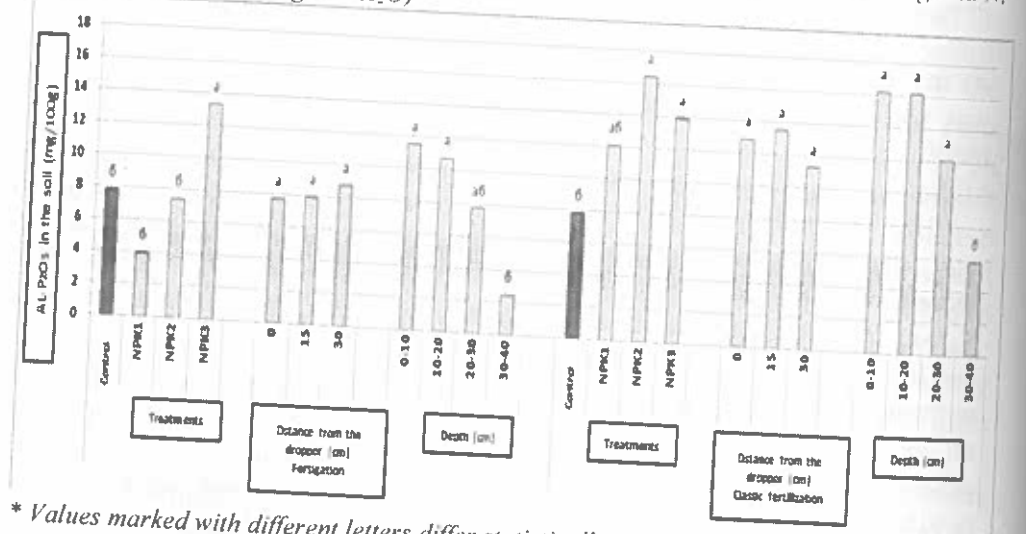
found a constant growth of readily available phosphorus due to the use of different combinations of nutrients.

The amount of easily accessible phosphorus was higher on plots on which fertilization was applied in the classical way than on those fertilized by fertigation at all three applied doses of fertilizer. Among the samples taken from different distances from the dropper, no statistical significance was found in both applied treatments, but there was more readily available phosphorus in the application of classical fertilization than in the application of fertigation.

As the depth increased, the amount of readily available phosphorus decreased, with both applied treatments. During fertigation, the concentration of readily available phosphorus decreased from 11.54 mg P_2O_5 / 100 g, as recorded in the surface layer (0-10 cm), to 2.1 mg P_2O_5 / 100 g of soil as measured in the layer from 30 to 40 cm. In soil samples from a depth of 20 to 30 cm, a concentration of readily available phosphorus was found to be 24.95% lower compared to the previous layer, and in samples from the last studied layer, a concentration of 51.73% lower was found compared to the layer from 20 to 30 cm.

Graph 6. Amount of easily accessible phosphorus at the end of vegetation (mg P_2O_5 / 100 g of soil)

(Control-without fertilizer application; N1P1K1–50 kg / ha N, 30 kg / ha P_2O_5, 60 kg / ha K_2O; N2P2K2–100 kg / ha N, 59.8 kg / ha P_2O_5, 100 kg / ha K_2O; N3P3K3–150 kg / ha N, 80.6 kg / ha P_2O_5, 140 kg / ha K_2O)

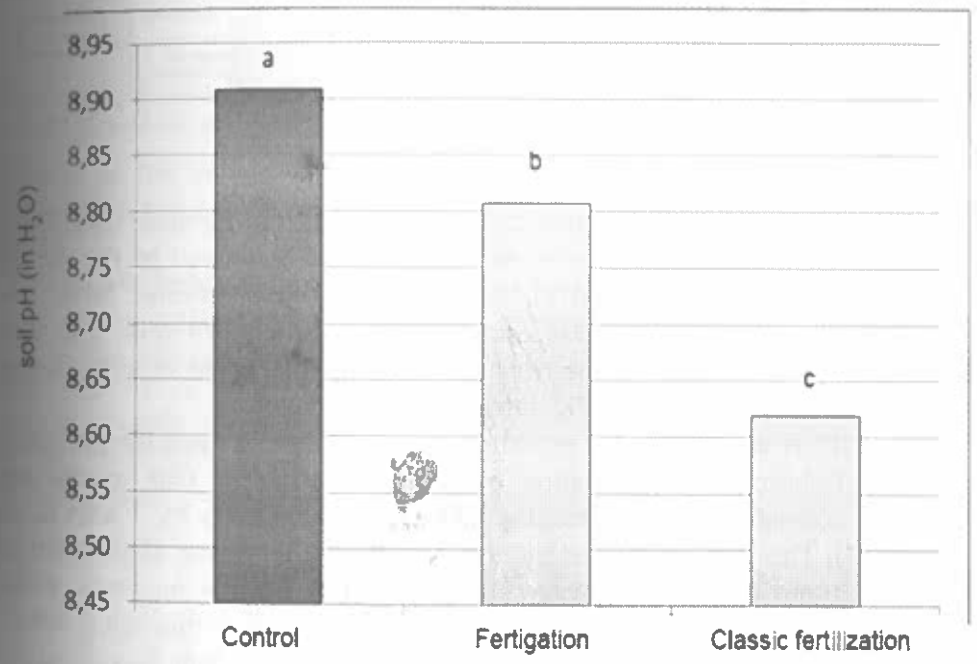


** Values marked with different letters differ statistically significantly at the level of 5% ($p < 0.05$).*

4.4. Soil reaction

As with the previously studied parameters, the property of active soil acidity (acidity extracted from the soil by water) was found to be very heterogeneous at the beginning of vegetation between the examined plots (Graph 7). On the control plot, the pH in the water was 8.91, on the plot where the application of fertigation was planned, the pH was 8.81, and on the plot where the classical fertilization was applied, the lowest pH value in the water was recorded (8.62). All pH values according to the soil classification in relation to the pH in the water indicate the soil reaction class of the base reaction.

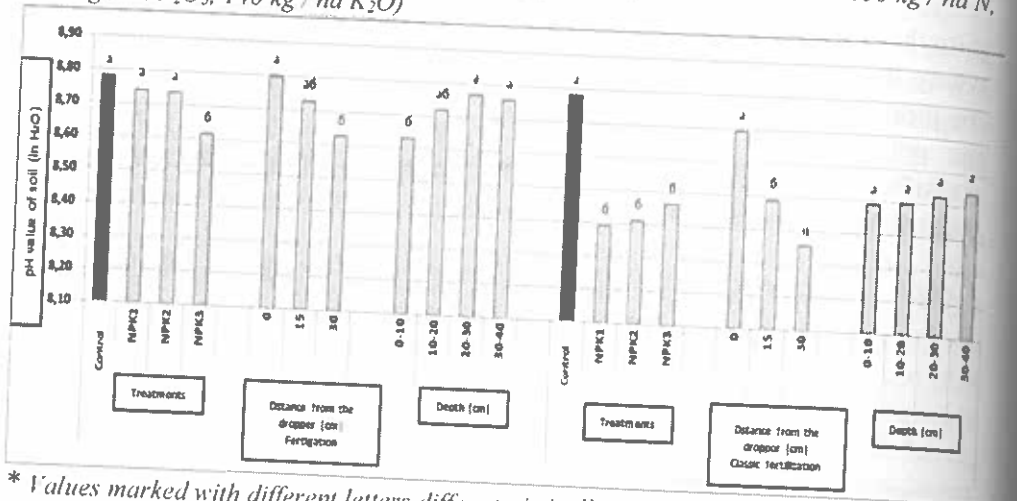
Graph 7. Active soil acidity (soil pH value in H2O) at the beginning of vegetation at a depth of 0-40 cm.



At the end of vegetation, during the application of fertigation, there was a decrease in the value of active acidity in relation to the beginning of vegetation. The highest value was recorded on the control, and it was statistically significantly different only in comparison with the application of the highest dose of nutrients **(Table 8).**

Table 8. Active soil acidity (soil pH value in H2O) at the end of vegetation

(Control-without fertilizer application; N1P1K1–50 kg / ha N, 30 kg / ha P_2O_5, 60 kg / ha K_2O; N2P2K2–100 kg / ha N, 59.8 kg / ha P_2O_5, 100 kg / ha K_2O; N3P3K3–150 kg / ha N, 80.6 kg / ha P_2O_5, 140 kg / ha K_2O)



* *Values marked with different letters differ statistically significantly at the level of 5% (p <0.05)*

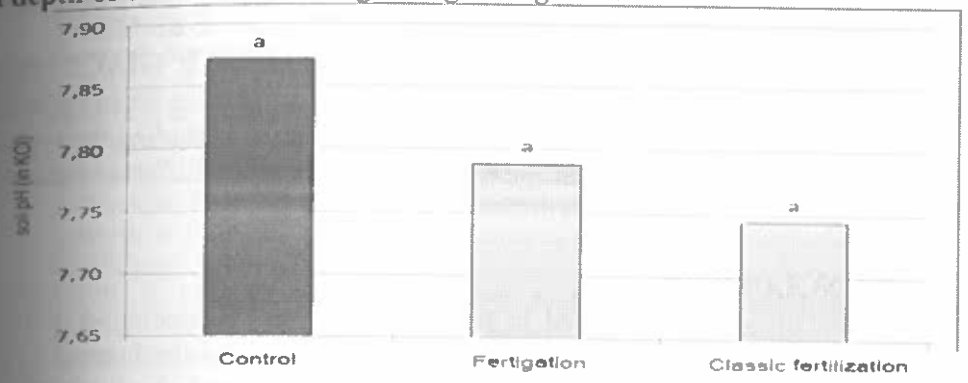
In classical fertilization at the end of the vegetation, there was also a decrease in the active acidity on the control plot compared to the active acidity on the control plot at the beginning of the vegetation. Also, the highest pH value in water was established on the control plot, and was statistically significantly higher in relation to the pH value in water when applying all three doses of NPK nutrients.

GE, et al. (2018) also established in their research that the pH value decreased during the application of mineral fertilizers. Our results are partially consistent with the results obtained in their study by **VASAK, et al. (2015).** The authors studied the long - term impact of the application of different types of cranes (sewage sludge, manure, pure N nutrients, NPK nutrients and a combination of N nutrients with straw) at four sites. When applying organic nutrients, the pH value decreased at all four localities, but it was not statistically significant. Pure mineral fertilizers (N and NPK), as well as a combination of pure nitrogen and straw, led to a decrease in pH at three of the four studied sites.

In fertigation, at a greater drip distance, the pH value of the soil had the lowest value (8.63), which was statistically significantly different from the distance of 0 cm (8.80). In the classical application of fertilizers, the pH values measured at all three distances from the drippers were statistically

significantly different from each other. Observed at different depths, in classical fertilization no statistically significant difference was found between pH values measured at different depths, while in surface layer fertigation the lowest pH value (8.63) was measured, which was statistically significantly lower than the values measured in the layer from 20 to 30 cm and from 30 to 40 cm **(Graph 8).**

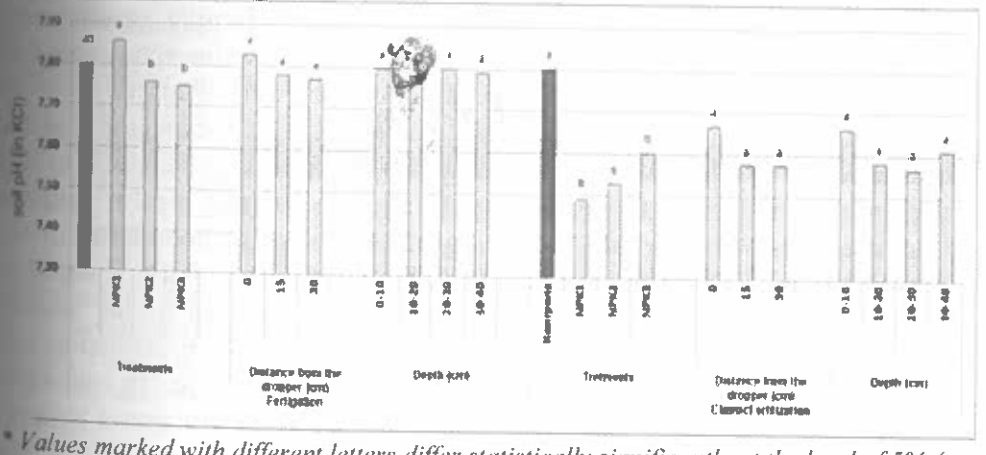
Graph 9. Substitution acidity of the soil (pH value of the soil in KCl) at a depth of 0-40 cm at the beginning of vegetation



Based on the value of substitution acidity measured at the beginning of vegetation (Graph 9) on all plots, the land belongs to the group of base soils.

Graph 10. Substitution acidity of soil (pH value of soil in KCl) at the end of vegetation

(Control-without fertilizer application; N1P1K1–50 kg / ha N, 30 kg / ha P_2O_5, 60 kg / ha K_2O; N2P2K2–100 kg / ha N, 59.8 kg / ha P_2O_5, 100 kg / ha K_2O; N3P3K3–150 kg / ha N, 80.6 kg / ha P_2O_5, 140 kg / ha K_2O)



* *Values marked with different letters differ statistically significantly at the level of 5% (p <0.05)*

In fertigation, pH (1M KCl) had a statistically significantly higher value at the lowest applied dose of NPK nutrients compared to the other two applied doses (Graph 10), while there was no statistical significance between the control and all applied doses of nutrients. In classical fertilization, the values of substitution acidity were statistically significantly lower at all three doses of nutrients, compared to the control. Our research is partly consistent with research conducted by **SAWICKA, et al. (2020).** They found that with increasing nitrogen dose, there was first a slight increase in substitution acidity, and then the pH value in KCl began to decline.
As pointed out by many authors **(LUPWAYI et al, 2012; GIACOMETI et al, 2013; SUN et al, 2020),** the change in soil properties when applying different doses of nutrients depends on several factors, including the type of soil and climatic conditions in the region can explain the different values of soil parameters established in different studies.

5) CONCLUSIONS

Based on the results obtained in this study, it can be concluded that the amount of mineral nitrogen at the end of vegetation was the highest at the highest doses of NPK nutrients, with both types of fertilizer application and statistically significantly different from the control and application of lower doses of NPK nutrients. The amount of easily accessible potassium was higher in the classical application of nutrients in relation to the use of nutrients with irrigation, but when interpreting these results it must be taken into account that the soil at the beginning of vegetation was very uneven in terms of easily accessible potassium. the amount of easily accessible form of potassium was recorded on the plots that were planned for the application of the classical method of fertilization. Similar results were established for the values of easily accessible phosphorus, the amount of which was higher in classical fertilization compared to fertigation.
Although based on the citations in the literature, it was expected that the application of fertigation would show better results in relation to the classical method of fertilization, the discrepancy of our results with the literature data can be explained by agrometeorological conditions in the examined period. Namely, during the vegetation period, extreme amounts of precipitation were recorded, which led to the dilution of the applied fertilizers, and also due to the large amount of precipitation, irrigation was not necessary, so no nutrients were applied in that period. In our agro-ecological conditions, the application of irrigation and fertilization in apple production requires agro-technical measures, and combining these two

measures provides the possibility not only of great savings, but also enables reduced contamination of the soil and the environment.

REFERENCES

BREMNER, J. M. 1965: Nitrogen Availability Indexes. Methods of Soil Analysis: Part 2 Chemical and Microbiological Properties, 9.2. Book Series: Agronomy Monographs. Book Editor: A. G. Norman. Online ISBN: 9780891182047 https://doi.org/10.2134/agronmonogr9.2.c37

EGNER, H. & RIEHM, H. 1958: Die Ammoniumlaktatessigsäure-Methode zur Bestimmung der eleichtlöslichen Phosphorsäure in Karbonathaltigen Böden (In German). Agrochimicae III (1),(49-65)

GE, S., ZHU, Z. & JIANG, Y. 2018: Long-term impact of fertilization on soil pH and fertility in an apple production system. Journal of Soil Science and Plant Nutrition 18 (1): 282-293.

GIACOMETTI, C., DEMYAN, M. S., CAVANI, L., MARZADORI, C., CIAVATTA, C. & Kandeler, E. 2013: Chemical and microbiological soil quality indicators and their potential to differentiate fertilization regimes in temperate agroecosystems. Applied Soil Ecology. 64: 32-48.

KESEROVIĆ, Z., MAGAZIN., N., KURJAKOV, A., DORIĆ., & GOŠIĆ, J. 2014: Popis poljoprivrede 2012, Poljoprivreda u Republici Srbiji – Voćarstvo, Beograd: Republički zavod za statistiku.

LUPWAYI, N. Z., LAFOND, G. P., ZIADI, N. & GRANT, C. A. 2012: Soil microbial response to nitrogen fertilizer and tillage in barley and corn. Soil & Tillage Research. 118: 139-146.

MIŠIĆ, P. 2004: Јабука. Београд. Нолит.

MMOLAWA, K., & OR, D. 2000: Root zone solute dynamics under drip irrigation: a review. Plant and Soil 222. No. 1-2, 2000, pp. 163-190. doi:10.1023/A:1004756832038

NIKETIĆ-ALEKSIĆ, G. 1988: Tehnologija voća i povrća. Beograd. Naučna knjiga

SAWICKA, B., KROCHMAL-MARCZAK, B., PSZCZOLKOWSKI, P., BIELNSKA, E. J, WOJCIKOWSKA-KAPUSTA, A., BARBAS, P.& SKIBA, D. 2020: Effect of Differentiated Nitrogen Fertilization on the Enzymatic Activity of the Soil for Sweet Potato (*Ipomoea batatas* L. [Lam.]) Cultivation. Agronomy 10: 1970 - 1986.

SUN, J., LI, W., LI, C., CHANG, W., ZHANG, S., ZENG, Y., ZENG, C.& PENG, M. 2020: Effect of Different Rates of Nitrogen Fertilization on Crop Yield, Soil Properties and Leaf Physiological Attributes in Banana Under Subtropical Regions of China. Frontiers in Plant Science 11:2083.

VASAK, F., CERNY, J., BUANOVa, S., KULHANEK, M.& BALIK, J. 2015: Soil pH Changes in Long-Term Field Experiments with Different Fertilizing System. Soil and Water Research 10 (1): 19-23.

VRAČAR, Lj. 2001: Priručnik za kontrolu svežeg i prerađenog voća, povrća i pečurki i osvežavajućih bezalkoholnih pića. Tehnološki fakultet, Novi Sad.

PENG, Y., SHIQI, P., YOUGUO, T., IVANOVA, S. & MAGEN, H. 2008: I Fertirigation managenet in young apple trees in Shandong, China. Optimizing Crop Nutrition.

DOES THE APPLICATION OF HERBICIDES THREATEN THE QUALITY OF AGRICULTURAL FOOD PRODUCTION? A MORPHOLOGICAL AND CYTO-GENETIC ASSESSMENT USING A CROP ASSAY

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Abstract

Pesticide pollution events are increasingly occurring, and many scientific data demonstrate the potentiality of certain herbicide classes to induce serious noxious damages on environmental components, non-target crops, agricultural food quality, other organisms and even human health. In the present study *Allium cepa* L. assay has been utilized to screen the toxicity evoked at morphological, cytological, and genetic level on rooting bulbs by three of the most recently used herbicides in Albanian agriculture: 2-4 D, glyphosate, and Quizalofop-P-ethyl. The biological material was treated with four different concentrations of aquatic solutions per each herbicide assessing subsequently the following parameters: number of roots per bundle, mean length of root bundles, mitotic index, frequencies of micronuclei, chromosomal aberrations, and types in mitotic root cells. The recorded indices differed depending on herbicides and mostly selected concentrations. The number of newly growing roots, their mean length and the proliferation activity of meristem came decreasing in negative correlation with the increase of herbicides concentration. Additionally, the microscopy observations revealed the presence of substantial quantities of chromosomal aberrations and micronuclei, particularly under the most concentrated treatments of Glyphosate and 2,4-D. The detected phytotoxic, clastogenic and even aneugenic effects of tested herbicides on onion roots displayed in general the rising order: Quizalofop-P-ethyl < 2,4-D < Glyphosate. The present data must be seriously evaluated by herbicide agricultural managing authorities and environmental protection agencies to stabilize the application of non-harmful doses, mode and period by farmers and ornamental plant cultivators, due to their viable value according to the quality of a commonly cultivated and consumed crop as onion on human's diet all around the word. Such simulation experiments might serve as simple, easy-handled, low-cost, short-term and reliable biotest procedures to be undertaken chiefly in developing countries as Albania for highlighting toxicity traces of pesticides as potentially environmental hazards.

Key words - agricultural food quality, herbicides toxicity, *Allium cepa* L. assay.

INRODUCTION

Crop production and protection directly depend on the field application of a wide spectrum of heterogenous chemicals as herbicides. Due to the exerted influence on financial profits more than half of worldwide pesticides in use are herbicides, which vitiate the growth and/or eliminate weeds, thus shielding and protecting cultivated plants from the concurrence for water, mineral nutrients, light, space, etc. Nevertheless, some herbicides and their commercial formulations are considered serious damaging pollutants of soil, water, and air due to the complex physical and chemical interactions with environmental components. and prolonged persistence after field application (BLANCO, et al. 2013).

Their fate and the involved transport processes depend a lot on their physic-chemical features, such as: solubility, degradation, absorptivity and volatility; the aerial or ground application methods; the soil's characteristics and topography, weather/temperature, rainfall regime and irrigation conditions of local area (MA et al., 2016, HELANDER et al., 2018; SILVA et al., 2019; MEHDIZADEH et al., 2021). Even the half-life of the herbicides is generally short, such chemicals are often resistant to break down, easily dissipated and bioaccumulated affecting the surrounding and far distant organisms and inducing harmful secondary consequences such as the hindering of nutrients availability to the non-target plants as well as to the other flora (BOUTIN et al., 2004, SAUNDERS & PEZESHKI, 2015). According to SHERWANI, et al. (2015) the excessive use of herbicides could damage the vegetation and impart resistance to the same weeds. The herbicides, which are more resistant to physic/chemical and biological degradation leach down to the soil, are absorbed by plants, accumulate in food chains, and are critically biomagnified in intricate food webs (ISLAM 2018; SANG et al., 2021). In this context non target plants as crops (primary recipients of herbicides and crucial part of human food chains) are seriously threatened.

Quizalofop-P-Ethyl (ethyl (2*R*)-2-[4-(6-chloroquinoxalin-2-yloxy)phenoxy] propionate) based herbicides belong to the aryloxyphenoxypropionic

chemicals class, acting as selective post-emergence weed killers (BRANCATO et al., 2017),. They inhibit the normal biosynthesis of lipids on target plants and are used also in forestry management, aquatic weed control, green surfaces in public and private areas. Quizalofop-P-Ethyl is moderately persistent in soils, having a moderately 60 days half-life. Easily absorbed from roots, QPE move upward the plant, predominantly remaining concentrated in root and shoot meristematic tissues. Ecotoxicological studies report that QPE and its commercial formulations can seriously contaminate environmental components close and far distant from their application place, being at the same time toxic to soil macro- and microorganisms, fishes, invertebrates, algae, and aquatic plants (DOGANLAR, 2012; LIANG et al., 2014; DESHMUKH & DHABE, 2015; SAHA et al., 2015; MA et al., 2016; HWANG et al., 2017; ZHU et al., 2017, BISERNI et al., 2019; YU et al., 2021).

The non-selective herbicide formulations of 2,4 - dichlorophenoxyacetic acid are available as salts, esters, combinations of salts and esters, or mixed with other herbicides and commonly used against weed broad leaf species. The most known molecular actions of 2,4-D include changes: induced by ROS formation, in cell functions by binding with proteins and lipids, in DNA structure and apoptosis induction (ATSDR, 2020). Different scientific reports have demonstrated 2,4-D toxicity to the immune system, especially when combined with other herbicides as glyphosate, by disrupting. the cell membrane and cellular metabolic processes (ATSDR, 2020). 2,4-D-related toxic effects in studies with mammals have shown alterations in cholesterol profiles, myotonia, cardiac arrhythmia, muscle twitching, immunotoxicity, and neurotoxicity, due to the interference in normal Acetyl-Co-A formation and pathways it is involved ISLAM et al. 2018). IARC (2016) 2,4-D to Group 2B, possibly carcinogenic to humans. The action of 2,4-D in plants concerns mostly disruption of the hormonal equilibrium of the auxin-cytokinin system (SONG, 2014). 2,4-D alters the plant metabolism and growth characteristics, often causing a proliferation of abnormal growth that interferes with the transport of nutrients throughout the plant ((PANNU et al. 2018). Roots are more sensitive than shoots to 2,4-D formulations, which increase the permeability of root membranes that can lead to a loss of nutrients and possibly increase risk of invasion by pathogens. In high concentrations they cause functional and genetic damages (even carcinogenicity) in different organisms (PETERSON et al., 2016; RUIZ DE ARCAUTE et al., 2016; LI et al., 2017; ZHANG et al., 2017; DENHERT et al., 2019; JU et al., 2019).

Organophosphorus-based heribicides (N-Phosphonomethyl glycine) consist in the most quintatitatively applied group of worldwide used pesticides in agricultural and urban areas. The capability to kill or damage many annual and perenial weeds due to nonselective mode of action result to be associated with increasing resistant weed species. The extensive appliance, high water solubility, relatively long persistence in soil has led to alarmingly increased levels of glyphosate detected in different environmental matrixes and in food stuff (MILESI et al., 2021). Diferent sometime contradictory studies have revealed the real potency to induce toxicity in different non target organisms including higher plants and crops (DIMITROV et al., 2006; KUMAR & SRIVASTAVA, 2015; MESNAGE et al., 2015; DRUILLE et al., 2016; GOMES et al., 2016; MYERS et al., 2016; SWANSON et al., 2016; CEDERLAND, 2017; ZHONG2017; ABRAHAM et al., 2018; JANSONS et al., 2018; MARTINEZ et al., 2018; HALANDER et al., 2019; INGARAMO et al., 2020; JANG et al., 2020; JARRELL et al, 2020; SESIN et al., 2020; DUKE et al., 2021; SANG et al., 2021; van BRUGGEN et al., 2021).

Allium cepa L., a cosmopolite plant and broadly cultivated crop has been also validated, standardized and used as a successful assay to detect and screen for deleterious effects of many chemicals including herbicides (FISKESJÖ, 1993; 1994; MA et al., 2005; MAYER et al., 2005; LEME & MARIN-MORALES, 2009; MESI & KOPLIKU, 2012; SHARMA & VIG, 2012; TEDESCO & LAUGHINHOUSE, 2012; FIRBAS & AMON, 2014; OGELEKA et al., 2016; ÖZKUL et al., 2016; BONCIU et al., 2019; IQBAL et al., 2019; RUSCULETE et al., 2019; DATCU et al., 2020). The current study focused to assess the comparative toxic effects induced on *A. cepa* L. roots at morphological, cytological, and genetic level by the application of Quizalofop-P-Ethyl, 2-4 D and Glyphosate herbicides and to evaluate their eventual threatening of food crop production and quality.

MATERIALS AND METHODS

The experimental work was done using healthy and equal size bulbs (Φ = 2-2.5cm) of *Allium cepa* L. Albanian native ecotype Drishti. The biological material purchased from standard met markets of Shkodra and Malësia e Madhe localities (Albania) and untreated formerly with pesticides and/or growth hormones, was warehoused for one year under dry and dark regime. To allow the growth of newly emerging rootlets, the bulbs were in advance neatly defoliated from the dried roots and outer scales, preventing the damage of the primordial ring and keeping it entire. The protocols for toxicity inducement on common onion roots were effectuated in room temperature (at 20±2°C) out of direct sun light contact, in a completely

randomized design with ten test tubes and three replicates per sample. The QPE, 2-4 D and Glyphosate herbicides were provided from licensed pesticide markets in Albania in accordance with the list of PPP-s, registered to be imported and trading in the Republic of Albania (MARD, 2021). For each tested herbicide four treatment solutions were prepared, having the following respective concentrations: 0.05, 0.075, 0.15, 0.2% (QPE); 0.005, 0.01, 0.015. 0.02% (2-4 D) & 0.5, 1, 1.5, 2% (Glph). The dilution was accomplished with filtered drinking water, which has been used also as negative control sample (NC). Formerly the test tubes were filled with distilled water putting on each of them one onion bulb with the root primordia fully submerged into the liquid When the new emerged root bundles achieved a length on the average 1.5-2 cm, the distilled water was replaced with the chosen herbicide concentrations samples. The pre-labelled bulb series were treated simultaneously with all chemical solutions, while the absorbed quantity of liquids was renewed daily. The potential inducement of herbicides toxicity was examined through the comparative limitation of roots number/bundle (NRB), restriction of normal mean roots length/bundle (MRL) and reduction of mitotic index (MI), presence, and frequencies of micronuclei (FMN) and chromosome abnormalities (FAC) and types in roots meristematic tissue. Microscopy analyzes were done after exposing bulbs to the different water solutions for 48 hours. Root tips of 10 mm were randomly chosen from 5 bulbs, growing in each of negative control, herbicide, and concentration sample. The terminal tips (1-2 mm) were cut off and used for further preparation of microscopy slides, following the standard procedure for orcein staining second SINGH (2016). After preliminary preparation, slides observation was done under light microscopy at a 500x magnification. The total number of dividing cells (NDC) was determined in 1000 examined cells in the field of view/er slide, and then MI was scored as percent ratio of NDC. The micronuclei presence was scored in a minimum of 1000 cells/slide at interphase, while 1500 dividing cells out of prophase (300 cells/slide) have been observed for the characterization and classification of chromosome abnormalities (CA). The frequencies of micronuclei (FMN) and aberrant cells (FAC) were expressed as percent ratio. Morphological analyzes were performed after treating for 96 hours the rooting bulbs with selected herbicides and respective concentrations to permit the evaluation of sprouted roots/bundle (NRB) and the mean roots length (MRL). Analysis of Variance One-way ANOVA and post-hoc Student Newman-Keuls (SNK) were used to test for significant value differences of all evaluated parameters in *A. cepa* rooting bulbs, exposed to different treatment

concentrations of QPE, 2-4 D and Glyphosate herbicides. All the results were expressed as the mean of three replicates per sample ± standard deviation (SD). Parameter differences between chemical treatments, and corresponding NC values were considered statistically significant at level 5%.

RESULTS AND DISCUSSION

Tables 1 and 2, and graphs in Figures 1 and 2 summarize all data about the analyzed morphological, cytological, and genetic endpoints obtained after the treatment of *A. cepa* roots with the chosen concentrations of QPE, 2-4 D and Glyphosate. The results generally differed in dependent manner from herbicides and concentration treatments, revealing consistent phyto- and genotoxicity-induced (mostly significant changes, using ANOVA and SNK tests).

Root elongation and growth constitute determinant stages of plants life cycle establishing the efficient uptake of water and mineral ions. Consequently, balanced water regime and metabolically ensured mineral nutrition are good indices for further successful development and reproduction of crops. These growth processes result to be strongly affected after exposure to chemical stressful factors including herbicides (MAGDALENO et al., 2015). According to SAUNDERS & PEZESHKI (2015) many studies certify that plant roots can take up the herbicides present in runoff waters and in the root-zone that glyphosate, exposing non-target vegetation to growth restriction.

Related to root growth as the combination of cell division, biomass gain and elongation, reduction of root length and decrease of roots number over 55% are strong indexes of rhizotoxicity, being a general phenomenon caused by different hazard chemicals and herbicides. Additionally, reduction up to 22 and 50% of MI compared to control are considered three-shold values for sublethal and lethal effects on test organism (FISKESJÖ, G. 1993; BOUTIN et al., 2004, BONDADA, 2011; BLANCO et al., 2013; OGELEKA et al., 2016; BISERNI et al., 2019; HELANDER et al., 2019). The results of the present investigation showed that the onion roots treated with the control sample (NC) grew at normal rates, about 1 cm/day, 24 roots/bundle and an average of 14.74% dividing cells (respective values of NRB, MRL and MI; Tab. 1), being consistent with data from the literature regarding the categorization of good quality for drinking water (FISKESJÖ, 1993; FIRBAS & AMON 2014; MESI & KOPLIKU, 2013; DIZDARI & KAPCARI, 2018; DIZDARI & BALA, 2019). This is why the potable tap water of Shkodra city (Albania) was

used as negative control sample. Similar observations were present, excepting some sporadic morphological aberrations as slight bending and stunted roots, in bub series under treatment of 96h with the most diluted samples of all herbicides. Typical deformities as: thickened roots (at 0.2% cc of QPE), hook-like roots (at 0.02% cc of 2-4 D sample) and brownish root tips (indicating cells death, at 1.5 and 2% cc-s of Glyphosate) were abundantly present, as well.

Tab. 1 Morphological and cytological data of induced toxicity by the tested solutions of QPE, 2-4 D and Glyphosate herbicides on root bundles of *A. cepa* L. Albanian native ecotype Drishti

Treatment solutions	Concentrations (%)	NRB ± SD (in %)	MRL ± SD (%)	MI ± SD (‰)
NC	0	24±5	5.41±0.339	14.32±1.491
QPE	0.05	22±3^{a}	4.65±0.291^{a}	11.60±1.680^{a}
	0.075	20±2^{a}	4.38±0.107^{*ab}	11.03±0.973^{ab}
	0.15	18±2^{ab}	4.11±0.122^{*b}	9.45±0.555^{*c}
	0.2	15±1^{*bc}	3.30±0.457^{**c}	8.16±0.242^{**d}
2-4 D	0.005	26±3	4.29±0.384^{ab}	11.88±1.067^{a}
	0.0075	19±2^{ab}	3.62±0.402^{bc}	11.12±1.731^{b}
	0.015	17±1^{*bc}	2.94±0.268^{*cd}	8.31±0.824^{**cd}
	0.02	14±1^{**cd}	2.87±0.312^{**de}	6.44±0.446^{**de}
Glph	0.5	19±3^{a}	4.22±0.425^{bc}	10.78±0.512^{ab}
	0.75	16±2^{*bc}	3.68±0.171^{*bc}	8.59±0.353^{*c}
	1.5	15±1^{*bcd}	3.25±0.106^{**d}	6.30±0.141^{**e}
	2	13±1^{**de}	2.59±0.229^{**e}	5.65±0.205^{**f}

Notes: Along each column means labeled with asterisks are significantly different from corresponding NC values according to One-Way ANOVA test (* $P<0.05$; ** $P<0.001$) and with letters between herbicide concentrations according to SNK test ($p<0.05$).

Significative reduction of roots/bundle was detected starting from treatment concentrations, respectively: 1.5% of Glyphosate, 0.2% of QPE and 0.015 % of 2-4 D. The results revealed the first significant differences of root length and mitotic activity from corresponding NC-s ($P<0.05$) at 0.75% cc of Glyphosate (MRL) and 0.075% of QPE (MI). A rapid and significant reduction ($P<0.05$, $P<0.001$ and $p<0.05$ second ANOVA and SNK tests) of both MRL (14-46%) and MI (19-67%) was observed across all concentrations, particularly in the bulbs exposed to 2-4 D and Glyphosate cc-s (Fig. 1), thus reflecting the impairment of related metabolic processes. OGELEKA et al. (2016) refer the suggestion that glyphosate for example

interferes with absorption and utilization of Mn, increasing a plants susceptibility to disease. Moreover NEUMANN et al. (2006) predicted constantly increase in disease problems, particularly on soils with low micronutrient availability due to the negative side effect of herbicides such as the inhibited acquisition of micronutrients such as Zn, Fe and B, which are directly involved in plant own disease resistance mechanisms. Generally, the deleterious action mechanism of herbicides is due to the production of reactive oxygen species (ROS) into cells, inducing par consequence protein and lipid peroxidation of membranes and consequently their rupture and definitive cell damage (BIANCHI et al., 2016). In full compatibility our data also confirmed the statement of KARAISMAILOGLU (2015) who emphasized that some specific proteins involved in cell cycle remains a target site of herbicides, including also the tested herbicides. There were no lethal effects induced on the proliferation activity of root meristematic tissue, meanwhile subletal effects were detected only under 2-4 D 0.02% and Gylphosate 1.5 & 2% treatments. The same 2% solution of Glyphosate resulted the highest hrizotoxic one, reducing MRL to 46% of NC. The roots number incurred the most and significant sloping decrease from 0.15 to 0.2 % treatments of QPE (13%) and reached the lowest value (39% of NC, $p<0.05$ and $P<0.001$) at Glyphosate 2%. Comparable data have been reported, by DIMITROV et al. (2006), ÇAVUŞOĞLU et al. (2011), MUSTAFA & ADHAM (2016), DIZDARI & KAPCARI (2018), MERCADO & CALEÑO (2019), ROSCULETE et al. (2019), IQBAL et al. (2019), DATCU et al. (2020) and FATTAH & OMER (2021), etc. but inflicted after *A. cepa* roots were grown under much higher QPE, 2-4 D and Glyphosate concentrations. The quantification of significantly higher toxicity induced at cytological level, sustaining the effective use of mitotic index as a valuable parameter for the identification of cytotoxicity, quick determination of the toxic substances present in the environment and for the monitoring of pollution degree in the agricultural ecosystems. As explained by TÜRKOĞLU (2012) inhibition of DNA synthesis and microtubule formation, suspension of cell cycles at G_1 and G_2 phases, impaired nucleoprotein synthesis and reduced level of ATP to provide the required quantity of energy for spindle elongation, microtubule dynamics and chromosomal dislocation could be the possible causes of detected mitotic depression.

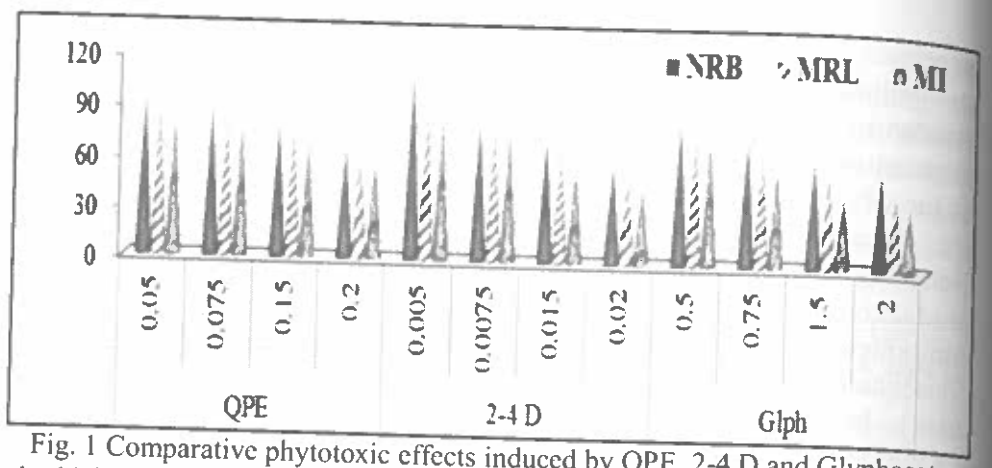

Fig. 1 Comparative phytotoxic effects induced by QPE, 2-4 D and Glyphosate herbicide solutions on root bundles of *A. cepa* L. Albanian native ecotype Drishti; herbicide concentrations in %; parameter values are expressed in % of corresponding NC-s); QPE – Quizalofop-P-ethyl; Glph – Glyphosate; NRB – mean roots number per bundle; MRL - mean length of roots per bundle; MI- mitotic index.

Only 95 % of applied agrochemicals reach the target organisms, engendering to cause even in short-term but chronic exposure unpredictable harmful effects on genetic material of nontarget biota. Pesticide residues that do not undergo immediate adsorption of dissipation are hold on the soil solution, potentially absorbed by plant roots, remaining concentrated into or translocated up to the shoot through xylem and transpiration flow. The increase of present chromosomal anomalies in mitotic cells and micronucleated cells during interphase commonly associate the suppression of proliferation activity in root meristem. These phenomena, which reflect the capability of chemicals under study to induce genotoxic effects, quite often appear in much lower concentrations than those of phytotoxicity incitement (DIZDARI & KAPCARI, 2018), being a confident reason to necessarily include in eco-toxicological studies the assessment of genotoxicity. Root meristematic tissue of *Allium cepa* is extensively applied as an effective detector of genotoxic and clastogenic potency of environmental pollutants, including different herbicide classes (FISKESJÖ, 1994; Ma et al., 2005; Fernandes et al., 2007; ENAN, 2009; LEME & MARIN-MORALES, 2009; SHARMA & VIG, 2012; KUMAR & SRIVASTAVA, 2015; BONCIU et al., 2018; MAGDALENO et al., 2019; ROSCULETE et al., 2019). According to TEDESCO & LAUGHINGHOUSE (2012) it is one of the most efficient biotests for detecting and measuring the degree of alterations in the system subjected to

carcinogens/mutagens or chemicals causing damage and allow to describe the effects by observing chromosomal aberrations.

Tab. 2 Cytogenetic data of induced toxicity by the tested solutions of QPE, 2-4 D and Glyphosate herbicides on root tip meristem of *A. cepa* L. Albanian native ecotype Drishti

Treatment solutions	Concentrations (%)	FAC ± SD (in %)	FMN ± SD (‰)
NC	0	1.08±0.536	0.009±0.0034
QPE	0.05	1.72±0.951	0.011±0.0019
	0.075	3.35±0.282^{*bc}	0.019±0.0093^{a}
	0.15	5.63±0.378^{**e}	0.043±0.0125^{*cd}
	0.2	4.29±0.114^{*d}	0.024±0.0052^{abc}
2-4 D	0.005	1.57±0.223	0.020±0.0007^{ab}
	0.0075	2.91±0.400^{*b}	0.034±0.0023^{*bc}
	0.015	6.69±0.546^{**ef}	0.068±0.0144^{*e}
	0.02	4.55±0.281^{**d}	0.029±0.0056^{**c}
Glyphosate	0.5	1.99±0.135^{a}	0.022±0.0012^{ab}
	0.75	3.62±0.247^{*c}	0.041±0.0077^{*cd}
	1.5	9.53±0.168^{**g}	0.075±0.1010^{**e}
	2	6.44±0.111^{**f}	0.039±0.0025^{*cd}

Notes: Along each column means labeled with asterisks are significantly different from corresponding NC values according to One-Way ANOVA test (* P<0.05; ** P<0.001) and with letters between herbicide concentrations according to SNK test (p<0.05).

The current microscopy observation scored a considerable presence of chromosomal aberrations and micronuclei, positively correlated with tested herbicides and concentrations (Tab, 2 and Fig. 2). Abnormal dividing cells with aberrant chromosomes were always higher and statistically more significant compared to NC test (1.08% of the total NDC, except the lowest concentration treatments (0.05%, 0.005% and 0.5% of three herbicide), where they showed an increase of only 59%, (QPE), 45% (2-4 D) and 85%(Glph). FAC values started being significant at the concentration 0.0075% of 2-4 D exceeding with 169% the respective NC (P<0.05). At the other cc-s they distinctly increased, varying: 3.1-5.2 (QPE), 2.2-6.2 (2-4 D) and 3.3-6.0 (Glph) folds higher than the corresponding NC. The most genotoxic sample resulted the concentration 1.5% of Glyphosate, inducing the 9 folds augmentation of CA-s as compared to NC (P<0.001) and 2.7 folds as compared to the treatment of 0.75% cc of the same herbicide (P<0.05). It could be noticed that the induction and the incidence of

aberrant chromosomes in onion root meristem generally declined under the mostly concentrated solutions of each herbicide as compared to the precursor ones. These findings positively correlate with those of cytotoxicity induced, marking that the obvious reduction of mitotic activity diminished the number of present dividing cells (NDC) and obscured the real harmful genotoxic effects of the above-mentioned samples.

Most abundantly observed CA types were due to chromatin dysfunction (fragments, bridges, and chromosomal adherence) present in statistically significant quantities compared to NC under treatments with the highest concentrations of Glyphosate and 2-4 D treatments ($P<0.05$, <0.001). Spindle disorders and failure (lagging chromosomes, multipolar and c-anaphases) were detected in low order revealing the potential turbagenic activity induced on onion roots. Maximal occurrence was counted at 0.15, 0.015 and 1.5% concentrations of QPE, 2-4 D & Glyphosate, respectively. C-Mitosis considered a specific type of aberrant chromosomes induced by pesticides (de SOUZA et al., 2016; IQBAL et al., 2019) predominated in all highly concentrated treatments. Our findings might be due to the mutagenicity inflicted by the organic moiety substances as adjuvant and surfactants mixed with the respective active ingredients of tested herbicides. MESNAGE et al. (2015) emphasize that the toxic effects of herbicide commercial formulations can also be explained by adjuvants, which have their own toxicity, but simultaneously enhance the toxicity of glyphosate. Fragments and bridges resulted the most frequent CA-s in meristematic tissue of roots treated with QPE 0.075%, 2-4 D 0.0075, 0.015% and Glph 1.5% concentrations, revealing the clastogenic potency of tested herbicides on A. cepa roots.

The formation of chromosomal fragments and bridges (observed mainly during anaphase) second BIANCHI et al. (2016) result respectively in cases of lost chromosomal integrity from numerous breaks and fusion during the translocation of the unequal chromatid exchange or dicentric chromosomes. Stickiness which achieved the picks at 0.2% of QPE, and 1.5% of Glyhosate treatments (21-33 % of total respective FAC values) is considered an irreversible type of genetic damage inciting cells to die. It has been suggested that sticky chromosomes get out of improper folding of chromosome fibers into single chromatids and chromosomes, consequently fibers admixture and chromosomes attachment ought sub-chromatid bridges happen (MAJER et al., 2005; LEME & MARIN-MORALES, 2009; FIRBAS & AMON, 2014). Multipolar anaphases primarily incorporate chromosomal bridges originating from chromosomal adherences. Their

presence might be also induced by the direct disturbance of the spindle placement by herbicides, responsible also for the formation of lagging chromosomes (FERNANDES et al., 2007). Compared to former data extrapolated according to Glyphosate based herbicides on *A. cepa* L. by DIZDARI & KAPCARI (2018) the roots of onion Albanian native ecotype Drishti in the present study resulted more sensitive to detect in lower concentrations clastogenic and even aneugenic damages.

The observation of micronuclei during interphase stage of root cells undergoing mitosis is widely used to examine qualitatively and quantitatively the mutagenic effects of pollutants such as herbicides during cell cycle. It was noticed no significative micronuclei frequency in onion roots treated with QPE solution despite 0.15% cc where FMN resulted 4.8 folds higher ($P<0.05$) than corresponding NC value (0.009 ‰ of NDC). Excluding the less diluted cc-s, the other tested concentrations of 2-4 D and

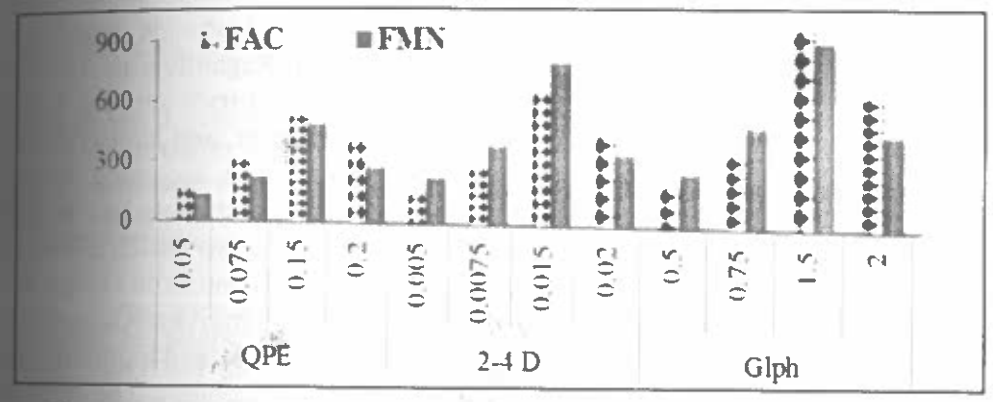

Fig. 2 Comparative clastogenic and mutagenic effects induced by QPE, 2-4 D and Glyphosate herbicide solutions on root tip meristem of *A. cepa* L. Albanian native ecotype Drishti; herbicide concentrations in %; parameter values are expressed in % of corresponding NC-s

Glyphosate markedly increased MNC frequency. Their presence started being significant at the cc 0.0075% of 2-4 D (3.8 folds higher than NC), while the strongest mutagenicity-induced was scored in root intephase cells under Glph treatment of 1.5% (8.4 folds higher than NC), $P<0.001$. High, but nonlinear range of FMN increase through concentration treatments of the same herbicide differed: 1.3 - 4.8 (QPE), 2.2 - 7.6 (2-4 D) and 2.5 - 4.2 (Glph) folds ($p<0.05$). Noxious chemicals such herbicides evoke on non-target biota incorrect cell division promoting nuclear DNA damage, incorporating in the DNA during cell replication; interfering in mitotic or

meiotic activity and definitively causing the formation of cytoplasmic chromatin-containing bodies called micronuclei, which may arise even from chromosome breaks or lagging (MA et al., 2005; TIMBRELL, 2013). Micronuclei are, arising from (Ma et al., 1995). The rate of MN induced by the selected concentrations of tested herbicides in the current study ascertain that plant damage caused by herbicides are associated with increased shikimate accumulation in the root tissue, which may cause clasto-mutagenicity JANG et al., 2020). Similar data has been reported by SHARMA & VIG (2012) and ÖZKUL et al. (2016).

de SOUZA et al. (2016) punctuate that the environmental components as soils and water bodies s are constantly and directly and/or indirectly impacted by the herbicide application, whereas the accumulation of a wide spectrum of permanent or transitional pesticide residues including herbicide's could significantly undo the balance of soil physic-chemical parameters (MARIN-MORALES et al., 2013). In addition, surface and ground waters can by contaminated by substantial herbicide quantities adsorbed by soil particles and leaching phenomena. Regardless in Albania the agriculture fields occupy approximately 1/4 of country's surface, a big variety of pesticides are in use for plant production and conservation (MARD, 2021). Likewise, few recent reports are given according to the environmental occurrence, potential bioaccumulation and even less to the toxic effects of pesticides on non-target living beings (MARKU ET AL., 2011; MYRTAJ et al., 20218; NURO et al., 2018). To our knowledge no previous research investigations according to the comparative toxic activity of QPE, 2,4 D and Glyphosate-based herbicides on crops and explicitly on an Albanian native ecotype of *A. cepa* was done in our country. The current data draw attention to the consequences of the adverse effects potentially occurring on agricultural and wild ecosystems (DRUILLE et al., 2016) by indiscriminate appliance of tested herbicides and their respective concentrations which include those directly used in farms and public/private areas. Aquatic ecosystems must be also considered threatened because most of the rivers percolate the agricultural areas located mostly in west part of the country, jeopardizing the costal ecosystems of Adriatic Sea. MESNAGE et al. (2015) and SWANSON et al. (2016) have revealed confident data that herbicides as glyphosate could be toxic including: chronic acidosis, mitochondrial dysfunction, teratogenic, tumorigenic, hepatorenal neurodevelopmental, reproductive, and transgenerational effects when contaminate food consumed by human

population and the environment in even in extremely low levels. even below regulatory thresholds.

CONCLUSIONS

The displayed toxicity order of analyzed herbicides incurred by *A. cepa* L. roots came decreasing as follow: Glyphosate > 2-4 D > QPE. The extrapolated results of cytogenetic parameters were generally in compatibility with morphological ones, but revealed higher sensitivity according to concentrations, particularly 0.15% (QPE), 0.015 (2-4 D) and 1.5% (Glph) routinely applied in agricultural practices which in our opinion need urgent revision of use. The present data demonstrated the concrete effectiveness of threshold toxicity tests using higher plant assays and evidenced once more the great susceptibility of an Albanian ecotype (Drishti) of common onion to the numerous commercial formulations of tested herbicides as noxious chemicals, considering they are often provided from not reliable sources, and applied not fully compliant with the legislation.

REFERENCES

ABRAHAM, J., BENHOTONS, S., KRAMPAH, I., TAGBA, J., AMISSAH, C. & ABRAHAM, J. D. 2018: Commercially formulated glyphosate can kill non-target pollinator bees under laboratory conditions. Entomologia Experimentalis et Applicata, 166 (8): 695-702.

ATSDR (USDHSS) 2020: Toxicological Profile for 2,4-Dichlorophenoxyacetic Acid (2,4-D).
https://www.atsdr.cdc.gov/toxprofiles/tp210.pdf

BISERNI, M., MESNAGE, R., FERRO, R., WOZNIAK, E., XENAKIS, T., MEIN, C. A., ANTONIOU, M. N. 2019: Quizalofop-p-Ethyl induces adipogenesis in 3T3-L1 adipocytes. Toxicological Sciences, 170 (2): 452–461.

BLANCO, F. M. G., DE ALMEIDA, S. D. B. & MATALLO, M. B. 2013: Herbicide - soil interactions, applied to maize crop under Brazilian conditions, In: Herbicides - current research and case studies in use. PRICE, A. J. & KELTON, J. A. IntechOpen. DOI: 10.5772/56006.

BONCIU, E., FIRBAS, P., FONTANETTI, C. S., JIANG, W., KARAISMAILOĞLU, M. C., LIU, D., MENICUCCI, F., PESNYA, D. S., POPESCU, A., ROMANOVSKY, A. V., SCHIFF, S., de SOUZA, C. P., SRIVASTAVAK, A., SUTAN, A. & PAPINI, A. 2018: An evaluation for the standardization of the *Allium cepa* test as cytotoxicity and genotoxicity assay. Caryologia: International Journal of cytology, cytosystematics and cytogenetics, 71 (3): 191-209.

BONDADA, B. R. 2011: Micromorpho-anatomical examination of 2, 4-D phytotoxicity in grapevine (*Vitis vinifera* L.) leaves. Journal of Plant Growth Regulation, 30: 185-198.

BORGGAARD, O.K. & GIMSING, A. L. 2008: Fate of glyphosate in soil and the possibility of leaching to ground and surface waters: a review. Pest Management Science, 64: 441-456.

BOUTIN, C., ELMEGAARD, N. & KJÆR, C. 2004: Toxicity testing of fifteen non-Crop plant species with six herbicides in a greenhouse experiment: implications for risk assessment. Ecotoxicology, 13 (4):349-369.

BRANCATO, A., BROCCA, D., DE LENTDECKER, C., ERDOS, Z., FERREIRA, L., GRECO, L., JARRAH, S., KARDASSI, D., LEUSCHNER, R., LYTHGO, C., MEDINA, P., MIRON, I., MOLNAR, T., PEDERSEN, R., REICH, H., SACCHI, A., SANTOS, M., STANEK, A., STURMA, J., TARAZONA, J., THEOBALD, A., VAGENENDE, B. & VERANI, A. 2017: Review of the existing maximum residue levels for quizalofop-P-ethyl, quizalofop-P-tefuryl and propaquizafop according to Article 12 of Regulation (EC) No 396/2005. EFSA Journal, 15 (12):

CEDERLAND, H. 2017: Effects of spray drift of glyphosate on nontarget terrestrial plants – a critical review. Environmental Toxicology and Chemistry, 36 (11): 2879-2886.

COSTA, L. G. & ASCHNER, M. 2014: 2,4-Dichlorophenoxyacetic Acid. In: Toxicology of Pesticides, Reference Module in Biomedical Sciences, Elsevier. https://doi.org/10.1016/B978-0-12-801238-3.00208-7.

ÇAVUŞOĞLU, K., YALÇIN, E., TÜRKMEN, Z., YAPAR, K., ÇAVUŞOĞLU, K. & ÇIÇEK, F. 2011: Investigation of toxic effects of the glyphosate on *Allium cepa*. Journal of Agricultural Sciences, 17: 131-142.

DATCU, A.-D., CIOBANU, D.-G., BOROS, B.-V., OSTAFE, V., IANOVICI, N. 2020: A new approach for phytotoxicity testing using Allium cepa bulbs. Romanian Biotechnology Letters, 25 (2): 1488-1494.

de SOUZA, C. P., GUEDES, T. A. & FONTANETTI, C. S. 2016: Evaluation of herbicides action on plant bioindicators by genetic biomarkers: a review. Environmental Monitoring and Assessment, 188: 694.

DESHMUKH, U. S. & DHABE, S. P. 2015: Sub-chronic toxicity studies of quizalofop-p-ethyl in female albino rats. European Journal of Environmental Ecology, 2 (4): 186-189.

DEHNERT, G. K., KARASOV, W. H. & WOLMAN, M. A. 2019: 2,4-Dichlorophenoxyacetic acid containing herbicide impairs essential visually guided behaviors of larval fish. Aquatic Toxicology, 209:1-12.

DIMITROV, B., GADEVA, P., BENOVA, D. & BINEVA, M. 2006: Comparative genotoxicity of herbicides roundup, stomp and reglone in plant and mammalian test systems. Mutagenesis, 21: 375-382.

DIZDARI, A. & KAPCARI, R. 2018: Vlerësim i krahasuar i fito-gjenotoksicitetit të shkaktuar në bioprovën *Allium cepa* L. nga disa herbicide me bazë glifosatin. Universiteti i Tiranës, Buletini i Shkencave të Natyrës, 25: 12-23.

DIZDARI, A. & BALA, U. 2019: Assessment of potential phyto- and genotoxicity induced by some imidacloprid- based insecticides on a non-target crop and higher plant assay. International Journal of Ecosystems and Ecology Science, 9 (2): 367-374.

DOGANLAR, Z. 2012: Quizalofop-p-ethyl-induced phytotoxicity and genotoxicity in Lemna minor and Lemna gibba. Journal of Environmental Science and Health, 47 (11): 1631-1643.

DRUILLE, M., GARCÍA-PARISI, P. A., GOLLUSCIO, R. A., CAVAGNARO, F. P. & OMACINI, M. 2016: Repeated annual glyphosate applications may impair

beneficial soil microorganisms in temperate grassland. Agricultural Ecosystems and Environment, 230:184-190.

DUKE, S. O. 2021: Glyphosate: Uses other than in glyphosate-resistant crops, mode of action, degradation in plants, and effects on non-target plants and agricultural microbes. In: Springer Link Reviews of Environmental Contamination and Toxicology book series, 255: 1-65.

ENAN, M. R. 2009: Genotoxicity of the herbicide 2, 4-dichlorophenoxyacetic acid (2, 4-D): Higher plants as monitoring systems. American-Eurasian Journal of Agriculture, 3 (3): 452-459.

FATTAH, Y. M. & OMER, A. H. 2021: Evaluation of genotoxic and cytotoxic effects of Glyphosate on *Allium cepa*. Technium BioChemMed, 2 (1): 131-140.

FERNANDES, T. C. C., DÂNIA ELISA C., MAZZEO, D. E. C., MARIN-MORALES, M. A. 2007: Mechanism of micronuclei formation in polyploidizated cells of *Allium cepa* exposed to trifluralin herbicide. Pesticide Biochemistry and Physiology, 88 (3): 252-259.

FIRBAS, P. & AMON, T. 2014: Chromosome damage studies in the onion plant *Allium cepa* L., Caryologia, 67 (1): 25-35.

FISKESJÖ, G. 1993: Allium test I: A 2-3 day plant test for toxicity assessment by measuring the mean root growth of onions (*Allium cepa* L.). Environmental toxicology and water quality. Technical methods section, 8 (4): 461-470.

FISKESJÖ, G. 1994: The *Allium* Test II: Assessment of chemical's genotoxic potential by recording aberrations in chromosomes and cell divisions in root tips of *Allium cepa* L. Environmental Toxicology and Water Quality, 9 (3): 234-241.

GOMES, M. P., Le MANAC'H, S.G., MACCARIO, S., LABREQUE, M., LUCOTTE, M. & JUNEAU, P. 2016: Differential effects of glyphosate and aminomethylphosphonic acid (AMPA) on photosynthesis and chlorophyll metabolism in willow plants. Pesticides Biochemistry and Physioloy, 130: 65-70.

HELANDER, M., SALONIEMI, I., OMACINI, M., DRUILLE, M., SALMINEN, J. P., & SAIKKONEN, K. 2018: Glyphosate decreases mycorrhizal colonization and affects plant-soil feedback. Science of the Total Environment, 642: 285-291.

HELANDER, M., PAUNA, A., SAIKKONEN, K. SALONIEMI, I. 2019: Glyphosate residues in soil affect crop plant germination and growth. Scientific Reports, 9 (1): 19653

HWANG, J., SUNG, L., JANG, K. 2017: Comparison of theoretical and experimental values for plant uptake of pesticide from soil. PLOS ONE: https://doi.org/10.1371/journal.pone.0172254

IARC (2016) 2,4-Dichlorophenoxyacetic acid. http://monographs.iarc.fr/ENG/Monographs/vol113/mono113-03.pdf

INGARAMO, P., ALARCÓN, R., MUÑOZ-DE-TORO, M. Ó. & LUQUE, E.H. 2020: Are glyphosate and glyphosate-based herbicides endocrine disruptors that alter female fertility? Review. Molecular and Cellular Endocrinology, 518 (3):110934.

IQBAL, M., ABBAS, M., NISAR, J., NAZIR, A. & QAMAR & A. Z. 2019: Bioassays based on higher plants as dosimeters for ecotoxicity monitoring: A review. Chemistry International, 5 (1): 1-80.

ISLAM, F., WANG, J., FAROOQ, M. A., KHAN, M. S. S., XU, L., ZHU, J., ZHAO, M., MUÑOS, S., LI, Q. X., ZHOU, W. 2018: Potential impact of the herbicide 2,4-

dichlorophenoxyacetic acid on human and ecosystems. Environment International, 111: 332-351.
JANG, S. J., MALLORY-SMITH, C. & KUK, Y. I. 2020: Inhibition of wheat growth planted after glyphosate application to weeds. Weed Science, 68 (4): 373-381.
JANSONS, M., PUGAJEVA, I. & BARTKEVIČS, V. 2018: Occurrence of glyphosate in beer from the Latvian market. Food Additives Contaminants (Part A), 35 (9): 1767-1775.
JARRELL, Z. R., AHAMMAD, M. U., BENSON, A. P. 2020: Glyphosate-based herbicide formulations and reproductive toxicity in animals. Veterinary and Animal Science, 10:100126.
JU, Z., LIU, S. S., XU, Y. Q. & LI, K. 2019: Combined Toxicity of 2,4-Dichlorophenoxyacetic Acid and its metabolites on two nontarget organisms. ACS Omega, 4 (1): 1669-1677.
KARAISMAILOGLU, M. C. 2015: Investigation of the potential toxic effects of prometryne herbicide on *Allium cepa* root tip cells with mitotic activity, chromosome aberration, micronucleus frequency, nuclear DNA amount and comet assay. International Journal of Cytology, Cytosystematics and Cytogenetics, 68 (4): 323-329.
KUMAR, G. & SRIVASTAVA, A. 2015: Comparative Genotoxicity of Herbicide Ingredients Glyphosate and Atrazine on Root Meristem of Buckwheat (Fagopyrum esculentum Moench) Jordan Journal of Biological Sciences, 8 (3): 221-226.
LEME, D. M. & MARIN-MORALES, M. A. 2009: *Allium cepa* test in environmental monitoring: A review on its application. Mutation Research, 682 (1): 71-81.
LI, K., WU, J. Q., JIANG, L. L., SHEN, L. Z., LI, J. Y., HE, Z. H., WEI, P., ZHUO, L. Y., HE, M. F. 2017: Developmental toxicity of 2,4-dichlorophenoxyacetic acid in zebrafish embryos. Chemosphere, 171: 40–48.
LIANG, Y., WANG, P., LIU, D., SHEN, Z., LIU, H., JIA, Z., ZHOU, Z. 2014: Enantio-selective metabolism of quizalofop-ethyl in rat. PLoS ONE 9 (6): 101052.
MA, T. H., CABRERA, G. L. & OWENS, E. 2005: Genotoxic agents detected by plant bioassays. Reviews on Environmental Health, 20: 1-13.
MA, L., LIU, H., QU, H., XU, Y., WANG, P., SUN, M., ZHOU, Z., LIU, D. 2016: Chiral quizalofop-ethyl and its metabolite quizalofop-acid in soils: Enantioselective degradation, enzymes interaction and toxicity to *Eisenia foetida*. Chemosphere, 152, 173-180.
MAGDALENO, A., PERALTA GAVENSKY, M., FASSIANO, A. V., RÍOS DE MOLINA, M. C., SANTOS, M., MARCH, H., MORETTON, J. & JUÁREZ, Á. B. 2015: Phytotoxicity and genotoxicity assessment of imazethapyr herbicide using a battery of bioassays. Environmental Science and Pollution Research, 22 (23): 194-202.
MAJER, B. J., GRUMMT, T. & KNASMÜLLER, S. 2005: Use of plant bioassays for the detection of genotoxins in the aquatic environment. Acta Hydrochimica et Hydrobiologica, 33: 45-55.
MARCATO, A. C. C., de SOUZA, C. P. & FONTANETTI, C. S. 2017: Herbicide 2,4-D: A Review of Toxicity on Non-Target Organisms. Water, Air and Soil Pollution, 228 (3): 120.

MARD (Ministry of Agriculture and Rural Development) 2021: List of PPP registered to be imported and trading in the Republic of Albania. https://bujqesia.gov.al/wp-content/uploads/2021/01/Lista-e-PMB-ve-janar-2021-4.pdf
MARTINEZ, D. A., LOENING, U. E. & GRAHAM, M. C. 2018: Impacts of glyphosate-based herbicides on disease resistance and health of crops. Environmental Sciences Europe, 30:2.
MEHDIZADEH, M., MUSHTAQ, W., SIDDIQUI, S. H., AYADI, S., KAUR, P., YEBOAH, S., MAZRAEDOOST, S., AL-TAEY, D. A. K & TAMPUBOLON, K. 2021: Herbicide Residues in Agroecosystems: Fate, Detection, and Effect on Non-Target Plants. Reviews in Agricultural Sciences, 9: 157-167.
MERCADO, S. A. S. & CALEÑO, J. D. Q. 2019: Cytotoxic evaluation of glyphosate, using Allium cepa L. as bioindicator. Science of the Total Environment, 700: 134452.
MESI, A. D. & KOPLIKU, D. & GOLEMI, S. 2012: The use of higher plants as bio-indicators of environmental pollution - a new approach for toxicity screening in Albania. Mediterranean Journal of Social Sciences, 3 (8): 237-248.
MESI, A. D. & KOPLIKU, D. 2013: Cytotoxic and genotoxic potency screening of two pesticides on *Allium cepa* L. Elsevier Procedia Technology, 8: 19-26.
MESNAGE, R., DEFARGE, N., de VENDÔMOIS, J. S. & SÉRALINI, G. E. 2015: Potential toxic effects of glyphosate and its commercial formulations below regulatory limits. Food and Chemical Toxicology, 84: 133-153.
MILESI, M. M., MARÍA MERCEDES, LORENZ, V., DURANDO, M., ROSSETTI, M. F. & VARAYOUD, J. 2021: Glyphosate Herbicide: reproductive outcomes and multigenerational effects. Frontiers in Endocrinology, 12: 672532.
MYERS, J. P., ANTONIOU, M. N., BLUMBERG, B., CARROLL, L., COLBORN, T., EVERETT, L. G., HANSEN, M., LANDRIGAN, P. J., LANPHEAR, B. P., MESNAGE, R., VANDENBERG, L. N., VOM SAAL, F. S., WELSHONS, W. V. & BENBROOK, C. M. 2016: Concerns over use of glyphosate-based herbicides and risks associated with exposures: a consensus statement. Environ Health, 15: 19.
MYRTAJ, B., NURO, A. & MARKU, E. 2018: An overview of organochlorinated pollutants in agricultural soil samples from Albania. Annual of Sofia University "St. Kliment Ohridski" Faculty of Biology Book 4 - Scientific Sessions of the Faculty of Biology, 104: 256-[illegible].
MUSTAFA, U. I. & ADHAM, K. A. 2016: Effects of glyphosate herbicide on chromosomes aberration, mitotic index in the root meristem cells. African Journal of Biology, 3 (6): 228-232.
NEUMANN, G., KOHLS, S., LANDSBERG, E., SOUZA, S-O. K., YAMADA, T. & RÖMHELD, V. 2006: Relevance of glyphosate transfer to non-target plants via the rhizosphere. Journal of Plant Diseases and Protection, 20: 963-969.
NURO, A. & MARKU, E. 2011: Organochlorine Pesticides Residues for some Aquatic Systems in Albania. In: Pesticides - Formulations, Effects, Fate. In Tech; 351-374.
NURO, A., MARKU, E. & MYRTAJ, B. 2018: An overview of organic pollutants in water ecosystems of Albania. Madridge Journal of Analytical Sciences and Instrumentation, 3 (1): 77-81.

OGELEKA, D. F., OKIEIMEN, F. E., EKPUDI, F. O. & TUDARARO-AHEROBO, L. E. 2016: Short -term phyto-toxicity consequences of a nonselective herbicide glyphosate (Roundup™) on the growth of onions (*Allium cepa* Linn.). African Journal of Biotechnology, 15 (18): 740-744.

ÖZKUL, M., ÖZEL, Ç. A, YÜZBAŞIOĞLU, D. & ÜNAL, F. 2016: Does 2,4-D induce genotoxic effects in tissue cultured *Allium* roots? Cytotechnology, 68 (6): 2395–2405.

PANNU, A. K., SAROCH, A., AGRAWAL, J. & SHARMA, N. 2018: 2,4-D poisoning: a review with illustration of two cases. Tropical doctor, 48 (4): 366-368.

PETERSON, M. A., MCMASTER, S. A., RIECHERS, D. E., SKELTON, J. & STAHLMAN, P.W. 2016: 2, 4-D Past, Present, and Future: A Review. Weed Technology, nr. 30 (1), 303–345.

PRASAD, S., SRIVASTAVA, S., SINGH, M. & SHUKLA, Y. 2009: Clastogenic Effects of Glyphosate in Bone Marrow Cells of Swiss Albino Mice. Journal of Toxicology: 308985.

RODRIGUES, L. B., de OLIVEIRA, R., ABE, F. R. BRITO, L. B., MOURA, D. S., VALADARES, M. C., GRISOLIA, C. K., de OLIVEIRA, D. P., de OLIVEIRA, G. A. R. 2017: Ecotoxicological assessment of glyphosate-based herbicides: Effects on different organisms. Environmental Toxicology and Chemistry, 36:1755-1763.

ROSCULETE, C. A., BONCIU, E., ROSCULETE, E. & OLARU, L. A. 2019: Determination of environmental pollution potential of some herbicides by the assessment of cyto-genotoxic effects on *A. cepa*. International Journal of Environmental Research & Public Health, 16 (1): 75.

RUIZ DE ARCAUTE, C., SOLONESKI, S., LARRAMENDY, M. L. 2016: Toxic and genotoxic effects of the 2,4-dichlorophenoxyacetic acid (2,4-D)-based herbicide on the Neotropical fish *Cnesterodon decemmaculatus*. Ecotoxicology and Environmental Safety, 216: 222-229.

SAHA, A., SHABEER T. P., A., BANERJEE, K. SANDIP, H., JAIN, N. K. & UTTURE, S. 2015: Simultaneous analysis of herbicides pendimethalin, oxyfluorfen, imazethapyr and quizalofop-*p*-ethyl by LC–MS/MS and safety evaluation of their harvest time residues in peanut (*Arachis hypogaea* L.). Journal of Food Science and Technology, 52 (7): 400-414.

SANG, Y., MEJUTO, J-C., XIAO, J. & SIMAL-GANDARA, J. 2021: Assessment of Glyphosate Impact on the Agrofood Ecosystem. Plants, 10 (2): 405.

SAUNDERS, L. E. & PEZESHKI, R. 2015: Glyphosate in runoff waters and in the root-zone: a review. Toxics 3 (4): 462-480.

SESIN, V., DAVY, C. M., STEVEN, K. J. HAMP, R. & FREELAND, J. R. 2020: Glyphosate toxicity to native non-target macrophytes following tree different routes of incidental exposure. Integrated Environmental Assessment and Management, 17 (3): 597-613.

SHARMA, S. & VIG, P. N. 2012: Genotoxicity of atrazine, avenoxan, diuron, and quizalofop-P-ethyl herbicides using the *Allium cepa* root chromosomal aberration assay. Terrestrial and Aquatic Environmental Toxicology, 6 (2): 90-95.

SHERWANI, Sh. I., ARIF, I. A. & KHAN, H. A. 2015: Modes of action of different classes of herbicides. In: Herbicides, physiology of action, and safety. PRICE, A., KELTON, J. & SARUNAITE, L. IntechOpen, 10.5772/61779.

SILVA, V., MOL, H. G. J., ZOMER, P., TIENSTRA, M., RITSEMA, C. J. & GEISSEM, V. 2019: Pesticide residues in European agricultural soils – A hidden reality unfolded. Science of The Total Environment, 653 (25): 1532-1545.

SINGH, R. J. 2016: Plant cytogenetics. CRC PRESS, 528 pp.

SINGH, S., KUMAR, V., DATTA, S., WANI, A. B., DHANJAL, D., ROMERO, R. & SINGH, J. 2020: Glyphosate uptake, translocation, resistance emergence in crops, analytical monitoring, toxicity and degradation. Environmental Chemistry Letters, 18: 663-702.

SONG, Y. 2014: Insight into the mode of action of 2,4-dichlorophenoxyacetic acid (2, 4-D) as an herbicide. Journal of Integrative Plant Biology, 56: 106-113.

SWANSON, N. L., HOY, J. & SENEFF, S. 2016: Evidence that glyphosate is a causative agent in chronic sub-clinical metabolic acidosis and mitochondrial dysfunction. International Journal of Human Nutrition and and Functional Medicine, 4: 32.

TEDESCO, S. B., LAUGHINGHOUSE, H. D. 2012: Bioindicator of genotoxicity: The *Allium cepa* Test. In: Environmental Contamination. InTech, 137-156.

TURKOĞLU, S. (2012): Determination of genotoxic effects of chlorofenvinphos and fenbuconazole in *A. cepa* root cells by mitotic activity, chromosome aberration, DNA content, DNA comet assay. Pesticide Biochemistry and. Physiology, 103: 224-230.

USEPA 2021: 2, 4-D. https://www.epa.gov/ingredients-used-pesticide-products/24-d

VAN BRUGGEN, A. H. C., FINCKH, M. R., HE, M. M., HARKES, P., KNUTH, D. & GEISSEN, V. 2021: Indirect effects of the herbicide Glyphosate on plant, animal and human health through its effects on microbial communities. Frontiers in Environmental Science, 9: 763917.

YU, X., HUANG, C., Wu, L., HUA, S., YE, J., MENG, L. & XU, C. 2021: Effects of the herbicides quizalofop-p-ethyl and quizalofop-ethyl on the physiology, oxidative damage, synthesis, and release of microcystin-LR in *M. aeruginosa*. Science of the Total Environment, 776: 146036.

ZHANG, D., WU, Y., YUAN, Y. Y., LIU, W., KUANG, H., YANG, J., YANG, B., WU, L., ZOU, W. & XU, C. 2017: Exposure to 2,4-dichlorophenoxyacetic acid induces oxidative stress and apoptosis in mouse testis. Pesticide Biochemistry and Physiology, 141: 18-22.

ZHONG, G., WU, Z., YIN, J. & CHAI, L. 2017: Responses of *Hydrilla verticillata* (L.f.) Royle and *Vallisneria natans* (Lour.) Hara to glyphosate exposure. Chemosphere, 193 (2): 385-393.

ZHU, L. Z., QI, S. Z., CAO, F. J., MU, X. Y., YANG, Y., WANG, C. 2017: Quizalofop-P-ethyl exposure increases estrogen axis activity in male and slightly decreases estrogen axis activity in female zebrafish (*Danio rerio*).

EFFECTS OF CLIMATE CHANGE, RESILIENCE AND ECOSYSTEM ADOPTION IN SOME LAGOONS IN ALBANIAN ADRIATIC AREA

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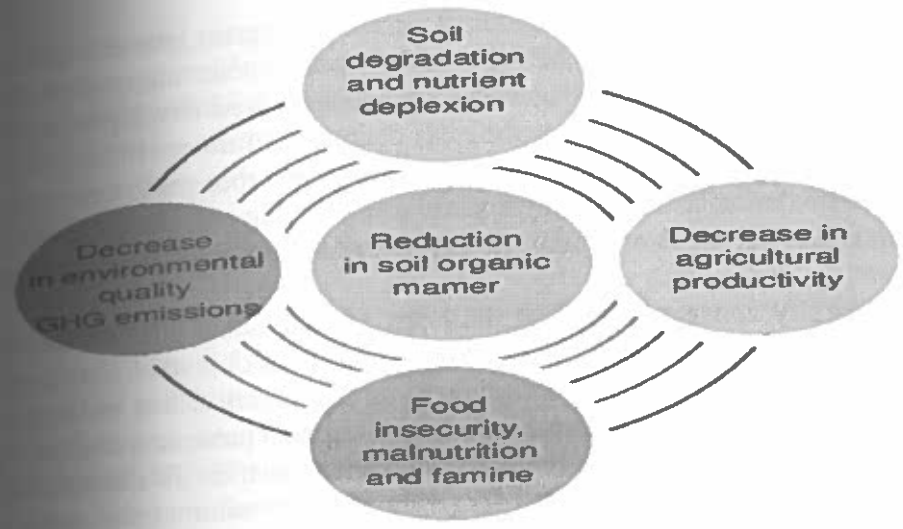
Bacground

The biosphere includes the bio-geo-physical processes of land surfaces including living species, and in particular the vegetation ecosystem. The description of biophysical processes on continental surfaces can significantly affect the prediction of meteorological variables, such as precipitation, low-level wind or sheltered temperature. The surface patterns adopted are representative of various spatial scales such as plant, field, watershed in the continental case, or an ocean basin with point observations. The study of terrestrial ecosystems is a priority in scientific research and its operational monitoring because sustainable development and the economy of societies depend heavily on it. Man, himself is part of it by occupying most of the urban ecosystem, which is often poorly represented in meteorological-hydrological models, because urbanized areas occupy a fraction of the continental surface area of less than 1%. Earth System modelling will soon have to consider the various anthropogenic changes affecting natural cycles, not only at the climate scale where the greenhouse effect is already being considered in a simplified way, but at all spatial and temporal scales. In this context, the modelling of global cycles of surface water, energy, and biomass, at spatial resolutions high enough to represent the main physical processes. Climate has always been an important factor in the evolution of human societies. Researchers and experts work to identify the elements that are the subject of a consensus in the scientific community.

- evaluation of the scientific aspects of how the climate machine works and of climate changes;
- vulnerability of social, economic and natural systems to climate change and the possibilities for adaptation;
- solutions to limit greenhouse gas emissions and mitigate the negative effects of climate change.



The effects

The consequences of climate change, both present and future, vary according to region, type of activity, economic sector, etc. Simulations indicate that in the event of average global warming of more than 4°C compared to pre-industrial levels (today this warming is of the order of 1°C) – which is likely to occur towards the end of this century if no action is taken to fight against global warming – the probable consequences will be as follows. Extreme weather phenomena (heat waves, tornadoes, floods, etc.) are likely to become more frequent and intense, with a higher risk for the most disadvantaged countries and populations. The biodiversity will be increasingly at risk. Phenomena may occur or even manifest themselves in the form of sudden and sometime irreversible changes, such as the acidification of the ocean, the reduction of permafrost. Significant changes in temperature or water balance, rising sea levels on coastal regions and deltas, land erosion, loose on wetland surfaces and biodiversity.

Resilience and ecosystem adoption

Adaptation to the environment has often been the **key to sedentarization**. This adaptation is all the easier when the environment is favorable. The development of several large cities through the ages, ancient or more recent, is closely linked to the availability and management of natural resources, and in particular fresh water. Climate records show that the extent of this balancing has varied over time, with significant hydrological impacts. The hydraulic engineering of the peoples has made it possible to build reservoirs, retention basins or irrigation canals: these installations have proved extremely effective in dealing with short or moderate climatic

hazards. When climate change has proved too great, these ingenious adaptations have not been sufficient. Most people then migrated to find new conditions elsewhere that were favorable to their development. The climate changes expected over the next century will not be homogeneous across the globe. Each region can expect significant changes in temperature or water balance, as well as impacts related to rising sea levels on coastal regions and deltas. People will then have several possibilities: adaptation, migration, or disappearance.

Biodiversity conservation is at the heart of sustainable development. At one level, it is inspired by deep ecology that considers all life forms as having value in themselves. In as much as communities live in harmony with biodiversity, it gets regenerated and, in the process, provides the community with resources required by them for their livelihood. This dependency leads to an understanding of human communities and nature as being part of the same living, breathing ecosystem. Additionally, biodiversity conservation is not meant to be restricted to wildlife sanctuaries and national parks since it is the active interaction between humans and nature that, while helping humans produce, also rejuvenates nature, thus making the act of production sustainable. Understanding the need for biodiversity to maintain the delicate balance in an ecosystem and being mindful of the same in employing different methods of production is a good start toward practicing sustainability.

Development of rural tourism

Today knowledge and skills related to cultural and natural tourism are mainly transmitted orally from one generation to the next, by taking part tradition and learning through continuous observation and training from the experienced inhabitants; and through non-formal education, such as workshops organized by local communities. The role of the practitioners is of great importance in the transmission of the culture of using lands and biodiversity; the inhabitants are fully connected to their environment, they enjoy a special bond with their animals (livestock, plant species and animals and they experientially understand the requirements of the area and their biodiversity.

Wetland landscapes. Cultural aspect has an impact on the spatial heterogeneity of vegetation, affecting ecosystem processes and wetland landscapes. Communities have used local resources in supporting peripheral economies in the rural contexts of villages and inland areas, which have been facing massive depopulation. The development of

settlements and complementary farming activities, thereby creating sustainable and resilient networks are required.

Food safety and sustainability. Rural life plays a vital role in environmental protection. In fact, thanks to the sustainable use of land and water resources and admitting livestock to live in the wild, food prepared using milk and meat and clothing made from wool and leather, have lower environmental impacts than similar products from intensive farming.

Methodology

The article is based on a short review of materials published on climate change and ecosystem resilience on Lagoons in North Albania, expedition in the field and data collected directly in the ecosystems, photos and maps assessments. SWOT analyze and the problem tree analyze lied to the list of recommendations for the best way to adopt strategies to combat climate changes in the wonderful ecosystems as lagoon in North.

Discussion and results

Kune Vain Tale Lagoon System is located within the Drini – Mati River Delta in the Lezha region of Albania. It provides a wide range of valuable goods and services to nearby communities. A rapid increase in population size and widespread poverty in the area, have led to an increased pressure on the lagoon for ecosystem goods and services, as well as unplanned alterations in the buffer zone surrounding the lagoon. The local communities derive most of their income from fishing or agriculture, and therefore depend on functional, intact ecosystems in the lagoon system for their livelihoods. Unsustainable use of resources within the KVLS, is also causing a reduction in quality and quantity of waters in the lagoon (affecting lagoon productivity), and increased coastal flooding, and increased sand dunes erosion. Being vulnerable to the Climate change effects Kune Vain Lagoon System is expected to experience more frequent and intense floods and storm surges. Climate change has created additional problems all over the site. Among others the following can be mentioned: Increase of the erosion intensity in coast/littorals, and riparian forests and floods on inland agricultural areas. As a result of this, tourism assets have been seriously reduced (reduction of beaches); important habitats for species of flora and fauna (with visual and economical values) have been damaged; a direct loss of agricultural production is happening; The existence of the lagoon is being threatened from the destruction of littorals and the creation of one body lagoon/sea waters; migration risk has increased (especially from the youth living in the site) due to loss of hope

for lagoon conservation. o Reduction of the lagoon depth by intensive sedimentation coming from eroded sites and overflows, blockage of communication channels between sea and lagoons etc. This phenomenon has caused direct effects (decreased fish productivity of the lagoon), and indirect ones (making the lagoons very much prone to eutrophication, due to reduction of vertical and horizontal water circulation capabilities). In addition to these, some the other effects include reduction of fish; reduction of tourist numbers; and also a decrease on communities' beliefs as to the values of the protected area. o Contamination of clean sites is being encouraged by transporting pollution through water running into overflows from the Tale Pumping station discharge channel to the Ceka Lagoon (Vaini site). Also, they are causing environmental degradation (in terms of reduction of the environmental quality and tourism potentials) of the site. The unsustainable use and alteration of the lagoon is being compounded and will be further exacerbated by the effects of climate change, in several ways. Recent climate change models predict an increase in air (1.8°C by 2050) and sea surface temperature, which will lead to increased evaporation. In addition, global climate models also predict a reduction in precipitation, which will also result in an increase in salinity in the lagoon with detrimental effects on the fisheries. Models predict an accelerating rate of sea-level rise (up to 61 centimeters by 2100) resulting in increased erosion and the consequent loss of habitat within the lagoon. Finally, the lagoon is expected to experience more intense and frequent floods and storm surges. These extreme events will lead to the erosion of beaches and riparian forests and the alteration of flow patterns within the lagoon, which in turn reduces physical barriers to extreme coastal flooding events and limits the capacity of the lagoon to buffer the surrounding communities from these events. Overall, climate change effects are reducing the capacity of this system to provide ecosystem goods and services to local communities.

Objectives for an efficient EBA

- Improving technical and institutional capacity of policy and decision-makers in Albania to address climate change risks through the implementation of adaptation interventions, including ecosystem based adaptation (EbA)
- Demonstrating adaptation interventions within the lagoons.
- Improving awareness and knowledge of local communities and national stakeholders on effective EbA.

- Scientific research should used to develop an integrated suite of adaptation interventions including EbA that will improve the quantity and quality of water in the lagoon resulting in improved lagoon productivity.
- Reduce beach dune erosion thereby improve the resilience of local communities to coastal flooding.

Actions to be undertaken

The Coastal protection and dune stabilization, using autochthonous plants (trees, shrubs and graces) to control erosion activity and stabilize the pseudo-dunes. The plants defined for plantation will **serve to improve the degraded habitats of the site**, and in the future, to **reduce the negative effects of sea storms** in the surrounding areas.

Amelioration of sea/lagoon water exchange at Vaini site, Ceka lagoon, to reduce eutrophication risks, improve the lagoon water quality and increase the fish population and species living, nesting or feeding in the lagoon bodies. The fishery remains one of the main economic and recreational activities at a local and national level.

Enhance local and national awareness on the advantages of EbA to increase resilience towards climate change impacts. Such interventions, considering their protection effectiveness, will help to improve the socio-economic status of the community, by reducing negative effects caused by Climate Change, and improving fishing and nature tourism potential and capabilities. The Baseline Survey project is prepared respecting TOR guidelines, duties and expected outputs, to enable in the best possible way the baseline document for resilience of Kune Vain Lagoon through management of existing and expected effects of climate change. It aims to evaluate the Vulnerability Index, in regard to Climate change effects and assess the Indicators and targets for each of the project outcomes.

Action to adopt (EbA)

Knowledge management plan developed to capture and share information on climate change impacts and lessons learned to inform future EbA interventions. No management plan for future EbA interventions has been developed yet.

Awareness-raising campaign is conducted on the advantages of EbA to increase resilience to climate change impacts. A previous awareness campaign was developed two years ago by the UNDP, on climate change effects in Lezha region. This awareness campaign did mention EbA, but it

was not focused on it. The output above, aims on the awareness raising campaign to be strongly focused on EbA.
Scientific reports produced on the performance of implemented EbA interventions and research projects are not yet developed, for as long as intervention actions are yet not implemented. Still, the outputs and targets seem to be appropriate considering the phase in the near future. A number of scientific articles and PhD's related to Climate changes have been developed in Tirana University, but only one of them was directly focused in EbA interventions. This indicator is expected to be developed on another stage.
A web-based platform has been established to share information and provide access to project products. This output is under implementation by the project unit and is expected to be developed very soon.
Reduced vulnerability, to Climate Change – induced extreme events, of communities living nearby the Kune Vain lagoon system through pilot adaptation interventions including EbA, will be evaluated by the monitoring process. There should also be strong collaboration between Ministry of Tourism and Environment, stakeholders and decision makers to ensure the long term efficiency of EbA interventions in Kune Vain.
The project is in three sites at the KuneVain Lagoon system in the Lezha region of Albania, which hosts stunning biodiversity. The main approaches include: opening a tidal channel to allow the free circulation of sea water, which regulates the salinity of the lagoon and reduces flooding; and dune rehabilitation to mitigate coastal erosion and reduce habitat loss. As a result, fish stocks and bird species will recover, leading to positive economic benefits for fisheries and ecotourism businesses. Once the sand dune erodes, the lagoon will turn to sea and disappear. The planting activities strengthen the sand dunes against erosion by holding the soil in place, helping to preserve the Kune-Vain Lagoon ecosystem. The maintenance of the channel between the Ceka Lagoon and the Adriatic Sea . The channel allows the exchange of water between the lagoon and the sea. which significantly improves the water quality of the lagoon. The embankment at Shëngjin Island is being raised and maintained to protect adjacent agricultural land and population areas from flooding and storm surges.

Case study 2

The **Buna River Velipoje Protected Landscape** is a protected landscape area in Northwestern Albania, encompassing the estuary of Drin, the

lagoon of Viluni, the river Buna and its estuary and the gulf of Drin that runs across Velipoja alongside the Adriatic Sea. The area is categorized as protected landscape as category V and has further recognized as a wetland of international importance by designation under the Ramsar convention. Being part of European green belt too, the landscape is also important bird and plant area because it supports threated and endemic species of birds and plants. Stretching between the Dinaric Alps, and the Mediterranean Sea the river of Buna is an outflow of the lake of Shkodra, the largest lake in Balkan peninsula, witch ultimately runs through the river until it drains into the Adriatic Sea. The landscape is an essential migration corridor at the season for hundreds of species between the Adriatic Sea and the inland. The region is explicitly marked by a relatively flat and shallow landscape supplied with alluvial forest, dry grasslands, marsh and shrublands, estuaries and freshwater wetlands and also beaches. The climate of the landscape is strongly under the influence of the Adriatic Sea and in the West and the Albanian Alps in North. Koeppen climate classification it experiences a Mediterranean climate characterized by warm to dry-hot summers and mild-wet to rainy winters. In the region live a variety of wildlife species. Golden jackal occurs in woodlands and marshes of the riverine floodplains. The coastline is dotted with sand dunes and offers great feeding opportunities for ***bears***. In waters lives the ***Common bottlenose dolphin*** which prefers the coastal waters and river deltas. In the area leves also sea turtle and dalmatioan pelican. The pelican use the salt pans around the region as feeding habitats during autumn. **Viluni lagoon** as all the Mediterranean lagoons ins one of the richest ecosystem in the area, with an exceptional value, but is also the most threatened. The lagoon supports high concentrations of birds, mammals, reptiles, amphibians, fish and invertebrate species that cannot be found anywhere else in the world.
A lot of anthropogenic activities are causing problems for the wildlife and biodiversity in Viluni lagoon. The use of pesticides and other pollutants in the soil, in the water ecosystems are damaging the natural habitats of species. The decrease number of individuals of bird and fish populations, the decrease numbers of plants in forests of lagoons, Buna river and around the Shkodra Lake are indexes for a bad management of soil and poor practices for the protection of key species and key habitats. Forest vegetation once was much richer than today. One of the major degrading factors was the illegal cutting of trees to the limits of a complete deforestation. Forest vegetation is located in mountains administrative units, riverbanks in the Velipoja Reserve, Ada Island, villages of Reç,

Sutjel, Shënkoll and Bahçallek. The vegetation of the lowland forest areas is mainly composed of several poplar species liard or aspen (*Populus* sp), spit (*Salix* sp), spruce (*Fraxinus* sp), oak (*Quercus* sp), acacia (*Robinia pseudoacacia*), cornel-bush (*Cornus mas*), hornbeam (*Carpinus bettulus*), marina (*Tamarix parviflora*), etc. There are over 50 species of fish in the Buna outskirts. Buna, along with the waters near it, represents one of the richest areas of poultry in the region. Buna river, Velipoja Reservoir, Domna's Cave, Viluni Lagoon, Shas Lake, Ulcinj Basin, Ulcinj's Lower Depersity Area are populated with poultry, especially in winter. Buna's waters and the associated wetland complex are an important station and one of Europe's migrating birds' routes to the Balkans. This is also the main reason for the richness of bird biodiversity, high dynamics and generating potential, with main indicators of mass migration and nesting Over 76% of the number of Buna bird species are migratory, while about 29% are nesters. In Buna there are counted about 50 species of waterfowl. The Buna Delta contains a diverse range of unique natural habitats that are the habitat of twenty-four rare and endangered species and support for native and protected wildlife. Delta wetland carries more than 250 species of birds, some endangered. Delta also serves as the gateway to the region's 107 different fish species. Protected mammals in the area include large carnivores such as golden coyote and brown bear. The effective protection of plant and animal species in this region is an obligation under international agreements. A lot of awareness projects are implemented in Albania and especially in Shkodra urban ecosystem for the protection of the biodiversity and natural resources. Positive impacts for the biodiversity protection are starting from the good knowledge for the areas and their biodiversity and the strong link with the biodiversity conservation and awareness of people living in protected areas. The communities are more aware for the values of species, for the services that traditional and medical plants could gave, for the good values of flora and fauna living in the forest of Shkodra urban ecosystem. The most important initiative was the involvement of the business in good practices for the management of the biodiversity with environmentally friendly investments. The use of natural resources and biodiversity for economic development is not sustainable and a lot of areas are not well developed although they have big potential for ecotourism or sustainable agriculture. The real situation of flora and fauna and the status of species are important for assessing the value of ecosystem in economical perspective. These species and other natural resources should be considered as an asset for the economic value of ecosystem and

as a service for the community living in natural areas. The natural ecosystems should be restored in a biological harmony and the economical use of them should be sustainable.

The plan for the biodiversity protection for the years 2017-2022 has the vision **"The protection of the biodiversity in its complexity and the compilation of an action plan for its sustainable use with the goal to protect the environment"** and its strategic priorities are linked with the use and the protection of the biodiversity.

- Assessment of ecological situation in Shkodra Region
- Indentification of problems and factors that are threating our natural habitats and their biodiversity.
- Creation of new strategies and action plans for key habitats and key species.
- Increase dhe awarenes of the community and stimulate eco friendly investments in natural areas.
- Integrate the management of the biodiversity with plans and development strategies in the territory.
- Promote the investments in eco and agrotourism.

All this priorities are considered important for the sustainable use of natural resources and the sustainable use of land and biodiversity. All this priorities bring to the protection of the biodiversity in an integrated way and the sustainable use of the biodiversity. We considered that are necessary also the development of a legal and institutional framework with the standarts of EU and their effective implementation and the use of the practices that stimulate the sustainable development and ecotourism and the best management practices for the biodiversity as a mechanism for the protection. Actors should integrate the politics for biodiversity protection in all relevant sectors with the economic development in order that the national strategy for the biodiversity protection is taken into consideration during the decision-making process. An important step is the involvement of private sector in biodiversity protection and protection of natural resources. Encourage the sustainable land use, the sustainable use of genetic resources for food and in agriculture. Encourage the system of certification of forest in order to have the sustainable use of forest. Sustainable use of wetlands with good practices and development of management plans for protected areas is considered important for ecomonical profit and the sustainable development in the Region. Ecotourism is considered a good industry that is contributing to the economic development of the ecosystem. Shkodra ecosystem is having big

potential for ecotourism. The community should consider natural resources and biodiversity as an asset for ecotourism development but should search for more investments in transport and infrastructure, eco-hotels and accommodation's structure.

Recommendations and action for ecosystem approach

- Assessment of ecological situation in Shkodra Region is important to have an clear overwiev of the real situation of natural resources.
- Indentification of problems and riscks that are threating our natural habitats and their biodiversity is important to evaluate the use of land, forests and biodiversity resources.
- Creation of new strategies and action plans for key habitats and key species should be part of projects and priority for the investements in order to protect the biodiversity in the Region of Shkodra.
- The local authorities and the civic sector should work hardly to increase dhe awarenes of the community and stimulate eco friendly investments in the Region.
- Integrate the management of the biodiversity with plans and development strategies in the territory for the sustainable development in our Region.

Priority activities should be:

- Improvement of the quality of environment and natural habitats.
- Decrease of the eutrofication process in water ecosystems.
- Reforestation of several surfaces in north forest.
- Promote te alternative sources of energy and smart thechnology in the investement in order to protect the environment and biodiversity.

Recommendations and conclusions

Flora and fauna are threatened due to misuse, over-utilization and poor management of these resources of great economic, environmental, and social value. Mostly these problems have arisen in recent decades and are primarily related to the environmental education of the population and demographic movements of the population in areas of natural value.
On the territory of the Wetland Complex of Buna river and Viluni Lagoon has favorable conditions for people's housing due to climate, soft soil, fresh-water natural resources. Territories with natural values in general as well as those with high biodiversity values in particular have been seen not only as auxiliary, but as inseparable from the development of many local economies. Many of the biodiversity values are utilized directly. One of the

developed economic sectors has been fishing. The local population of areas around Lake and Buna river engages in fishing for family consumption but also for trade ,but this engagement is lower in Viluni lagoon. The zoos ,around the lake, provide the best opportunity for carving a carp as a very important commercial type. Another economic benefit from exploitation of biodiversity is the use of forests ,but also the floor of the medicinal herbs or even the tanning plants. The forests of the area are used for heating materials but also as building material. The wetland vegetation has been used for artisanal production, e.x. production of xunth baskets or willow birch. Today there is no data that can still be used for this purpose. There is not much data on business activities of gathering or processing of medicinal and ethereal plants. Often areas of natural value also have the value of the indirect services that they provide for the communities living in them: e.g. wetland areas serve as preventative of flooding, flooding in marshy areas is a regular occurrence in the season, wetland vegetation is the initial water retention filter.
Because the core of biodiversity consists of species, habitats and ecosystems, their protection must begin with the management of critically threatened species and habitats such are: Acipenser sturio, Lynx Lynx, Taxis baccata) etc, or even habitats at risk of irreversible extinction like Franc Joseph's island. Their conservation and management would result in local and national economic and educational benefits for the areas around the Lake and Buna river and all of the water basin. Flood protection becomes a priority since the economic and social weight of this phenomenon exceeds the magnitude of isolated events, making it imperative for intervention with regional-scale development projects.
In this priority action area, all public and private actors find a co-operation challenge and the need to step up interventions as soon as possible at the level of EU technologies and the best organizations that use developed countries today.
In the territory of the Dajc municipal unit ,as well as in other areas of natural value in recent years, there have been rapid socio-economic developments that have caused the decline of the population in rural areas, the increase of the average age of the population, changes in the population, the way of land use and other natural resources. Traditional agriculture has been replaced more by tourism and services received from natural areas.
This is why sustainable development in these areas is recommended through the creation of ecosystem services, bringing to the attention of the

community the development of socio-economic activities such as agro-tourism and eco-tourism.

Recommendations

List of me measures recommended in our endangered wetland ecosystems to be implemented.

Several measures are recommended to be implemented by local communities in the upcoming years, referring to the following areas of actions.

Supporting ecosystem approach analyse

1. Scientific research on ecological social and cultural functions of wetland ecosystem.

Surveys, reports and scientific studies will be conducted by researchers from local universities involving international experts, with the aim to share good practices and investigate shared values related to climate change, land use and biodiversity. Work in supporting local communities from a scientific point of view, creating networks, practicing good ways in land uses and, especially, with regards to the production of high quality local dairy products.

2. Documenting and mapping the local economies, farmers and agritourism structures in the area, nature trails and biodiversity and touristic attractions. Through a multidisciplinary approach, in the local area a research group could coordinate a work on ecological and socio-economical (ethnological, sociological, spatial, architectural, ecological and economic) aspects. The results of the study could be used to restore routes and promote the incorporation of nature and biodiversity with natural, rural, cultural and alternative tourism projects.

3. Implementation of awareness-raising and information activities. Creation of a local multimedia web site dedicated to climate change and sustainable development in the area will ensure the dissemination and information on several elements; educational material (including free documents and newsletters, regarding the social and cultural values of the area will be provided for downloading, targeting young people and school students, in order to promote and exchange good practices for the safeguarding of the nature and sustainable practices in the zones. The local group are always in action in receiving and sharing relevant information from the other communities. Local authority will support it.

4. Education and courses at primary and secondary school. Students will be involved in seminars and courses held by local authorities and several programmes supported by donors. With the support of local cultural

associations, a calendar of tours, interviews and other interactive activities have already been scheduled to promote the contact between the new generations and traditional ways of using ecosystems, since it is equally important to highlight the importance of education as a vehicle of sensitizing youth to various aspects of intangible cultural heritage. The educational programme follows experiential pedagogical approaches, motivating schoolchildren to walk trails, watch, recognize and learn how to interpret the rural landscape as transformed by the interaction of man and the environment as well as the development of productive activities.

5. Temporary exhibitions Organization of temporary exhibitions will show handcrafts related to land and water use and will elaborate on the cultural meaning and social functions of the nature, involving younger and previous generations in the recognition of their cultural heritage.

6. Coordination meeting of the communities. On a regular basis, each community, with the support of the Municipality, will organise a meeting to monitor the situation of nature elements and their use from the community.

7. International symposiums. Since some elements of land use are linked with tourist request and the development of tourism is good to promote the region by local and international tourist agencies. The topic of sustainable tourism should be an important topic of discussion.

8. Supporting the continuity of local events and processes. Festivals and events in the villages and/or settlements organized by local associations, should be strongly supported by national and local authorities.

9. Information point in the national parks. Establishment of Museums and information centres in the area.

10. Use of new technologies. Use of social web instruments and new ICT solutions allow the exchange of good practices, through a widespread involvement of communities. All the produced material should be used for the diffusion of information and especially for educational activities.

11. National days of Lagoons The organization of an annual event aims at transmitting and promoting the common cultural values related to nature protection. Should be organized campaigns of information on the history, traditional instruments of wetlands use and biodiversity use. Furthermore, conferences and seminars should be organized with the purpose of disseminating deep knowledge related to nature protection.

12. International collaborations for exchanging good practices. New partnerships and collaborations between community members, business in the area, individual artisans (butchers), artists and institutions shall

strengthen cultural, social as well as economic skills of the owners in order to strengthen the international network based on the nature protection to spread and share values related to sustainability.
Link's resilience, smart growth, low-carbon urbanism, climate-friendly cities, sustainable development in transition cities, being all these concepts crucial to improve effective climate policies.
Includes number of case studies showing how cities, different in size, geographical, cultural and economic context are currently dealing with environmental issues.
Provides strategic and operative guidelines to overcome barriers and critical issues emerging from current practices, promoting cross-sectorial approach to counterbalance climate change.
Take urgent action to combat climate change and its impacts.
Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries. (Linked with the goal 13 of SDG 2030,).
Conserve and sustainably use the oceans, seas and marine resources for sustainable development. (Linked with the goal 14 of SDG 2030)
Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss. (Linked with the goal 15 of SDG 2030)
Unravels individual behaviors and national policies about global warming by evaluating motives and incentives.
Provides an economic analysis of the ways individuals makes decision faced with climate change.
Details a full range of alternative economic and policy responses, placing them in an integrated conceptual and policy framework.

THE DEVELOPMENT OF PREFECTURES IN ALBANIA

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Abstract
The purpose of this paper is to give a short description of the history of Prefectures in Albania, their development and their competencies.
During the last three decades, Albania has been facing with many changes and challenges. Even the Territorial-Administrative Division of Albania has undergone numerous and continuous changes, both in terms of geographical spread, as well as in terms of functions and structures. These changes can be presented in two stages, with a dividing line the year 1991.
Prefectures are one of the most important institutions operating at the central level in Albania. The Prefect, as a direct representative of the Council of Ministers at the regional level, is the only institution of the Central Government that controls and verifies the legality of the decisions of Local Government Units. Actually, in Albania there are currently 12 Prefectures according to the new Territorial-Administrative Division, based on the division by regions and prefectures.
The role of Prefectures has been strengthened during the years. In the implementation of the Sectoral Strategy for Decentralization and Local Government 2015-2020, the Prefectures play an important role in the coordination of activities between central and local government.

Keywords: prefecture, administrative division, functions, competencies, central government.

I. Introduction

During the last three decades, Albania has been facing with many changes and challenges as well. One of those is the Administrative Division, both in terms of geographical spread, as well as in terms of its functions and structures. These changes can be presented in two stages, with a dividing line the year 1991.
Prefectures are one of the most important institutions operating at the central level in Albania. The Prefect, as a direct representative of the

Council of Ministers at the regional level, is the only institution of the Central Government that controls and verifies the legality of the decisions of Local Government Units.

Actually, in Albania there are currently 12 Prefectures according to the new Territorial-Administrative Division, based on the division by regions and prefectures. Law 107/2016 has positioned the Prefect in the role of a working coordinator and the centre of cooperation between central and local units. Based on this law, the mission of the Regional Prefect is to fulfill the obligations to guarantee the implementation of the political program of the Council of Ministers, at the regional level, but also as a balancing intermediate party.

The Prefecture is the only administrative institution that verifies the legality of acts approved by local government bodies, municipalities and regions, according to the provisions of Law 139/2015 "On local self-government units", that is one of the most important laws regarding LGU. They play an important role in the economic development and are both responsible for attracting, fostering and retaining investments in their territory.

2. A historical overview of territorial administration in Albania

The Territorial-Administrative Division of Albania has undergone numerous and continuous changes both in terms of geographical spread, as well as in terms of its functions and structures.

These changes in the Territorial-Administrative Division can be presented in two stages, with a dividing line the year 1991:

- ***Before 1991***, starting from the declaration of independence until the coming of democracy.
- ***After 1991***, which coincides with the most important democratic changes in Albania.

2.1 The territorial- Administration before 1991

At the beginning of the first stage, the five-centuries influence of the Ottoman rule is noticed, where the Albanian territories were divided into four "vilajete". They were then divided into "sanxhaxhë" and "kaza". This form came from the legacy of the Ottoman administrative division (Dervishi,K.2006).

The Declaration of Independence of Albania in 1912, led to the creation of an independent state, which led the necessity to create a new local administration. The first government accepted the organization of the

"Kanun of the Civil Administration of Albania" in 1913, according to which the country was divided into 10 prefectures. At the head of the prefectures stood the prefects and next to him the Administrative Council, which limited its power. As sub-units were the sub-prefectures, which were run by the Deputy Prefect. On the other side, there were the provinces, which were run by the Head of Province (Dervishi, K. 2006).

The Conference of Ambassadors held in 1913, imposed the Organic Statute of Albania and its division into 7 prefectures.

In 1928, the functions of prefectures and sub-prefectures were sanctioned in the "Organic Law" of the Ministry of Internal Affairs. In this law, the Prefect is defined as:

"The highest official of the Executive Authority and Representative of all ministries, with the primary duty to declare and implement all laws and regulations of the state, to implement the orders and orders of ministers, to ensure calm and the private rights of the people, to control the municipalities, various commissions and societies and other tasks of economic and cultural development in their region"[1].

These models of territorial-administrative division have in common the fact that the prefecture has been considered like an "*extended hand*" of the Central Government, in order to fulfill its duties and accomplishments in a certain or specific territory.

2.2 The territorial- Administration after 1991

The second stage began in 1991, after the fall of the communist regime and the democratic changes. The first territorial-administrative division after the democratic changes was carried out in 1992 according to VKM no. 269, dated 25.06.1992 "On the administrative-territorial division of the Republic of Albania".

In 2000, the other administrative division was approved, with law no. 8653, dated 31.7.2000 "On the administrative-territorial division of local government units in the Republic of Albania" where no change was made from the previous division. This division is as a result of the historical developments of the Albanian state.

In this way the division was approved with:

- 65 municipalities,
- 308 communes
- 12 regions

[1] Baki Bala: Këndvështrim mbi institucionin e Prefektit, 2019.

This division is not based on any particular study related to supporting factors that would affect the improvement of the situation. This allocation or division was not effective as the system of municipalities burdened the State Budget, could not generate revenues and could not provide the proper and effective level of service to the citizen (Bala, B. 2019).

The last division coincides in 2014, with the decision of the Albanian Parliament, which approved the new administrative-territorial organization that provides for the division of the country into:

- 12 regions,
- 61 municipalities (and other administrative units)

This division was provided from law 115/2014 "On administrative-territorial division of local government units in the Republic of Albania". So this division focuses only on ***municipalities*** as an integral part of local government and ***counties***, as an integral part of local and central government.

Figure 1. Albanian Territorial-Administrative Division
Source: UNDP Albania

The Constitution of Albania, specifically in the Article 108, states that *"administrative-territorial divisions of local government units are determined by law on the basis of common economic needs and historical tradition."* Therefore, the new territorial division had this major function: **the fulfillment of economic and social needs** (Bala, B. 2019).

However, even after so many years of adoption and implementation, this territorial reform is still incomplete and is characterized by a process of complementary measures, which has been accompanied by the adoption of Law no. 139/2015 "On Local Self-Government", Law no. 68/2017 "On the Finances of Local Government Units" and a series of other acts with a regulatory character.

Obviously, the whole system of financial management, territorial jurisdiction and other legal competencies regarding the municipalities, have been reformulated with a new legal framework.

In fact, there are a number of other issues, which have been addressed through administrative-territorial reform[2]:

- The high fragmentation of the country - 20% of the population of Albania live in 232 LGUs or over 75% of the total LGUs, have less than 5,000 inhabitants - results in very high costs in providing basic services to citizens;
- Limited human capacity often faced by small local units, resulting in inability to exercise local functions, generate and accumulate revenue and provide services;
- The process of halving the administrative and fiscal decentralization, to some extent due to low local capacities, but also due to frequent and chaotic interventions in the legal basis, reduction of fiscal autonomy and financial non-coverage of mandates for joint functions;
- Unclear role of regions / prefectures as coordinators and supporters in the exercise of local functions;
- The need for an internal regional development policy that meets the requirements of EU integration and the need for multi-level governance, including regional governance; etc.

Currently, according to this division, there are 12 Prefectures in Albania (in the head is the Prefect), based on the division into regions or counties.

[2] State Control, 2018, "*The functioning of Municipalities, in the administrative-territorial reform framework*"

Their functioning is based on Law 107/2016 *"On the Prefect of the Region"*, which presents the role of the prefect of the region, his mission and competencies in fulfilling his duties, as a representative of the Council of Ministers, at the regional level.

3.1 The etymology of the word "Prefect" throughout history

If we go back to the etymological meaning of the word "Prefect", it comes from the Latin "praefectus" which is a derivative of the verb "praeficere", which is composed of "prae", which means forward, and "facere", do. In Roman history, this term referred to those public officials who performed duties at a high military and civilian level, a function delegated to them by high authorities or by the Emperor himself.

In the Imperial Law, the figure of the Prefect of the rank of military leader appeared, with various duties such as governing the imperial provinces and exercising urban administrative duties. During the empire, he was the head of the city police, who was tasked with maintaining order in the city. Later came other prefects appointed directly by the Emperor with powers comparable to those of a prime minister in the area, giving him the mandate to judge.

In the post-Roman period the Prefect reappeared in France, under the imperial regime of Napoleon Bonaparte. The role of the Prefect at that time was the highest representative of the central government, as the chief administrator in a department, which can be compared to a county (Bala, B. 2019).

According to the Royal Decree in Italy of 1861, it was determined that the governors of the provinces were to receive the title of Prefect and the government advisers, that of the Prefect's advisers. The great importance of the Prefect at that time was clearly understood, in fact he had more power than a Minister. In the period of fascism, the Prefect became the key instrument to ensure the bureaucratic centralization of the state and the local implementation of political directives. After the fall of fascism, the removal of the function of Prefect was demanded because it was considered contrary to the principles of liberal democracy. However, the 1948 Constitution did not abolish its function, but limited its power (Bala, B. 2019).

3.2 The concept of "Prefect" in Albania after the 90's

After the democratic changes and the approval of the Constitutional Provisions, the territorial division was made into 12 Prefectures, which was

crystallized in the first law for prefectures, specifically in Law no. 7608, dated 22.09.1992 "On Prefectures".

According to this law, the Prefect was positioned as the de facto representative of the Council of Ministers in the territory. According to article 1 and 2 of this law, it is defined as: "In order to coordinate the activity of ministries and other central institutions in the administrative-territorial units, as well as to control the legality of acts issued by local government bodies, prefectures are created. The number, the territorial extent and their center were determined by the Council of Minister. The head of the prefecture is the Prefect and he is the representative of the government in the local plan" (Bala, B. 2019).

This law was drafted in this way due to the historical context and the strong control of the central government over the local one, which is still fragile. According to this law, the Prefect took considerable powers and responsibilities.

In 1997, this law underwent some significant changes that were crystallized with the new law no. 8209, dated 22.04.1997, which aimed to reduce the power of the Prefect compared to that of the ministers. According to this law, the Prefect was appointed by the Council of Ministers but on the proposal of the Minister of Interior.

He had the following responsibilities:

- Verifies and monitors the legality of local government units decisions
- Controls and takes the adequate measures in order to implement all the decisions or other acts of the Council of Ministers
- Monitors and takes the adequate measures in cooperation with the police to ensure law and order in the territory
- Controls the implementation of the state budget
- Coordinates the activity of local and state administration services at the local level
- Takes care of the good administration of all economic, cultural, natural and historical resources
- Is responsible for preparing and taking protection measures against natural disasters.

3.3 The role of the Prefectures today, after the territorial-administrative division

Prefectures are one of the most important institutions operating at the central level in Albania. The prefect, as a direct representative of the

Council of Ministers at the regional level, is the only institution of the central government that controls and verifies the legality of the decisions of local government units. The prefect of the region (county) is appointed and dismissed by the Council of Ministers, on the proposal of the minister of interior[3].

In Albania there are currently 12 Prefectures according to the new Territorial-Administrative Division, based on the division by regions and prefectures.

Law 107/2016 has positioned the Prefect in the role a working coordinator and the center of cooperation between central and local bodies. Seen in this point of view, the Prefect is like a balancing intermediate party.

However, the role of the Prefect has been interpretable over the years or has been subject to many discussions or interpretations by both central and local government units.

Law 107/2016 "On the Prefect of the Region" is the law which presents schematically the mission, purpose, functioning and competencies of the Prefect, and consequently of the institution he represents, the Prefectures.

This law consists of 5 chapters and 26 articles and regulates the relations of the prefect of the region with the bodies and institutions of state administration, with the bodies of local self-government units, territorial branches operating in the region and with other state institutions. Based on this law, the mission of the regional prefect is to fulfill the obligations to guarantee the implementation of the political program of the Council of Ministers, at the regional level.

However, the mission and purpose of the Prefect and of the Prefectures cannot be understood, without the functions and responsibilities defined in this law. In this context, the Prefect and the institution he represents, must have the appropriate authority to carry out the tasks on time and at the required level. Authority and responsibilities are interlinked in order to effectively achieve the mission of the Prefectures.

The relations between the prefect of the region and the bodies of local self-government are regulated according to Law no.107/2016, specifically:

1. There is an independent relationship between the prefect of the region and the bodies of local self-government.

2. The relations between the prefect of the region and the bodies of local self-government are based on the principle of consultation and cooperation for the solution of common problems.

[3] Law no.107/2016 "On the Prefect of the county'

The Prefecture is the only administrative institution that verifies the legality of acts approved by local government bodies, municipalities and regions, according to the provisions of Law 139/2015 "On local self-government units" and on the Law no. 107/2016 "On the Prefect of the Region".

4. Conclusions:

- During the last three decades, Albania has been facing with many challenges, closely related to historical, political, social and economic events, that required numerous and continuous changes even in the Territorial-Administrative Division of Albania, as well as in terms of functions and structures.
- The role of the Prefect and Prefectures has been strengthened over time, to the level of its treatment as a direct representative of the central government at the county level.
- Prefectures are one of the most important institutions operating at the central level in Albania. The Prefect, as a direct representative of the Council of Ministers, is the only institution of the Central Government that controls and verifies the legality of the decisions of Local Government Units.
- In relations with local government institutions, the control of the legality of the acts taken by them is the main task of the Prefectures. The control of legality is a primary competence that highlights the important role of the Prefect and his administration, in such a way as not to allow the passage of decisions that are contrary to the law.
- The effectiveness of the role of the Prefectures, in fulfilling the obligations and commitments that guarantee the implementation of the political program of the Council of Ministers at the county level, is not at the right level, a position attributed to Law 107/2016 "On the Prefect of the County".
- In Albania there are currently 12 Prefectures according to the new Territorial-Administrative Division, based on the division by regions and prefectures. Law 107/2016 has positioned the Prefect in the role of a working coordinator and the centre of cooperation between central and local units.
- There is an independent relationship between the prefect of the region and the local government. This relationship is based on the principle of consultation and cooperation for the solution of common problems.
- In the implementation of the Sectoral Strategy for Decentralization and Local Government 2015-2020, the Prefectures play an important role in

the coordination and coordination of activities between central and local government.

Bibliography

1. Bala, B (2019): *"Perspectives regarding the institution of Prefect"*.
2. Dervishi, K.(2006): *"The history of the Albanian State 1912-2005"*
3. Mita, R., Lumi, E. (2015) : Aspects of the development of the Prefecture of Elbasan (Albanian Prefecture) in the Albanian Monarchy, Working Paper, European Scientific Journal October 2015 /SPECIAL/ edition Vol.1 ISSN: 1857 – 7881 (Print) e - ISSN 1857- 7431
4. Nako, N. (2013): *"Reforms of Administrative Division"*
5. Shkodra Prefecture (20018): *"Internal regulations of Shkodra Prefecture"*.
6. State Control (2018): "Performance Auditing, functioning of Municipalities according to the Administrative-Territorial Division".

MANAGEMENT OF SECONDARY REVENUE IN HEALTH CENTERS

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Abstract

The purpose of this paper is to give a short description of the function of the Health Centers in Albania, as well as the introduction of secondary revenue management.

The Health Center is the primary service institution, ëith public funding, non-profit, which is responsible for the entire network of service providers that depends on it.

The Health Center has the obligation to implement the Albanian legislation, bylaës in force, instructions and orders issued by the Ministry of Health, the Operator of Health Care Services, the Compulsory Health Insurance Fund and the local health authorities authorized by the Ministry of Health.

The health center is committed to providing the community with high quality, complete, continuous, integrated and accessible health services.

The health center offers free primary health care services as well as other specialized paid services, from which secondary revenue are obtained for the financing of the center.

The health center has the right to use the secondary income after receiving the approval of the relevant institutions.

Keywords: health center, health care services, secondary revenue, management.

Intrudaction

The Ministry plays the main role in the Public Health System in Albania of Health which is the drafter and responsible for the implementation of policies and strategies of the health system, for the regulation of its

functioning as well as for the coordination of all actors within and outside the system.
The diagnostic and curative health service is organized at three levels: primary service, secondary hospital service, and hospital terciar. Public health and promotion services form the basis of the activity of the Institute of Public Health, which is the institution single state under the Ministry of Health that provides
the most qualified expertise in the above fields. With the exception of Tirana where the primary health care is organized and operates on the basis of the Regional Health Authority (ASHR), in all other regions there are Health Directorates Public (DFS) and Regional Health Directorates (DRA) in it 12
centers of 12 regions in Albania. The Public Health and Regional Health Directorates coordinate
all health services in primary care of each district. Health centers function as autonomous units, which are
contracted for the health services they provide through the scheme of Compulsory Health Insurance and Basic Package of Services of Primary Care.

Methodology
The methodology followed is based on the first and second research.
The second data is the result of a review of a foreign and domestic literature, regarding the organization of the health system, other packages offered, as well as financing and fund management systems for an ever-increasing performance. In the analysis of this literature, the main dimensions of the orientation of primary health care were identified, as well as the financial management practices of the Health Centers, practices which appear in detail for the Health Centers in the region of Shkodra.
Primary research is based on analytical research through interviews.
The interview was conducted in advance with the help of economists and doctors, staff of these centers.
The purpose of this paper is to present a general health function in the Primary Health Care sector as well as a health center funding, focusing on secondary income menagement.

Financing of Health Centers
The Health Center is funded by:
a) Ministry responsible for health

b) Compulsory Health Insurance Fund;
c) Other sources according to the legislation in force.
Other sources of financing of the centers according to the legislation in force, defined as secondary income, represent:
- Fee to be provided with anamnesis certificate and medical certificate for activities allowed with weapons (order no. 402,2015)
This service started to be offered by family doctors in 2015 and with a fee of 1500 ALL.
- Fee to be provided with the medical examination form for driving license of motor vehicle (instruction no. 205,2015)
This service started to be offered by family doctors in 2015 and with a fee of 1000 ALL.
- Fee for obtaining a health booklet,
This service started to be offered by family doctors in 2017 and with a fee of 100 lek, experiencing a decrease from the value of 500 lek that had before this year.
- Fee to be provided with a work ability report.
This service started to be offered by family doctors in 2019 and with a fee of 200 ALL.
These fees are collected directly in the bank account of the health center.

Secondary income over the years and opportunities for use
Over the years, the demand for health services outside the package of Primary Health Care services has increased, services listed above, which benefit income used entirely by the center itself.
The table below shows the increasing trend of secondary income, for 20 health centers of Shkodra region, for the years 2018,2019,2020.
Table 1: Secondary revenues accumulated in the last three years for 20 health centers of Shkodra region.

Years	Revenues (000)
2018	9,450
2019	9,587
2020	9,713

Source: FSDKSH reports

The use of these revenues is done as follows (instruction no. 10, 2019):
a. Salaries and benefits of employees, 20% of the total amount,
b.Investments, 40% of the total amount.
c.Goods and services, 40% of the total amount.

Analysis	Name
	SHPENZIME PËR SIG.SHËNDETËSORE
600	**PAGA, SHPËRBLIME E SHPENZ. TJERA PERSONELI**
6001	***PAGA TË PERSONELIT TË PËRHERSHËM***
6003	***SHPËRBLIME***
6003100	SHPËRBLIME PËR REZULTATE NË PUNË
6003900	TË TJERA SHPËRBLIME PËR PERSONELIN
602	**MALLRA DHE SHËRBIME TË TJERA**
6020	***MATERIALE DHE SHERBIME ZYRE DHE TE PERGJITHSHME***
6020100	KANCELARI
6020200	MATERIALE PËR PASTRIM, DEZINFEKTIM, NGROHJE DHE NDRIÇIM
6020300	MATERIALE PËR FUNKSIONIMIN E PAJISJEVE TË ZYRËS
6020400	MATERIALE PËR FUNKSIONIMIN E PAJISJEVE SPECIALE
6020500	BLERJE DOKUMENTACIONI
6020900	FURNIZIME DHE MATERIALE TË TJERA ZYRE DHE TË PËRGJITHSHME
6021	***MATERIALE DHE SHERBIME SPECIALE***
6021001	UNIFORMA DHE TË TJERA VESHJE SPECIALE
6021003	ILAÇE DHE MATERIALE MJEKËSORE
6021099	TË TJERA MATERIALE DHE SHËRBIME SPECIALE
6022	***SHERBIME NGA TE TRETE***
6022001	ELEKTRICITET
6022002	UJË
6022003	SHËRBIME TELEFONIKE
6022004	POSTA DHE SHËRBIMI KORRIER
6022005	SHËRBIM PËR NGROHJE
6022006	SHËRBIME TË ISSH PËR FSDKSH
6022007	SHËRBIME BANKARE
6022008	SHËRBIME TË SIGURIMIT DHE RUAJTJES
6022009	SHËRBIME TË PASTRIMIT DHE GJELBËRIMIT
602201	SHËRBIME TË PRINTIMIT DHE PUBLIKIMIT
6022011	KOSTO E TRAJNIMIT DHE SEMINAREVE
6022099	SHËRBIME TË TJERA
6025	***SHPENZIME PËR MIRËMBAJTJE TË ZAKONSHME***
6025300	SHPENZIME PËR MIRËMBAJTJEN E OBJEKTEVE NDËRTIMORE
6025500	SHPENZIME PËR MIRËMBAJTJEN E APARATEVE, PAJISJEVE TEKNIKE DHE VEGLAVE TË PUNËS
6025600	SHPENZIMEVE PËR MIRËMBAJTJEN E MJETEVE TË TRANSPORTIT
6025800	SHPENZIME PËR MIRËMBAJTJEN E PAJISJEVE TË ZYRAVE
6026	***SHPENZIME PËR QIRAMARRJE***

6026100	SHPENZIME PËR QIRAMARRJE AMBIENTESH
6026300	SHPENZIME PËR QIRAMARRJE PËR APARATE DHE PAJISJE TEKNIKE, MAKINERI
6026400	SHPENZIME PËR QIRAMARRJE MJETESH TRANSPORTI
6026900	SHPENZIME TË TJERA QIRAJE
23	**SHPENZIME PËR RRITJEN E AKTIVEVE TË QËNDRUESHME**
231	***SHPENZIME PËR RRITJEN E AKTIVEVE TË QËNDR. TË TRUPËZUARA***
2312101	SHPENZIME PËR NDËRTESA ADMINISTRATIVE
2312118	SHPENZIME PËR OBJEKTE TË TJERA NDËRTIMORE
2314110	SHPENZIME PAJISJE DHE INSTALIMI TELEKOMUNIKACIONIT
2314130	SHPENZIM PAJISJE QË SIGUROJNË ENERGJI
2314160	SHPENZIME INSTALIMI SIST. KOMPJUTERAVE
2314170	SHPENZIME PAJISJE DHE INSTALIMI I KONDICIONERËVE
2314180	SHPENZIME MAKINERI PRINTIMI DHE GRAFIMI
2314250	SHPENZIME PAJISJE PER MBROJTJEN NDAJ ZJARRIT
2314280	SHPENZIME PAJISJE PËR SISTEMIN E SIGURIMIT
2314290	SHPENZIME PAJISJE AUDIO-VIZUALE
2314320	SHPENZIME MJETE DHE PAJISJE TË TJERA TEKNIKE
2315120	SHPENZIME PËR MAKINA
2318100	SHPENZIME ORENDI ZYRE
2318400	SHPENZIME FOTOKOPJE
2318500	SHPENZIME FAKSE
2318600	SHPENZIME PAJISJE KOMPJUTERI
2318700	SHPENZIME TË TJERA PËPAJISJE ZYRE

Source: Contract QSH-FSDKSH 2021

The use of these revenues by the Health Centers is mainly focused on the purchase of equipment and furniture in order to improve the facilities where health services are provided, orientation signage, audio-visual equipment, adaptation of centers for people with disabilities and general maintenance. of buildings under the administration of health centers. Public procurements for secondary revenue source purchases must be approved in advance by the Regional Directorate of the Operator and the Regional Directorate of the Fund.

Conclusions

- PHC is an integral part of the country's health system, as a central part as well as part of the economic development of the community.
- PHC is the first level of contact of individuals, family and community with the national health system bringing health care as close as possible

to where people live and work, and is the first element of a process of continuous health care ".

- Health centers receive income from services provided outside the package of basic services, which are used entirely by the centers themselves.
- These revenues are increasing from year to year but their use has a narrow aspect.

Suggestions for future actions

- The use of secondary income should have a wider scope.
- To increase the independence of the Managers of the health centers and strengthens autonomy within primary health care centers.
- It is necessary to plan and build laboratories, near the main health centers, where minimal tests should be performed so that patients do not sorrolaten since the first visit to the doctor.
- Health centers need to increase capacity in cooperation with civil society organizations to absorb additional funds. By managing secondary resources together with additional funds, larger projects can be realized.
- It is very important that investments be extended to the improvement of the environment outside the buildings of the centers, for the benefit of the surrounding community.

Bibliography

1. United Nations, Annual Report on Primary Health, 2008.
2. *Gilson*, L. (*2003*). Trust and the Development of Health Care as a Social Institution. Social Science & Medicine, 56, 1453-1468.
3. Sen, A. (1999). Development as freedom. Oxford: Oxford University Press. Introduction.
4. Rogers,W. and Veale,B. 2003: Primary Health Care and General Practice, Department of General Practice Flinders University Bedford Park SA 5042 Australia.
5. Boerma W, Kringos D. Introduction. In: Kringos DS, Boerma WGW Hutchinson A, et al., editors. Building primary care in a changing Europe [Internet]. Copenhagen (Denmark): European Observatory on Health Systems and Policies; 2015. (Observatory Studies Series, No. 38.) 1. Available from: https://www.ncbi.nlm.nih.gov/books/NBK458731/
6. Order No. 402, dated 18.09.2015, Approval of standard forms of medical report for activities for weapons.
7. Instruction No. 205, dated 07.05.2015, Completion of the medical examination form for persons applying for a motor vehicle driving license.
8. Instruction no.10, dated 09.04.2019, On the use of the revenues realized by the health centers from their activity.
9. Reports - Department of Finance, FSDKSH, Shkodër.
10. Contract QSH- FSDKSH 2021.

FUND MANAGEMENT IN THE PRIMARY HEALTH CARE CASE STUDY: SHKODRA REGION

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Abstract

The purpose of this paper is to give a short description of the function of the Primary Health in Albania, as well as the channeling of funds in health centers.

Health care can vary in all countries and individuals , affected by social and economic conditions as well as health policies.

An efficient health care system can contribute to an important part of a country's economy and development.

Primary health care includes monitoring the health status of residents of different age groups and categories , in the progress of their health.

The services are organized and provided on the basis of health centers , according to the instruction of the Minister of Health. The health center operates and is administered based on the laws in force , the statute of the health center and the general regulation for the provision of the package of basic services.

Keywords: health center, statute, package of basic services.

1.Introduction

The right to health care is fundamental and is a right regulated by Albanian and International laws.

It is precisely the Constitution of Albania that recognizes this right for all its citizens and specifically in its Article 55 it is stated: "***The citizens***

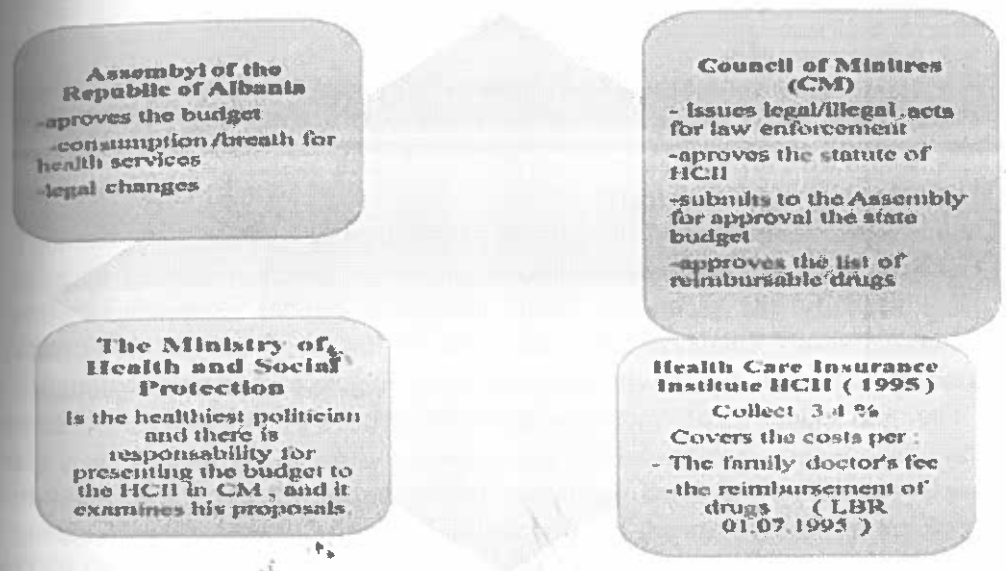
equally enjoy the right to health care by the state. Anyone has the right to health insurance according to the procedure set by law "[1]
A bold step towards creating a health insurance scheme was taken between Albanian and foreign experts, but remained at a low insurance rate of 3.4%, which was also insufficient to cover those few services that were included in the health insurance scheme.
Today, the Compulsory Health Care Insurance Fund (CHCIF) is the only public and autonomous institution that manages and develops the compulsory health care insurance scheme in Albania.
CHCIF finances health services from public and private providers, in line with national health care policies.

1. History of the development of the Health System in Albania

Prior to the declaration of Independence, health services were provided organized to maintain the combat capacity of the troops, while the rest of the population was mainly served by popular medicine .
During the reign of King Zog I . a limited public and private health system was created , with few opportunities to help many people in need. During this time was established the General Directorate of Health within the Ministry of Interior, as the first institution which for the law of all health functions.
The years of the Communist Regime were exactly the most difficult times of the Albanian health service where despite the fact that there were cadres and highly prepared doctors, hospital conditions, depreciated apparatus and scarce funding, made health treatment very difficult. Despite the fact that the health service continued to be declared free, in the first years after the fall of the communist system, there were basic shortages in drugs, the apparatus of everything else necessary for the treatment of patients.
The decision to set up an insurance scheme, as well as the debate over its creation, started precisely from the essential list of reimbursable drugs. The political decision to raise this scheme was limited to the list of reimbursable drugs and the inclusion of the family doctor in the health insurance scheme.
In this discussion, the Institute for Health Insurance (IHI) was born.
In December 2006, the Government decided to extend the scheme to the entire primary health service, with DCM no. 857 dated 20.12.2006 "On the financing of primary health care services by the compulsory health care

[1] Law no.8417 dated 22.11.1998 Constitution of the Republic of Albania.

insurance scheme "[2] BECI.A , BELISHOVA.A , KOLA.E (2015) *"Who pays - Financing of health services in Albania.* Tiranë 2015[2].
The decision determined the organization of primary health care based on health centers (HC) with the status of legal entity, public, not budgetary, not profitable, with independent budget, with their account number, with limited independence - which exercises activity under applicable law, of the statute of HC, of the general contract regulation, of the HC contract with IHI, of the individual contract of employees with the director of Health Center.



Scheme: Health system operators in Albania

With this DCM for Health Centers, a new management way was launched, which enabled self-planning, procurement of necessary goods and services. HC funding from health insurance is added to the revenue coming from the center's activity as well as donations.
Although approved in 2011 in Parliament, the FSDKSH (former - IHI) would function as such in March 2013, as the law provided for a 2-year transition period.

[2] BECI.A , BELISHOVA.A , KOLA.E (2015) *"Who pays - Financing of health services in Albania,* Tiranë, 2015.

FONDI
I SIGURIMIT
TË DETYRUESHËM
TË KUJDESIT
SHËNDETËSOR

2. Financing of Health Centers in Shkodra Region

Primary health care, being the first point of contact of the patient with the health service, are the basis on which the health system is based with the package of 7 basic services which it offers:

Basic service package
1. Emergency care
2. Health care for children
3.Health care for adults
4.Health care for women and reproductive health
5. Health care for the elderly
6. Mental health care
7.Promotion and health education

Traditionally, the secondary health system (Regional Hospital) has been dominated in Albania, and it is well known that health service users prefer to turn to the specialist, without going through general family doctors.
The introduction of multiple services and the delegation of some responsibilities, which forces the patient to enter the health insurance scheme, initially channeling to the family doctor, has begun to make his role more visible.
In the Sersover County there are 20 health centers, which are funded by the Regional Directorate of the Insurance Fund of Health Care Shkodër, and are managed by health policies by the Local Health Care Unit .
These centers are distributed as follows in urban and rural areas:

No	Health Care	No	Health Care
1	**Health care No.1**	*11*	**Gur i Zi**
2	**Health care No.2**	*12*	**Vig Mnele**
3	**Health care No.3**	*13*	**Hajmel**
4	**Health care No.4**	*14*	**Bushat**
5	**Vau Dejës**	*15*	**Bërdicë**
6	**Postribe**	*16*	**Velipoje**
7	**Pult**	*17*	**Dajç**
8	**Shosh**	*18*	**Ana e Malit**
9	**Shale**	*19*	**Rrethina**
10	**Shllak**	*20*	**Temal**

For the last 3-year-old, the finance of these health centers is presented as follows, showing the upward trend of the contracted budget from 2019 to 2021.

Në (000) ALL

No	*Year*	*Contracted budget*	*% of growth*
1	2019	350 480	
2	2020	360 284	*2.8 %*
3	2021	486 235	*34.96 %*
	TOTAL	*1 196 999*	

Funding table for centers for the last 3-year
Source: The Regional Directorate of the Insurance Fund of Health Care.[3]

This budget is contracted from the beginning of the year, and is distributed in equal 12-month quotas, financing each health center in its bank account at the beginning of each month.
The new calendar year of the new calendar year begins with a bank situation inherited from the previous year as a result of the annual accumulation of unused secondary atonements.
Each start played the bank account of each center is financed with the monthly budget by the Regional Directorate of the Fund according to the quotas determined according to the indicators of the annual budget.
With this monthly income the center copes with expenses in the three main expense accounts:
Account 600 "Payment and staff rewards", which include the salaries of employees of the structure of any center made by general practitioners, specialist doctors, nurses and support staff of: economist, sanitary and receptionist. Wage elements consist of payment in: basic salary , additional for the position , extra page for the director's fun, extra page for distance from the residence, extra pay for seniority at work, additional page for employees who are regulated by special acts . At the end of the year in this account, 5% of the annual salary fund is included as a reward, if the indicators determined by the Directorate for its benefit are achieved.
These wages change as an effect of the new Wage Guidelines, where the most recent change was made according to Instruction AC No. 19.01.2021

[3] ***Source: The Regional Directorate of the Insurance Fund of Health Care.***

"For some changes in Instruction No. 1 dated 03.05.2017, " For the payment and remuneration method for health center employees from the mandatory health care insurance scheme ", changed.
With this increase, the basic salary for the nurse was changed, the payment from the distance of housing for those who benefit from it as well as the payment per capita for the adult doctor, the pediatrician doctor and the specialist doctor.
I emphasize that the remuneration of employees who benefit from the Special Fund , is calculated as 5% of the annual salary factor fund and this reward can be obtained by employees according to a division realized by Internal Order , set up by the Director of the Center based on the realization of some measuring indicators that are: PHVP (visits for the first time) depitation for CA breast , chronicles , vaccination of children , treatment of patients with Diabetes, HTA and chronic disease, treatment of pregnant women and finally the realization of the projection of basic Check -Up).
***Account 601* "*Social and health insurance contributions*"** that the center handles for its employees, divided into: 15% social security contributions and 1.7% health insurance contributions.
They are declared through electronic declaration in E-services and are paid on behalf of Regional Tax Directorate (RTD) Shkodra until the 20th of the following month.
Account 600 "Payment and Remuneration of Personnel" and Account 601 "Social and Health Insurance Contributions" has recognized significant growth especially since 2020 in 2021 , with about 35% ,regulated this with the increase of salaries according to Instruction No. 1 dated 19.01.2021 for "A Some changes in Instruction No. 1 dated 03.05.2017 "On the manner of payment and remuneration for employees of health centers from the mandatory insurance scheme of health care, changed " .
For any additional information that may be required in accounts 600 and 601, it will be realized in official letter to Regional Directorate of Fund Shkodra .
Account 602 "Goods and Services", a voice which includes the coping with all costs of purchasing:

- Goods such as: chancellor, detergents, medicines and medical materials, disinfectants, office materials, purchase specific documentation, etc.
- Services such as: internet, maintenance of construction facilities, maintenance of computer system, maintenance of office equipment, DDD service, prints, etc

All these voices, with the exception of electricity and water , are procured as small purchases in the Public Procurement Agency , where the center is the Contracting Authority which makes the purchase .These goods and services are deemed to perform their function within the calendar year , otherwise the same item may be procured twice or more according to public procurement provisions.
Each item is defined as the need to detail the annual and monthly budget, approved by the Regional Directorate of the Fund in general in March of the year.
Each item is part of a well-thought-out planning both in monetary value and in the procurement period, while maintaining the principle of non-overcoming the monthly plan according to the budgetary distribution of the 3 items mentioned above.
For each of the items in this account, a change of procurement period, additional and reduction of the fund may be required once every 2 months in case of shortages / surpluses, always maintaining the total budgeting value of this account.
If for any item the expenditure is not managed to be borne, then the right arises to request the use of secondary or additional budget revenues through Regional Directorate of Fund - and Directirate of Fund inTirana.
If with the contracted budget at the beginning of the year the need for any of the items mentioned above of account 602 has not been met, then the right arises that this is required with secondary income that the center realizes through the collection of administrative actions with the respective fees as follows:

Nr	*Administrative action*	*Fee*
1	Vehicle driving certificate	1 000 ALL
2	Certificate gun hunting certificate	1 500 ALL
3	Health care book	100 ALL
4	Work skills	200 ALL

According to Instruction No. 10 dated 09.04.2019 "For the use of secondary income realized by the health centers of primary care from their activity" the division of use is as follows:

- Wages and benefits of employment, in the amount of 20% of the total amount.
- Investments 40% of the total amount

• Goods and services ,40% of the total amount.

The main advantage of this instruction was that already the health centers will be able to, with the accumulated money, to use the investment voice, which voice was not allowed to be done before with the budget indicators. Investment issues would also be the reconstruction of the centers, the investment in office equipment and the general regulation of infrastructure in the service of the patient.

3.Results and discussions

Undoubtedly health is the fundamental theme of every family and every home, concluding in what we expect as an exchange of what we pay insufficiently, we can say that in every of its link there is room for improvement .

What I want to promote and show today is the first of the smallest link of this system, where the role of the family doctor is effectively realized especially at this Covidian time.

Financing the health system remains in the context of financing in clearly defined quotas, but which is still a path that needs support.

The primary health service, despite the difficulties, has shown dynamism in the implementation of existing health programs. But the quality of medical services leaves room for improvement, generally in rural areas, where access is lower, so does medical infrastructure.

3. Conclusions

- ✓ Quality improvement is an essential object of the Government's strategy in the health sector .
- ✓ Active contributors make up less than a third of the active workforce, which speaks to a major evasion of contributions.
- ✓ Public services are trying to be clearly defined according to the numerous trainings in the information sector.
- ✓ The basic service package is being reflected in health centers giving priority to primary service.
- ✓ Management of funds in the health sector through the establishment of computerized systems remains a developing challenge.

4. Recommendations

- ➢ To develop quality of life promotion campaigns for patients, reducing the cost of hospitalization.

- ➢ To strengthen attention to health promotion through contemporary curricula.
- ➢ To improve health management in accordance with the autonomy of the primary service.
- ➢ Increase accessibility and credibility in the primary care service.
- ➢ Improve reward indicators according to well-defined protocols .

References

1. BECLA , BELISHOVA.A , KOLA.E (2015) *"Who pays - Financing of health services in Albania,* Tiranë 2015 .
2. Ministry of Health https://shendetesia.gov.al/
3. Agjencia e Prokurimit Publik www.app.gov.al
4. Government of Albania, Long-Term Strategy for Development of the Health System in Albania, July 2004
5. USAID Albania, Pro Health, Healthcare Financing and its reform in Albania, a situation analysis, March 2005.
6. OECD Health Data, 2004 (http://www.oecd.org/)
7. HANA.E (2009 *"Reforms in financing health care.Development of the health insurance system in Albania"*. Balkan Forum III Montenegro 2009.
8. HANA.E (2008). *"Challenges in health care financing from the compulsory health insurance scheme;Albania: a health reform system* . Balkan II Forum; Ljubljen 2008.
9. https://fsdksh.gov.al/wp-content/uploads/2021/04/RAPORTI_VJETOR_2020-DR-E-AUDITIT-TE-BRENDSHEM.pdf
10. https://fsdksh.gov.al/wp-content/uploads/2019/11/revista27.pdf

BUILDING OF LAW STATE THROUGH FREE VOTE

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Abstract

Can be testified that the political organization, pluralism and cultivation of political culture it is necessary for factoring the free and fair vote. In this work there are analyzed some of the reports of foreign observers who monitor the development of political processes, and the electoral process in the Republic of Macedonia.

Through this work it is elaborated the meaning of electoral rules, electoral code and international standards for the free and fair elections. The free vote, the equal vote, the secret ballot gives meaning to the votes' right, as a political right which belong to the series of the basic human rights, as a fundamental value of democracy for state building, starting from the ballot box. The free vote eliminates the political irresponsibility, creates basic conditions for competition, to compete with various alternatives, for cultivation of national and state values, in increasing the political ethics for understanding of the political activities.

Which is the readiness of political parties for accepting the European civilization values, in respecting the democratic values, for regular electoral procedures, without criminalizing the free vote. It is necessary the implementation of the law to prevent the electoral administration from fraud with electoral lists, with electoral materials, with registering and foreshadowing of the vote results.

Free elections are the basis from where the building of democratic state starts.

Key words: democracy, electoral right, pluralism, free vote, state

The structure and exercising of state power is legitimate, if the idea of law and justice, including the ethical values and standards that underlie these, coincide with those present in the society, over which the state exercises power, and are generally recognized by this society as being universal. All forms of state power require legitimacy/legitimating. (www.dadalos.org)

Identity: Being distinctl from others and the same only with itself in some feature that serve to recognize without difficulty as such, being the same.[1] It is an interesting history of unwanted term globalization. Only about ten years ago the word has rarely been used in academic papers and popular press. From nowhere, now the term is everywhere, not a political speech is complete, nor is a working manual acceptable without its reference. In order not to be apathetic, it is worth mentioning Lerner, who besides empathy, emphasizes the importance of rationality in politics, and that the future can be influenced by its own labour.

"Modern man considers the world changeable and believes that his/her activities can change something that his/her opinion deserves/ is worth".

The activities of politicians who are able to stimulate positive processes and their ability to tell the most important qualities that can be encouraging are expected to create space for political factors and party functional coalitions. In Macedonia, the political structures from the government and the opposition should create real conditions for harmonization of political activities and building of civic trust/confidence in all these integration activities within the country to promote forms of real dialogue in order to preserve the values of common interest regarding the EU integration. Political loyalty and disloyalty The notion of Loyalty as a civil obligation is challenging and important phenomenon. Thonnberry Patrick offers an interesting explanation when he says:

"There is no doubt that loyalty is directly linked to equality and non - discrimination before the law, but even more it should be provided by reducing the factors that create sense of actual discrimination and insecurity". Regarding loyalty to the state and non loyalty, a great significance has been attributed to the state/public function which is managed officially by a person/an individual. Possible disagreements of this kind or concerns should be explained, because building the policies relating to the functioning of the political institutions is directly related to the functioning of the party coalition, because they constitute the structure of the government. The dilemma for non loyalty to the state on the one hand and loyalty to the party on the other hand with which the pie of responsibility for managing the state is shared, is an issue that should be analyzed among the leaderships of the political parties in question.

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[1] Human identity (Dictionary of Modern Albanian Language, Renaissance, Pristina, 1981) 310 E. Giddens, The Third Way, Recovery of Social Democracy, Skopje, 2002,

Pre – Macedonian - Albanian coalition If we analyse in detail the election programmes of the political parties in Macedonia, from 2002 to 2011312 it can be noted that almost all of them contain the major campaign issues that our country faces, and they include: the character of the political order of the state/ the nature of the political system of the country; the functioning of the state law/the rule of law and protection of fundamental values; the Euro - Atlantic processes and the entry of Macedonia in NATO and EU; the economic system and policy development; the social and residential policy; international relations; Relations between Europe and the Balkans and Macedonia's place in those relationships etc. Nowadays it is hard to think that politicians who were part of the government, thought about managing and building policy in view of dichotomies and measures such as the essential and non essential, primary and extra, irrelevant and declined. Even fewer knew how to precisely define what is higher priority and major national interest in order to receive common political values. We have seen building of serious policy movements with disappointing results, patriotic collusion to stage political actors. Preservation and affirmation of the material and spiritual heritage, encouragement and affirmation of ethnic diversity and diversity in culture, encouraging youth creativity, continuity of traditional cultural - artistic events should be promoted. Multiculturalism, according to [2]

Election platforms for parliamentary elections in Macedonia elections 2002 SDS, there is hope for Macedonia, DUI winners along with you, VMRO DPMNE, Macedonia is a reality, DPA wish west, Skopje, August-September 2002

Habermas, cannot be reduced to separate existence of cultural ghettos, closed and sufficient to themselves.In fact, the aim of linguistic, ethnic, and religious, cultural, political tolerance is to realize the creative person's resources without hurting anybody. Tolerance is a supreme model of human ethical behaviour, the affirmation of love, understanding, generosity and dialogue. It is not denying the other, nor bullying, it is denial of moral norms. Today there is worldwide interest in religion - Gulen says "I think the representation of the religion with its true values is even more important than before.

In this context I would like to remind the ideologists if they are true architects of the project "Skopje 2014" that the architect does not lead a battle against time, but he collaborates with time. The best defence for their

[2] Thonbery Patric, Minorites Rights, Human Rights and Internacional law, Etnic and Racial studies, 1980.

project would be when they would admit that they were wrong and that political directive for such construction does not reflect the true past of the centre of Skopje.

My idea is a recommendation that they learn something about Peter Hofshteter, summarising the thoughts of Le Bon, when he says — to be raped, by leaders, heads of advertising, propagandists and deceivers - It seems is the main desire of the table, and, where they do not rape, wants to be sleeping in apathetic slumber, by offering banal superficiality." This can be supported by the analysis of the political scientist Arend Liphart relating to democracy and access to the instruments of power. In the case of Macedonia, from 1992 and before that, in the Assembly and the Government there were Albanians and other national/ethnic communities. It is another question to what extent and at what coalition platform the party actors determined and adjusted the policies for division of the state functions. Party coalition partners, present and future, should seriously discuss this issue. From a political perspective it is possible for the democratic states to be successful in providing a relaxed situation if there is a stable coalition between the leading parties in all segments of the pluralistic society, and consequently in the division of the managerial positions in (the public/stateowned) institutions.

Political browsing analysis should provide clarification for current coalitions among Macedonian and Albanian parties whose aim is primarily forming/establishing a government and therefore the need to achieve the required majority of votes.316 Such practice proved unsuccessful and a basis for potential conflicts without proper functional policy. Therefore, in future, VMRO - DPMNE, DUI, SDSM, DPA and other parties, relying on the constitutional provisions, should start thinking about pre- election coalitions with political platforms. So, future winners of the elections would have the election platform as a government project. Such government program would be more transparent and more feasible because it would have accepted both the Macedonian and the[3] All things have a tendency to help. Almost all of the things help the man - the breath, the water, the fire, the earth, the sun and the sky, like the cells, the part and the system of human body that help to realize his life. The things help the plant

[3] 313 Хабермас, за толеранцијата и мултикултуралноста (повеќето наводи во текстов се од "Ле Монд" од 8 ноември 2002, цитирано Дневник, Скопје, 18 март 2006 314 M. Fethullah Gülen: Humanism and Love for Humanity, in :Toward a Global Civ ilization of Love and Tolerance, op. cit., p. 8. Gulen explains the altruism and help of each other in the world as an expression of its essence and general love.

life and the other live beings as well. That magic and ordained life cooperates and help each other.[4] Parliamentary elections in Macedonia. [5]

Albanian voters

This is my thought so far based on a political argument. Albanian voters - in the last parliamentary elections did not vote for DUI for it to be enforcer/an implementer of party projects of VMRO - DPMNE. DPA were in a similar situation in the past. They could not represent the interests of their electorate/constituency. Building such coalitions should focus on intellectual labour, rather than on patriotic campaigns. Tolerance in politics is achieved if it is democratic, then depending on the extent to which it represented the interests of citizens and how credible the election platform is. For the violence and the lack of tolerance, Vaclav Havel, writer and former president of the Czech Republic, highlights: " Violence is injustice for a human being. Intellectuals have the right to think of the future, to imagine what it would look like. But their task, their main priority, I think, is to understand the present and to understand its crises and grant them a name. This is how true awareness about the perspectives was conceived .
In Macedonia, it seems, people are prone to being easily influenced in terms of creation of their political opinion and acceptation of the the popular dance of political populism, while the unpredictable game / objective is to maintain "national populist balance". For that purpose there is an excessive reliance on the historical past. In that direction in our country a more prominent phenomenon is the party individualism among the ruling structures and the opposition with the absence of incentives that will develop consensual spirit. They might be real, while some estimates from diplomatic circles indicate that it might be a diplomatic tension where party games can serve as a good scenario for political acting. What would be the implications of the possible pre-election coalition between VMRO - DPMNE, DUI, SDSM or DPA or any other party of Albanians and other national communities? Will these election coalitions impose another perception on the political careers of politicians who would accept such pre - building policy? Perhaps this kind of thinking among the political actors will mean termination of offering populist policies and the failure of

[4] M. Fethullah Gülen: Understanding and Belief: The Essentials of Islamic Faith, op. cit., p. 6. 315M. Fethullah Gülen: Dialog in the Muhammadan Spirit and Meaning, in: Toward a Global Civilization of Love & Tolerance, op. cit., p. 73. 316.

[5] L. Hristova, electoral behavior of the citizens, p. 51-71, Institute for Sociological Political and Juridical Research, Skopje, 1999.

campaign promises will stop conflicting governmental coalitions. That is, the Albanian party leaders will show political motive to stop the practice Albanians in the Macedonian Government to represent just a number, not the weight in deciding about the appointment of the state authorities. Those same politicians or leaders of parties that have so far proved to be good negotiators to form government coalitions need to overcome themselves and become actors for making pre - election coalition platforms. We should not forget that the electoral coalition programs should contribute to overcoming interethnic polarizing and politicizing. It should be emphasised that politicians have a level of responsibility in terms of preservation of human conscience and therefore they should protect their activities from uncontrolled political statements during elections and other public appearances. Pre interethnic party coalitions would reduce the euphoric actions of politicians, whose performances are often without reasonable background / explanation. Political communication and the search for political identity The impression from the many factors in the information contained in the news relating to our Balkan and Albanian - Macedonian occasions; negativity represents a complicated sequence of priorities. Media are used to promote inter-party communication and political, economic, social and cultural priorities. However, it still remains as an issue to identify the values that will distinguish and define the framework of the ethics of responsibility. We had and we still have moving policy priorities in inter party political arena and in the current situation as part of party elites, which seem to wish[6]
To understand this, we should accept the rule for real framework in information. "Comments are free but facts are sacred", so reads the journalistic maxim often promoted by Klaus Shonbah. Unfortunately, inadequate performances with diplomatic contradictions are inherited from partisan diplomatic arena. But one thing is certain - political behaviour is an art and a skill that adds a style of diplomatic communication. Diplomatic communication is a value. Therefore, I would use the thought/quotation of Hartmann saying "A person does not constitute values, but values constitute the personality of an individual."
It is time for civil action by the parties In building a common political value and respect for the state and its fundamental values, citizens are in

[6] Nazmi Maliqi, Political tolerance in the function of peace, the Foundation Friedrich Ebert - Skopje, 2003 372 to confirm the journalistic factor of informing when he says that "The more negative an event is, the better/the more attractive it becomes as subject for the news reports."

anticipation of having more prospects. In building public policy, change is expected in the intentions and actions of political leaders. Citizens cherish their hopes having confidence in the political elite and the emergence of new individuals with new messages and standards that will bring freshness and new reality in the political behaviour. A new way of political communication, not burdened with the current and often manipulative politics that causes mistrust, poor perceptions of personal safety, poor perceptions of politicians that disrupt the relationship: politics - values - ethics, rights and obligations.

The idea of institutional tool of obligation (responsibility/accountability) should be understood as a roadmap for strengthening a political project capacity for compliance with the laws, whilst the politician and politics should mean trust and confidence among citizens. The key question is how among the party, particularly among government officials public accountability can be operational. Chronology indicates that significant amount of time has been wasted on conflicting partisan majorities with Albanian parties to form coalition governments applying the manipulation of numbers. Therefore, a political analysis for building a political statement with clear and firm arguments/position can reveal a political thought regarding the issue of which Albanian politicians should be involved in the further actions of one political party and grouped into an early or late majority. Otherwise, if combinations are made of, relatively speaking, Macedonian and Albanian block parties political alternatives tend to become obscure. Today's politicians act in time that does not allow modification or confusion of values.[7].

Conclusion

If one insists on building a political identity, relying predominantly on mythology, then it can be viewed as an indication that there are constant attempts to build a future of national, cultural, [8]To avoid building the idea

[7] EU remains consistent in the strong/strict message regarding the independence of the judiciary, improving the efficiency of public administration, guaranteeing freedom of expression/speech and the necessity of full implementation of the Ohrid Framework Agreement. Therefore, in view of this, it is worth mentioning the former director of UNESCO, Federico Mayor, who said: -Today we know that we live in a transparent world, and we can no longer justify that or we were naïve

[8] More details about this, in M. Kunchik-A. Cipfel, Introduction to the science of literature and communication p.. 67-74, Skopje, 1998 319 Human rights as a democratic value, M. Maleska, rights and responsibilities go together, pg. 249, Fridrich Ebert Foundation and the Democratic Club, Skopje, 2003 373 political, economic prospects of the country.

of myths the values should be explored, because they are part of the actual/visible and current setting, while myths are nonexistent or imaginary. The need for creation of civil initiatives is essential in order to promote political engagement / involvement and help overcome the state of apathy. It is expected that this will cause increased preparedness/improvement in the willingness for participation on the part of the population, primarily of people with higher education degrees, so that they can find their place in the increased number of civil initiatives at local and regional levels. Consequently, it will lead to respect for the democratic values and the values of integration into EuroAtlantic structures, the continuity of the integration values and democratic standards, as well as promotion of the concepts of tolerance as well as human rights and freedoms.

References

- Kushtetuta e Republikës së Maqedonisë, Shkup. Gazeta Zyrtare e RM-së, Nr. 40, Shkup, 2006.
- Kodi Zgjedhor (teksti i spastruar). —Gazeta Zyrtare e Republikës së Maqedonisë‖ nr. 54 nga data 14.04.2011 dhe Ligji për ndryshimin dhe plotësimin e Kodit Zgjedhor —Gazeta Zyrtare e Republikës së Maqedonisë‖ nr. 142 nga data 13.11.2012.
- Deklarata Universale e Të drejtave të Njeriut, miratuar dhe shpallur nga Asambleja e Përgjithshme me rezolutën e saj 217 A9(III), neni 21 nën (1, 2, 3) të 10 dhjetorit 1948.
- Udhëzimet për zgjedhjet, miratuar nga Komisioni i Venecias në Seancën e tij të 51-të Plenare (Venecia, 5-6 Korrik 2002), faqe 34, CDL-AD (2002) 23 rev me gjeresisht Shihni CDL(98) 45, p. 3; CDL (99) 51, fp. 8; CDL (2000) 2.f. 5; CDL-AD (2002) 9, para. 22.
- Vëzhgimin e zgjedhjeve në Ish-Republika Jugosllave e Maqedonisë – Zgjedhjet Lokale, Misioni ndërkombëtar për vëzhgimin e zgjedhjeve, Shkup, 7 prill 2013 E. Gidens, Tretiot pat, Obnova na socijal-demokratijata, Skopje, 2002.
- N.O.` Shonesi, The phenomenon of political marketing, positive statement, p. Step, Skopje, 1994.
- Adnan i Kimete Agai, Albnsko-makedoski reçnik, "Meshari", Skopje, 1996.
- Thonbery Patric, Minorites Rights, Human Rights and Internacional law, Etnic and Racial studies, 1980 Izborni platformi za parlamentari izbori vo Republika Makedonija izbori 2002 Skopje, avgust-septemvri 2002.
- Liphard, Demokratijata vo pluralnite op{testva, str. 25-30, Skopje, 1994 Хабермас, за толеранцијата и мултикултуралноста (повеќето наводи во текстов се од "Ле Монд" од 8 ноември 2002, цитирано Дневник, Скопје, 18 март 2006.
- M. Fethullah Gülen: Humanism and Love for Humanity, in :Toward a Global Civ ilization of Love and Tolerance,M. Fethullah Gülen: Dialog in the Muhammadan Spirit and Meaning, in: Toward a Global Civilization of Love & Tolerance, op. cit., p. 73.

- L. Hristova, Парламентарни Избори 98 во Република Македонија, Изборно однесување на граѓаните, Институт за социолошки и политички правни истражувања, Скопје1999
- Nazmi Maliqi, Toleranca politike ne funksion te paqes, Fondacioni Friedrich Ebert – Shkup, 2003
- M. Kuncik - A. Cipfel, Voved vo naukata za publicistika i komunikacija, Skopje, 1998
- Човекови права како демократска вредност, M. Maleska, Pravata i odgovornostite odat zaedno, Fondacija Fridrh Ebert i Demokratski klub, Skopje, 2003
- Ch. Montesquieu, —L'esprit des lois— II. Ch.II. Paris, 1923
- Maks Veber: —Разбирањето на современото општество", Instituti i socioologjis-Fakulteti Filozofik, Shkup, 2000.
- Udhëzimet per zgjedhjet, miratuar nga Komisioni i Venecias në Seancën e tij të 51-të Plenare (Venecia, 5-6 Korrik 2002), CDL-AD (2002) 23 rev 374 M.

THE ROLE OF KOSOVO CUSTOMS AGAINST THE GREY ECONOMY IN KOSOVO- COMPARATIVE ASPECTS

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Abstract

Informal economy or grey economy is one of the possible problems that every economy is dealing with; therefore, as well the economy of the Republic of Kosovo is dealing with and if we don't take any serious step we can't wait any economy gain in the near future.

The Republic of Kosovo is working hard every day to stop the grey economy because of that we every year are losing such of state budget incomes.

One of the reasons of that is may be the non-efficient of the customs authorities to fight the goods smuggling and the non-regular import and export of the goods.

Republic of Kosovo can in the theirs daily activities stop the informal economy and the other forms of illegal economy, which is also written in the strategic plan of activities for the 2019-2023 year). In order to defend in efficient way citizens and businesses from the illegal traders in the international trade the customs authorities needs to work up closely with the other state agencies like Police, Tax Administration etc.

The main task of this research is to analyze the grey economy in the main structure of the state and to see the proper rule of the customs authorities of the Republic of Kosovo in order of fighting against them.

During this research I took information in comparing methods and law-normative.

Key words: grey Economy, Kosovo Customs, Smuggling.

INTRODUCTION

The gray (gray) economy known in everyday life as the informal economy exists in all countries in the world, both developed and underdeveloped. Every country tries to reduce the level of the gray economy and transfer as much as possible the illegal market, into the legal streams. Many authors

have given different definitions of gray economy, and here we have singled out some of them.

The gray (hidden, invisible) economy is most often defined as the sum of all current unregistered economic economic activities that contribute to the official gross domestic product (GDP) of the observed country. The gray economy can also be described as illegal or legal trade of products and services which cannot be detected by official methods of estimating GDP.Schneider,F (2011).

From a tax point of view, the gray economy represents the value of taxable activities and rights for which no tax has been paid, and which are taxed according to law. Fiscal evasion is the difference between the taxpayer's tax liabilities according to the regulations in force and the reported tax obligations. Popović,D (1997).

The gray economy is an activity which, through the lack of legal norms and business outside the legal channels, aims to avoid the prescribed fiscal taxes and other liabilities/obligations to the state. "Based on the above definitions, we can conclude that the gray economy represents: - economic activities of certain legal and natural persons over which the state has no control - comparative existence of regular and irregular illegal economic activity - benefit for individuals and companies in the form of tax evasion, contributions, customs, etc. Suceska.M, (2007).

The gray economy has been one of the biggest challenges facing the economy of the Republic of Kosovo for years, and its consequences are evident in the areas of tax evasion, market distortions, unfair competition and inefficient allocation of resources.

In many transition countries, including our country, the gray economy is an important obstacle to developing a strong entrepreneurial sector, especially to building a functioning market economy. Although the gray economy is still important to many individuals and families in the country, its negative consequences for employees, companies and society as a whole far outweigh the benefits. it is of great importance to take measures to encourage the formalization of the gray economy, which should be based on knowledge of the causes and formal structural activities. A particular problem in their design is the fact that information on the gray economy is uncertain and incomplete. The Customs Administration of the Republic of Kosovo is one of the most important institutional factors. On the one hand, by not fulfilling the basic visions and tasks set by the current strategy, it contributes to the emergence of the gray economy, while, on the other

hand, by undertaking certain activities it makes possible the successful fight to reduce the gray economy and the black market.

Since this is a very complex phenomenon, the causes and factors that affect the emergence of the gray economy (gray) are numerous. Among the main factors influencing the decision to enter the gray area of business are: the functioning of the justice system and law enforcement mechanisms, the level of administrative control over the liberalization of the economy, tax burdens, macroeconomic instability and the destruction of the payment system. Corruption also affects the size of the gray economy. In developing and transition countries, such as our country, the high level of regulation results in a significantly larger perimeter of corruption, which is manifested by the difficulty of activities in the legal economy and entry into the illegal economy. These moves undermine public finances and weaken the state's ability to protect property rights. This means that, in essence, these are factors of an economic nature. In addition to economic causes and factors, some theorists consider, among the factors of the gray economy, also psychological factors, such as, e.g., the loss of trust of the state and its economic measures, the mentality of the people and its disagreement with the objectives and economic policy measures, the presence of a high degree of risk in business, etc.

Other phenomena also contribute to the expansion and development of the gray economy, such as: high unemployment, declining output and living standards, loss of confidence in the banking system, and the large number of displaced and deported persons who are unemployed. , the inefficiency of state bodies, the relatively lenient policy of punishment, the slow privatization process, the lack of a labor market, the underdevelopment of the capital market, etc., which practically encourage illegal financial operations.

The forms of the gray economy differ more or less from country to country, depending on the economic conditions of economic policy and economic situation. However, the forms of the gray economy that are most characteristic of developed countries differ in part from its forms in countries in transition. The gray economy in Kosovo manifests itself in various forms and in almost all areas of economic activity: such as • illegal import and export; • unregistered import and export of currencies; • cash flow outside the payment service system; • smuggling of various goods in the domestic market; • withdrawal of goods from circulation and setting specific prices on the black market; • evasion of paying taxes and other fees, in various ways, etc.Suceska,M(2007).

The role of Customs in preventing the gray economy in the Republic of Kosovo

After the war in Kosovo in 1999/2000, during the international protectorate and especially after the declaration of independence of Kosovo, the customs authorities were one of the most important factors influencing the emergence and development of the gray economy.

Many illegal businesses related to the import of goods developed more or less knowledge of customs officials, and especially excise products were current - mainly cigarettes, oil and petroleum products.

However, in that period the import of goods by local physical persons was very common and those goods are sold illegally in markets and retail stores. After 2008, the illegal import of goods decreased significantly, but was, as in all countries of the world, still represented, which causes instability and concerns in the domestic market.

As forms of gray economy related to the work of customs authorities, can be:

- illegal import and export of goods;
- unregistered entry and exit of foreign currency;
- smuggling of various goods across border crossings;
- abuse of customs privileges;
- misuse of intellectual property

In most cases it is not uncommon to record cases where the customs documentation lists a type of goods that has a lower customs rate or has a lower price, and there is another type of goods in means of transport that is significantly higher which has a value or has a higher rate of customs duties.

Also, as a manifestation of the gray economy, there are cases where customs officials mistakenly accept the charging of goods, accept preferential treatment of goods, ie accept a lower customs tariff as if the goods were of EU origin, and thus creating conditions for a more favorable position of one importer in relation to others.

Illegal export and import of foreign currency is one of the important forms that affect the appearance of the gray economy.

Customs officials, in accordance with the Customs and Excise Code of Kosovo and the Law on Prevention of Money Laundering and Combating Financing, control the export and entry into the Republic of Kosovo of passengers, goods and postal traffic. The customs authorities have the power to temporarily confiscate monetary funds (money) that are in a larger amount than that provided by this legislation (over the amount of 10,000

Euros).(Law no. 05/L-096 article 31). Smuggling of cigarettes and frozen or rejected tobacco has marked an increase, from 2014/15 when there is a sharp increase in excise duty on tobacco products. The increase in excise duty on these products has determined an increase in their price in the domestic market and consequently has also felt the increase in smuggling of these products. It should be said that smuggling routes, cigarettes and tobacco lead from Albania, Montenegro, and are heading towards the EU, where Kosovo is emerging as a transit country. It should be noted that customs control is one of the important measures carried out by the customs authorities. The customs supervision of goods entering the customs territory of the Republic of Kosovo starts from the moment of its entry and lasts until the goods are released for free circulation, at the moment of fulfilling the customs obligations.

Customs supervision ceases when goods are exported, destroyed or customs cleared and put into free circulation. It happens that some companies take the goods under customs supervision and place such goods on the domestic market without paying customs duties and value added tax, so (VAT) they become more competitive. In doing so, they disrupt and create a gray market.

For the emergence of the gray economy due to the taking of goods under customs control in part the customs authorities are also responsible for not conducting timely inspections of companies dealing with inward processing and temporary importation, obviously such a thing is related to the negligence or form of passive corruption on the part of customs officials.

As a result of non-measures taken by customs in the fight against gray economy, the following occur:

- Less funds in the budget;
- Unhealthy competition;
- Money laundering;
- Unemployment.

The shadow economy and the inadequate action of the customs authorities lead to unfair competition. If someone imports heating oil and pays only customs and value added tax, and then sells the same goods as oil, he has the opportunity to make a corresponding profit for the amount of excise he does not pay, and thus conquers the market, while companies that import legally oil and pay in order all the obligation, lose the market and profit. Many participants in imports dealing with the smuggling of goods such as weapons, ammunition, tobacco, petroleum products and the like. Illegally earning money is brought and invested in legal flows. Illegally earned

money can be further used to facilitate the smuggling and illegal import of goods or for the bribery of customs officials as well as for even more dangerous activities such as are the financing of terrorism or sabotage, etc. Although the main task of the customs service lies in the protection of the company and financial interests for the collection of import duties in favor of the state budget, in supporting the competition of companies, as well as in the control of persons and goods, in order to distinguish deceitful and dangerous persons, the finality and goals of this mission have undergone a significant change. There must be the political will to provide the customs administration with extraordinary means of action in the legal field, i.e. important powers to act against persons and goods subject to controls, as well as the powers it carries to punish fraudsters and smugglers under a specific and particularly effective repressive procedure. Hyseni, A (2003).

Measures to fight

The gray economy as part of the activities and the desire for our country to integrate into the common European market as an economic, legal and customs area.

Certain measures to prevent the gray economy can be taken mainly by the Customs Administration of the Republic of Kosovo, while others require cooperation with other state bodies. The measures that should above all be to be taken by the Customs Administration in the fight against the gray economy, are among others:

- Strengthen the control at border crossings during the entry and exit of goods, passengers and means of transport,
- To strengthen the in-depth control within the customs territory of the Republic of Kosovo,
- Strengthen the control of goods under customs supervision at customs offices.

There have been many cases of detection of customs violations at border crossings by customs officers, thus actively participating in the fight against the gray economy. The subject of illegal import and smuggling at border crossings are, in addition to narcotics and cigarettes, to a large extent also gold, textiles, medicines, weapons, etc.

If the Customs Administration of the Republic of Kosovo wants to successfully fight the gray economy, in border areas and inland, measures must be taken, among other things, to equip the border customs offices with scales for measuring cargo, X-ray scanner, inspection statements of vehicles under the chassis and on the roof of the vehicle, vehicle inspection garages, etc. It is also necessary to develop risk analysis and management

at border crossings in order to achieve the best possible results with time and expenditure of energy and resources. Intelligence must be well developed, if this key state administration body wants to fight successfully against the gray economy, it must cooperate with other state administration bodies, mainly the Ministry of Interior (Border Police Directorate and Police Directorate of Anti-Economic Crime), Tax Administration, Market Inspectorate, Kosovo Food and Veterinary Agency and other bodies.

Customs officers at border crossings should cooperate within the framework of integrated border management with the border police and should work together to prevent the smuggling of excise goods, and other dangerous goods, as manifestations of the gray economy.

The problem of the gray economy are the measures that the state should take in reducing customs and taxation, because there was an increase in smuggling of cigarettes and cut tobacco in the period from 2018-2020, the result of increased excise duty on tobacco and tobacco products. If it wants to prevent the gray economy, the state will have to take measures to start economic production and reduce unemployment. The continuing rise in unemployment is causing various forms of gray economy, which are partly related to the illegal business of importing and exporting goods.

The data show that in recent years the Kosovo Customs, which is competent in addition to customs and excise, to collect VAT at the border, in the case of import of goods has participated with about 60-65% in filling the budget of the Republic of Kosovo,

Through its activities, Kosovo Customs strives to actively participate in reducing the gray economy in the Republic of Kosovo, which is also set as a part of the strategic goals.

Conclusions

The informal economy or the gray economy is one of the potential problems facing the economy and if it is not suppressed or reduced to an acceptable level, our country can not expect any serious economic development. Considering such a point of view, it can be concluded that the fight against this type of economy is directly related to the problem of measures, instruments and competent institutions for the fight against the shadow economy. Due to the reduction of its annual budget revenues by one third as a result of this economy, the Republic of Kosovo is trying to fight the gray economy to a large extent. The customs service of the Republic of Kosovo itself can cause the gray economy, facilitating the irregular import and export of goods, trafficking, smuggling of weapons / ammunition / drugs, etc. Customs activities can help prevent and control

import-export irregularities, but this can only be done with the participation and cooperation between the customs service and other government bodies such as tax administration and the Police against economic crimes and together can significantly reduce the gray economy, increase budget funds and reduce unemployment.

However, the informal economy cannot be considered a temporary phenomenon. Moreover, the informal economy has been more pronounced in countries where incomes and assets are not evenly distributed. If economic growth is not accompanied by improvements in employment and income levels sufficiently and deservedly distributed, the informal economy does not shrink. Therefore, it is no coincidence that the informal economy is considered to be constantly growing in most developing countries and consequently in our country.

The conclusions that we have presented and analyzed in this scientific paper will also reveal the obstacles that arise in preventing this phenomenon, which may eventually lead to the comprehensive strategy of the state in the fight against the gray economy and its transformation into legal flows, where the customs service make sure it has an irreplaceable place. Undoubtedly, the aim is to transform this problem into contemporary trends and to provide as complete information as possible to both lay people and experts on the role of the customs service in the fight against the gray economy.

REFERENCES:

1. Suceska.M, Basics of Economic Crime, Prishtina 2007
2. F. Schneider, The Shadow Economy and Shadow Economy Labor Force: What Do We (Not) Know. Discussion Paper Series, Bonn, 2011.
3. D. Popović, Nauka o porezima i poresko pravo, Beograd, 1997
4. Delibašić, T; *Carinski prekršaji u praksi,* Poslovni zbiro, Beograd, 2011.
5. Kosovo Customs and Excise Code No. 03 / L-109
6. Law no. 05/L-096 on prevention of money laundering and fight against terrorism financing in Kosovo
7. Olters, J. P., .*The informal sector . impeding economic development*?. Fourth conference of Bank of Albania .Albanian Economy:Performance and Policy Challanges. Saranda, Shtator 2003.
8. Hyseni,A Veprat Penale ne Fushen Doganore,Tirane, 2003.

CONSUMER BEHAVIOR AND PRO-ENVIRONMENTAL BEHAVIOR: DOES CONSUMMATION CONTRIBUTE TO CLIMATE CHANGE?

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ABSTRACT

Numerous activities of the people that could have possible influence on climate changes include various patterns of consumer behavior. The aim of this study is to assess the relationships between the consumers' behavior and climate changes, and the opportunities of limiting the changes. Several studies that focus on the relationship between the consumer behavior and climate changes are reviewed in this study. These studies indicate different perspectives on consumerism and climate change. The presented data could contribute to the understanding of the consumer behavior of individuals in relation to the climate changes. The study will increase the awareness of the crucial importance of individual consumer behavior together with state legislation in achieving effective responses to climate change issues and challenges.

Keywords: consumer behavior, climate change, pro-environmental behavior.

INTRODUCTION

The environmental changes leading to ecological crises are among the most important current problems of humanity, needing urgent scientific actions. Many of the current environmental issues are primarily caused by human activities and acts. Humanity is spending the products with a higher grade than the natural regeneration and recycling capability. It emphasizes the urgent need of achieving sustainable consumer behavior, to preserve healthy living conditions **SAARI, et al (2021)**. Scientists increasingly recognize the need for behavioral changes to accomplish a maintainable

future and try to illuminate the behavioral drivers that alter human behavior and give rise to the current ecological problems **BLANKENBERG & ALHUSEN (2018).**

The article aims to increase the awareness of the crucial importance of individual consumer behavior together with state legislation in achieving effective responses to climate change issues and global challenges that arise in the modern world.

DETERMINANTS OF PRO-ENVIRONMENTAL BEHAVIOR

Consumer behavior in the recent past was principally in the studying field of Economical science. However, it became increasingly recognized that consumer decisions are not always rational and balanced, and are often influenced by individual and social motives and factors, giving significant importance to the psychological view of consumer behavior **KIRCHLER & HOELZL (2015).**

Consumer psychology is a psychology discipline exploring the process of selection, buying, placing, or spending goods, ideas, or services by groups or individuals to satisfy necessities or wishes **SOLOMON (2005).** The term "pro-environmental behavior" is usually defined as all actions that are carried out by an individual to reduce the negative effect on the environment, and a clear objective to transform the environment **STERN P. C. (2000), KOLLMUSS & AGYEMAN (2002), BLANKENBERG & ALHUSEN (2018).**

STERN P. C. (2014) identified several different climate-influencing behaviors that could be evaluated by psychologists. They include but are not limited to energy consumption for home power needs and fuel for motor vehicles, and engagements that contour upcoming energy needs (choosing a home, family planning). Additional behaviors are selecting goods that are non-energy consuming or don't include fossil fuel consumption in their producing process, limiting the energy usage, or reducing fossil fuel consumption by the managers and employees in organizations. Influencing government policies by approving or opposing different energy sources and technologies are other important climate-influencing behaviors.

BAUM & GROSS (2016) described 4 groups of determinants that are important for environmental behavior. Internal factors, which include the intentions, preferences, and attitudes, compose the first group. The individual-level context includes knowledge, resources, and habitual

behavior and self-image, and identity values. The third group – socio-cultural context includes status considerations, personal and structural norms, and socio-demographic factors. The last group or the techno-economic context, includes policies, regulations, prices, infrastructure, technology, and institutional framework.

Personal motivations and characters are important behavioral determinants for pro-environmental behavior. The altruism directed towards the environment or other human beings could be a strong motive, but also could be the self-interested motivations, such as decreasing costs for energy consumption at home or working place **WOLSKE & STERN (2018). DE DOMINICIS, et al. (2017),** for example, evaluating pro-environmental behaviors by performing three different experiments, provided an Inclusion Model for Environmental Concern, where the individual's self-interest and altruism are not excluding each other, but are integrated into a hierarchical structure. Authors emphasize the importance of self-interest and personal benefit in promoting pro-environmental behavior. Altruistic individuals can be stimulated to participate in pro-environmental behavior not only by environmental but also by a personal, self-interested benefit.

Some authors discuss that financial motivations are not the strongest and prevailing reasons for pro-environmental consumer behavior; the well-being might not be significantly improved by high-energy consumption characteristics for rich societies and could be achieved even in poor countries with only modest energy rise **DIETZ T. (2015). ASENSIO & DELMAS (2015)** evaluated the energy consumption changes in more than a hundred households in California compared to the control group, after encouraging energy effectiveness in two different ways. Two different psychological strategies were used in the experiment, increasing prosocial conservation inclinations or intensification of self-interested benefits from reduced energy consumption. The first group received information about the air pollution levels and the other group received information about the financial benefit of performing energy-saving practices. The first group significantly reduced the energy consumption, particularly families having parents with children. On the opposite, the group that had an only a financial motive for energy-saving significantly increased the energy consumption. The results of the study confirmed that behavioral strategies could successfully aid the political and financial pro-environmental strategies.

Knowledge about the effectiveness of different pro-environmental strategies is another behavioral determinant **WOLSKE K. S. (2018).**

Individuals are often unaware of the difference between the low and high-impact behaviors and focus on actions that have an insignificant environmental effect, such as recycling, instead of concentrating on energy-conserving strategies, which have the highest effectiveness. A study by **ATTARI S. Z. (2014),** focusing on the perception of drinking water use, including more than 1000 participants, revealed that the individuals highly underestimated the average usage of water in their households. In addition, they usually pointed out the water restriction activities, for example, shorter shower period, instead of increased efficacy, like retrofitting washers, as important water-conservation tactics. This is the opposite of the expert's opinions and recommendations.

However, not always, the pro-environmental behavior is reliable and constant among the individuals. Performing a single pro-environmental behavior can trigger carrying out another pro-environmental behavior, a sequence known as positive behavioral spillover **WAN DER WERFF, et al (2014).** The behavioral pro-environmental spillover, though, can also be negative, and in some circumstances and situations, positive environmental behavior can lead to a weakening of implementing different pro-environmental behaviors or adopting an environmentally unfriendly behavior. A recent study by **DREJIERINIK, et al (2021)** in an example, explored both psychological and economic ways of the negative environmental spillover. The authors showed that the environmentally friendly actions acquiring greater effort are more likely to be hardly performed, and that the individuals often rationalize and find different excuses for not performing them. Individuals are usually unconscious of the negative spillover and rationalization, and undervalue their negative environmental behavior.

WHITE et al. (2019) highlighted the importance of the social influence on the positive environmental behavior, and identified three social factors as important aspects for adopting pro-environmental activities. Social norms can be predictors of positive environmental behavior, including preserving energy in households, choosing green transportation, recycling, etc. Social identities can be strong influencers of sustainable behavior. Individuals tend to act more environmentally friendly if they perceive themselves as members of a pro-environmental group. In addition, individuals do not like their group to be outpaced by another group by performing pro-environmental behaviors **WHITE et al. (2019), WHITE et al. (2014).** Social desirability is the third social influence for performing pro-environmental behavior. Individuals can perform eco-friendly actions to

create a positive, affirmative impression to others, especially if their actions are detected and valued.

A recent literature review studying pro-environmental behavior by **BYERLY, et al (2018)** reviewed 76 research papers that incorporated 160 different interventions in 6 environmental fields including the planning of the family, choices of transportation, meat consumption, use of water, land management, and production of waste. The authors revealed that social norms and decision-context alteration could inspire environmentally friendly behavior in several of the researched fields. Changing the background for the decision-making process could encourage individuals into pro-environmental behavior, including a healthy way of life and nutrition choices, involvement in social beneficial agendas, etc.

The approach of focusing on the societal characteristics should be added to the technological developments to achieve and improve the pro-environmental behavior. In an example, **BERNEISER, et al. (2021)** evaluated the technology and person-related factors that influenced the acceptance of electric vehicles, in a study including more than 1900 participants. The authors concluded that the negative technological factors of battery electric vehicles compared to conventional vehicles, including higher cost and lower driving range could be possibly relativized by the person-related factors, such as collective efficacy, subjective norms, risk attitude, and perceived information.

It is important to note that the different determinants of the pro-environmental behavior should not be evaluated separately and individually, since the determinants are interconnected and interdependent, and the authors should always combine several of them to establish results that are more accurate and precise. There is a difference in the researching approach of the pro-environmental behavior by different disciplines. Psychologists dominantly evaluate the internal factors, while economists focus mostly on external aspects of the pro-environmental behavior. Examining pro-environmental behavior should always be performed carefully, with taking into consideration numerous behaviors, carrying out interdisciplinary approaches, and always-exchanging ideas and results between economy and psychology science **BLANKENBERG & ALHUSEN (2018).**

CONCLUSION

Faced with the increasing environmental changes, that often result in ecological crises, dealing with global warming, floods, or droughts leading

to hunger, diseases - epidemics and pandemics the humanity has an urgent necessity for rapid and decisive scientific actions. The presented data could give a modest contribution to a better and more comprehensive understanding of the various determinants of the pro-environmental behavior of individuals, social groups, and societies. Considering the psychological aspects of the consumerism and pro-environmental behavior could provide different perspectives and changed point of view to the other scientific fields dealing with the same questions and issues. Understanding how individuals react in different environmental settings and surroundings and possibly finding ways of shaping their behavior to lead to more sustainable and ecological friendly actions could make significant differences in the efforts of reducing the climate changes and establishing a healthy living environment. Interdisciplinary research of the pro-environmental behavior should be performed with paying constant attention and exchanging numerous different factors, approaches, and ideas between psychology and other relevant scientific fields.

REFERENCES

ASENSIO, O. I. & DELMAS, M. A. 2015: Nonprice incentives and energy conservation. Proceedings of the National Academy of Sciences of the United States of America 112 (6): E510E515

ATTARI, S. Z. 2014: Perceptions of water use. Proceedings of the National Academy of Sciences 111(14): 5129–5134

BAUM, C. M. & GROSS, C. 2016: Sustainability policy as if people mattered: developing a framework for environmentally significant behavioral change. Journal of Bioeconomics 19(1): 53–95

BERNEISER J, SENKPIEL C, STEINGRUBE A & GÖLZ S. 2021: The role of norms and collective efficacy for the importance of techno-economic vehicle attributes in Germany. J Consumer Behav. 1–16.

BLANKENBERG, A.K. & ALHUSEN, H. 2018: On the Determinants of Pro-Environmental Behavior-A Guide for Further Investigations. University of G¨ottingen, Center for European, Governance and Economic Development Research (CEGE), G¨ottingen

BYERLY, H. BALMFORD, A. FERRARO, P. J. HAMMOND WAGNER, C. PALCHAK, E. POLASKY, C. RICKETTS, T. H. SCHWARZ, A.J. & FISHER, B 2018: Nudging pro-environmental behavior: evidence and opportunities. Front. Ecol. Environ 16: 159-168

DE DOMINICIS, S, SCHULTZ P. W. & BONAIUTO M. Protecting the Environment for Self-interested Reasons: Altruism Is Not the Only Pathway to Sustainability. Frontiers of Psychology. 28 (8): 1065

DIETZ, T. 2015: Altruism, self-interest, and energy consumption. Proceedings of the National Academy of Sciences of the United States of America 112 (6): 1654-1655

KIRCHLER, E. & HOELZL, E. 2011: Economic and psychological determinants of consumer behavior. Zeitschrift Für Psychologie/Journal Of Psychology. 219(4); 195-197

KOLLMUSS, A. & AGYEMAN, J. 2002: Mind the gap: why do people act environmentally and what are the barriers to pro-environmental behavior? Environmental education research. 8(3): 239–260

SAARI, U.A. DAMBERG, S. FRÖMBLING, L. & RINGLE, C.M. 2021: Sustainable consumption behavior of Europeans: The influence of environmental knowledge and risk perception on environmental concern and behavioral intention. Ecol. Econ. 189; 107-155

SOLOMON, M. R. 2004: Consumer psychology. In Encyclopedia of applied psychology. 483–492 pp. Elsevier 2018

STERN, P. C. 2000: New environmental theories: toward a coherent theory of environmentally significant behavior. Journal of social issues. 56(3): 407–424

STERN, P. C. 2014: Individual and household interactions with energy systems: Toward integrated understanding. Energy Research & Social Science. (1): 4148

VAN DER WERFF, E. STEG, L. & KEIZER, K. 2014: I am what I am, by looking past the present: the influence of biospheric values and past behavior on environmental self-identity. Environ. Behav. 46. 626–657

WHITE, K, SIMPSON, B. ARGO, J. J. 2014: The Motivating Role of Dissociative Out-Groups in Encouraging Positive Consumer Behaviors," Journal of Marketing Research 51; (4): 433–47

WHITE, K. HABIB, R. & HARDISITY, D. J. 2019:. How to SHIFT consumer behaviors to be more sustainable: A literature review and guiding framework. Journal of Marketing, *83*; 22–49

WOLSKE, K. S. & STERN, P. C. 2018: Contributions of psychology to limiting climate change. Psychology and Climate Change. 127–160

THE IMPACT OF INDUSTRIAL-ORGANIZATIONAL PSYCHOLOGY IN PRO-ENVIRONMENTAL BEHAVIORS: TIME FOR ACTION!

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Abstract

Industrial-organizational psychology, as scientific study emphases on individual, group and organizational dynamic forces, and therefore could recognize effective solutions for human well-being. Given the importance of taking action to tackle climate change, it is essential to include the concepts of industrial-organizational psychology in fostering pro-environmental behavior. The aim of this study is to examine the role of industrial-organizational psychology in understanding pro-environmental behaviors and contributions of industrial-organizational psychology to climate change. There are many ways in which industrial-organizational psychologists should play a proactive role in climate change. The study concludes with a discussion of the need for utilization of knowledge and practices of industrial-organizational psychology in development of pro-environmental behaviors that cannot be left for better days, but the action should be taken immediately.

Keywords: industrial-organizational psychology, pro-environmental behaviors, climate change

INTRODUCTION

Climate change impacts are increasingly felt in the world, adapting and taking action to increase people's awareness and activities to maintain the environment becoming critical. Environmental problems could therefore be reduced if people adopted more pro-environmental behaviors (BALUNDE et al., 2019). The World Health Organization (2021) emphasizes that climate change has a huge impact on human health and is committed to finding ways to decrease greenhouse gases, developing appropriate travel behavior, and encouraging all organizations to get involved. There is a gap

in the literature, research, and practice of industrial-organizational psychology in the climate change context. Encouragement of employees' pro-environmental behavior within organizations is now a critical and very important challenge for industrial-organizational psychologists. People spend most of their time during the week at work, even when they are not at work they usually think about work. It means that work is important to people and industrial-organizational psychology, as a scientific study is pointed to the work of people in work settings.

The purpose of this study is to emphasize the importance of industrial-organizational psychology in developing pro-environmental behaviors and highlighting appropriate approaches to applying the principles of industrial-organizational psychology in environmental sustainability.

1. Why Industrial-organizational psychology?

Industrial-organizational psychology integrates the knowledge and scientific methods of psychology that are applied to issues of critical relevance to business (SIOP, 2021). Landy and Conte (2019) gave the simplest definition of industrial-organizational psychology as an application of psychology principles, theory, and research to the work setting and indicate three directions, personnel psychology which is related to the hiring, firing, evaluation, training, and performance of employees, organizational psychology addresses issues such as emotions, motivation, and interpersonal behavior in the context of the organization and human factors psychology concentrates at the human capacity and limitations in any given environment, towards improving the working environment for individuals.

Organizations have the power to shape behaviors, attitudes, and character traits of the employees (ROSE, 2014), so industrial-organizational psychology can take the responsibility to form, develop and shape the pro-environmental behaviors among employees.

2. Pro-environmental behaviors

There are many synonyms for pro-environmental behaviors as ecological behavior, green behavior, sustainable behavior, and other terms which are used interchangeably. Pro-environmental behavior can be defined as actions that harm the environment as little as possible or even benefits the environment (STEG & VLEK, 2009). A behavior in society that is valued as a way of protective behavior towards the environment or respect for a healthy environment (KRAJHANZL, 2010) is determined as pro-

environmental behaviors. When pro-environmental behaviors are associated with workplace context, there is a definition of workplace pro-environmental behaviors as any action taken by employees that she or he thought would improve the environmental performance of the organization (RUSSELL & GRIFFITHS, 2008). YURIEV et. al. (2018) make a distinction between voluntary pro-environmental behaviors inside and outside the organization. They propose a categorization of pro-environmental behaviors within the organizational context. Behaviors practiced at work and within an organizational context are recycling, writing successful stories for a sustainability annual report, attending specialized training and workshops active participation in a green committee, then behaviors practiced at work and without an organizational context, as turning off lights, giving suggestions to reduce environmental impact, helping colleagues inactivation in pro-environmental behaviors. Also, in the category behaviors practiced outside the work and without an organizational context are mentioned the use of public transport, cycling, walking, choosing eco-friendly lunch options, and the fourth category is behaviors that are practiced outside the work context and within an organizational context, as active involvement in social campaigns such as tree planting.

3. Training and education program

Organizations conduct several different pieces of training and educations for their employees. The industrial-organizational psychologist should provide systematic acquisition of concepts or attitudes that result in pro-environmental behaviors. Different training methods are organized in the organizations, and industrial-organizational psychologists should increase the interest and passion of employees towards greening their work tasks and the organization as a whole. ROSE (2014) suggested just as organizations have their lawyers, so they should have their educators, motivational speakers to keep up with the rapid changes in the world. It is necessary to redefine and reorganize the existing education and adjust the reality. Accordingly, it is of great importance to maintain eco-sustainability in corporations through industrial-organizational psychological principles to the maximization of the three bottom lines, profits, people, and the planet. PINZONE, M., GUERCI, LETTIERI, & HUISINGH (2019) concluded that the green training was related to the voluntary engagement of the employees in pro-environmental behavior because the green training gave them a sense of challenge, which motivated them to get involved in pro-environmental behavior. Also, they noted that green training makes

employees more satisfied with their jobs, and they explained this with the perception of the employees that the management supports the employees which cause employee satisfaction.

4. Organizational climate

Organizational climate is defined as a shared perception among employees regarding their work entity, a particular organization, or workgroup (LANDY & CONTE, 2019). Climates play a relevant role in shaping employees' corresponding behaviors. The employees' perceptions of the environmental policies and practices in the organizations are of great importance. MOURO & DUARTE (2021) examined how employees' perceptions of organizational policies about environmental sustainability and perception of coworkers' pro-environmental behaviors affect employees' self-reported voluntary pro-environmental behaviors. The findings suggested that after controlling for the effects of tenure, education level, and a management position, a pro-environmental organizational climate predicts stronger personal norms and a greater tendency to adopt pro-environmental behaviors at work. The findings of this research has emphasized the importance of increasing the visibility of pro-environmental behaviors at the workplace in which employees volunteer to engage. Organizations need to encourage employee' pro-environmental behavior much more in the workplace.

5. Reward systems

An organization gives a manager the power to make decisions and authority. One type of power is reward power which means the potential of a supervisor to mediate or dispense valued rewards. Accordingly, the organization could make a system of rewards about pro-environmental behaviors among employees, using rewards symbolically to reinforce desirable pro-environmental behavior. Offering desirable rewards and providing rewards as promised for appropriate pro-environmental behaviors displayed by the employees. Motivational interventions boost pro-environmental behaviors through incentives and rewards, or discourage environmentally harmful behaviors via disincentives and penalties (BOLDERDIJK, LEHMAN, & GELLER, 2018), and can be used at the workplace. Offering monetary and non-monetary rewards for pro-environmental behavior provides an extra incentive to make more green choices. The use of money rather than non-monetary consequences has its drawbacks. Adverse effects of the monetary consequences can be reduced

if it is determined that monetary consequences will support the pro-environmental behavior than undermine it. (BOLDERDIJK, LEHMAN, & GELLER, 2018). In one organization, HANDGRAAF et al. (2014) measured electricity consumption for some time and each week employees were rewarded for saving electricity. Monetary and social rewards were distributed, publicly and privately, therefore public rewards have been shown to surpass private rewards for maintaining behavior, and social rewards outweighed monetary rewards. Organizations should take these findings into account when creating internal policies.

6. Managerial behavior

Organizational managers have an impact on the employees` attitudes, the commitment of employees, performance outcomes, and environmental performance (ROBERTSON & BARLING, 2013). The findings from ROBERTSON & BARLING (2013) suggested that leaders' environmental descriptive norms and the leadership and pro-environmental behaviors managers ratify play a significant role in the greening of organizations. It is no coincidence that because managers have the power to shape policies, reward and promote employees, and have authority in the organization. WESSELINKA, BLOK & RINGERSMA (2017) in their research tried to discover the factors that influence pro-environmental behaviors among individual employees. They wanted to understand to what extent factors as leadership support, perceived organizational support for the pro-environmental behaviors, and leadership, exemplary behavior influence employees' intention to pro-environmental behaviors. According to the findings, the researchers concluded that there is a relationship between leadership behavior, exemplary behavior, and pro-environmental behaviors. It was interesting that leadership support did not have a positive relationship with an intention to act and actual pro-environmental behaviors among individual employees.

CONCLUSIONS

Enhancing the role of industrial-organizational psychology in the development of pro-environmental behaviors would help to address interconnected crises such as climate change, food security, and environmental degradation. Industrial-organizational psychologists have an important role to play in adopting and developing pro-environmental behaviors among employees. Every person could participate significantly in achieving lasting environmental sustainability with specific pro-

environmental behaviors. Industrial-organizational psychologists are faced with the challenges to facilitating and encouraging pro-environmental behaviors in the workplace setting and transfer by the employees outside of the work context.

New worldwide changes suggested that it is of great importance for organizations to improve the pro-environmental behaviors of employees. Training and educational program about pro-environmental behaviors is set as one of many alternatives in the development and improvement of the desirable pro-environmental behavior of the employees. The success of different managerial activities, such as the implementation of environmental policies, codes of conduct, and industrial ecology actions, largely depends on employees' pro-environmental behaviors (BOIRAL, PAILLE, & RAINERI, 2015). Based on the topic covered in the study, a number of research and practice opportunities are opened for the application of the industrial-organizational psychology principles for pro-environmental behaviors in the workplace context. What should be emphasized is that we should not be waiting but need to take action immediately.

REFERENCES

BALUNDE, A., PERLAVICIUTE, G., & STEG, L. (2019). The Relationship Between People's Environmental Considerations and Pro-environmental Behavior in Lithuania. *Frontiers in Psychology, 10*.

BOIRAL, O., PAILLE, P.& RAINERI, N. (2015). The nature of employees' pro-environmental behaviors. In The *Psychology of Green Organizations*, NewYork: Oxford University Press, pp. 12-32.

BOLDERDIJK, J.W., LEHMAN, P.K., & GELLER, E.S. (2018). Encouraging Pro-Environmental Behaviour with Rewards and Penalties. *Environmental Psychology*.

PINZONE, M., GUERCI, M., LETTIERI, E., & HUISINGH, D. (2019). Effects of "green" training on pro-environmental behaviors and job satisfaction: Evidence from the Italian healthcare sector. *Journal of Cleaner Production*, 226, 221–232. doi:10.1016/j.jclepro.2019.04.048

HANDGRAAF, M.J.J., Van Lidth de Jeude, M.A. & Appelt, K.C., (2013). Public praise vs. private pay: Effects of rewards on energy conservation in the workplace, *Ecological Economics*, Elsevier, vol. 86(C), pages 86-92.

KRAJHANZL, J. (2010). Environmental and pro-environmental behavior. School and Health 21,Health Education: International Experiences, 251-274.

KURISU, K. (2015). What Are Pro-Environmental Behaviors (PEBs)?. In: Pro-environmental Behaviors. Springer, Tokyo. https://doi.org/10.1007/978-4-431-55834-7_1

LANDY, F. J., & CONTE, J. M. (2016). *Work in the 21st century: an introduction to industrial and organizational psychology*. Hoboken, NJ : Wiley.

MOURO, C., & DUARTE, A. P. (2021). Organizational Climate and Pro-environmental Behaviors at Work: The Mediating Role of Personal Norms. *Frontiers in psychology*, *12*, 635739. https://doi.org/10.3389/fpsyg.2021.635739

ROBERTSON, J.L.& BARLING, J. (2013). Greening organizations through leaders' influence on employees' pro-environmental behaviors, *Journal of organizational behavior*, 34 (2), 176-194.

ROSE, K. (2014). Adopting Industrial Organizational Psychology for Eco Sustainability. *Procedia environmental sciences*, *20*, 533-542.

RUSSELL, S., & GRIFFITHS, A. (2008). The role of emotions in driving workplace pro-environmental behaviors. *Research on Emotion in Organizations*, 4, 83–107.

STEG, L. and VLEK, C. (2009). Encouraging pro-environmental behavior: An integrative review and research agenda. *Journal of environmental psychology*, 29(3):309-317. https://doi.org/10.1016/j.jenvp.2008.10.004

WESSELINK, R., BLOK, V., & RINGERSMA, J. (2017). Pro-environmental behavior in the workplace and the role of managers and organization. *Journal of cleaner production*, *168*, 1679-1687.

WHO (2021). Climate change. Available online: https://www.who.int/health-topics/climate-change#tab=tab_3

THE IMPACT OF INCREASED WEATHER SALIENCE IN AUTISM SPECTRUM DISORDER

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Abstract

Weather is important to all people, including vulnerable populations (those whose difficulties concern cognitive processes, hearing, visual differences and physical disability). Autism spectrum conditions affect neurological functioning and concerning the weather changes, people with autism are more receptive on these changes in comparison with neuro-typical ones. According to different studies, people with autism tend to score highly in tests of systemizing, a psychological process that entails attention to details and to a specific way to be aware of any change in the environment. The difficulties of people with autism concerning the change of weather conditions are particularly correlated with their ability to systemize and their difficulty to accept changes that they cannot be prepared of.

The aim of this article is to present a qualitative study concerning the observations in two months (September 2020 and May 2021) of 10 children (5-10 years old) diagnosed with Autism Spectrum Disorder during the weather changed conditions and analyzing these dynamics considering the different approaches and studies that correlate the weather conditions with emotional consequences in children with Autism Spectrum Disorder.

Key words: weather conditions, systemizing, autism, changed conditions.

Introduction

Weather supplies many metaphors for our changeable minds. Moods can brighten and darken, dispositions can be sunny, futures can be under a cloud and relationships can be stormy. Like the weather, our emotions sometimes seem like fickle forces of nature: unstable, enveloping and uncontrollable. Weather has long held an important place in human experience and it continues to be an important determinant of everyday mood and behavior in modern life (Persinger, 1980; Watson, 2000).

Autism spectrum conditions affect neurological functioning. According to different studies, people with Autism, due to sensorial differences in comparison with neuro typical development, tend to be more aware of environmental changes. Their ability to systemize creates them difficulties to adapt to changes (Vivanti, 2010).

This qualitative study concerns on the observations in two months (September 2020 and May 2021) of 10 children diagnosed with Autism Spectrum Disorder (5 to 10 years old), during the weather changed conditions. The aim is to analyze some emotional dynamics on children with autism correlated to these changes and to present some strategies that would help children with autism cope with weather changes.

1. A review of studies on the impact of weather salience in Autism Spectrum Disorder

By definition, and to a remarkable degree, children and youth with autism spectrum disorders (ASD) are affected by environmental variables (American Psychiatric Association, 2000; Bregman & Higdon, 2012; Simpson, Myles, & LaCava, 2008).

The scientific evidence links weather with childhood emotions and behavior. The literature that is available on this topic (Essa et al., 1990; Lagacé-Séguin & Coplan, 2001) considers the possible influence of weather and other meteorological conditions on children and youth including those with Autism Spectrum Disorder. Faust et al. (1974) reported that a sizable portion of Swiss adolescents noted complaints related to the weather, including changes in energy level and mood. Howarth and Hoffman (1984) found that high humidity levels and low barometric pressure may negatively affect children's ability to focus in the classroom. Clarke (1967) found that delinquent acts correlated with meteorological fluctuations such as daylight hours, temperature, and sunshine. Essa et al. (1990) reported that preschool children showed an increase in interactions with in-class materials during times of stable weather; when the weather was unstable, the children were more prone to interact with peers and adults. Positive emotions have been reported to occur more frequently during times of calm and pleasant weather conditions (Lagacé-Séguin & Coplan, 2001).

2. Methodology of the study

Participants and setting

In this study participated 10 children with autism from Shkodra region. Their age range is 5 to 10 years old, from whom six are boys and 4 girls. The study was conducted during the month of September 2020 and May

2021. We chose these months due to weather changes that are more frequent, to observe the dynamics of children's emotions. There were two settings: classroom and home. In the classroom the observation was direct while at home, the parents were instructed to notice children's emotional dynamics and to take notes through a diary.

Procedures

This study was divided in three parts:

- Direct observation

In this part of the study, we observed the behavior of 10 children with autism in classroom, for 20 days in two emotional components: intensity of emotions and changes in mood in correlation with two weather components: sunny or rainy day, changes on weather conditions during the same day. To make sure that the weather affects the emotional wellbeing of the children, we identified the other factors to be excluded like: physical conditions of the child, conflicts and other difficulties that could affect the results of this study. We took notes through a diary and asked the teacher to help us be aware of other factors that could influence the results, considering that she knows well the child.

- Indirect observation

We asked parents to do the same process at home as we did in the classroom and to take notes through a diary. We asked them to sign every change and to be careful to notice if other factors, except the weather, would influence the results. When parents would notice in the child emotions with high intensity, would send us a video registration.

- Interview with teachers and parents

The interviews were two types: long structured interview concerning behaviors and emotional wellbeing of the child in general and a short interview concerning the emotional situation of the child in each day (at the beginning of each day and at the end). The first type of interview was done before starting the observation sessions and the second one was done on a daily basis.

Instruments

The instruments that we used for this study are: observation schedule for each child on a daily basis; long structured interview for the parents and for the teachers for the emotional wellbeing of the child and their behaviors. The first interview combines closed and opened questions and considers these aspect: the sensorial sensibility of the child, the behaviors that

indicates that he is experimenting an intense emotions, other factors that may influence his emotions and behaviors. The second interview considers the same aspects of the first interview, not in general, but considering the present moment. It is shorter and it is done on a daily basis considering the perception of the teacher and of the parents.

Results

To present the following results, we have considered the information collected from the daily diary schedule, the long initial interview and the short interviews on a daily basis. In 10 children that participated to this study we have arrived to these results:

Eight from ten children that participated to this study experience sensorial difficulties like: sensibility to the change of light, to noises and to the material of the clothes they wear. Considering these previous difficulties, we have noticed that they experienced intensity in their emotions when it was raining and when it was sun: when it was a rainy day they experience emotions like: sadness and angriness, while in the sunny days they experience intensive positive emotions like happiness and excitement. The behaviors that indicated the intensity of the emotions are: crying, laughing loudly, flapping, echolalia, pushing other children, getting up frequently. The same was noticed by the parents at home.

Two from ten children that participated to this study, doesn't experience sensorial difficulties. However, in rainy days they are more apathetic and less willing to do activities that they do every day like: doing class works and home works, playing etc., while in sunny days they are more willing to do these activities. This result means that even when they're not very influenced by the level of light, sounds and other components that difference a rainy day from a sunny day, they still experience different levels of motivation in doing the everyday activities. At home, there were the same results. The parents reported that in rainy days, their child was more willing to lie down on the sofa, while in sunny days, the child was more active and participated in different activities.

Considering the changes in weather during the same day as for example when it's sunny and then it rains or vice versa, all the children that participated to the study experienced changes in their emotions, from excitement to angriness when there was a sunny day and it changed into rain and from angriness to excitement when a rainy day changed into a sunny one. However these changes were more noticeable in children that have generally sensorial issues.

Discussion

The repetitive and restricted response patterns displayed by children with ASD occur frequently, across multiple contexts, and persist over time (Joseph, Thurm, Farmer, & Shumway, 2013). Results of factor-analytic studies suggest that lower order repetitive motor behaviors (e.g., motor stereotypies, lining up toys) are somewhat separate and distinct from higher-order response patterns alternatively called "insistence on sameness" or "resistance to change" (Bishop et al., 2013; Richler, Bishop, Kleinke, & Lord, 2007).

According to our study and related to other studies too, people with autism, find it difficult to deal with changes that they're not prepared to. This study shows that the children with autism, due to their ability to systemize and create schematic representations, find it difficult to deal with changes that they cannot predict. They get up in the morning and if the previous day was sunny, they expect the current day to be the same. They also find it even more difficult when the change is presented at the same day (when in one part of the day there is sun and then it rains).

3. Strategies to help children with Autism to cope with weather changes

Providing a predictable environment and routine is an important component of classroom programming for students on the autism spectrum (Iovannone, Dunlap, Huber, & Kincaid, 2003). People on the spectrum may demonstrate rigidity or inflexible behavior if classroom scheduling is inconsistent or absent. However, it is impossible to avoid changes in daily activities due to school scheduling, staff absences or weather changes. Along with unpredictable changes, staff members may find value in introducing students to novel settings, materials, peers, and activities throughout the school year to increase exposure to a broad range of experiences. When these changes in environment or routine occur, students with autism spectrum disorder (ASD) may feel stressed, anxious, or confused (Kluth, 2004). Studies have noted that during times of transition or change, students are more likely to engage in tantrums, aggressive behavior, and refusal (Schreibman & Whalen, 2000).

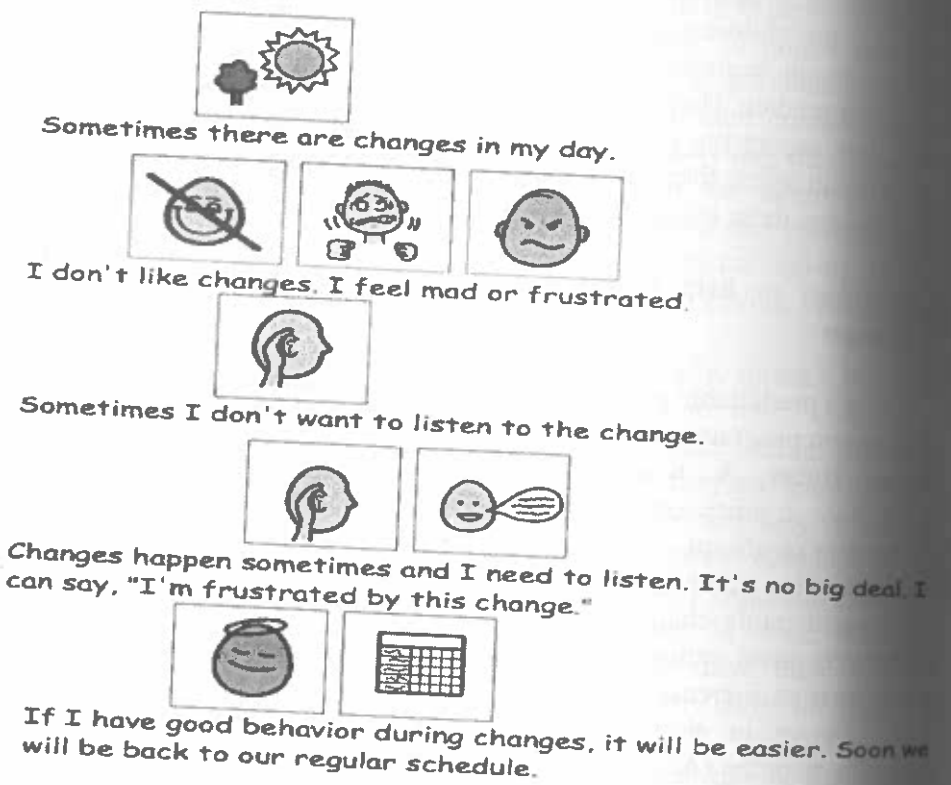
Preparing students for the possibility of change, as well as the procedures that will be followed when change occurs, are vital tools in increasing successful transitions. Using visual supports throughout the preparation for

new events and when teaching positive routines around change is also essential. Some of the strategies that could be used are:

1. Social stories that explain changes

Social stories help children with autism understand change like part of everyday life. Through these stories we help them deal with change, undestanding that might be differences from one day to another. We can also teach them how to behave when the change comes. The following example shows how we can use social stories to help children with autism deal with change:

Social story for change (Gray, 2000)

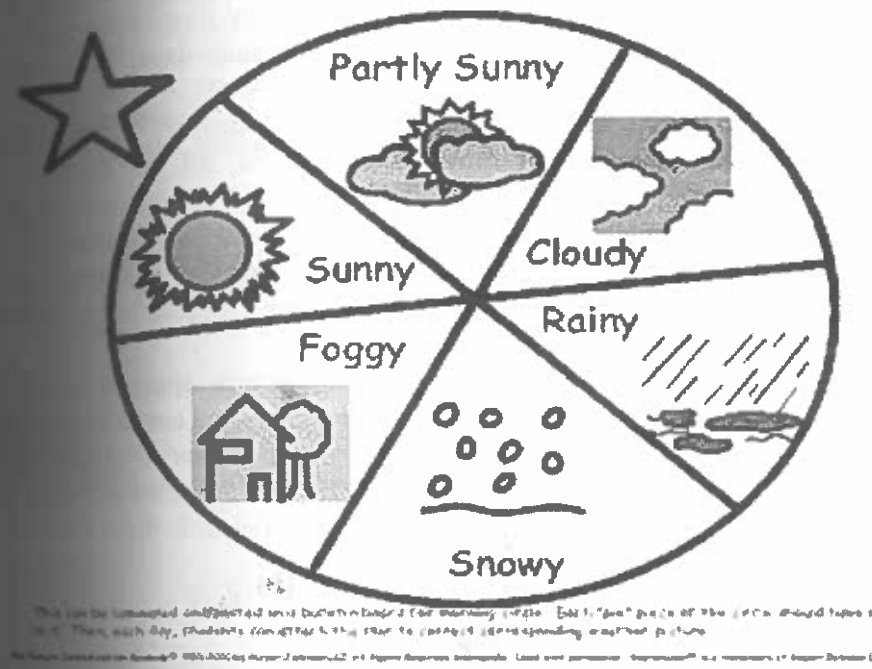


2. Presentation of images that explain the transition from one specific meteorological condition to another

Same as with all the other transitions and changes, we can use images to help children with autism understand that it can happen to start a day with a

sunny weather and then to pass to a rainy day. Also, we can make them understand that today it can be a sunny day, but that doesn't mean that tomorrow it will be a sunny day again. Through the following image, we can explain that the weather can pass from sunny, to clody and sometimes to rainy.

Social story for change (Gray, 2000)



Conclusions

The scientific evidence links weather with childhood emotions and behavior. The literature that is available on this topic (Essa et al., 1990; Lagacé-Séguin & Coplan, 2001) considers the possible influence of weather and other meteorological conditions on children and youth, including those with Autism Spectrum Disorder.

In this study, eight from ten children that have sensorial difficulties, experienced intensity in their emotions when it was raining and when it was sun: when it was a rainy day they experience emotions like: sadness and angriness, while in the sunny days they experience intensive positive

emotions like happiness and excitement. Two from ten children that don't have sensorial difficulties, were more apathetic in rainy days and less willing to do activities that they do every day like: doing class works and home works, playing etc., while in sunny days they were more willing to do these activities. This result means that even when they're not very influenced by the level of light, sounds and other components that difference a rainy day from a sunny day, they still experience different levels of motivation in doing the everyday activities. At home, there were the same results. The parents reported that in rainy days, their child was more willing to lie down on the sofa, while in sunny days, the child was more active and participated in different activities.

Considering the changes in weather during the same day as for example when it's sunny and then it rains or vice versa, all the children that participated to the study experienced changes in their emotions, from excitement to angriness when there was a sunny day and it changed into rain and from angriness to excitement when a rainy day changed into a sunny one. However these changes were more noticeable in children that have generally sensorial issues.

Some strategies that can be helpful in dealing with changes in weather conditions are the Social Stories and the images that could help explain weather changes. Anyway, these strategies are important to reduce anxiety in children with autism but not always sufficient. Sometimes, when they still feel anxious, they need a caregiver that still reminds them that they're not facing this sensorial challenge alone.

Bibliography

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders (4th ed)*.Washington DC.

Bishop, S. L., Hus, V., Duncan, A., Huerta, M., Gotham, K., Pickles, A. & Lord, C (2013). Subcategories of restricted and repetitive behaviors in children with autism spectrum disorders. *Journal of Autism and Developmental Disorders, 43*, 1287-1297

Bregman, J. D. & Higdon, C. (2012). Definitions and clinical characteristics of autism spectrum disorders. In D. Zager, M. Wehmeyer & R. Simpson (Eds.), *Educating students with autism spectrum disorders*, 13–45. New York, NY: Routledge.

Clarke, R. (1967). Research and methodology: Seasonal and other environmental aspects of absconding by approved school boys. *British Journal of Criminology, 7*, 195-206.

Essa, E. L., Hilton, J. M., & Murray, C. I. (1990). The relationship between weather and preschoolers behavior. *Children's Environmental Quarterly, 7*(3), 32–36.

Faust, V., Weidmann, M., & Wehner, W. (1974). The influence of meteorological factors on children and youth. *Acta Paedopsychiatrica, 40*, 150–156.

Gray, C. A. (2000). *The new social story book*. Arlington, TX: Future Horizons.

Howarth, E., & Hoffman, M. (1984). A multidimensional approach to the relationship between mood and behavior. *British Journal of Psychology, 75*, 15–23.

Iwanome, R., Dunlap, G., Huber, H., & Kincaid, D. (2003). Effective educational practices for students with autism spectrum disorders. *Focus on Autism and Other Developmental Disabilities, 18*, 150-166.

Joseph, L., Thurm, A., Farmer, C., & Shumway, S. (2013). Repetitive behavior and restricted interests in young children with autism: Comparisons with controls and stability over 2 years. *Autism Research, 6*, 584-595.

Kluth, P. (2004). *You're going to love this kid*. Baltimore, MD: Brookes Publishing.

Lagacé-Séguin, D. & Coplan, R. (2001). Winter weather go away, come again another day! Meteorology and mothers' perceptions of children's emotions during the winter season. *Canadian Journal of Research in Early Childhood Education, 8*(4), 39–50.

Richler, J., Bishop, S. L., Kleinke, J. R., & Lord, C. (2007). Restricted and repetitive behaviors in young children with autism spectrum disorders. *Journal of Autism and Developmental Disorders, 37*, 73-85.

Schreibman, L. & Whalen, C. (2000). The use of video priming to reduce disruptive transition behavior in children with autism. *Journal of Positive Behavior Intervention, 2*, 3-12.

Simpson, R., Myles, B., & LaCava, P. (2008). Understanding and responding to the needs of children and youth with autism spectrum disorders. In R. Simpson & B. Myles (Eds.), *Educating children and youth with autism*, 1–59. Austin TX: Pro-Ed.

Vivanti, G. (2010). *La mente autistica*. Torino: Omega Edizioni.

IMPACT OF CLIMATE CHANGE INTO ENERGY AND INCREASE OF THE RISK FOR VULNERABLE GROUPS. EVIDENCE FROM SMALL SCALE ENERGY POVERTY INTERVENTIONS IN VLORA MUNICIPALITY

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Abstract

Over the past few decades, scientists have become increasingly aware of the adverse effects that human activities are having on the environment and climate on Earth. These environmental and climatic changes have several consequences, impacting both the health of living organisms and more practical aspects of society. Climate change can increase the overall demand for energy, as people may use heating and cooling systems more frequently due to intolerable or extreme climatic conditions. In the Mediterranean, coastal areas face several specific energy poverty challenges, notably related to the thermal comfort of housing. Buildings are barely isolated, often without heating systems at all, or very inefficient. An important element of energy poverty in these areas is also the cooling component. Implementation of a series of practical measures for energy efficiency and the use of RES aimed at strengthening households in addressing energy poverty, with a particular focus on women and health. Energy policies have a history of being focused on supply of energy, not consumption, and therefore, energy policies assume that women and men have the same needs, values, experiences and aspirations towards energy production and use. Energy policies would need to consider the distinct gender and intersectional difference in the causes of energy poverty, as well as the access to and control over energy in the context of energy poverty.

Key words: climate change, sustainable development, energy poverty, renewable energy sources.

Background

Climate Change, its impact and vulnerability in Albania

The climate of Albania is typically Mediterranean. It is characterized by mild winters with abundant precipitation and hot, dry summers. Based upon

the relief of its territories and distance from the sea, Albania's territory is divided in four climatic zones: Mediterranean Plain Zone, Mediterranean Hilly Zone, Mediterranean Pre-Mountain Zone, and Mediterranean Mountain Zone.

All existing studies reveal that Albania is likely to become warmer under IPCC scenarios. The real observations received after the year 2000 have shown that values being reached are equal with those previously projected for the year 2020.

The projected future trends define continuously increasing temperatures. According to the TNC, the changes in annual temperatures in the Albanian Costal Area are likely to reach values of 1.7 °C (1.3 to 2.2), 2.8 °C (2.0 to 3.5) and 3.2 °C (2.4 to 4.1) respectively by 2030, 2050, and 2100 compared to the reference period 1961-1907. For summer projections, the annual temperature change is likely to reach up to 5.3°C (4.6 -6.0°C) by 2100. The coastal zone is unlikely to experience average temperatures less than 25°C by the summer of 2050; average temperatures up to 30°C will dominate in all the parts of this zone by 2100. The IPCC scenarios project the lowest increase for temperature in winter and higher increases in spring. The annual precipitation is likely to decrease up to -8.5% (-56.0 to 47.4 mm) by 2050; and up to -18.1% (-89.7 to 94.9 mm) by 2100. Despite the decreasing over-all trend, higher variability (annual and seasonal) is expected, associated with an increased frequency of extreme precipitation and climate related hazards (Figure 4). It is being projected that once every 10 years dangerous precipitation events may occur in the northern coastal region (Shkodra area) while in the central and southern coastal regions they are expected to occur once in 20 years. Although the number of extreme precipitation events can be expected to increase in terms of magnitude and frequency, the reduced levels of overall precipitation will produce an increase in the number of consecutive days without precipitation (drought). The maximum number of drought days is likely to be higher in the northern part (23 days) and up to 15 days going southwards by 2100 compared to the baseline period 1960-1990. Projected sea level rise will result in higher inundation risks for most urban areas along the coast and in increasing threats of coastal erosion. As a result of sea level rise, the level of the rivers is expected to increase in the lower parts of the basins and the flow will decelerate. In total, until 2030 approximately 1082.45 km2 (32% of the coastal areas or 3.76% of the country's surface) will suffer direct consequences from flooding. Huge amounts of arable lands will be lost and not used any longer due to inundations and increased salinity. Most of the

coastal habitats such as sand dunes, fresh and brackish water wetlands, marshes and lagoons, will be lost or further deteriorated. The Adriatic coastline will shift towards inland, and coastal erosion will be intensified, as migration of coastal wetlands and other habitats toward inland will be impeded by embankments and drainage schemes constructed as part of the wetland reclamation work over the years 50's-60's of the last century.

Knowledge on Vulnerabilities

Several studies as well as the First, Second and Third National Communication provide a quite clear picture on vulnerabilities to climate change in Albania. Many vulnerabilities have to be related to sectors of socio-economic activities. The following summary mainly reflects the present situation, e.g. vulnerabilities which become already visible as of now. However, most effects can be projected into the future with tendencies to enlarged magnitude.

- Hydrological systems: Changing precipitation or melting snow are altering hydrological systems, affecting water resources in terms of quantity and quality (as in the case of Mati aquifers).
- Agriculture: Negative impacts of climate change on crop yields have been more common than positive impacts. Impacts can result from changes of temperature, precipitation, hydrological systems (e.g. irrigation), soil quality, erosion, and extreme events. Climate change has already negatively affected wheat, maize and other yields for many regions, such as the Shkodra, Lezha, Lushnja, Fieri and Vlora regions. Several periods of rapid food and cereal price increases following climate extremes in key producing regions indicate a sensitivity of current markets to climate extremes among other factors.
- Energy: The high share of hydropower (the river Drin generates about 90% of the electricity used by Albania's local industry and households) implies direct impacts of changes in the hydrological systems on energy production. Electricity production can vary from almost 6,000 GWh to less than half that amount in very dry years. Climate change will likely have an adverse effect on hydropower production: by 2050, annual average electricity output from Albania's large hydropower plants could be reduced by about 15% and from small hydropower plants by around 20%.
- Health: There has been increased heat- as well as cold-related mortality in some regions because of climate changes. Local changes in temperature and rainfall have altered the distribution of some waterborne illnesses and

disease vectors. However, the statistics are still not fully clear about the causes.

- Social vulnerabilities: Inequalities and social vulnerabilities produced by uneven development processes can aggravate risks from climate change. Marginalized people are especially vulnerable to climate change as exemplified by illegal settlements along riverbanks and marginalized communities in areas like suburbs of Tirana, Keneta in Durres, Mifol and the surroundings in Vlora, Shkodra and Lezha plain.
- Forestry: Wildfires were present few years ago in the oak zone but there are no clear evidences for underlying causes (obviously climate related effects just support them).
- Climate related hazards and disasters: Increasing incidences of floods, droughts and other extreme events exacerbate other stressors, often with negative outcomes for infrastructure, production sectors and people livelihoods, especially for marginalized communities. Climate related hazards may directly affect peoples' lives or indirectly through food insecurity, disrupted supply of drinking water and electricity, destruction of homes etc.
- Eco-systems: Changes in climate have caused impacts on natural systems, which is visible already along the coastal lagoons and estuaries (from Buna to Pavla river), as well as in the river basins at the low plain (the frequency is higher in Drini, Buna and Vjosa). Evidence of climate-change impacts is strongest and most comprehensive for natural systems, including the coastal protected areas (for instance in Kune Vaini).
- Species: Many terrestrial, freshwater, and marine species have shifted their geographic ranges, seasonal activities, migration patterns, abundances, and species interactions in response to ongoing climate change. Typical for Albania are becoming the abundance entrances of sea turtle Caretta caretta in the Patoku lagoon, apart from many other new entries of alien species (fish, crabs, etc.)
- Tourism: Sector is exposed to numerous direct and indirect impacts from climate change. Sea-level rise will threaten coastal tourism infrastructure and natural attractions.

Climate Change, Energy Poverty, Health and Gender

Climate change can increase the overall demand for energy, as people may use heating and cooling systems more frequently due to intolerable or extreme climatic conditions. In the Mediterranean, coastal areas face

several specific energy poverty challenges, notably related to the thermal comfort of housing. Buildings are barely isolated, often without heating systems at all, or very inefficient. An important element of energy poverty in these areas is also the cooling component. Implementation of a series of practical measures for energy efficiency and the use of RES aimed at strengthening households in addressing energy poverty, with a particular focus on women and health

Energy policies have a history of being focused on supply of energy, not consumption, and as a consequence, energy policies assume that women and men have the same needs, values, experiences and aspirations towards energy production and use. Energy policies would need to consider the distinct gender and intersectional difference in the causes of energy poverty, as well as the access to and control over energy in the context of energy poverty.

While the UN and EU is spearheading global action on the climate emergency, millions of Europeans are unable to access a sufficient level of domestic energy services for fully participating in the lifestyles, customs and activities that define membership of society. This condition has become widely known as energy or fuel poverty (EP) in the scientific and policy literature and is defined as the "inability to attain a socially and materially necessitated level of domestic energy services". According to the European Energy Poverty Observatory (EPOV), tens of millions of Europeans suffer from high energy expenses, cold homes and arrears on utility bills among other symptoms.

Methodology

Analyse of the energy consumption at household level and impact into climate change

The study aims to identify the energy gap in the broad picture and enhance the energy sustainable conditions of the local communities. This report is a product of 5- month intensive research and communication activity. Primary the activities were focused on the selection of the young people, delivering capacity building of them in energy data collection and analysing the data according to the database provided.

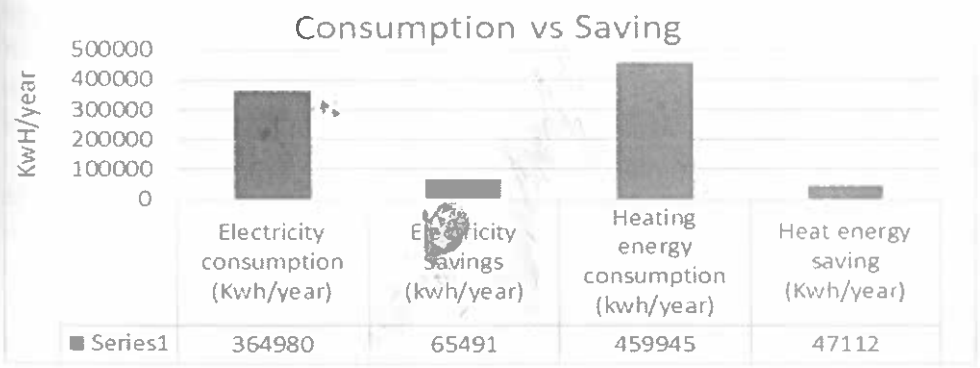
The whole data collection and analyzing phase lasted for a period of 3 months including the

editing, translation, and finalization was delivered to the beneficiary efficient equipment's as LED lamps (lighting) (300 pieces); power strip (100pc), shower head (50pc), tap aerator (100pc), draught proofing window (155pc), draught proofing door (160pc). The total number of the respondents (households) interviewed was 100.

Discussion and results

Before the installation of the LED lamps and power strips, the total electricity consumption of the target households was around 364,980 kwh/year with a total value 32,848 EUR[1]. After the implementation of the proposed measures the total savings were estimated to be 65,491 kwh/year (18% less) or 5,894 eur with an average of 59 EUR/HH/year.

Regarding heating the energy that is consumed mainly for heating is estimated to be 459,945 kwh/year. After the implementation of the proposed measures (draught proofing of doors and windows) the savings was estimated to be 47,113 kwh/year (10% less) or in economic terms 4225 eur/year with an average of 42.3 eur/HH/year. Taking into consideration the some of the of residents use wood for heating and some other use electricity. Must be noted that the heating energy consumption related with electricity and heating (wood, LPG, etc) according to each household.



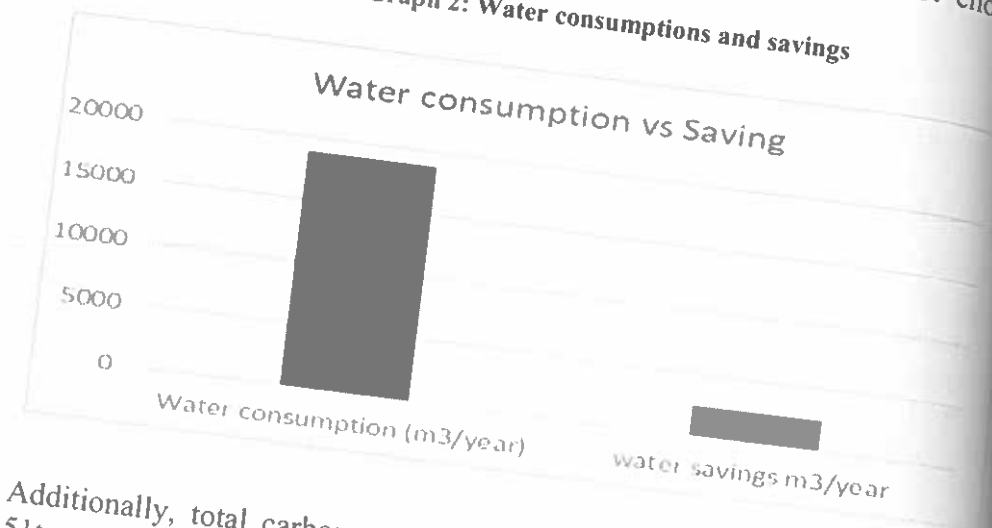
Graph 1: Electricity and Heating, Consumption and Savings

Regarding the water consumption, the type of investments made were on shower head (50pc), tap aerator (100pc). Before the intervention, the total water consumption was estimated to be around 18,842 m^3 /year or 10,740 EUR. The estimated savings after the intervention are around 2,356 m^3/year

[1] Price in Albania of energy is 1kwh = 0.09 eur

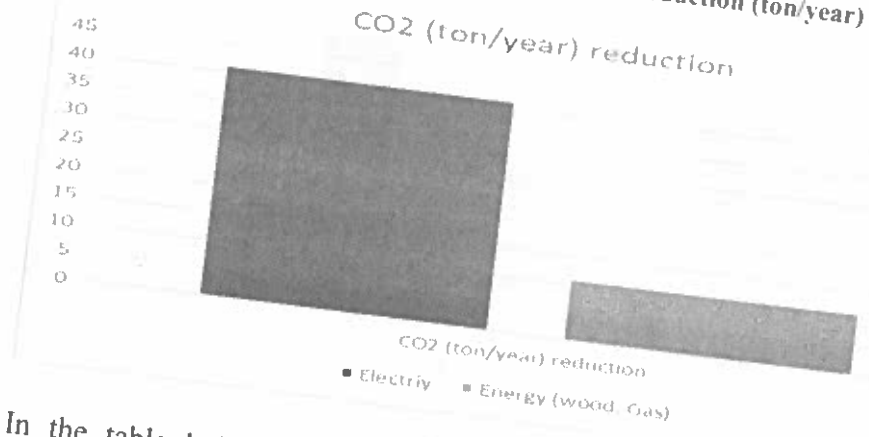
(12.5% less) or 1,331 eur/year. The existing facilities were not enough efficient.

Graph 2: Water consumptions and savings



Additionally, total carbon emission reduced annually is estimated to be 51ton CO_2/year, where 41ton result to be reduced from the energy efficiency measures and 10ton results to be from heating savings.

Graph 3: Carbon emissions reduction (ton/year)



In the table below is given the annual saving opportunities from the implementation of the appliances, the savings from energy are estimated to be 112,603 Kwh/year, from the water are 2,356 m3/year in economic terms 10,565 euro/year. Carbon emission reduction will be 53.199 kg/year and total primary energy savings 214,944 Kwh/year.

Table 1: Annul savings (per life- time of the device)

Total Annual Saving				
total final energy savings	total water savings	total cost savings	total CO2 savings	total primary energy savings
(kwh/year)	(m^3/year)	(eur/year)	(kg CO_2/year)	(Kwh/year)
112,603	2,356	10,565	53,199	214,944

Considering the lifetime of the energy saving products we came to the following long-term savings.

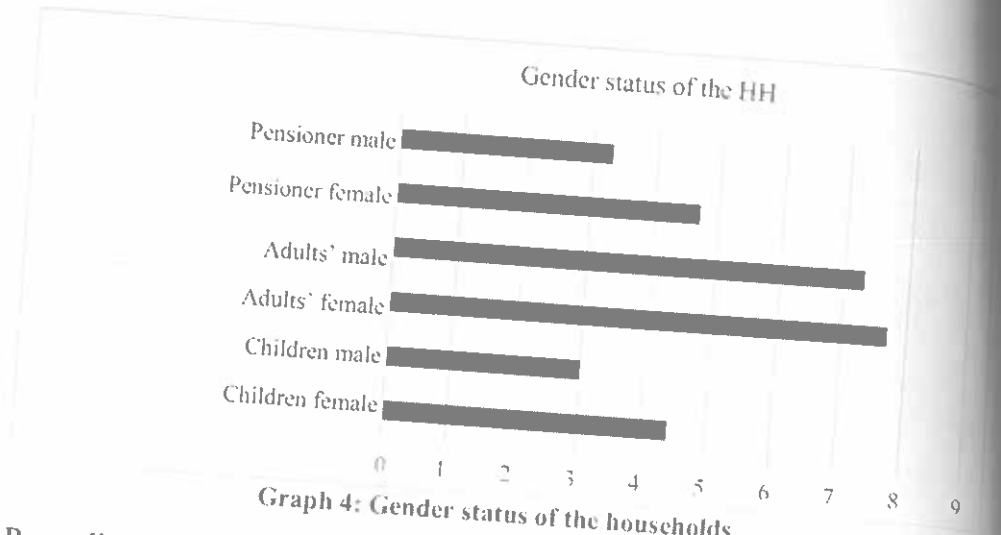
Table 2: Long term savings (per life- time of the device)

Long term savings (per lifetime of devices)											
Eletricity	Eletricity	Eletricity	Water	Water	Heat energy	Heat energy	Heat energy	Total final energy savings	Total cost savings	Total CO2 savings	Total primary energy savings
kWh	€	kgCO2	m³	€	kWh	€	kgCO2	kWh	€	kgCO2	kWh/y
649756.592	58478.09	408047.1	23560.25	13311.07	264272.9	18698.82	153570.7	914029.5	90487.98	469496.9	1887337

In the long-term saving opportunities from the implementation of the appliances, the savings from electricity are estimated to be 649756 Kwh/year or 58478 EUR. From the heating the long-term savings are estimated to be 265272 kwh OR 18,698 EUR. From water the amount will be 23560 m^3 OR 13,33 EUR.

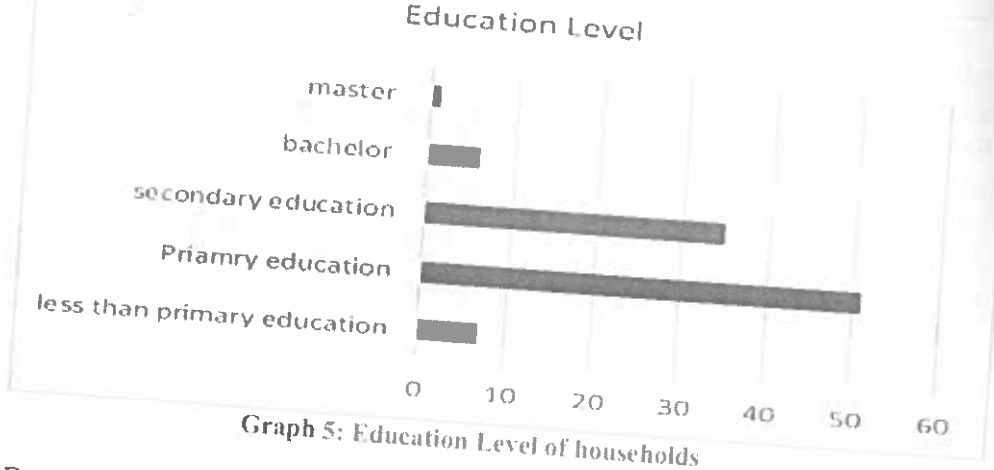
Based on the results of the questionnaires, 51% of the respondents are male and 49% of the respondents are female. The questions also asked for information about the number of persons in each of the households. Based on these data, it resulted that 33% of households have 2 persons, 19% of households have 1 person, 14% of households have 3 persons, 14% of households have 5 persons, 9% of households have 4 persons, 5% of households have 6 persons, 3% of households have 7 persons, 2% of households have 8 persons and only 1% of the interviewed households have 10 people. The interviewed households were asked additionally about the number of children, adults, and pensioners in their families. The collected data were analysed to determine the gender status of these categories. Based on these data, it results that 44% of them are minor (female), 30% of them are minors (male), 77% of them are adult (females), 73% of them are adult (males), 47% of them are pensioners (female) and 33 % of them

are pensioners (male)



Graph 4: Gender status of the households

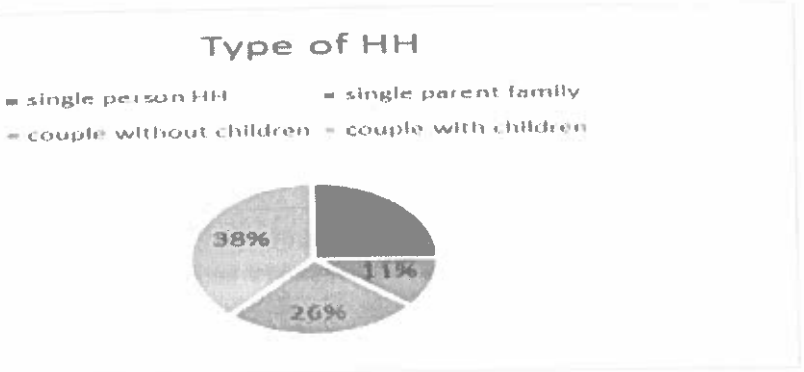
Regarding the level of formal education completed, most of the respondents (51%), have completed primary school, while 35% of them have completed secondary education, 7% of them have completed less than primary education, 6 % of them have completed the bachelor and only 1% of the respondents have completed the level of master studies.



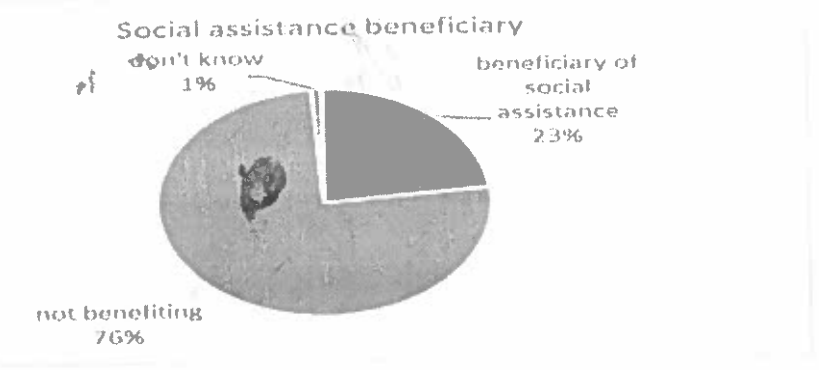
Graph 5: Education Level of households

Based on the results of the questionnaires, were identified 4 types of households, where 25% of the interviewed households are single person, 11% of the interviewed households are single parent family, 26% of them are a couple without children and 38% of them are a couple with children.

Graph 6: Type of households

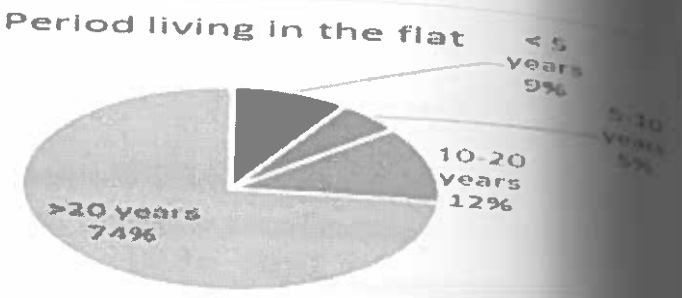


From the collected data, 76% of families do not receive social assistance, 23% of them are beneficiaries of social assistance and 1% of them answered that they do not know. None of the interviewed families is accommodated in a social housing.



Graph 7: Social Assistance Beneficiary

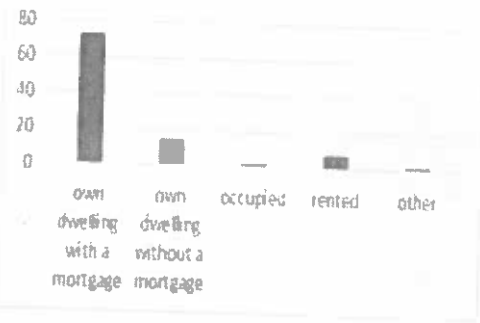
Approximately **74% of the respondents answered that they have lived in the flat for more than 20 years**, while 12% of them have 10-20 years living in the flat, 9% of them have less than 5 years living in the flat and 5% of households have 5-10 years living in the flat.



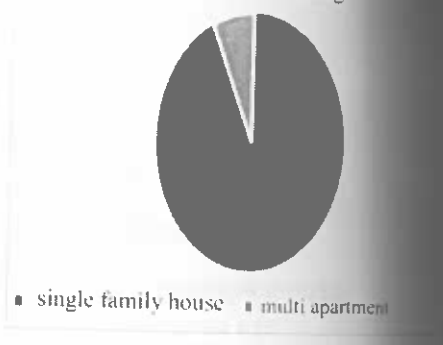
Graph 8: Period of living in the flat

Regarding the tenancy status, **73% of the interviewed households live in own dwelling with a property title**, 15% of them live in own dwelling without a property title, 8% of them live in rented dwelling, 2% of them answered that the own dwelling is occupied and 2% of them answered other. The ceiling height in all dwelling of the interviewed family's results normal (2.50 - 2.80 m).

In relation with the number of flats in the buildings, 78% of the respondents answered they have 1-2 flats in the building, 16% have 3-5 flats in the building, 3% answered have 6-10 flats in the building and 2% answered they do not have flats in their building.



Graph 9: Tenancy status



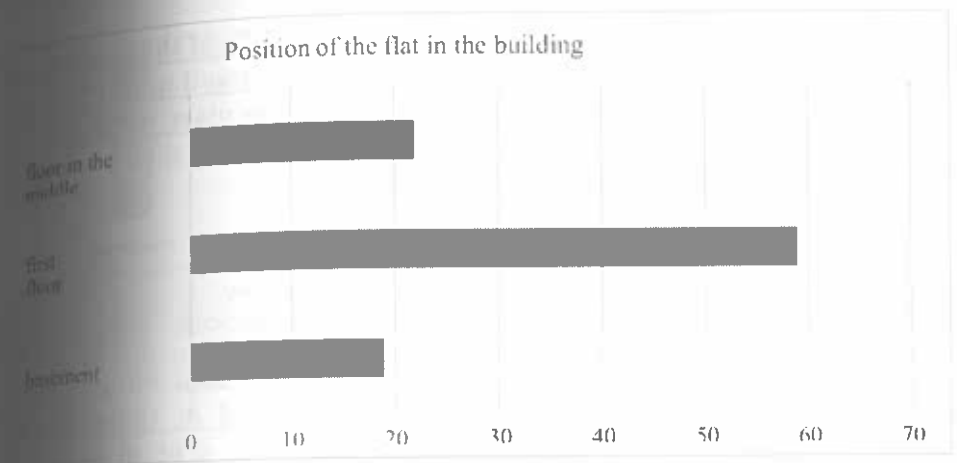
Graph 10: Type of building

Following, the interviewed households were asked about the type of dwelling, and from the results of the questionnaires **93% of them live in a single-family house** and 7% of them live in multi-apartment buildings.

Regarding the position of the floor in the building, 19% of the interviewed families answered that their dwelling is located on the basement, 59% of them answered that their dwelling is located on the first floor and 22% of

them answered that their apartment is located on the floor in the middle.

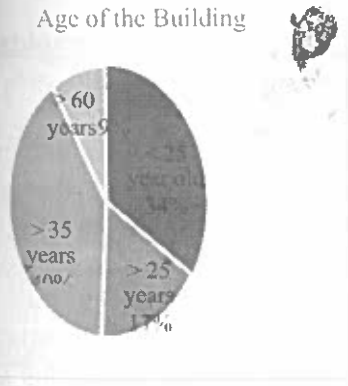
Graph 11: Position of the flat in the building



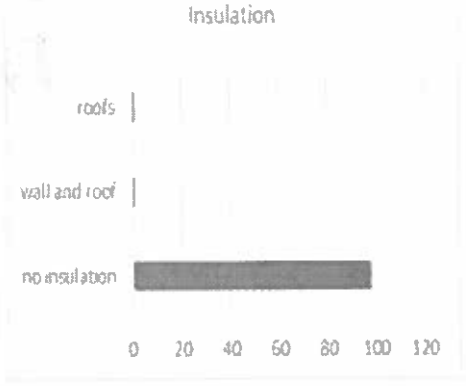
Based on the data collected, 68% of houses stand alone, 24% of houses stand in line middle and 8% of houses stand in line corner.

Regarding the age of the buildings, resulted that **40% of the buildings of the interviewed households are older than 35 years**, 34% of the buildings of the interviewed households are less than 25 years old, 17% of the buildings of the interviewed households and 9% of the buildings of the interviewed households are more than 60 years.

Graph 12: Age of the Building

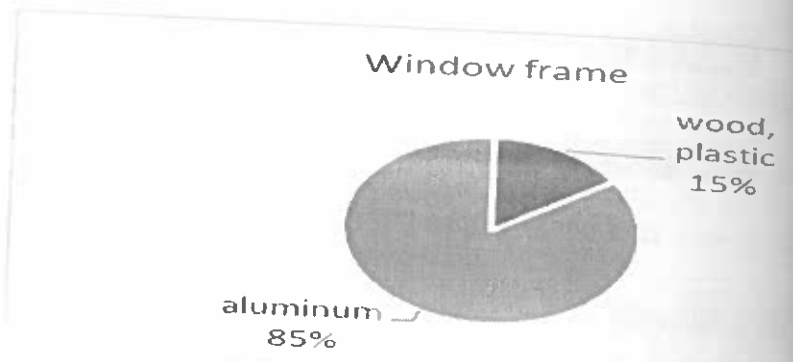


Graph 13: Insulation



The interviewed households were asked if their dwelling has any insulation

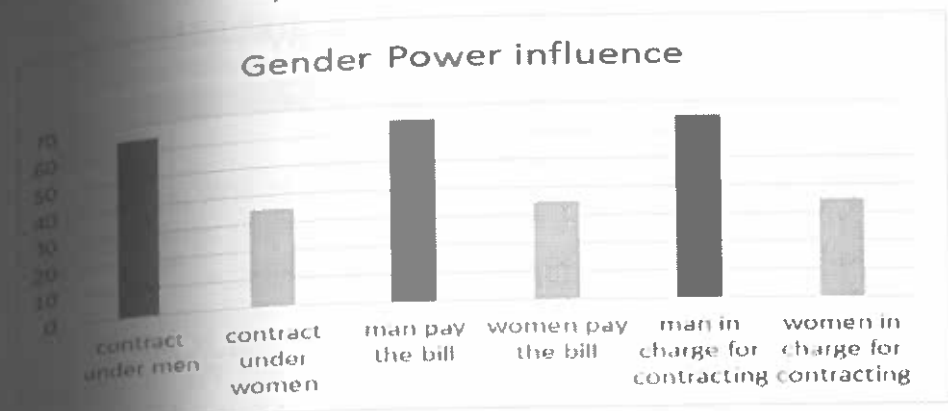
and from the results of the questionnaires **98% of them answered that they have no insulation** in their dwellings. Only 1% of them answered that they have insulation on the walls and roofs of dwelling and 1% of them answered that they have insulation only on the roof.
Regarding the standard of windows, it results that **99% of the dwellings of the interviewed families have single glass windows and only 1% of the dwellings of the interviewed families have double glass windows**. The standard of the window frame in 85% of the households is aluminiumand in 15% of the households it is wood, plastic.



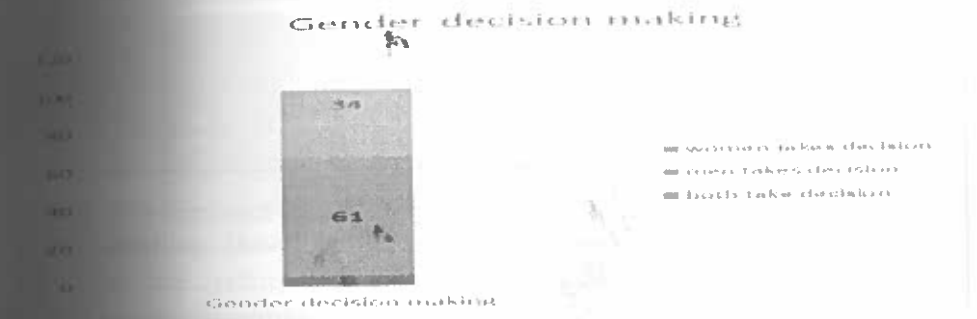
Graph 14: Window frame

From the questionnaires were collected data about the number of rooms in the dwelling of the interviewed households. Based on these data, 43% of the respondents live in dwelling with 2 rooms, 41% of respondents live in dwelling with 3 rooms, 12% of respondents live in dwelling with 4 rooms, 2% of respondents live in dwelling with 1 room, 1% of the respondents live in dwelling with 5 rooms, 1% of the respondents live in dwelling with 6 rooms.
The average surface of dwellings of interviewed households is 88.86 m2 where 74% of dwellings have a surface up to 100 m2 and 26% of dwellings have a surface more than 100 m2.
Regarding the question, under which name are the water and energy supply contracts in the interviewed households, it resulted that **65% of the contracts are in the name of men and 35% of the contracts are in the name of women**. Men are responsible of paying bills in 65% of households interviewed while women are responsible of paying bills in 35% of households. Men is responsible of contacting energy and water suppliers in 65% of households interviewed while women are in charge of contacting energy and water suppliers in 35% of households interviewed.

Graph 15: Gender power influence



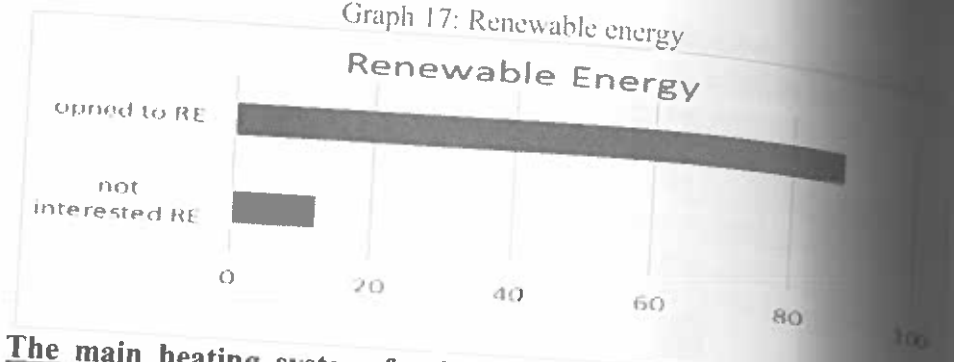
Regarding the question who takes decisions on energy, water, **men take the decisions in 61% of households interviewed while women take decisions in 34% of interviewed households** and both take decisions in 5% of households interviewed.



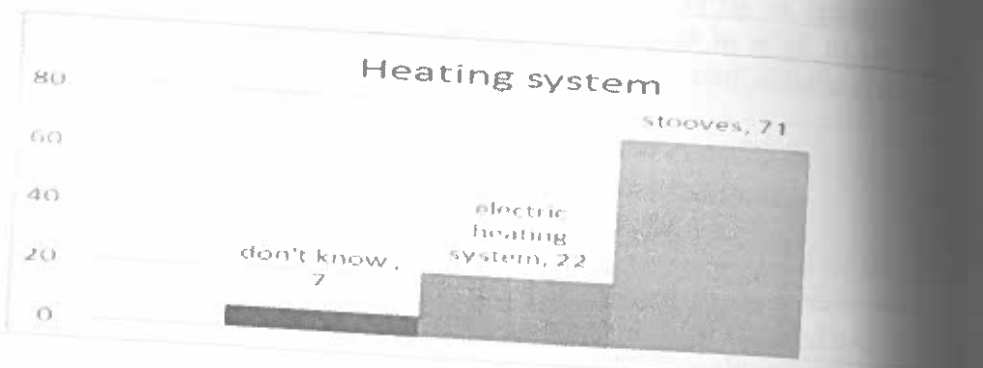
Graph 16: Gender decision making

The average days of absence per year in most of the interviewed households (75%) are 0 days while in 16% of the households the average days of absence per year are 10 days, in 6% of households the average days of absence per year are 30 days, in 1% of households the average is 15 days absence, in 1% of households the average is 20 days absence and in 1% of households the average is 60 days absence. Approximately 82% of people interviewed stay home during the day and only 18% of them do not stay home all day. Regarding renewable energy, **88% of households answered that they are interested in having renewable energy**, while 12% are not interested in renewable energy. The households do not have green energy tariff.

Graph 17: Renewable energy

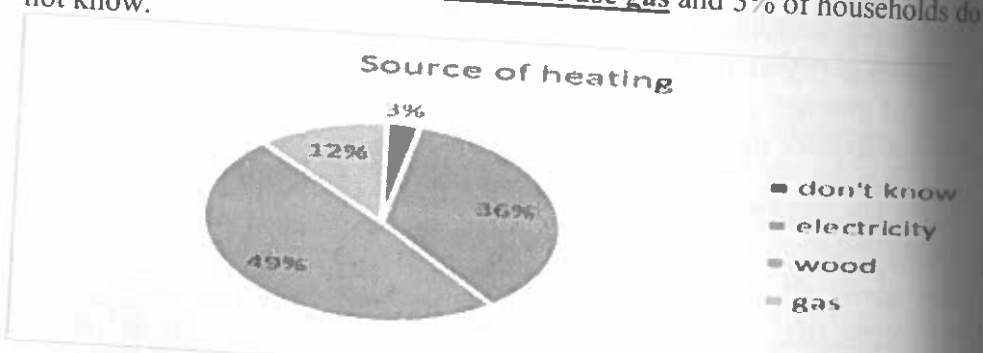


The main heating system for 71% of respondents is stoves. Electric heating system is used in 22% of households and 7% of households answered that they do not know the heating system. All interviewed households (100%) answered that they heat or cool only some rooms in their dwelling and not the entire dwelling.



Graph 18: Heating system

As a result, **49% of households use wood for heating, 36% of households use electricity for heating, 12% of them use gas** and 3% of households do not know.

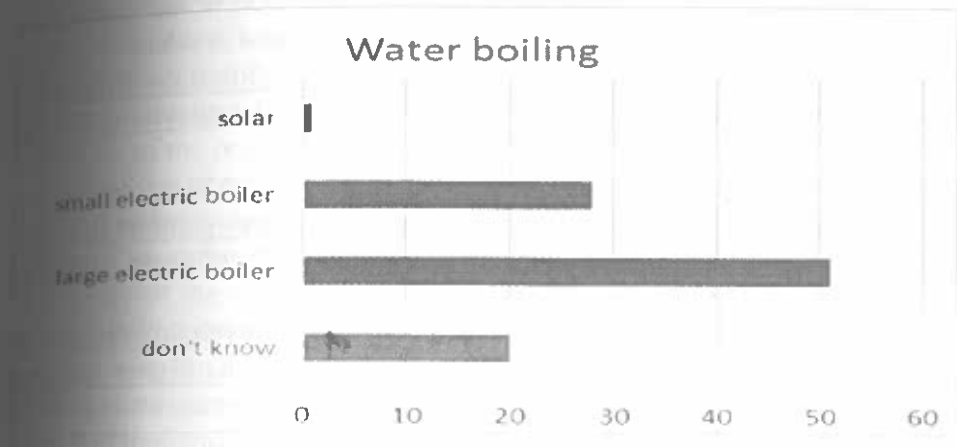


Graph 19: Type of heating

Regarding water boiling system for bathroom, **more than half of households (51%) have large electric boilers** while 28% of them have small electric boilers with a capacity (5-10 l) and 20% of households answered that they do not know. **Only 1% of households have a solar system.**

For the kitchen, 98% of households do not have water boiling system, 1% of them have large electric boiler and 1% of them have solar system.

Graph 20: Water boiling



In addition to the heating system, households also were asked about the cooling system they have in their dwelling. Based on the collected data, **63% of households** do not have a cooling system, 35% of them use fan and **2% of households use mobile air conditioning**.

The households also have assessed the summer thermal comfort and winter thermal comfort by using a rating scale from 0 to 10. Most of the households **(76%), assessed that they have poor summer comfort** while 24% of them assessed that they have good summer comfort. **All of households (100%), were answered that they do not have winter thermal comfort.**

Most of households (94%) ventilate the rooms in the winter by turning the window wide for some minutes and 6% of them ventilate the rooms by tipping the window for a longer time. None of the households do not switch the thermostatic valves if they ventilate the rooms. Based on the data collected, **48% of households always reduce the temperature while**

absence/at night, 28% of them do not reduce temperature while absence/at night, 15% of them mostly reduce temperature while absence/at night and 9% of them sometimes reduce temperature while absence/at night.
The households were asked if they close the doors between heated and not heated rooms and from the questionnaires it resulted that **64% of households always close the door between rooms**, 22% of them do not close the door, 8% of them mostly close the door and 6% of them sometimes close the door between rooms. Approximately 91% of households do not use an additional electrical heater/radiator in winter whereas 4% of them sometimes use it, 3% of them always use it and 2% of them mostly use an additional electrical heater /radiator in winter.
Regarding the structure problems, **89% of households have draught at the window**, **83% of households have draught at the doors and 80% of households have problems with mold.**
Based on the household's answer, **83% of them cannot keep comfortable warm during winter**, **84% of them cannot keep comfortable cool during summer and in the last twelve months, 39% of them have been in arrears.**
Regarding the confidence for the future, **64% of households feel a little confident about whether their energy consumption is higher or lower than normal for their type of household**, 25% of them somehow, 10% of them not at all and 1% of them fully confident. Approximately 56% of households feel a little confident about their current energy price that they are not paying too much,24% of them somehow, 17% of them not at all and 3% of them fully confident about that.
Also 49% of households feel fully confident to help others saving on their energy bill, 34% of them to some extent confident, 8% of them a little confident, 5% of them somehow, 3% of them not at all and 1% of them fully confident about that. More than half of households (52%) feel to some extent confident to help others saving on their water bill and only 2% of households are fully aware of how different energy tariffs can be used to lower their energy bill.

Conclusions

The data gathered in the field and majority of the data provides a clear picture of the current gender issues and energy performance of the households. According to the results, 51% of the respondents were male gender and 49% of the respondents were female. In addition, regarding

decisions, 61% of the respondents replies that decisions are taken by men and 34% taken by women and onl5 5% by both. Also, from the questionnaires resulted that only **65% of the respondents** replied that contracts are under men and **35% of them replies are under women**.
This data emphasize that majority of woman have the power of participation and decision-making in household related activities. The level of education of most respondents (51%) resulted to be low as most of them has undertaken only primary education. The low level of education might bring also low awareness on energy activities and main efficient devices from the technical point of view. Regarding the composition of households, about 38% of the houses is composed of couples and children and only 25% of the respondents are single person. The intervention of energy efficiency measures will bring reduction of 51 ton/year CO_2.
Only 93% of the respondents replies that they live in a single-family house and 7% of the live-in multiple apartments. So, the owners can manage by their self to renovate their house by avoiding misunderstandings with other owners of the same property. Furthermore, only 23% of the respondents are beneficiary of the social assistance and 76 % are not benefiting from this scheme. Following the economic situation, 73% of the respondents replies that they own the dwelling with a property title. Regarding insulation, 98% of respondents replied that the dwellings are not insulated and have single glass window and only 2% have insulation in the roofs and in the walls. The average surface of the dwellings of the respondents is 88 m^2.
88% of the respondents are aware and willing to have renewable energy technologies while 12% are not interested in having renewables. 71% of the respondents replied that the main source of heating is wood stoves, 22% uses electricity and the others are aware on the heating systems they use. Regarding thermal conditions, 76% of the respondents replied that are having poor summer comfort conditions while 24% of them assessed that are having good summer comfort. 83% of them cannot keep comfortable warm during winter, 84% of them cannot keep comfortable cool during summer and in the last twelve months, 39% of them have been in arrears. The level of awareness related with energy behaviour resulted to be more than average, where 64% of the respondents always close the door between rooms or 45% of the respondents replies that they slow down the temperature during the night.
The level of energy quality of the internal space of the house (windows/doors) resulted to be low, as 89% of the households have draught at the window, 83% of draught at the doors and 80% of the households

have problems with mould. Even health issues are present to the respondents, where 50% of them suffer from blood pressure diseases, have associated chronic diseases. Still the energy remains very expensive for responses as 35% of them have great difficulty to make the ends meet, meaning that the incomes still are not enough to cover the energy and the price of energy is still high for the citizens.

References:

UNDP, Third National Communication to the United Nations Framework Convention on Climate Change | UNDP in Albania, 2016.

Bouzarovski, S.; Petrova, S. A global perspective on domestic energy deprivation: Overcoming the energy poverty–fuel poverty binary. Energy Res. Soc. Sci. 2015, 10, 31–40. [CrossRef]

Bouzarovski, S.; Thomson, H. Transforming Energy Poverty Policies in the European Union: Second Annual Report of the European Union Energy Poverty Observatory; EU Energy Poverty Observatory: Manchester, UK, 2019.

Bouzarovski, S.; Tirado-Herrero, S. The energy divide: Integrating energy transitions regional inequalities and poverty trends in the European Union. Eur. Urban. Reg Stud. 2015, 24, 69–86. [CrossRef] [PubMed]

Bouzarovski, S.; Thomson, H.; Cornelis, M. Confronting energy poverty in Europe: A research and policy agenda. Energies 2021, 14, 858. [CrossRef]

Gouveia, J.P.; Seixas, J.; Long, G. Mining households' energy data to disclose fuel poverty: Lessons for Southern Europe. J. Clean. Prod. 2018, 178, 534–550 [CrossRef]

Milieukontakt Albania, Vlora pilot site assessment report in Albanian (with an executive summary in English). Available online: D1.1-Vlora-Albania.-Pilot-site-2.pdf (empowermed.eu).

Lluc Canals Casals; Jordi Pascual Data recording, collection framework and analysis framework. Available online: Data-recording-collection-framework-and-analysis-framework.pdf (empowermed.eu)

Eurostat. Electricity Prices for Household Consumers–Bi Annual Data (from 2007 Onwards). Available online: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nrg_pc_204 (accessed on 13 August 2021)

ASSESMENT OF THE ECOLOGICAL FOOTPRINT IN SHKODRA ECOSYSTEM FOR THE PANDEMIC YEAR 2020-2021

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Abstract

Control of anthropogenic activities and consumption of the natural terrestrial ecosystem constitute new directions related to environmental management. Their integration in the concept of ecological footprint makes it possible to assess their impact on the environment by providing us with concrete data on the mark left by residents in the environment where they live. In this topic are given data on the ecological footprint in the urban ecosystem of the city of Shkodra for a period of these years (2020-2021). The result is determined on the basis of interviewing a sample of citizens for their behavior towards consumption in relation to food, housing, transportation and consumption of material goods and services. Calculating the ecological footprint will help us to reflect on the impact of human behavior on the environment and the direction to be followed to reduce the ecological footprint in this ecosystem.

Introduction

The direct objective is to accurately determine the size of the ecological footprint for the city of Shkodra for the years 2020-2021.

- Analysis and evaluation through values and figures of the impact of Shkodra citizens on the environment.
- Providing recommendations on how we can reduce our negative impact on the urban ecosystem of the city of Shkodra.
- Providing recommendations to local authorities, mainly the Municipality of Shkodra and surrounding administrative units to work in the field of environment for the development of sustainable environmental policies.

The importance of this study lies in the assessment of the ecological footprint which serves as a strong indicator for promoting the use of nature in a sustainable way and the design of local policies for a sustainable development of the urban ecosystem of the city of Shkodra. The analysis of an urban ecosystem mainly summarizes information and data on 70 environmental parameters. The assessment of the Urban Ecosystem is based on the comparison of the declared real values against some sustainability objectives and parameters of an ideal city. For each parameter a reference scale is constructed which predicts the minimum and maximum values. The most acceptable values which aim at the sustainability of cities are those that reach 95% of the acceptable values according to international criteria. Cities have a complex nature, but also organized as in the natural sciences. They represent situations in which a series of fine elements, connected by invisible threads, are all changing. Cities are not just a problem, but a series of problems that can be analyzed in relation to each other, not because they are randomly interdependent, but because they are organically related. The indicators used serve the achievement of environmental sustainability in cities, the impact they have on economic activities and lifestyles as well as the use of environmental resources. The norms that are evaluated today provide a normality of data for some of the objectives of concrete and practical sustainability. The opportunity to develop actions based on issues addressed by urban ecology gives opportunities for education and environmental awareness initiatives, as well as the development of a society that pursues fair policies for intervention in its territory. Local government bodies represent the most important state structure for the administration and protection of the environment that they have in their jurisdiction, implementing the responsibilities, rights and duties given to them by law.

Regarding environmental protection, they have the following duties:

- implement the laws on environmental protection;
- draft local plans for environmental protection and territorial regulation plans;
- make public programs and measures for environmental protection;
- inform the public about the state of the environment and local activities, subjects of environmental impact assessment;
- promote and support the activities of environmental non-profit organizations, drawing their attention to environmental decision-making; etc.

Materials and Methods

To calculate the ecological footprint, statistical data analysis is used, which translates into the biological production quantities of the sites as well as the spaces that are needed but the elimination of waste, on an annual basis.

Since the use of natural resources by humans also causes pollution problems in most countries, the ecological footprint is the sum of these spaces wherever they are scattered on the planet.

Trace calculation is based on four consumption categories:

1. It is possible to curb the consumption of resources by humans and to generate most of the waste.
2. Most of these resources and waste streams can be converted into biological production space which can withstand this flow.
3. These different areas can be expressed in the same unit (hectare or gold) although they can be scaled proportionally depending on the biomass production.
4. This space for human demand can be compared to the ecological services of nature, so it is possible to add to the space that is biologically productive on the planet.

The calculation of the ecological footprint is done by compiling a matrix, in which the surface is attached to each category of consumption; then the entire land area is added and divided by the population number giving the result in hectares per person. Determining the ecological footprint for the city of Shkodra summarizes the drafting of the questionnaire with the relevant sections, the collection of data from the community through their completion, the processing of these data. The questionnaire contains five sections using five consumption indicators: food, waste production, purchases, transport, water and energy. The data for each section are processed and expressed through graphs; they are also scored and converted, expressing the hectare / citizen / year ratio, in accordance with the concept of ecological footprint.

300 surveys were conducted, being distributed proportionally in age groups, young people (18-25 years old), middle-aged people (40-50 years old), elderly people (over 60 years old), as well as in gender, women and men. Respondents include mainly high school students and students, different ages, casual passers-by.

All the results of the surveys, organized according to the rubrics are presented with tables and graphs. The data is processed with excel as well as the graphs.

Each of the individuals interviewed was familiar with the number of points in total and assessed their behavior towards the environment through the result of the ecological footprint.The results below are a total of all respondents expressed in percentage.The total ecological footprint is calculated as the average of the individual ones (between min max).The survey summarizes data on the assessment of home behavior, nutrition, shopping, garbage transportation, each answer has a score and the points collected at the end of each interview give the result of the trace based on the following table:

Table 1. Number of points and track result by points

Number of points	Result off the footprint
Less than 150 points	Less than 2 ha
150-350 points	From 2 to 4 ha
350-550 points	From 4 to 6 ha
550-750 points	From 6 to 10 ha

This paper provides data on the ecological footprint in the urban region of Shkodra. It helps us reflect on the impact of human behavior on the environment and the direction to be taken to reduce the ecological footprint.

This study makes an important contribution to the theoretical and practical training on ecological footprint as a novelty today. It helps to create good relationships not only with people and society but also with the environment. It helps us to show how the human-environment relationship should always strive to be at the most acceptable values in the urban ecosystem or in the city where we live.

Ecological footprint as a new concept of recent years is defined as a land area that would be needed to meet the need for consumption of a certain population as well as to absorb the waste produced.

Results and Discussions

Discussion of our random results and data analysis.

The results of the questions analyzed in 2021 are presented below, also through graphs.

They are listed as follows

First Category - House

1% of respondents answered that their family consists of one person, 16% of respondents answered that their family consists of 2 people, 11% of

respondents answered that their family consists of 3 people, 33% of respondents answered that their family consists of 4 people, and 39% of them answered that they have 5 or more people in the family.

Albanian families generally consist of 3-4 people. We also see an increase in families with 2 children compared to previous years. but in our sample, they dominate with more than 5. This also brings greater opportunities for the consumption of material goods.

2. With what you heat your home?

7% of respondents answered that they heat with gas, 46% of respondents answered for heating with electricity and 46% of them answered for heating with fuel. Only 1% of respondents respond that they use renewable energy. As can be seen from the graph, the highest percentage belongs to households that use electricity for heating and live in apartaments, it also belongs to households that consume more fuel.

3. How many water taps do you have at home?

52% of respondents answered that they have 3-5 taps in the house, 33% of respondents answered that they have 6-8 taps, 10% of respondents state that they have 8-10 taps, and 5% answered that have more than 10 water taps in their homes. Household water consumption is higher among households living in private dwellings, which means that there is often misuse of its reserves and this obviously has a direct consequence in reducing it as a natural resource.

4. In what kind of house do you live?

There is not a big difference in fact of people living in apartments with those living in private houses in the city of Shkodra. But we think this may be related to the random selection of the sample of persons for our survey.

Category 2 – Nutrition

5. How many times a week you eat fish or meat?

2% of respondents answered that they do not consume meat and fish, 56% of respondents answered that they consume them 1-3 times a week, 41% answered that they consume meat and fish 4-6 times a week, 1% of respondents answered that they consume them 7-10 times a week and 0% of respondents consume meat and fish more than 10 times a week. Consumption of protein meals is a phenomenon not very common in Albanian families.

6. How many times a week do you eat home cooked meals?
12% of respondents consume less than 10 meals in their homes, 14% of respondents eat 10-14 times home cooked meals, 32% of them eat about 14-18 meals a week in their homes and the largest percentage 42% consume more than 18 meals in their homes.

7. When you buy food, do you prefer to buy local (local) products?
From the answers of the respondents, we understand that 33% of them prefer to buy local products of the country, 14% do not prefer, 12% sometimes buy them, 18% rarely buy these products and 23% do not know, which means that they lack information on how to eat and on the purchase of traditional products, as a premise for a healthy diet while also helping to exploit the local agribusiness.

Category 3 - Purchases

8. How many important purchases have you made in the last 12 months?
60% of respondents claim to have made 1-3 significant purchases, 2% claim to have made no purchases, 32% have made 4-6 purchases while 6% of respondents claim to have made more than 6 purchases.

9. Have you bought energy saving items these last 12 months?
This result with this conclusion shows that 46% of respondents intend to buy items that save electricity, and that 54% do not buy items that save electricity. This result expresses a very positive attitude towards energy saving and its use. There are two first reasons, the price of devices that have A +, A ++, A +++ is more favorable and the second is the increase in the price of energy. LED lamps, which are very economical and save about 80% of energy, have started to be widely used, especially in some state institutions.

Category 4 – Transportation

10. If you have a means of transportation, which one do you use the most?
45% of respondents answered that they use a small car for their transport, 16% answered that they use a caravan car, 3% answered that they use sports cars more often, while 10% move by van. 26% of respondents say they travel by bicycle and this is a relatively high percentage for a large urban center such as the city of Shkodra. This is related to the tradition of

cycling in the city, people even though they are few owners of a car definitely have a bicycle as well. This does not make the traffic very problematic; it is also a good premise for setting the urban air in Shkodra.

11. What do you go to school with?
41% of the respondent's state that they go to school by car, 2% of them use public transport, 6% answered that they go by school van, while the biggest movement belongs to the bicycle movement which is 51%. So, there is a stable mobility in the city of Shkodra.

12. Where did you spend your vacation this year?
19% of respondents say they have not taken a vacation at all, 44% of respondents have taken a vacation near the city, 32% of respondents have taken a vacation in Albania, 5% of city residents have spent their vacation tryre this year in Europe, while 0% have taken holidays outside the continent.

13. How many times do you use the car during the weekend?
12% of respondents answered that they do not use the car on the weekend, 36% of respondents answered that they use the car 1 to 3 times, 38% answered that they use the car 4 to 6 times, 10% use 7 to 9 times the car over the weekend, while 4% of respondents answered more than 9 times. The percentage of people who often use the car in the city of Shkodra is relatively high, but still remains very small number of people who use the car on weekends.

Category 5 - Waste

14. Do you do waste reduction?
32% of respondents answered that they always do waste reduction, 35% of respondents sometimes do waste reduction, 12% rarely do waste reduction, while 21% of respondents answer that they have never done the reduction of waste. waste. The percentage of residents who recycle is relatively likable and this indicates a kind of awareness in terms of waste reduction, or it may be a response to changing their behavior with waste.

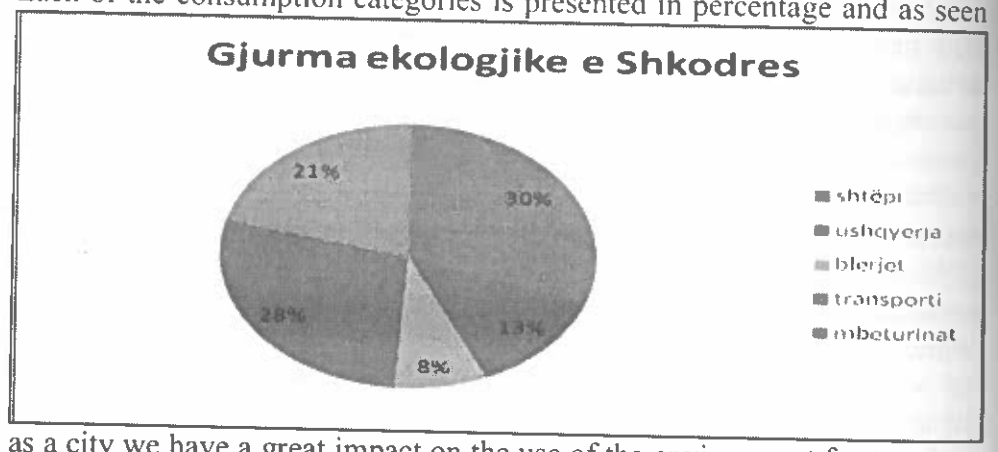
15. How many garbage bags do you produce each week?
0% of respondents answer that they do not produce any garbage bags within a week, 3% of respondents answer that they produce one bag, 20% of respondents answer that they produce 2 bags of waste within a week,

22% of respondents answer that they produce 3 bags every week, while 55% produce more than 3 bags every week. To bring to attention the results of the question about home nutrition or not, the large number of bags produced by 67% of the population is also related to the percentage of high of people consuming meals at home, this naturally increases consumption and consequently also increases the production of waste, mainly those of organic origin.

16. Do you recycle newspapers, glass bottles and plastic ones?
86% of respondents answer that they do not practice recycling at all. 0% always, while about 14% of respondents realize this practice sometimes or very rarely.

17. Do you compost fruit scraps and vegetables?
Although the graph shows that 1/5 of the respondents sometimes do the composting of fruit and vegetable waste, we believe that this is a practice that is not very possible to be done in the city, especially for residents who live in apartments and not at home.

The summary graph presents the impact of each of the components on the ecological footprint of the city of Shkodra
Each of the consumption categories is presented in percentage and as seen



as a city we have a great impact on the use of the environment for transport and a still negative impact in terms of reducing and eliminating waste, about 28% each. Positive effects still remain the tendency to consume clean and home-produced foods. It is still seen as a novelty to buy energy-saving devices.

The average ecological footprint for the urban area in Shkodra is 2 to 4 ha / person / year. Referring to the standards, the acquired value of the ecological footprint in the study is included in the second class of values, ranking Shkodra as an environmentally friendly city.
The results show that the environmental resources in the region still have the potential to strengthen local biodiversity, are preferable to citizens and serve to strengthen the market with local food products.
Given the fact that unsustainable use of natural resources and their consumption are a threatening factor for the biosphere and affect climate change, in the Shkodra region it should be possible to use more alternative energy and waste management in an integrated way.
Development of organic agriculture and sustainable fishing can make it possible to minimize the negative impact on natural resources and reduce ecological footprint. Reducing ecological footprint should be a sustainable objective in order to increase valuable biocapacity per person.

Conclusions

- The average ecological footprint for the urban area in Shkodra is 2.63 ha / person / year and is included in the class 2 to 4 ha / person / year.
- Referring to the standards, the acquired value of the ecological footprint in the study is included in the second class of values, ranking Shkodra as an environmentally friendly city.
- Environmental resources in the region have the potential to strengthen local biodiversity, are preferable to citizens and serve to strengthen the market with local food products.
- Given the unsustainable use of natural resources and their consumption are a threatening factor for the biosphere and affect climate change, in the Shkodra region it should be possible to use more alternative energy and waste management. is done in an integrated way.
- Development of organic agriculture and sustainable fishing can make it possible to minimize the negative impact on natural resources and reduce ecological footprint.
- The acquisition of material goods and economic growth in the region should also provide for the rehabilitation of ecosystems in order to increase the number of ecological resources available to be exploited.
- Reducing the ecological footprint should be a sustainable objective in order to increase the biocapacity available to the person.

• Utilization of natural resources and their consumption are considered a threatening factor for biodiversity and climate change. Shkodra must act in the direction of:

• reduction to a maximum, inefficiencies and complete consumption of waste;

• increase the percentage of GDP by using natural resources in a sustainable way;

• transformation of agriculture and fisheries in order to increase production with a minimal impact on environmental resources.

References

1. Holmberg, J., Lundqvist, U., Robèrt, K-H. and Wackernagel, M. (1999). The Ecological Footprint from a Systems Perspective of Sustainability. International Journal of Sustainable Development and World Ecology 6:17-33.
2. Campbell, C. J and Laherr're, J . H. (1998).The End of Cheap Oil.Scientific American,278(3), 78-83
3. Edwards,J.D. (1997). Crude Oil and Alternative Energy Production Forecast for the Twenty-First Century:The End of the Hydrocarbon Era.American Association of Petroleum Geologists Bulletin,81, 1292-1305
4. Fao. (1995). United Nations Food and Agricultural Organization Production Yearbook,49, Table 1, and others.
5. Primental, D. and 10 others. (1995). Environmental and Economic Costs of Soil Erosion and Conservation Benefits.Science,267,1117-1123.
6. Wackernagel, M. and Rees, W. (1996).Our Ecological Footprint:Reducing Human Impact on the Earth. New Society Publishers, Philadelphia, PA and Gabriola, Island, BC
7. https://www.google.al/webhp?sourceid=chrome-instant&ion=1&espv=2&ie=UTF-8#q=www.gjurma+ekologjike.com
8. Rees, W. and Wackernagel, M.:1996. Our Ecological Footprint. New Society Publishers, Gabriola Island.
9. Wackernagel, M., Monfreda, C., Moran, D., Wermer, P., Goldfinger, S., Deumling, D., and Murray, M.: 2005, National Footprint and Biocapacity Accounts 2005: The Underlying Calculation Method, Global Footprint Network, Oakland, California.
10. van den Bergh, J.C.J.M. and Verbruggen, H.: 1999, 'Spatial sustainability, trade and indicators: an evaluation of the ecological footprint,' Ecological Economics 29(1), 61-72.
11. Ferguson, Andrew R.B.: 1999, 'The logical foundations of ecological footprints,' Environment, Development, and Sustainability 1, 149-156, 1999.
12. https://citizens-channel.com/2020/10/23/shkoder-pasurite-ujore-te-riskuara-nga-ndotja/

PRIMARY EDUCATION CURRICULUM IN FUNCTION OF ENVIRONMENTAL EDUCATION OF STUDENTS

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1. Abstract

The environment is the set of biotic and abiotic elements of organisms. The air, the land, the waters of rivers, lakes, seas and oceans, the groundwater and everything where it lives and affects man make up the surrounding environment. With the frequent rates of change and development, in addition to progress, there has been damage to the surrounding environment. This negative impact on the environment has irreparable consequences on climate and human life. The environment is a common asset and environmental education is an extremely important factor in protecting this asset. In educating the younger generation we make a good investment for our future. This education is realized in society, family and school.

The purpose of the study is to analyze textbooks to identify how the education of students in the preservation of the environment is realized. How much is transmitted and understood the importance of the environment in cultivating environmental education among primary school students.

Objectives

1. To highlight the importance given to environmental problems in nature science textbooks.
2. Reflect on how necessary it is to learn about the environment through the textbook
3. To understand how environmental education is realized through the text.

Hypothesis: The primary education curriculum influences the formation of environmental education in students.

Research questions;

- What is the role of the teacher and how does the curriculum help in the transmission of environmental education to primary school students?

-How much does the teacher encourage the activation of students in nature through assessment?

Key words; curriculum, environment, environmental education, mind maps, psychological suitability.

Introduction:

1. What do we mean by environment and environmental education?

The background or environment is the totality of circumstances around an organism or many organisms, the combination of atmospheric conditions with the life of living things, the development, and the survival of organisms.

Today, how much do we respect and preserve our environment? The environment in which we live is a very important issue for children, adults and the elderly. Our health depends on it. Irresponsible behavior towards the environment and public spaces is a major problem that requires a radical change in attitude, psychology and behavior towards the environment. This problem requires full awareness of all ages, without distinction. It is very important for one

instead of having a clean environment with the best standards. Images of dirt and debris everywhere are not only unpleasant to the eye, but they also endanger our health.

Caring for the living environment is the irreversible mission of every inhabitant of planet earth. It becomes clear that nature every day sends us signals of the danger that threatens us from climate change and misuse of the environment. Therefore we need to capture these signals and react to them to do the best possible life for the health, our children.

The environment is the source of human life, so its protection is a problem that worries us all as a society. Thus environmental education plays a special role in what we will do for our health and future generations. Man and the environment are in a relationship of mutual influence. The environment determines the quality of human life and man changes for better or worse the quality of the environment.

2. What is the environment?

The environment, is the entirety around an organism or group of organisms, especially the combination of external physical, natural conditions that act and affect the growth, development, and survival of organisms.

The environment is the totality of all external conditions that affect the life, development and survival of any organism on earth. External conditions: include the natural environment of air, soil, water, biological ecosystems, human health, values and cultural, scientific, religious and social heritage. In relation to man we distinguish the following environments:

- Social environment.
- Cultural environment
- Natural environment

2.2 Man connection with nature

Man connections with nature are millennia old, and finally the role of the environment in the life of the individual is more of an economic-social character than of a physical character that was centuries ago. The environment and natural resources are very important aspects for peace, because when natural resources become insufficient then we fight for them. And this kind of struggle to compensate for the socio-economic inadequacy of the environment has two ways: by forcibly plundering the wealth of others and increasing them naturally, in those cases where such a thing is possible. Adding greenery through new plantings and preserving the natural condition of tourist sites are an aspect of naturally increasing natural resources and improving the overall climate. But nowadays people do not know how to maintain the environment. Man should live in a clean environment not polluted by garbage. In an environment, air is key and if it is polluted it negatively affects our health.

2.3 Pollution, types

The environment has no personal boundaries. We cannot separate our environment from the environmental impact of others. If the environment is polluted or destroyed somewhere, the consequences are felt not only in that area. Ecological rehabilitation of damaged and polluted areas by places of natural phenomena affect the preservation of ecological balance and its improvement.

2.4 Everyone's responsibilities for environmental protection

Our impact can be on all elements of environmental protection to improve or worsen them in our community, country and land. Everyone as part of family, school, village, city, country and finally, part of the human race is interconnected at the group level, local, national, regional and global level. This has an impact on the environment at all of these levels.

We have responsibilities for environmental protection in two directions:

1. Be aware of protecting the environment through our personal attitudes and behaviors.

2. Take action against those who pollute the environment in which they live.

3. Environmental protection education

3.1 Why is community participation important?

Community participation in all stages of solving environmental problems is a factor that guarantees solutions to be effective and sustainable. The best way to achieving community participation is to provide community information from central and local government bodies and to seek community involvement in finding solutions.

Why should central and local governments encourage and guarantee community participation in problem solving?

Central and local government bodies are obliged, based on the Aarhus Convention, ratified by Albania, to provide information to community members and to encourage, support and guarantee their participation in problem solving. The legal basis guarantees the community the right to information and participation in environmental issues.

1. Aarhus Convention, on 25.07.1998. Access to information, participation and access to justice in environmental matters "ratified by Albania in 2001.
2. Law no. 8652, on 31.07.2000 "On the organization and functioning of local government".
3. Law no. 8503, on 30.07.1999 "On the Right to Information on Official Documents"

3.2 Why is it difficult to understand the impact of the environment?

The consequences of environmental pollution do not appear immediately but only after a few years. The components of the environment do not change immediately, but slowly and invisibly to the human eye. Misuse of natural resources does not create immediate purity.

Society and state interventions to improve the environment, conserve and maintain natural resources, rehabilitate the damaged environment, have a slow impact and results that come after a few years. For this reason, states, societies, communities and citizens must be aware to carry out economic, social and lifestyle activities in understanding and adaptation to the environment, in order to have a clean environment protected from pollution and damage.

Community participation in identifying environmental needs, finding appropriate solutions to environmental problems and involving them in decision making is very important.

What does civic participation mean?

Civic participation means obtaining community opinion on environmental issues. This participation involves stakeholders in the trial and decision-making process for each and every stage of the process.

What is a community?

Taking many big actions to clean the country from waste is a good thing, but it remains a short-term solution, as the long-term solution is given only by the education of the new generation, which is also the largest investment that can make a government and a nation. If we manage to make environmental education an integral part of school knowledge and civic ethics, I am convinced that after a decade we will no longer talk about waste on the streets and in the environment that surrounds us.

3.3 School environmental education

Environmental education is as important as mathematics, language, literature, etc. Students in school learn about great writers who have described nature in wonderful words, about painters who have presented extraordinary landscapes, but students themselves have the opportunity to contribute individually to the preservation of the environment, and nature itself as a masterpiece that goes beyond any description or color of a great artist. Teachers, the social environment and the family play a big role here. Harmony with the environment brings harmony even within the community itself. The environment unites us with each other and is the heritage that connects us to future generations. Therefore, the younger generation needs to be more educated about the environment, because the nature that surrounds us determines who we are from within, as citizens, students, and human beings.

Considering this importance on environmental education, the Ministry of Environment is also committed to focusing more on drafting and discussing the inclusion of environmental education in curricula, engaging and participating in environmental education awareness campaigns, and increasing green spaces in school and residential facilities, providing experience and advice to teaching staff, providing and sharing experience in drafting and implementing the Green Code in schools, providing assistance in identifying, exchanging and disseminating environmental information, participating in and promoting demonstration and awareness activities of pilot projects in school and community, etc.

4. Methodology:

The methodological tool of the questionnaire was used to obtain the results, based on which the study was made possible. The questionnaires consisted of alternative questions. Two questionnaires were implemented. The

campers were students and primary school teachers. The main method of data analysis and interpretation is based on the answers given by the subjects. The questionnaires were applied in the third and fourth grade of Ismail Qemali, Branko Kadia, Dëshmorët e Prishtisë and Ndre Mjeda schools. All teachers who taught in the primary education of the schools under study and 10 students of the third and fourth grades of the same schools were asked. This is done by random selection of one of the following three names in the register. In the application of the questionnaire to teachers, their answers are often argued, thus creating a broader picture of the situation. I received this information personally as I personally assisted and carried out the procedure of completing the questionnaire

5. Results:

For teachers:

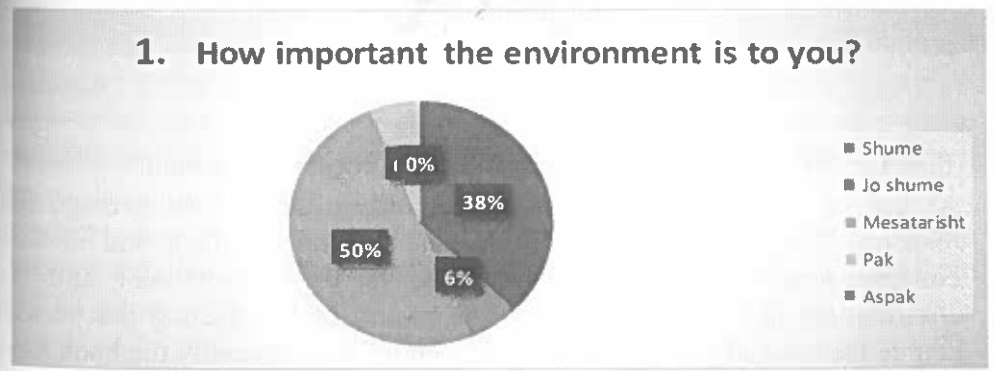
Question	Very much	Not many	Medium	Few	None
Have you done nature excursions?	4	3	2	1	6
Have you conducted outdoor lessons?	0	4	0	2	10
Do you have a plan of outdoor activities that you must complete during the school year?	8	2	6	0	0
Do textbooks have incentives to lead outdoor activities?	10	0	5	1	0
Do textbooks convey an education of respect and individual responsibility for the environment?	5	1	5	5	0
Are special water protection holidays, such as March 22, or similar holidays mentioned in the texts?	0	2	2	2	10
Are there enough topics for keeping the planet clean or recycling waste?	2	7	3	2	2
Do textbooks express the importance of the environment in our lives?	6	2	4	4	0
Is it clearly conveyed to the student in the curriculum how they can and should protect and preserve the environment?	3	3	5	5	0

As can be seen from the interpretation of the questionnaire results and the analysis of the answers, teachers do not feel much supported by the school infrastructure and curriculum in promoting students' civic responsibility in environmental protection. They say that there is little opportunity to plan lessons in nature due to the lack of continuity of topics that condition the time of realization of activities or learning in nature. Here we mention with influence the situation of the worldwide pandemic that we went through, but also the curricular shortcomings of the planning of this nature of activities. The impact of the school, the teacher and the book is very important in this developmental period. This is to internalize the students' responsibility and sense of respect for the environment as a great force. This force is the first one that can make a positive difference in the future. The implementation of the green package, the supporting infrastructure and not only the restriction on food waste recycling or classroom cleaning, but also an increased attention of this topic in the textbooks would help the teacher in his mission.

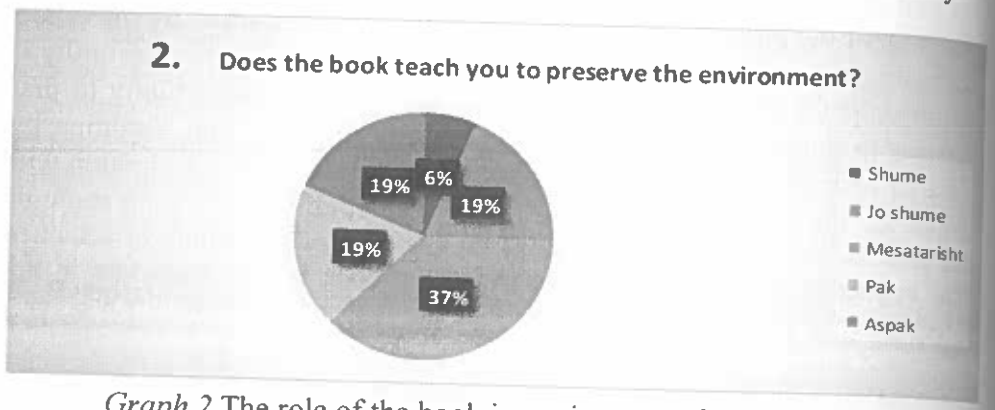
In response to the first question, the conditioning of COVID-19 can also influence. While the second question may be a continuation of pandemic conditioning. This applies to the realization of the lessons but also to the planning that the curriculum of Nature 3 and 4 has reserved for this teaching typology. The derivative of this is also the result of the third and fourth question. Maintaining a balanced percentage in the past question is reversed in question six which somewhat shakes the result of the fifth question. And in the following three questions the analysis of the answers that are more direct with the study hypothesis, clearly shows the lack of an optimal level in the curriculum of topics that promote environmental education to the student or support the teacher in the transmission of environmental care.

For the students;

Graph. 1 The importance of the environment

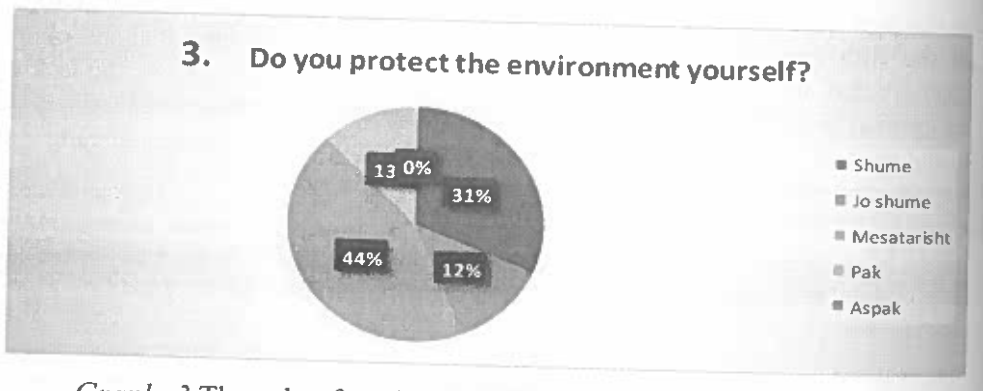


As can be seen from the answer to this question, a moderate interest of students in the environment is shown. They for the most part say that the environment is moderately important to them. While a large number do not express interest in the importance of the environment for them personally.



Graph.2 The role of the book in environmental protection.

In answer to this question there is a noticeable average impact of the book on the environmental education of students. To a large extent students answer that it has little impact and immediately after that in percentage comes the answer that the book teaches not much about environmental protection.

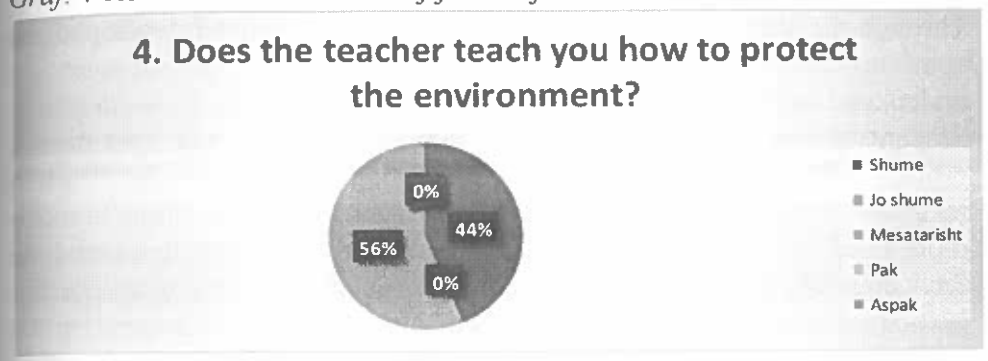


Graph. 3 The role of students in environmental protection.

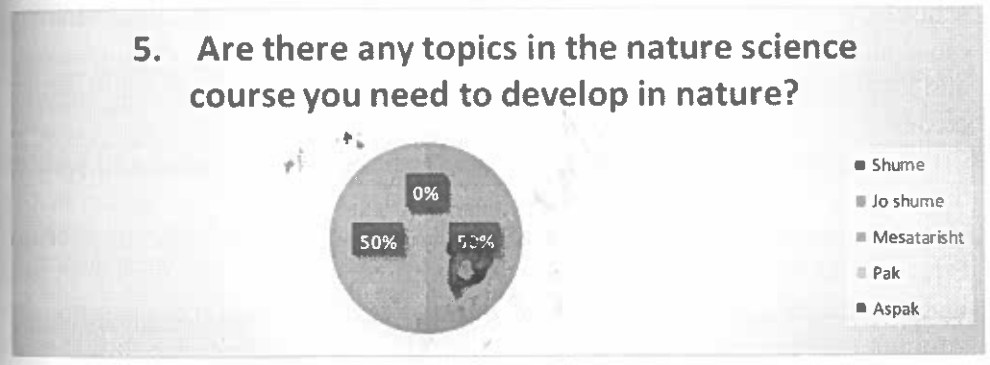
As can be seen from the graph of responses, students on average feel responsible for protecting the environment. This for them and in their consciousness is how much they owe to the environment and the environment that surrounds them. The reality of this feeling has various source factors and one of them and the school and especially the book have

a special importance. What stands out is the very high level of response and I very much protect the environment, which shows the impact of factors on students. So a job that has started and continues to be done. This is reinforced even by no answer with the alternative at all. This suggests that they recognize the responsibilities and feel an obligation to the environment although more work needs to be done in this regard. The answers a little and not much occupy an equivalent place with a small percentage, but that is the contingent that needs the most to work.

Graf. 4 Roli i mësueses në mbrojtjen e mjedisit.



As can be seen in the vast majority of students, they are moderately satisfied with what the teacher con



Graph.5 Natural science course topics that you should develop in nature

veys to educate them about the environment, but there are also many students who say that the teacher does not help them at all. Many and not many alternatives remain unanswered.

Students also in answer to this question express themselves with two answers and that are almost antagonistic. Half of the students say that there are on average topics in the text that take place in nature and the same

number of students say that there are not many topics in the text of nature knowledge that they have to do in nature.

6. Conclusions

At the end of this study we came to the conclusion that still people (teachers, textbooks and students) have not given proper assessment and behavior to the environment. It must be said that people need to be made aware and still have a lot of work to do to give positive results in protecting the environment.

Through the answers of the students (of the questionnaire I developed) we come to see that they have begun to care for the environment and understand its importance in their lives.

Students also in their answers say that the school teaches, educates them to protect it through various activities or through the introduction in school textbooks topics that provide knowledge on environmental protection. But more needs to be done in this regard such as drafting and discussing the inclusion of environmental education in curricula; engaging in and participating in environmental education awareness campaigns; in the increase of green spaces in the premises of schools and residential centers; providing experience and counseling for teaching staff, providing and exchanging experience in drafting and implementing the Green Code in schools, providing assistance in identifying, exchanging and disseminating environmental information, participating in and promoting demonstration and awareness -raising activities of pilot projects in school and community, etc.

Protecting the environment must be and remain the main goal and task of the younger generations and society as a whole. To find his place in the environment and the new generations to take care of his protection. Educational institutions in cooperation with other state institutions should work in the educational process so that the level of awareness among the younger generations is as high as possible. For this purpose, we should start working with school students, especially at lower levels, to contact them as much as possible, in order to raise their education and awareness from an early age.

At the end of this study we found that most have given negative answers. Thus, more work needs to be done in these aspects to acquaint them with the laws, the rights they have in the environment and the obligations they have towards it. Thus the emphasis should be placed on the dissemination of important messages, the right time and moment for environmental

education as an element that should grow together with man. Environmental education is a sustainable process for society which makes man aware of his environment. Awareness of the community on the necessity of environmental protection is needed. Man should be aware that the survival of our natural environment depends directly on his behavior.

7. From the achieved results we recommend that:

- Create a number of competencies and habits for environmental protection and present arguments in various forms to reinforce the student's opinion or attitude about the given tasks.
- To analyze the consequences of environmental and biodiversity damage, giving the student's position on this topic.
- Encourage participation in group work to raise awareness among other peers about environmental protection.
- Identify problems and encourage the generation of problem-solving and exploratory strategies for environmental issues.
- Encourage activities and activities that provide opportunities for self-correction, thus teaching you how the activity affects the local habitat.
- The curriculum should include topics that affect the student's motivation and awareness of environmental protection.

Bibliography:

1. Terry Hudson, Alan Haigh, Debbie Roberts, Geraldine Shaë. Nature Knowledge kl-4. Textbook.
2. Joan Board, Alan Cross.Nature Knowledge kl-3. BOTIME pegi.
3. http://www.academia.edu/5818081/Ndotja_e_mjedisi.
4. Official website of the Ministry of Environment
   http://www.mjedisi.gov.al/al/necsroom/fjalime/rendesia-e-edukimit-mvironmentor&page=2
   http://fermaime.com/?id-32&1-860
5. http://arditah.wwwbly.com/ndotja-dhe-mbrojtja-e-mvironmentit.html
6. http://botasot.info/opinione/400562/alarm-po-kriminalizohet-mjedisi-ne-kosove
7. Nature Knowledge 3, Curriculum. Nilkë Rama.
8. Curriculum of the subject Natural Knowledge 4, Manjola Xhehuri, School portal.
9. MASR Order No. 6 dated 10.01.2018 for the implementation of the initiative "Three subjects in six hours".

ENVIRONMENTAL CRIME WITH SPECIAL EMPHASIS TO CRIMES AGAINST THE ENVIRONMENT AND NATURE IN THE REPUBLIC OF NORTH MACEDONIA

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Abstract

In the last decade, one of the most important global issues has been climate change and environmental pollution. Many different factors could be linked to this issue. This is an extensive topic for which the main causes should be analyzed and then should be created a framework that will focus on the key targets in order to find appropriate solutions. In the context of our scientific paper, the issue of environmental pollution is covered from a legal point of view. The first part of the article covers environmental crime and activities related to environmental crime. We would like to emphasize that when it comes to this issue, we place special emphasis on environmental crimes that are recognized by certain international bodies such as G8, Interpol, European Union, United Nations Environment Programme, United Nations Interregional Crime and Justice Research Institute. These international bodies have recognized the following environmental crimes: wildlife crime, illegal mining, pollution crimes, illegal fishing, illegal logging. The second part of our article covers environmental safety, which is also crucial in the context of this issue. The third part covers the criminal legal framework of this issue and presents the statistical data on crimes against the environment and nature in the Republic of North Macedonia, which are important indicators about the situation of the state in the field of environmental crime.

Keywords: Environmental crime, environmental safety, crimes against nature, crimes against the environment, prevention of environmental crime.

Introduction

The rapid technical-technological development, the new inventions, and the development of modern society have innumerable significant positive

effects on humanity. In addition to the positive effects, there are also negative effects that endanger the environment. With the advent of environmental threats comes the need for environmental protection, and thus an environmental crime. The first part of the article analyzes the phenomenon of environmental crime, its types, and characteristics. Environmental crime refers to all actions that violate the provisions of environmental regulations, as well as those actions that endanger human health and the environment.

Environmental crime has become more pronounced lately, but one should also take into account the large number of environmental crimes that exist but have not been detected or proven. Environmental law and environmental safety are two related areas. It is very important to mention the importance of the existence of an environmental policy, which provides criminal protection in the field of environmental law and environmental safety. The most important thing is to mention the importance of the fight against environmental crime and its timely detection.

Environmental change, caused by human interaction, has been an inevitable factor for decades, leading to the need to create new safety systems. Therefore, the second part of the paper analyzes the concept of environmental safety. Defining environmental safety is the starting point in defining its concept which has appropriate implications at a national, international, and individual level. Environmental safety is analyzed in terms of international legal efforts to create an appropriate safety response to environmental change and the need to create a strategic approach of the Western Balkan countries in this area.

Although the paper deals with crimes against the environment at the national level, more precisely at the level of the Republic of North Macedonia. It is important to emphasize that crimes against the environment in today's conditions have a transnational dimension, which means that there is a special concept called transnational environmental crime that involves the trading and smuggling of plants, animals, resources and pollutants in violation of prohibition or regulation regimes established by multilateral environmental agreements and/or in contravention of domestic law.(Forni, 2010) The third part of this paper if focused on criminal acts in field of environment and statistical data which aims to show the rate of environmental crime in North Macedonia, especially the most common crimes such as: unlawful hunting, unlawful exploitation of mineral resources, bringing dangerous materials into the country, Pollution of the environment and nature , torturing animals etc.

1. Concept and Characteristics of Environmental Crime

The development of modern society and technology have positive and negative impacts on humanity. In the last few centuries, humanity has treated nature by possessing and using it without thinking about the negative effects it can cause with the uncontrolled use of natural resources. Along with the increase in the population of the planet, the pollution of the environment is simultaneously increasing. Additionally, with the technological development and industrialization of society, the damage to the environment significantly increases. Scientists believe that in the last 100 years we made damage to the earth so that the current environment cannot be compared to human history (Игњатовић, 2020, p.22).

Therefore, the human right to a healthy environment is increasingly being discussed nationally and internationally. Every individual has the right to live in a healthy environment. According to the division of human rights made by the Czech jurist Karel Vasak, the right to a healthy environment is included in the "third generation of human rights". We can say that third-generation rights have emerged since the 1970s (Domaradzki et al, 2019, p.429-430). First of all, we should point out that these rights are intertwined. The existence of one necessarily necessitates the existence of the other. Specifically, the right to a healthy environment from the third generation is a basic precondition for the realization of other human rights from the first and second generations. Therefore, the protection of the environment becomes a priority not only for the development of civilization but also for its further survival (Кацарски, 2013, p.5).

For the first time at the international level, the human right to live in a healthy environment is mentioned as a basic human right at the *United Nations Conference on the Environment* held in Stockholm in 1972, which had attendees from 113 countries. A declaration is adopted at this conference, which is the first document at the international level that recognizes the right to a healthy environment. In the declaration, the states agreed to accept responsibility for any environmental impacts caused by their actions (Çavga, 2018, p.7).

Along with the right to a healthy environment and the protection of the environment, environmental crime is emerging. This term can be defined as a special type of crime that results in environmental pollution, regardless of whether it is a pollution of a smaller or larger scale. Environmental crime includes pollution that endangers human health or causes negative consequences for flora and fauna.

Environmental crime, by definition, is an action that is directly or indirectly aimed at pollution and causing other types of damage to environmental values such as the atmosphere, soil, air, and water, or other actions aimed at the accumulation of solid waste, the accumulation of toxic substances in food, the occurrence of noise, the danger of radioactive substances, etc. (Сулејманов, 2003, p.637).

Environmental pollution and degradation are not only national but they are also a global problem. Rapid technological development, improper and inappropriate use of new energy sources, uncontrolled use of natural resources, are the reasons that cause enormous harmful consequences for the environment and humans. Apart from the harmful consequences for the environment, they also have negative consequences for the development and survival of the entire flora and fauna of the planet Earth (Кацарски, 2013, p.5).

Environmental crime possess a serious threat to our daily lives, to our planet Earth, but also to future generations. Therefore, it is part of crime in general and as such can be observed as a social and legally treated phenomenon.

Depending on the scope and intensity of the caused consequences on the environment, the undertaken activities, the properties of the perpetrators, the defined prohibited behavior, as well as the types of prescribed sanctions, are all regulated within certain crimes and offenses in the legislation of each country as environmental offenses.

Special features of environmental crime are dynamism, expansion, mass, international character, the ability to adapt the perpetrators, the diversity of environmental crime, the organization, and the dark number of environmental crimes.

The dynamism and expansion of economic crime imply rapid social, technical, and technological development. As a result, new products are emerging that pollute and endanger the environment. It is often said that the number of environmental crimes is small. But unfortunately, the truth is different. There are environmental crimes, but they are difficult to detect, they are unreported or hidden. That is why the characteristics mention the dark number of environmental crimes. "Dark number" of environmental crimes means the number of committed environmental crimes in a calendar year that remained undetected, and thus not recorded in any official statistics (Bošković & Bošković, 2010, p.54). Given the fact that they are difficult to detect and even more difficult to prove, we can freely say that the number of committed environmental crimes and offenses is much

higher than the number presented by the official statistics of a country, which leads to the police, prosecution, and courts (Кацарски, 2013, p.11). Environmental crimes have an international character. They by their very nature are transboundary and involve cross-border criminal syndicates. A tiger skin or an ivory tusk passes through many hands from the poaching site to the final buyer. A tree felled illegally can travel around the world from the forest via the factory to be sold on the market as a finished wood product. In the era of global free trade, the ease of communication and movement of goods and money facilitate the operations of groups involved in an environmental crime (Environmental Investigation Agency, 2008, p.1). For example, there are large rivers that flow through the territories of several countries, and if they become polluted in the territory of a certain country, the pollution will spread to other countries through which the rivers continue to flow. Therefore, the international element is very important. Many experts now believe that international environmental crime threatens to become an even greater problem than it already is. According to Durwood Zaelke, who directs the International Network for Environmental Compliance and Enforcement (INECE), a multinational group of enforcement experts based in Washington, D.C., countries are generating more waste than ever, and disposal systems are often unable to meet growing demands. And natural resources of fish, exotic species, and timber are dwindling, which increases the street value of the stocks that remain (Schmidt, 2004, p. 98). The same routes used to smuggle wildlife across countries and continents are often used to traffic weapons, drugs, and people. Indeed, environmental crime often occurs hand in hand with other offenses such as passport fraud, corruption, money laundering, and even murder. Unlike the illegal trade in drugs and other illicit goods, natural resources are finite and cannot be replenished in a lab. As such, there is a sense of urgency to combat environmental crime (İnterpol, 2021). The diversity of environmental crime can be seen from the number of crimes that national legislators have criminalized in the Criminal Laws of their countries, which include separate chapters for the crimes that protect the environment, the ways in which it is polluted or endangered, the consequences of pollution or destruction of the environment (Кацарски, 2013, p.12).

The appropriate level of organization of environmental crime is present in transnational organized environmental crime and refers to the illegal import of radioactive and other dangerous substances into the country or smuggling and illicit trade in protected and other natural goods, plants, and

animals. In order to protect the economic interests of certain influential social groups, the prescribed measures for installation of protective equipment in the industrial plants will not be taken, which neglects the protection of the environment.

The occurrence of environmental crime is influenced by almost all factors that affect the occurrence of crime in general. Discovering the causes of environmental crime and their study and scientific determination, certainly contribute to more successful management of this type of crime, as well as to a more accurate and complete determination of the competencies, power, and duties of the entities involved in the fight against it (Кацарски, 2013, p.14).

The desire for rapid development, progress, and advancement of society, for the improvement of living and working conditions, very often excludes the perception of the possible negative consequences of man and his attitude towards nature and the environment. Man often overlooks negative environmental consequences such as pollution and degradation, arguing that pollution is the result of the application of new technologies.

It can be said that one of the main reasons and a basic condition for the emergence and existence of environmental crime, is the indifferent attitude of people to the phenomena of pollution and endangering the environment, as well as the race to increase economic power and profits in which environmental standards are neglected and minimized (Кацарски, 2013, p.16).

Due to the seriousness and high material benefits arising from environmental crime, international organizations such as Interpol have formed working groups to prevent and combat this type of crime. (Игњатовић, 2020, p.30)

2. The Concept of Environmental Safety and Its National and International Implications

The modern way of life has had a huge impact on the environment and ecological systems for decades. Environmental problems have long been given global proportions. The current environmental challenges that are being diagnosed globally are becoming increasingly important for all nations. Environmental issues such as ozone depletion, climate change, biodiversity depletion, and chemical pollution are just the starting point for a global approach by the international community (Timoshenko, 1992, p. 413).

The analysis of the ecological situation in the world indicates that the environment continues to deteriorate despite the safeguard measures taken by the international community. The reality of the existence of world ecological catastrophes has an explicit impact on the human race. Ecological catastrophes have reached levels that threaten the survival of civilization. Overcoming environmental challenges requires radical changes in the approach to solving environmental problems. The protection of the natural environment becomes an important component of the protection of human civilization from self-elimination. Such societal challenges have established the concept of environmental safety at the international level (Timoshenko, 1989, p. 151-152).

The definition of the notion of environmental safety in modern society requires a review of the examples and ways of disturbing the ecological balance in the human environment. The definition of environmental safety derives from the general notion of safety, which denotes the state of protection of certain phenomena from disruption of their structural and functional connections. When approaching the definition of environmental safety, the definition should provide emphasis on the vital interests of the human perceived as a natural-social being, above all, from endangering and disturbing the balance in individual ecosystems and their totality. Having such an approach in defining environmental safety, can be understood as the protection of vital resources and interests of the human and its social life as a whole, within the action of all-natural and social factors. On the other hand, this raises the question of the responsibility for establishing and achieving environmental safety. In that direction, the greatest responsibility is primarily borne by the human as an individual and the institutions of its social organization, and above all the state as a force of social development. However, this understanding of the responsibility for environmental safety does not presuppose only the responsibility of the state and the abstraction of other social entities (Марковић, 2016, p. 93-94). That is why today environmental safety and the responsibility that arises from it are a current topic that is the subject of interest and analysis of state bodies and institutions, international organizations, NGOs, academia and the human as an individual (Малиш Саздовска, 2010, p. 193). As a sublimate of the above, we can define environmental safety as part of the overall safety, which is the absence of threats, damage to the environment, and the health of the population. The general determination of environmental safety is that it is a condition in which there is no danger of loss and damage to the environment. Environmental safety means a stable state of the human

environment which provides an opportunity to improve the quality of life of people, protection from natural and technical disasters, and the opportunity for the continuous progress of people and society (Blagojević & Simić, 2012, p. 185).

The concept of environmental safety is expressed at three levels of interaction: national level, international level, and individual level. Primarily security actors treat environmental change as a threat to national safety. Here, analysts and practitioners explore how environmental change can pose a threat to the sovereignty and territorial integrity of the nation-state. At the national level, state governments and the military are considered to be key agents in ensuring environmental safety. Threats arising from environmental change pose a threat to international security and stability. This is confirmed by the fact that recent conflicts occurring on the international stage are partly created by the dynamics of environmental change. The view that environmental change potentially poses a threat to regional and international stability has been particularly prominent in United Nations climate change interventions. Although the emphasis of these interventions is mainly on overcoming violent conflict, the reference object is ultimately defined as an international society, with conflict jeopardizing the norms and rules of that society and the capacity of its institutions to function effectively. In this regard, international co-operation is needed to reduce threats or manage the risks posed by conflicts caused by environmental change. The third level at which the relationship between environmental change and safety can be considered is human (individual) safety. At the individual level, the emphasis is less on the threat of environmental change in terms of causing violent conflict, and more on the rights and needs of individuals whose well-being is substantially undermined by the manifestations of environmental change. Human safety is defined in terms of the capacity to end, mitigate or accommodate threats that would have an impact on human, environmental or social rights. Here, human as an individual is at the center of the analysis as a key reference object of safety, emphasizing the potential capacity of states, institutions, and global civil society forces as providers of environmental safety (McDonald, 2018, p. 160-161).

The concept of environmental safety is gradually shifting from a political debate to a legal one. The first step is to recognize the link between the environment and safety and the need to make relevant improvements in the legal and institutional order. The evolution of the concept of environmental safety, despite its controversial nature, reveals its reflection in various

international acts, ranging from the United Nations system to NGOs. In this regard, in 1972, the Stockholm Declaration on the Human Environment made a step forward in terms of what could be treated as preconditions for environmental safety. This Declaration recognizes that humans have the power to transform their environment in countless ways and on an unprecedented scale. However, the wrong or careless use of the same power can do invaluable damage to humans and the environment. It has been established that humanity can do massive and irreversible damage to the planet Earth on which human life and well-being depend. The pan-European process began in 1975 at the Helsinki Conference on Security and Co-operation in Europe where the environment was included as a key element in the security agenda. The final act of the Conference contains a special part (part 5) dedicated to environmental protection. Special environmental chapters were also included in the concluding documents. These documents are considered to be of particular importance for international environmental safety (Timoshenko, 1992, p. 419-421).

Environmental safety can be analyzed from both regional and national perspectives. The focus is primarily on the region of the Western Balkans and the sovereign states of this region. It is noticeable that global environmental changes are affecting the environment in the Western Balkans, and consequently the environmental safety of the region. Environmental changes are expected to bring higher temperatures and lower rainfall which directly affects agriculture (especially in Albania, Kosovo, and North Macedonia), hydropower generation (especially in Albania, Bosnia and Herzegovina, and Serbia), as well as coastal touristic areas (especially in Croatia and Montenegro).

Environmental changes have a significant impact on regional biodiversity, which is characterized by a decline in biodiversity. Global losses could affect rich biodiversity in the Western Balkans, and threats to biodiversity in the region could affect biodiversity in other parts of Europe. The impact of environmental change in the region undoubtedly indicates that the Western Balkan countries should follow the global focus on environmental security and protection and that there should be no fragmentation on a regional basis (European Environment Agency, 2010, p. 69-71).

3. Crimes Against the Environment and Nature in the Republic of North Macedonia

With the development of society, the world is witnessing that new types of crimes are developing, hence confirming the general criminological view

about the crime rates, that they are especially high in modern societies. Environmental crime poses a growing threat, the causes of this crime need to be analyzed in different categories such as wildlife crime, illegal mining, pollution crimes, illegal fishing, illegal logging.

Environmental crimes can be broadly defined as illegal acts which directly harm the environment. They include illegal trade in wildlife; smuggling of ozone-depleting substances (ODS); illicit trade in hazardous waste; illegal, unregulated, and unreported fishing; and illegal logging and the associated trade in stolen timber. (Environmental Crime a Treat to Our Future) In the last decade, criminal law, as well as criminology has turned to research in the field of crimes against the environment. The reason behind this is simple. First, it is clear that the world is under a dangerous threat of pollution, second, the rate of crimes against the environment is increasing, thirdly, these crimes are profitable and it is no surprise that organized criminal groups are attracted to their high-profit margin and fourth, most importantly, the prevention of this crime is quite complex.

In the Macedonian Criminal Code, crimes against the environment are placed in a separate chapter. In the context of criminal code, the following crimes are covered: (Тупанчески, 2017)

1. Pollution of the environment and nature (article 218)
2. Production, trade, or use of substances that impoverish the ozone layer (218-a)
3. Pollution of drinking water (article 219)
4. Production of harmful products for treating livestock or poultry (article 220)
5. Unscrupulous provision of veterinary assistance (article 221)
6. Transmitting infectious diseases among animal and plant life (article 222)
7. Pollution of livestock fodder or water (article 223)
8. Destruction of crops by using harmful substances (article 224)
9. Appropriation of immovables (article 225)
10. Illegal exploitation of mineral raw materials (article 225-a)
11. The devastation of forests (article 226)
12. Causing a forest fire (article 227)
13. Unlawful hunt (article 228)
14. Unauthorized hunting, keeping, and transferring of ownership of wild animals and birds (article 228-a)
15. Unlawful fishing (article 229)
16. Endangering the environment and nature with waste (article 230)
17. Unauthorized procurement and possession of nuclear materials (article 231)
18. Unauthorized production of, dealing with, and trade in dangerous materials or harmful organisms or seed and planting material (article 232)

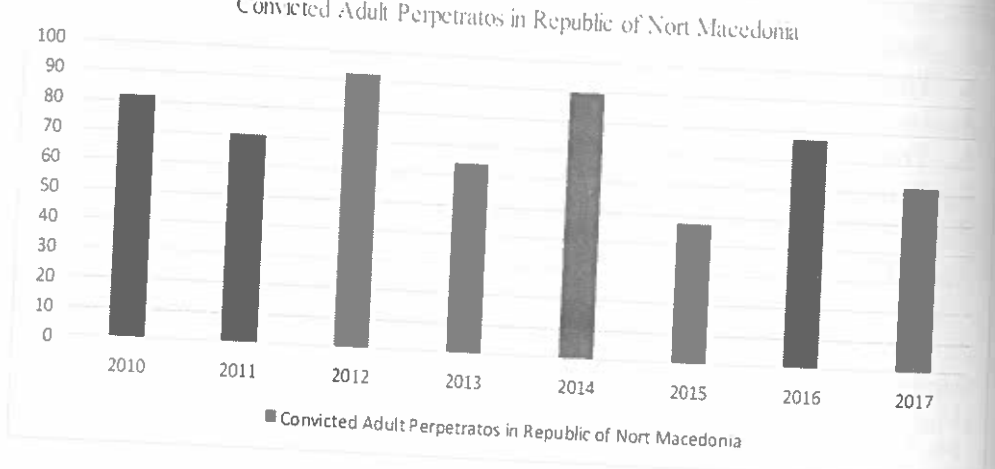
19. Killing or destruction of protected species of wild flora and fauna (article 232-a)
20. Unauthorized introduction of wild species into nature (article 232-b)
21. Unauthorized trade, import, or transport of wild flora and fauna (article 232-c)
22. Torturing animals (article 233)
23. Grave crimes against the environment and nature (article 234)

Within this paper table number 1 shows the statistical data on crimes against nature in the Republic of Macedonia, which are crucial to showing the real situation of the prevalence of crimes against the environment.

Table 1: Convicted Adult Perpetrators of Crimes Against Environment in the Republic of North Macedonia in the Period of 2010-2017 (Perpetrators of Criminal Offences, 2017)

Years	2010	2011	2012	2013	2014	2015	2016	2017
Convicted Adult Perpetrators	82	70	92	64	90	47	77	62

Graphic 1: Convicted Adult Perpetrators of Crimes Against Environment in the Republic of North Macedonia in the Period of 2010-2017



From the data presented in table 1 and graph 1, the following emerges: The most common crimes between 2010 and 2017 are: Unlawful hunting, torturing animals, illegal exploitation of mineral resources, and devastation of forests.

According to the data from the State Statistical Office of the Republic of North Macedonia ***in 2010,*** 30 people were convicted for unlawful hunting,1 for the unauthorized procurement and possession of nuclear materials, 4 people were convicted for torturing animals and 47 people committed other crimes related to the environment.

In 2011 total number of convicted adult perpetrators was 70. Hence, 20 persons were convicted for unlawful hunting, 3 for torturing animals and 47 persons committed other crimes related to the environment. From the analyzed period ***in 2012***, we have the highest crime rate, it was determined that 8 persons were convicted for unlawful hunting, and the other 84 persons committed crimes from the same category which were not defined.

In 2013 there was a reduction in the crime rate with a total of 64 perpetrators, unlike the previous years of the analyzed period. In 2013 for the first time, we face two new crimes: the first one is the pollution of the environment and nature and the second one is bringing dangerous materials into the country with one perpetrator for each. The other crimes are Unlawful hunting with 13 convicted persons, torturing animals with 5 convicted persons, and 44 other persons who committed crimes from the same category which were not defined. ***In 2014*** , according to the data received from the State Statistical Office, there was an increase in the total crime rate and the most common crimes were: Usurpation of real estate with 17 convicted persons, unlawful exploitation of mineral resources – 11 convicted persons, devastation of forest – 5 convicted, unlawful hunting – 16 convicted, unlawful fishing with 32 convicted persons and finally for committing the crime of torturing animals there were 4 convicted perpetrators. ***In 2015***, unlike 2014, there is a significant reduction in the rate of crimes against the environment. The total number of convicted perpetrators is 47. The most common crimes against environment in 2015 are the followings: Illegal exploitation of mineral resources, usurpation of real property , devastation of forests, unauthorized hunting, keeping and sale of wild animals and birds, unlawful hunting, unlawful fishing and torturing animals. ***In 2016*** total number of convicted perpetrators was 77, and the most common crimes were followings: Illegal exploitation of mineral resources, usurpation of real property, devastation of forests, unlawful hunting, unlawful fishing and torturing animals. Finally ***in 2017*** total number of convicted perpetrators was 62 and in this year the most common crimes against environment were: usurpation of real property, Illegal exploitation of mineral resources, unlawful fishing and devastation of forests. The analysis shows the following: crimes against the

environment show a different tendency to increase and decrease the number, but in general it can be concluded that these crimes have the potential to increase. One of the most important things about this issue is its prevention. In the context of crime prevention, national and international regulations are the key factors for the prevention of crime. In this context especially about the international regulations it is important to mention some of the major international initiatives that formally specify certain activities as offences: (White, 2011)

1. Convention for Prevention of Maritime Pollution by Dumping Wastes and Other Matters
   Convention on International Trade of Endangered Species of Wildlife Fauna and Flora (CITES)
2. International Tropical Timber Agreement
3. Vienna Convention for the Protection of the Ozone Layer
4. Montreal Protocol on Substances that Deplete the Ozone Layer
5. Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal
6. United Nations Framework Convention on Climate Change
7. Kyoto Protocol

8. Conclusion

In the last decades, we have had rapid development of science and technology. This development should not be aimed only at increasing human well-being and economic profit, but at the same time should move towards greater protection and improvement of the state of the environment. Environmental pollution and destruction are a phenomenon that is present in all parts of the planet Earth. The consequences of pollution in different regions are manifested differently, both by volume and by type of pollution. Environmental crime, with all its manifestations, forms, and specifics, today is an inevitable segment of modern human life and it should be considered and treated as part of the total general crime (Кацарски, 2013, p.147).

Environmental crime is a special type of crime, which is manifested through various human activities that result in pollution and endangerment of the environment. This pollution endangers human health or has negative consequences for the rest of the flora and fauna on the planet Earth. The need for environmental protection arises from the need to create conditions for the realization of one of the basic human rights that is guaranteed in the

highest legal acts of almost every country, and that is the right of every person to a healthy environment. (Кацарски, 2013, p.148).

Environmental criminals pose a great threat to our everyday lives, our planet, and future generations. Borders do not restrict environmental crimes, which range from ivory trafficking and overfishing of protected species to illegal logging and the dumping of hazardous waste. The further development of the ecological consciousness of modern man must move in the direction of reducing and eliminating the consequences of endangering and polluting nature and the environment. Organized environmental crime in its extreme forms can be very dangerous or extremely fatal, it involves socially dangerous actions and must be properly sanctioned. It is very important to mention the importance of the existence of an environmental policy, which provides criminal protection in the field of environmental law and environmental safety. The critical thing is to mention the importance of the fight against environmental crime and its timely detection.

Minimizing conflicts that have an ecological background is a commitment of modern society. Reducing the negative impacts on the environment, preserving and improving the quality of the environment as well as the opportunity to use natural resources in a way that will ensure their availability for future generations is the basis for improving environmental safety. It is not possible to talk about safety today if we do not incorporate environmental issues and the consequences of environmental change which, given their socio-economic importance, threaten stability at the global and national levels. For North Macedonia and the other countries of the Western Balkans region, environmental safety is vital in terms of population health, biodiversity preservation, healthy food sources, and safeguarding of water resources. There is no serious country in the world that does not base its security policy on environmental safety, and in that direction, the Republic of North Macedonia must proactively work on this issue in the National Security Strategy, in a way that strategically connects the protection of national values and interests from security risks and all forms of threats arising from environmental and climate risks.

Bibliography

Bošković, M. & Bošković, D. (2010). Ekološki Kriminalitet. Banja Luka: Fakultet za bezbjednost i zaštitu.

Blagojević, M. & Simić, B. (2012). Oblici i izvori ugrožavanja ekološke bezbednosti. Ecologica, 19 (66), 185-188

Çavga Ş. (2018). Çevre Hakkı ve Avrupa İnsan Haklarımahkemesi. İzmir: Dokuz Eylül Üniversitesi. Sosyal Bilimler Enstitüsü.

Domaradzki, S. et al. (2019). Karel Vasak's Generations of Rights and the Contemporary Human Rights Discourse. Human Rights Review 20. 423–443. https://doi.org/10.1007/s12142-019-00565-x
European Environment Agency. (2010). Environmental Trends and Perspectives in the Western Balkans: Future Production and Consumption Patterns. Luxembourg: Office for Official Publications of the European Union
Environmental Investigation Agency (2008). Environmental Crime: A threat to our future. https://www.unodc.org/documents/NGO/EIA_Ecocrime_report_0908_final_draft_low.pdf
İnterpol. (2021). Environmental crime. https://www.interpol.int/Crimes/Environmental-crime
Игњатовић, Н. (2020). Еколошки криминалитет. Ниш: Универзитет у Нишу. Правни факултет.
Кацарски, Љ. (2013). Улогата на полицијата на Република Македонија во превенирањето и сузбивањето на еколошкиот криминал. Скопје: Филозофски факултет. Институт за безбедност, одбрана и мир.
Марковић, Д. Ж. (2016). Цивилизација и етички аспекти еколошке безбедности. Зборник радова Филозофског факултета, XLVI (2), 85-98
Малиш Саздовска, М. (2010). Еколошка безбедност – состојби и предизвици. Безбедноста, еколошката безбедност и предизвиците на Република Македонија: Зборник на трудови, 193-205
McDonald, M. (2018). Climate Change and Security: Towards Ecological Security?. International Theory, 10 (2), 153–180
Schmidt W. C. (2004). Environmental Crimes. Environmental Health Perspectives 112-2. 96-103.
State Statistical Office of Republic of North Macedonia https://www.dzs.gov.mk
Сулејманов, З. (2003). Криминологија. Скопје: Институт за социолошки и политичко правни истражувања.
Timoshenko, A. S. (1992). Ecological security: response to global challenges. In E., Brown Weiss (Ed.). Environmental change and international law: New challenges and dimensions. (pp. 413-459). Tokyo, Japan: United Nations University Press
Timoshenko, A. S. (1989). Ecological Security: The International Aspect. Pace Environmental Law Review, 7 (1), 151-160
Тупанчески.Н (2017). Кривичен Законик. Скопје: Стоби Трејд.
White. R (2011). Transnational Environmental Crime Toward an eco-global criminology. New York: Routledge, 4.

ECONOMIC ASPECTS OF SMART CITY DEVELOPMENT

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Abstract

Cities are the foundation of the civilized world, the incubator of human labor and economic growth. At the same time, cities as dynamic and complex systems due to the high concentration of activities and increasing urbanization may turn into a point of convergence of many economic, demographic, social and environmental risks. Further development of cities is certainly unsustainable without innovative solutions and this is the main reason why smart city concept are becoming increasingly important. Smart cities are focused on people, sustainable development and quality of life, including technology which is a key instrument for their implementation. Together with the digital transformation, a process that fully follows and enables the development of smart works, together they are gaining more and more economic significance. Worldwide, investment in smart urban technologies is estimated at over a hundred billion dollars per year, building a brand new "smart city industry " that brings large investments directed to sustainable urban development. The main goal of this paper is to analyze smart cities from an economic point of view, in order to answer the question: whether and to what extent development of smart cities is economically important? Research results shows that the economic impact is a very important aspect of smart city development, which can be multiplied if its outcomes are used wisely and be a powerful booster of economic growth.

Key words: smart city concept, sustainable urban development, economic impact.

INTRODUCTION

The process of urbanization is a characteristic of modern civilization **MILUTINOVIĆ, S. (2004)**. It is one of the leading trends of the 21st century, while its course and nature are related to technological progress

and globalization **PAJVANČIĆ-CIZELJ, A. (2015)**. Urbanization in the simplest, demographic sense, is defined as an increase in the proportion of the population living in cities in the total population **PACIONE, M. (2009)**. As such, urbanization over time becomes one of the main social processes in modern society, because the share of the urban population in the total grows almost uncontrollably **PUŠIĆ, LJ. (1997).** Today, urbanization is intensifying in less developed parts of the world that were almost completely rural fifty years ago. The turning point for the redistribution of the world's urban population was 1970, when was a balance between developed and underdeveloped parts of the planet. In the period 1970-2021. years, urban trends are most pronounced in less developed parts of the world. For example, in 2008, for the first time, the number of inhabitants in cities exceeded the number of inhabitants in rural areas, while projections indicate that in 2050, 6 out of 9 billion people will live in urban areas **IVANOVIĆ, P. & RADEVIĆ, D. (2015)**. However, urbanization should not be to the detriment of rural development, but should be improved symbiotically and mutually **UNITED NATIONS. (2020)**. Urban areas are expected to absorb virtually all of the future growth of the world's population **UNITED NATIONS. (2018a).**

The meaning of the term "city" has changed throughout history and it was mostly understood as "compact spatial forms with a recognizable center that dominated the surrounding area" **GOTTDIENER, M. & HUTCHINSON, R. (2011)**. Nowadays, cities represent dynamic, economic and social structures that influence the growth and development of the national and international economy. At the same time, cities, due to the large concentration of socio-economic activities, are also areas in which numerous problems are concentrated, the solution of which has brought a change in the quality of life in urban areas. The trend of increasing population in cities causes diverse problems in the social and organizational sphere, which significantly burdens the management of urban structures, leads to a lack of resources, makes traffic difficult, endangers the environment and causes health problems for residents **FON. (2020)**. That is why the solution was found in smart city concept. Smart cities are urban areas that use smart technologies, such as the Internet of Things and Big Data, which are based on sustainability, economic, environmental, but also social, which leads to continuous improvement and efficiency - which is the basic goal **UKROPINA, N. (2020)**.

In order to understand the concept of "smart city" and its significance, it is necessary to start by getting acquainted with the dynamics of urbanization.

This is especially important while the world's urban population has increased from 751 millions to almost 4.2 billion in 2018 since 1950. **UNITED NATIONS. (2018b)**. Today, 55% of the world's population lives in urban areas, where the proportion is expected to grow to as much as 68% by 2050. Projections show that population shifts from rural to urban areas, combined with total world population growth, will bring another 2.3 billion people to urban areas by 2050, of which nearly 90% of this increase will take place in Asia and Africa. According to **UNITED NATIONS. (2020)** urban population and level of urbanization will be 58.3% in 2025, 60.4% in 2030, and 62.5% in 2035. Rapid urbanization outweighs rural development and by 2050 the urban population is projected to grow by 3.1 billion to 6.4 billion, while the rural population is declining to 2.8 billion **CIRIC, Z. & IVANISEVIC, S. (2017)**. Consequently, the rise of mega-cities is happening at the same time. In the 1950s, New York and Tokyo were the only mega-cities with over 10 million inhabitants. Today there are as many as 46 such urban agglomerations. It should not be forgotten that out of an estimated 7.7 billion people worldwide in 2019, the projection indicates that the global population could grow to about 8.5 billion by 2030, then to 9.7 billion by 2050 and to as many as 10,9 billion by 2100 **UNITED NATIONS. (2019)**. This means that cities are growing more and more. Despite the fact that the pandemic COVID-19 have had negative impact on the human population due to mass diseases and high mortality globally **IGNJATOVIC et. al. (2021)**, this will not reverse urbanization trend, while the primary drive for urban gathering will be the pursuit of a better life **UNITED NATIONS. (2020)**. To make the agglomeration process more inclusive, the focus is on collective well-being, sustainable development, efficient planning and management, but also environmental protection.

MATERIALS AND METHODS

The methodological framework of this research is based on data analysis and synthesis of theoretical and empirical facts, using the desk research method that includes basic methods, such as analysis and synthesis, deduction and induction in reaching conclusions, but also general scientific methods, such as descriptive and comparative analysis Also, methodology includes the method of collecting primary data, the method of analyzing the content of scientific papers, published texts and documents related to the research topic, as well as the systematization of collected information according to the objectives of the research. The initial hypothesis is that

smart cities, as a model of sustainable urban development, have positive economic effects. The subject of research is smart city concept, the theoretical framework of this concept and its economic aspects.The main goal of this paper is to analyze smart cities from an economic point of view, in order to answer the question is it development of smart cities economically important and justified? The research results are thematically divided into three parts. First part focuses on defining of smart city concept as a contemporary model of sustainable urban development. Second part refers to the global development of smart city industry, its scope and characteristics, while the third part analyzes smart city as an opportunity and driving force of economic growth. The conclusion unequivocally emphasizes the economic, social and environmental importance of smart cities as the flagship of sustainable urban development. Research results clearly show that the economic performance is a very important aspect of smart city, with strong positive effects on economic growth and futrher digital development. The significance of research is reflected in the theoretical and analytical knowledge about smart city concept and its role and importance from an economic perspective. For this paper used sources include updated database, contemporary literature and relevant scientific papers with complete, combined and related content.

RESULTS AND DISCUSSION

1)Definition of Smart City concept

Caused by the trend of growing urbanization and problems in urban areas, over the last two decades the concept of smart city has become increasingly relevant and gaining in popularity, both in the scientific literature and for policy makers. Despite the numerous literature, there is still confusion about what the concept of smart city essentially represents. The concept of smart city is most often thought of as a synonym for the use of advanced technologies and technological innovations in the urban area. These are, however, partial interpretations that ignore the numerous problems that cities face today, as well as the new challenges that the future will bring. There are many open questions and discussions regarding this concept to which there is no single answer. In the literature, these questions and their potential answers can be found systematized in this way **MOSANNENZADEH, F. & VETTORA, D. (2014)**:

- the necessity to create smart cities (Why?)
- the most important aspect of smart cities (What?)

- key actors of smart cities (Who?)
- how to make smart city (How?)
- the right place and time to create smart city (Where? When?)

Today, there are a large number of scientific and professional papers with an attempt to define and conceptually describe the term "smart city". However, so far there is no universally accepted definition. The meaning of the word "smart", as a characteristic of the city, has developed with the advancement of technology **ALBINO et al. (2015)**. "Smart" is often replaced with other alternative adjectives alongside the city (for example, intelligent, virtual or digital), in order to reflect evolution. Often the definitions are not comprehensive, they emphasize only one of the dimensions of this concept, due to the diverse interests of different stakeholders. The first attempts to define smart city concept was focused on the possibilities offered by information technology to manage the various functions of a city. Recent studies have been expanded and include other outcomes of a smart city such as sustainability, quality of life and service to citizens **KISIN et al. (2018)**. Some of Smart City definition that can be found in literature are:

1. **GIFFINGER et al. (2007)** presented probably one of the most quoted definitions in academic literature: "A Smart City is a city well performing in a forward-looking way in six characteristics. It is built on the 'smart' combination of endowments and activities of self-decisive, independent and aware citizens" .
2. **LAZAROIU, G.C. & ROSCIA, M. (2012)** define smart city as "new way of leaving and considering the cities. The optimization of available and new resources, as well as of possible investments is required. The achievement of Smart City objective can be reached through the support of various information and communications technologies".
3. "A city is smart when investing in human and social capital, traditional (transport) and modern communication (ICT) infrastructure encourages sustainable economic growth and a high quality of life, with wise management of natural resources, through participatory management" **CARAGLIU et al. (2009)**.
4. According to **BATTY et al. (2012)** "A Smart City is a synthesis of hard infrastructure (or physical capital) with the availability and quality of knowledge communication and social infrastructure.
5. **CANTON, J. (2011)** see smart city as "one that will use advanced technology and sciences – computing, neuroscience, nano-science, and

information science – to address the challenges of the future of the city such as energy, health, safety and commerce."

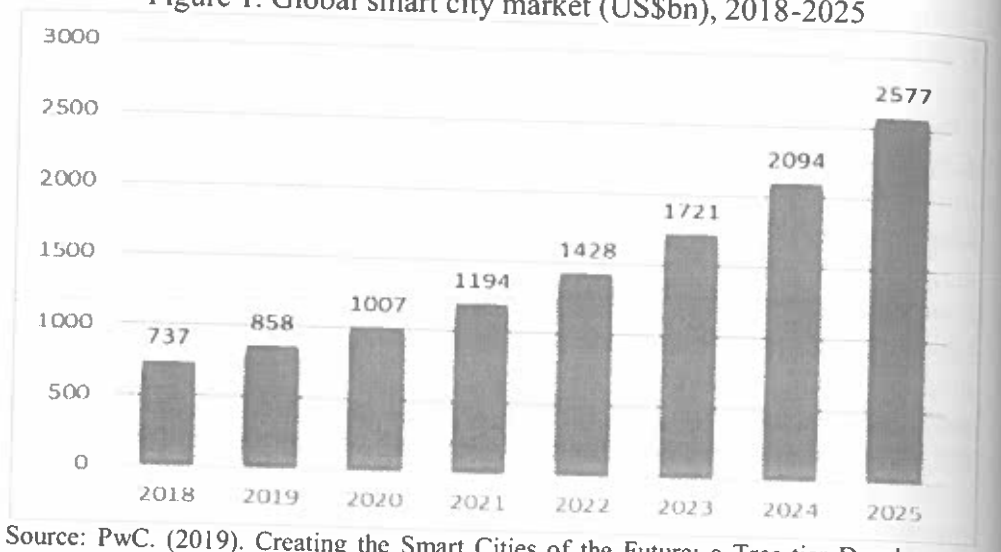
6. According **ODENDAAL, N. (2003)** "A Smart City or region is one that capitalizes on the opportunities presented by Information and Communication Technology (ICT) in promoting its prosperity and influence.
7. According **NAM, T. & PARDO, T.A. (2011)** "Key conceptual components of Smart City are three core factors: technology (infrastructures of hardware and software), people (creativity, diversity, and education), and institution (governance and policy). Given the connection between the factors, a city is smart when investments in human/social capital and IT infrastructure fuel sustainable growth and enhance a quality of life, through participatory governance.

The application of Information and communication technology (ICT) and data processing, with the collaboration of different stakeholders, serves as a means to address economic, social and environmental challenges in the city, to improve urban function in its various aspects and to help citizens overcome their urban problems. This is something that most authors agree, based on the brief review of literature. Without these essential determinants, the smart city development is not possible. In addition to numerous definitions by different authors, there are also different views regarding the characteristics and conceptual components of smart city. The separation of smart city concept in different dimensions indicates the evaluation of different aspects of the city system. Some of the most important challenges that smart cities need to solve are: demographic challenges, problems caused by climate change, environmental pollution, security risks, traffic problems, sustainable resource allocation, current health risks and others, all with the aim of providing a higher quality of life for its inhabitants. Smart city should develop and implement systems that are at the same time catalysts for sustainable development, development, high quality of life **DAMNJANOVIĆ et al. (2021)** and to provide new instrumentation that enables observation of urban systems at a micro-level **HARRISON & DONNELLY (2011).** „Is it possible to create a sustainable city in ecological, social and economic terms? " - is important for the survival of the entire civilization. Sustainable cities must be economically productive, socially inclusive and environmentally sustainable **RADOSAVLJEVIĆ, B. & MLADENOVIĆ, M. (2018)**. These three dimensions of sustainable urban development are exactly what the essential concept of smart city is based on in most theoretical frameworks.

1. Scope of Smart City industry

Cities are commerce and innovation centers that are a gateway to the global economy. In line with the rapid urbanization process, cities are growing in importance, with the urban population expected to double by 2030, adding 2 billion inhabitants to the cities. This contributes to the need to act rapidly and deliver a global response to all current and future challenges, ranging from climate change to rising inequality **WORLD BANK. (2016)**. Consequently, smart city can be seen as a system scope into which planning decisions are determined on the basis of urban scale, perceived multidimensional needs, and tailored innovations **QI, W. & SHEN, Z. M. (2018).** Around the world, the development of smart solutions in urban areas and the expansion of smart city industry have brought large investments in all its segments - from networks and sensors to new applications and services, from the world's largest technology companies to innovative new start-ups, in areas whose work is related to different segments of urban life. This is precisely the reason why the scope and area of operation of smart cities is extremely broad, diverse and widespread. The key services of urban life that are included in smart cities are in the areas of energy, security, mobility and emergency, with the sustainable use of resources, the transformation of the economy and society in that direction. In this context, smart city is complex systems of smart solutions that, thanks to data analysis, efficiently use their physical infrastructure, in which there is effective cooperation between local government and citizens through open and transparent processes, e-participation and e-governance, and which innovations adapts proactively to a changing environment **DAMNJANOVIĆ et al. (2021).** It is more than clear that the development of smart cities will be one of the most significant achievements of societies of 21st century. The everyday life of citizens in smart cities is easier, more fulfilling, and more secure. However, the development of smart cities primarily depends on the right relationship between two basic groups of players: the government and the public-private partners that contribute to creating an effective, connected, and 24/7 service reality to the citizens. The development of smart cities across the globe is continuously increasing, with the total value of the global smart cities market projected and expected to exceed $ 2.5 trillion by 2025 (Figure 1). In line with this growth, the most important aspect of the development of smart cities is the relationship of key participants in their design and creation **PwC. (2019)**.

Figure 1. Global smart city market (US$bn), 2018-2025



Source: PwC. (2019). Creating the Smart Cities of the Future: a Tree-tier Development Model for Digital Transformation of Citizen Services: 3.

The smart city means a city that functions effectively and efficiently in an advanced way and contains the following six characteristics: 1) smart economy, 2) smart people, 3) smart governance, 4) smart mobility, 5) smart environment and 6) smart living. A smart city concept means a "smart" combination of actions and activities of capable, determined, independent, and conscious citizens. These characteristics are considered crucial for a particular city could create and maintain smartness for others **DUDZEVICIUTE et al. (2017).** According to **JOSHI et al. (2016),** there are key drivers for understanding and developing smart cities. The pillars that form the holistic perspective of smart city development initiative are the following:

1. **Social pillar** – Smart cities need to respect the social conditions of their citizenship. They should be for all citizens, not just a certain group of enthusiasts. Smart city initiatives should be aimed at balancing the needs of different communities and contributing to a better quality of life, as well as more educated and informed citizens. In this way, smart cities will enable citizens to participate in the management of the city and become more active users of its services;
2. **Management pillar** – Smart city governance is a crucial feature of a city managed by citizen participation. Governance of smart cities includes the implementation of governance infrastructure that simplifies

and fosters communication and data exchange, service integration, and effective collaboration;

3. **Economic pillar** – The economy is one of the most significant drivers of the development of smart cities. The economic results of developing smart cities are the creation of new businesses and jobs, the development of the workforce, and the improvement of their productivity;
4. **Legal pillar** – Successful development of smart cities requires appropriate legal compliance. The government and government bodies play a key role in the smart city development initiative. Consequently, the political and legal components are considered to be fundamental to the development of the smart city concept;
5. **Technological pillar** – One of the main drivers that enable the easiest transformation into a smart city is technology. Today's modern cities are being transformed into smart cities primarily due to the rapid evolution of technology;
6. **Sustainability pillar** – Sustainable development is classified into three broad areas of social, economic, and environmental sustainability. Consequently, the main requirement expected of smart cities is to equally meet the three categories of sustainability.

Today's modern smart cities, and especially in the coming decades, are tending to develop and emerge on unprecedented scope. The concept of smart city is widely used, but at the same time, it is understood differently, which contributes to the idea sounding utopian. However, most scholars, government institutions, corporate ambassadors, and city dwellers all agree that the main elements of smart cities are modern information and communication technology and smart citizens. The beginning of the 21st century can be characterized as a period of expansion of the Internet, digital transformation and introduction of intelligent concepts of self-regulation and advanced automatic control, but we are witnessing ambitions to go much further because the introduction of technologies has expanded to comprehensive transformation of society and lifestyle in urban areas **MASTILOVIĆ, A. (2021).** In this context, the development of smart cities strongly contributes to the development of Super Smart Society 5.0. which is seen as a society centered on man, and in which a balance is maintained between economic progress and the solution of social problems, through a system that highly integrates cyberspace and physical space. The essence of this concept is that the most important thing is for a person to be happy and

that all modern technological achievements work for his benefit. It is these tendencies that should accelerate the development of smart cities, creating cities with cities with a human face. Smart city development strategies put their citizens and their needs at the center of technologies that are just a means to achieve a city that is smart, sustainable, competitive, participatory, creative, innovative and citizen-oriented.

2. Ecomonic impact of Smart City development

Based on keyword analysis, economic growth is identified as one of the most important goals. Also, the same research shows that companies are the main actors in the creation of Smart Cities and they are the ones who has an active engagement in the creation of Smart Cities **MOSANNENZADEH, F. & VETTORA, D. (2014).** From discrete innovative projects, Smart City have outgrown into a big market opportunity that will lead to major investments in technology. The development of a smart city technologies already is one of the most promising and economically justified invesments. It is estimated that the so-called smart city industry will make big investments in all its segments - from networks and sensors to new applications and services, from the world's largest technology companies, to innovative new start-up companies. Some forecast have shown that smart city market will reach almost USD 2000 billion by the end of 2023, with a compound annual growth rate of 24.21% **ORBIS RESEARCH. (2018).** By 2026 the positive impact of a smart city technologies on economic development and GDP growth could see cities locking in incremental growth of over 5% and driving more than USD 20 trillion in additional economic benefits over the coming decade **ABI RESEARCH. (2018).** Also, in line with global trends, forecasts agree that investments in smart city technologies can bring cities economic value four times higher than invested. The existence of a clear and indisputable business model is emphasized, where the return on investment in these solutions is practically safe, and the payback time varies from 2 to 7 years, depending on which service of the Smart City it is. Also, long-term smart solutions provide large savings that can be directed to the construction of additional services and infrastructure or facilities important for citizens **MASTILOVIĆ, A. (2021).** Some of the direct economic goals that can be achieved by developing smart cities are more employment and service efficiency. A smart city should stimulate the local economy by using available resources in a sustainable way, building human capital, promoting innovation and economic knowledge, and exploiting the full potential of businesses.

Guided by the concept of a smart city, it is possible to optimize and improve your own business and organizational processes as well as all related companies, institutions and establishments **KUMAR, T. M.V. (2017)**. Cost optimization, savings and increased efficiency of city services through real-time management stimulate cooperation between the public, private and civil sectors. Economy of cities include technological development, present in modern economies, which are becoming more and more digital, while at the same time before the development of information and telecommunication technologies there are new challenges that pose a different dynamic of relations of all market participants **ZIVKOVIC et al. (2017).** According to **BARON & KUZNIK (2017)** „the economy of a smart city comprises two segments: a traditional segment, based on sectors and economic specializations functioning to date in the city, and a new segment, which is being generated with respect to various forms of research and development activity, manufacturing and services of technological entities and creative economy companies". The series of questions regarding economy of smart city may be grouped into two **BARON & KUZNIK (2017)**:

1. The first set about new elements in the city's economy, as elementary questions, and
2. The second set that concerns structural transformations in the municipal economy and formulates a research problem as a problem of the creation of an economic structure of the town of a new quality as an intelligent economy.

From a strategic point of view, the application of the concept of smart cities contributes to the further development of the sharing economy, which is seen as the new economy of today. The system of sharing economy is based on the philosophy of modern times - access to products and services as opposed to owning goods and positions of the Internet and technology as tool that create a link between what people need and what other people have. The benefits that this business model brings to society and natural environment are numerous and basically share the principles of sustainable development and recycling, which corresponds fully with smart city objectives.

CONCLUSIONS

The resources that built mega-cities in the 20th century are no longer sustainable today. In the 21st century, for the first time in the history of mankind, more than half of the people live in urban settlements. According

to all projects, rapid urbanization overrides rural development in the coming decades. In addition, there are more and more disruptive moments of urban development. All these facts are the reason why are cities in the focus of many researches, because rapid urbanization produces a large part of today's problems, and the solutions to these problems are extremely important. Cities as complex systems with rapid urban growth can lead to congestion, pollution and increasing social inequality and turn a city into a point of convergence of many economic, demographic, social and environmental risks. This could seriously exceed their ability to provide adequate services to their citizens. With growing urbanization that is certainly unsustainable without innovative solutions, building the smart cities of the future may mean that we have cities in the future at all. Smart cities are more than a trend - they are the wave of the future as the world becomes more urbanized. This is the main reason why smart cities are becoming increasingly important. Today, new ways are being sought to use technology to solve the problems facing modern cities. On the other hand, although technology is a key instrument for the development of smart cities on a daily basis, the cities of the future are focused on people, sustainable development and quality of life. Smart city as a modern multidisciplinary concept of sustainable urban development, widely used worldwide, aim to enable more efficientcy and life quality in the city using innovative opportunities and solutions provided by modern information and communication technologies. Smart solutions in urban space should be feasible and practical, original and recognizable, directed towards the people to make city a better place for living. Smart cities are focused on people, sustainable development and quality of life, including modern technology which is a key tool for application of smart solutions. Along with the digital transformation, a process that fully follows and enables the development of smart cities, increasingly gaining economic significance and stand out as a significant economic opportunity. The development of smart cities also opens up some new important topics for planning sustainable urban development in the future. Primarily, it emphasizes the resilience in urban areas, as the capacity of a community to be prepared for crisis situation in order to be able to withstand, absorb, adapt, and then regain all its functions in a timely and efficient manner, has been an important issue last years. The lesson of the coronavirus pandemic has taught us a lot. Among other things, public health and monitoring of health risks in cities has become a new dimension of security in cities that should be included in smart city development. Smart city shoud be developed

urban area that creates sustainable economic development and a high quality of life, characterized by several key areas: economy, mobility, environment, people, life and governance. In this context, its goal is to provide the conditions for a healthy and happy community under the challenging conditions that global, environmental, economic and social trends can bring.

REFERENCES

ABI RESEARCH. 2018: Role of the Smart Cities for Economics Development, https://www.chordant.io/download/5a5faa56cd829e1e2d00080c

ALBINO, V., BERARDI, U. & DANGELICO, R. 2015: Smart cities: definitions, dimensions, performance and initiatives, *Journal of Urban Technology*, 22 (1): 3-21

BARON, M. & KUZNIK, F. 2017: Economic basis for functioning of a smart city, *Studia Regionalia*, 51: 83-103.

BATTY, M., AXHAUSEN, K.W., GIANNOTTI, F., POZDNOUKHOV, A., BAZZA, A., WACHOWICZ, M., OUZOUNIS, G. & PORTUGALI, Y. 2012: Smart cities of the future. *The European Physical Journal*, Special Topics 214: 481–518.

CANTON, J. 2011: The extreme future of megacities. *Significance*, 8: 53–56.

CARAGLIU, A., DEL BO, C. & NIJKAMP, P. 2009: Smart cities in Europe. 3rd Central European Conference in Regional Science – CERS, 2009, Technical University of Košice, Slovakia, p. 45-59.
https://inta-aivn.org/images/cc/Urbanism/background%20documents/01_03_Nijkamp.pdf

CIRIC, Z. & IVANISEVIC, S. 2017: Pametan grad - uslov i posledice kreiranja pametne turističke destinacije, Modern Management Tools and Economy of Tourism Sector in Present Era: International Thematic Monograph, Belgrade: Association of Economists and Managers of the Balkans; Ohrid. p. 257-266. https://www.udekom.org.rs/publications.html

DAMNJANOVIĆ, D., Andreja GLUŠČEVIĆ, A., MARKOVIĆ, S., NIKOLIĆ, J., JANJUŠEVIĆ, M. & POZDER, N. 2021: Pametni gradovi Srbije – Inovativnost i rezilijentnost lokalnih zajednica u Srbiji, PALGO smart 2021. Beograd.

DUDZEVICIUTE, G., SIMELYTE, A. & LIUCVAITIENE, A. 2017: The Application of Smart Cities Concept for Citiyens in Lithuania and Sweden: Comperative Analysis. *Independent Journal of Management and Production*, 8 (4): 1433-1450.

FON. 2021. Internet inteligentnih uređaja: Pametni gradovi. Katedra za elektronsko poslovanje. Univerzitet u Beogradu. Fakultet organizacionih nauka. https://elab.fon.bg.ac.rs/udzbenik-internet-inteligentnih-uredaja/pametni-gradovi/

GIFFENGER, R., FERTNER, C., KRAMAR, H., MEIJERS, E. & PICHLER-MILANOVIĆ, N. 2007: Ranking of European medium-sized cities, Final Report, Vienna, Centre of Regional Science (SRF), Vienna University of technology. http://curis.ku.dk/-ws/files/37640170/smart_cities_final_report.pdf

GOTTDIENER, M. & HUTCHINSON, R. 2011: The New Urban Sociology. Fourth Edition. Boulder: Westview Press. 2 p.

HARRISON, C. & DONNELLY, I.A. 2011: A theory of smart cities. Proceedings of the 55th Annual Meeting of the ISSS-2011. Hull, UK. p. 1-15.

IGNJATOVIC, J., KISIN, J. & MASHOVIC, A. 2021: Economic aspects of the COVID-19 pandemic in the Western Balkan region, International scientific conference, Susutainable economic transformation in the post pandemic period, Sremska Kamenica, University Educons, Serbia p. 63-88.
IVANOVIĆ, P. & RADEVIĆ, D. 2015. Rast stanovništva, globalizacija i proizvodnja hrane. Institut društvenih nauka. Bograd: 163 p.
JOSHI, S., SAXENA, S. & GODBOLE, T. 2016: Developing Smart Cities: An Integrated Framework, Procedia Computer Science, 93 (1): 902-909.
KISIN, J., OKANOVIĆ, A. & RALETIĆ-JOTANOVIĆ, S. 2018: Pametni gradovi – budućnost urbanog održivog razvoja, *Ecologica*, 25 (92): 799-804.
KUMAR, T. M.V. 2017: Smart Economy in Smart Cities. International Collaborative Research. Springer Nature Singapore Pte Ltd. 2017.
MASTILOVIC, A. 2021: Pametni gradovi: prvi korak za pametno društvo, Časopis Industrija. IndMedia. https://www.industrija.rs/vesti/clanak/pametni-gradovi-prvi-korak-za-pametno-drustvo
MILUTINOVIĆ, S. 2004: Urbanizacija i održivi razvoj. Fakultet zaštite na radu, Niš. 55p.
MOSANNENZADEH, F. & VETTORA, D. 2014: Defining Smart City a Conceptual Framework Based on Keyword Analysis, Eighth International Conference INPUT Smart City - Planning for Energy, Transportation and Sustainability of the Urban System p. 685-694.
NAM, T. & PARDO, T.A. 2011: Conceptualizing smart city with dimensions of technology, people, and institutions, Proceedings of the 12th Annual International Digital Government Research Conference: Digital Government Innovation in Challenging Times. ACM. p. 282–291.
LAZAROIU, G.C., & ROSCIA, M. 2012: Definition methodology for the smart cities model. *Energy*, 47 (1), 326–332.
ODENDAAL, N. 2003: Information and communication technology and local governance: understanding the difference between cities in developed and emerging economies. *Computers, Environment and Urban Systems*, 27: 585–607.
ORBIS RESEARCH. 2018: Global Smart Cities Market: Analysis of Growth, Trends and Forecasts (2018-2023). https://www.orbisresearch.com/reports/index/global-smart-cities-market-2018-2023
PAJVANČIĆ-CIZELJ, A. 2015: Koncept globalnog grada kao pristup razumevanju savremenih obrazaca urbanizacije i globalizacije. Doktorska disertacija. Filozofski Fakultet. Novi Sad.
PACIONE, M. 2009: Urban geography: a global perspective (Third edition). London: Routledge.
PUŠIĆ, LJ. 1997: Grad, društvo, prostor: sociologija grada. Beograd: Zavod za udžbenike i nastavna sredstva. 178 p.
PwC. 2019: Creating the Smart Cities of the Future: a Tree-tier Development Model for Digital Transformation of Citizen Services. 2-3 p.
RADOSAVLJEVIĆ, B. & MLADENOVIĆ, M. 2018: Održivi gradovi i globalna održivost, *Ecologica*, 25 (90): 450-455.
QI, W. & SHEN, Z. M. 2018: A Smart-City Scope of Operation Management. *Production and Operations Management*, 28 (2): 1-33.
UKROPINA, N. 2020: Pametni gradovi-put ka održivoj budućnosti. Centar za tehnološki menadžment, Fakultet organizacionih nauka. Beograd.

http://ctm.fon.bg.ac.rs/2020/03/26/pametni-gradovi-put-ka-odrzivoj-buducnosti/
UNITED NATIONS. 2020: World Cities Report 2020: The Value of Sustainable Urbanization. Digital Library. https://digitallibrary.un.org/record/3905819?ln=en
UNITED NATIONS. 2019: World Population Prospects 2019 Highlights. Department of Economic and Social Affairs. Population Division. New York. https://population.un.org/wpp/Publications/Files/WPP2019_Highlights.pdf
UNITED NATIONS. 2018a: World Urbanization Prospects: The 2018 Revision: key facts. Department of Economic and Social Affairs, Population Division. New York. https://population.un.org/wup/Publications/Files/WUP2018-KeyFacts.pdf.
UNITED NAIONS. 2018b: World Population Prospects: The 2017 Revision. Department of Economic and Social Affairs, Population Division. New York. https://population.un.org/wpp/
WORLD BANK. 2016: World Development Report 2016: Digital Dividends. Washington, DC. 240 p.
ZIVKOVIC, R., BRDAR, I., GAJIC, J. & CKONJEVIC, K. 2019: Pametni gradovi kao deo digitalne ekonomije, International Scientific conference on information technology and data related research, SINTEZA 2019. Belgrade, Singidunum University, Serbia, 2019, pp. 121-128. doi:10.15308/Sinteza-2019-121-128

SPECTRAL FLORISTIC ANALYSES OF MEDICINAL AND AROMATIC PLANTS IN SOME AREAS AROUND SHKODRA LAKE

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ABSTRACT

The areas around Lake Shkodra are distinguished for their ecosystem with very high biodiversity, especially, the areas where the study was conducted in Shiroka, Zogaj and Tarabosh Mountain - Fshati i Paqes) during May-June 2021 period. The aim of this study is spectral floristic analyses of medicinal and aromatic plants in some areas around Lake Shkodra. These floristic analyses show a richness of 41 of medicinal and aromatic species, which belongs to 10 families. The family *Lamiceae* occupies the main place of plant distribution with 17% of the total. This large diversity of families and species is influenced by the diversity of microhabitats. The life form spectrum shows 7% Ch, 8% G, 35% H, 15% Ph, 30% T and 5% nPh. This spectrum gives high percentage of hemicryptophytes and presence of Geophytes, which shows a degradation and drought soil of the studied territory. The chorological spectrum gives the highest percentage of Mediterranean origin species (31%) and Euro-Mediterranean (20%). These percentages of floristic spectrum analyses show the actual condition and distribution of the medicinal and aromatic plants in the studied area.

Key words: spectral floristic analyses, hemicryptophytes, chorological spectrum medicinal and aromatic plants

INTRODUCTION

Medicinal and aromatic plants represent that part of the flora that can be used for health and economic benefits. Medicinal and aromatic plants are considered as one of the main renewable potentials with an impact on the socio-economic development of the country as a whole and of rural areas PAZARI, F. (2014).

In many parts of the world, knowledge about medicinal plants is passed down from one generation to the next, and they are of particular importance

to folk medicine and pharmaceuticals. The use of medicinal plants and their cultivation dates to the Romans. Until the middle of the XIX century and the beginning of the XX century, medicinal plants were the raw material for the benefit of medicines. Even today, although the benefit of active substances through chemical compounds is quite large, the use of medicinal plants in folk medicine MEHMETI, et al. (2007).

Our study includes the floristic analysis of a very interesting area, such surrounding areas of Lake Shkodra.

Tarbosh Mountain is a mountain in the district of Shkodra, at the southwestern end of Lake Shkodra with a height of 595 m. The relief is rough and karst forms are quite widespread. The northeastern slope, broken by tectonics, falls steeply on Lake Shkodra. On this side are the area of Shiroka, tourist resort and Zogaj. In this inhabited and tourist areas live in harmony many species of plants, fish, birds, and animals.

Lake Shkodra represents a complex of large habitats, very interesting, unique. Deciduous forests, as well as scrubs in Zogaj (Tarabosh) are characterized by a rich flora, as well as rare and endangered plant species DHORA, DH. (2016).

The geographical position of these areas near the slope of Tarabosh and the lake of Shkodra (Shiroka and Zogaj) affects the formation of microclimates. The average annual rainfall is 1800 mm, the maximum air temperatures are 40 ° C and water 27 ° C. Over the years, these areas have been distinguished for their medicinal and aromatic plant resources, such as sage, chamomile, rosemary, wild rose, wild pomegranate, thyme, etc.

Other very interesting areas such as the Peace Village are located on the slopes of Mount Tarabosh and near the mouth of Lake Shkodra.

Various studies in recent years have been conducted in the areas of Lake Shkodra, especially on endangered species, plant associations or habitats RAKAJ, et al. (2015). Similar works on medicinal and aromatic plants have been carried out in the northern areas of our country MEHMETAJ, SH. & RAKAJ, M. (2017).

MATERIALS AND METHODS

In this study, three study areas have been taken into consideration: 1- Shiroka, 2- Zogaj and 3- Fshati i Paqes. This floristic study of the area is done through the expeditions, during the period May-June where the vegetation is more representative.

For the determination of species are used: Flora e Shqipërisë PAPARISTO, et al. (1988), QOSJA, et al. (1992, 1996), VANGJELI et al. (2000), Flora Ekskursioniste e Shqipërisë DEMIRI, M. (1983) dhe Udhëheqësi fushor i Florës së Shqipërisë VANGJELI J. (2003).

All surveys were conducted according to classical methods developed by Josias Braun-Blanquet of the Zurich-Montpellier School of Phytosociology BRAUN BLANQUET, J. (1964).

For the determination of medicinal and aromatic plants and floristic analysis (systematic spectrum, biological spectrum and chorogical spectrum) we are based on abundant literature about them RAUNKIÆR, C. (1934); ELLENBERG, H. & MÜLLER-DOMBOIS, D. (1967); PAPATHOPULI, G. (1976); KOKOLARI, P. et al. (1980); MEHMETI, et al. (2007).; KOÇI, A (2013, 2015); PAZARI, F. (2014); KOÇI, A. & MERSINLLARI, M. (2015); MILLAKU, F. (2015); KOÇI, A. (2016).

RESULTS AND DISCUSSION

From the floristic analyses of the surrounding area of Lake Shkodra these results area obtained:

- Species richness: 41 species
- Family richness: 10 families
- Biological spectrum: 7% Ch, 8% G, 35% H, 15% Ph, 30% T and 5% nPh.
- Chorogical spectrum: Mediterranean (31%), Euro-Mediterranean species (20%) and Paleotemporal species (13%).

In the table below are shown the floristic data use for these floristic analyses.

Table 1. Floristic list

	Scientific name of species	Family	Biological form	Chorogical form
1.	***Anthriscus sylvestris***	*Apiaceae*	H	Paleotemp
2.	***Agrimonia eupatroria***	*Asteraceae*	H	Med
3.	***Asphodelus albus***	*Liliaceae*	G	Subatl
4.	***Asplanium ceterach***	*Aspleniaceae*	G	Euroasiat
5.	***Cynoglossum creticum Mill.***	*Boraginaceae*	H	EuriMed
6.	***Carlica acaulis***	*Asteraceae*	H	EuQ
7.	***Crataegus monogyna***	*Rosaceae*	Ph	Paleotemp
8.	***Dittrichia viscosa***	*Asteraceae*	H	EuMed
9.	***Daucus carota***	*Apiaceae*	H-T	Paleotemp-subkozm
10.	***Euphorbia characias***	*Euphorbiaceae*	G	Med
11.	***Foeniculum vulgare***	*Apiaceae*	H	MedJ
12.	***Galium aparine***	*Rubiaceae*	T	EuAz
13.	***Geranium lucidum***	*Oxalidaceae*	T	EuMed
14.	***Lepidium virginicum***	*Brassicaceae*	T	AmV
15.	***Morus alba***	*Moraceae*	Ph	AzL
16.	***Mentha pulegium***	*Lamiaceae*	H	EuMed
17.	***Mentha suaveolens***	*Lamiaceae*	H	?
18.	***Mentha aquatica***	*Lamiaceae*	H	Paleotemp
19.	***Torilis arvensis***	*Apiaceae*	T	EuMed
20.	***Taraxacum officinale***	*Asteraceae*	H	Circumbor
21.	***Orlaya grandiflora***	*Apiaceae*	T	EuQ&J
22.	***Olea europeae***	*Oleaceae*	Ph	Med
23.	***Punica granatum***	*Punicaceae*	Ph	Med-AzJP
24.	***Pisum sativum***	*Fabaceae*	T	Med
25.	***Pinus nigra***	*Pinaceae*	Ph	EuJ
26.	***Rosa canina***	*Rosaceae*	NPh	EuAz
27.	***Rosmarinus***	*Lamiaceae*	Ch	Med

	officinale			
28.	*Matricaria chamomilla*	*Asteraceae*	T	AzJL
29.	*Lunaria annua*	*Brassicaceae*	T	EuJL
30.	*Vicia villosa*	*Fabaceae*	T	EuMed
31.	*Viola odorata*	*Violaceae*	H	Eu-Med
32.	*Sonchus asper*	*Asteraceae*	H	EuAz
33.	*Satureja hortensis*	*Lamiaceae*	T	AzP
34.	*Scandix pecten-veneris*	*Apiaceae*	T	Med
35.	*Salvia officinalis*	*Lamiaceae*	Ch	MedL
36.	*Senecio vulgaris*	*Asteraceae*	T	Med
37.	*Urtica dioica*	*Urticaceae*	H	SubKozmop
38.	*Myosotis sylvatica*	*Boraginaceae*	H	Paleotemp
39.	*Rubus ulmifolius*	*Rosaceae*	NPh	EuMed
40.	*Vitex agnus-castus*	*Verbenaceae*	Ph	Med
41.	*Teucrium polium*	*Lamiaceae*	Ch	Med

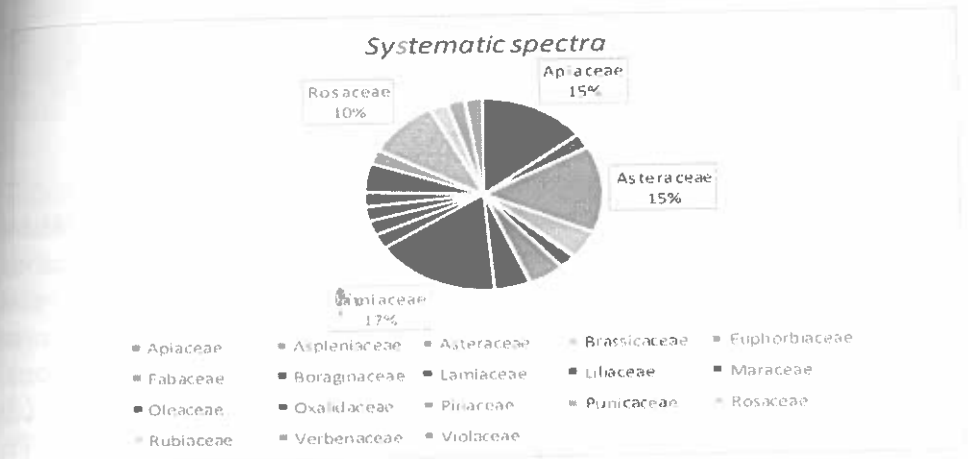
The following tables present the spectral analysis:

Table 2. Systematic spectrum

Family	*Systematic spectra*
Apiaceae	6
Aspleniaceae	1
Asteraceae	6
Brassicaceae	2
Euphorbiaceae	1
Fabaceae	2
Boraginaceae	2
Lamiaceae	7
Liliaceae	1

Maraceae	1
Oleaceae	1
Oxalidaceae	1
Pinaceae	1
Punicaceae	1
Rosaceae	4
Rubiaceae	1
Verbenaceae	1
Violaceae	1

Figure 1. Systematic spectra

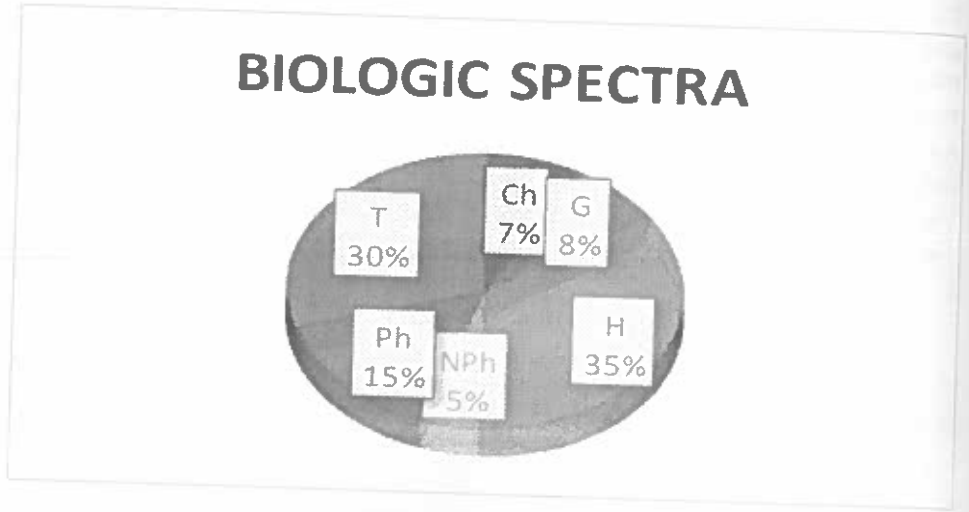


Based on the systemic spectrum, the families that are most prevalent in the study areas are: Rosaceae family which accounts for 10% of plant distribution, Apiaceae and Asteraceae family 15% and Lamiaceae family which corresponds to 17% of their distribution.

Table 3. Biologic spectra

Biologic form	*Biologic spectra*
Ch	3
G	3
H	14
NPh	2
Ph	5
T	12

Figure 2. Biological spect

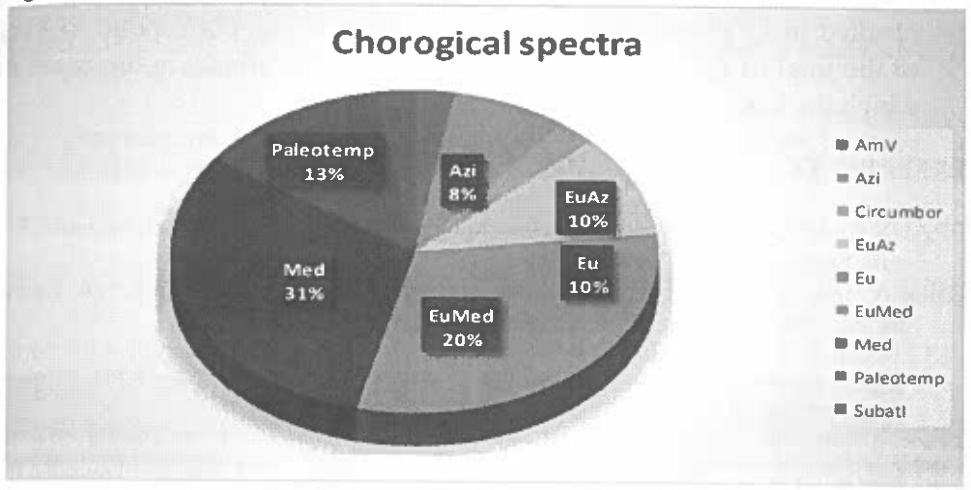


Biological life forms are dominated by form H (Hemicryptophytes) where they occupy 35% of their spread. They are typical perennial herbaceous plants which form perennial buds on the surface of the earth. The largest percentage is occupied by hemicryptophytic plants, which testifies to species that prefer low-soil, drought-tolerant, and cold-tolerant conditions. T (Therophytes) 30%, Ph (Phanerophytes) 15%, G (Geophytes) 8%, Ch (Chamaephytes) 7% and with the lowest percentage NPh (Nanophanerophytes) 5%.

Table 4. Chorological spectrum

Chorogical form	Chorogical spectra
North America	1
Asia	3
Circumboreal	1
Euro-Asiatic	4
European	4
Euro-Mediterranean	8
Mediterranean	12
Paleotemporal	5
Subatlantic	1

Figure 3. Chorogical spectra

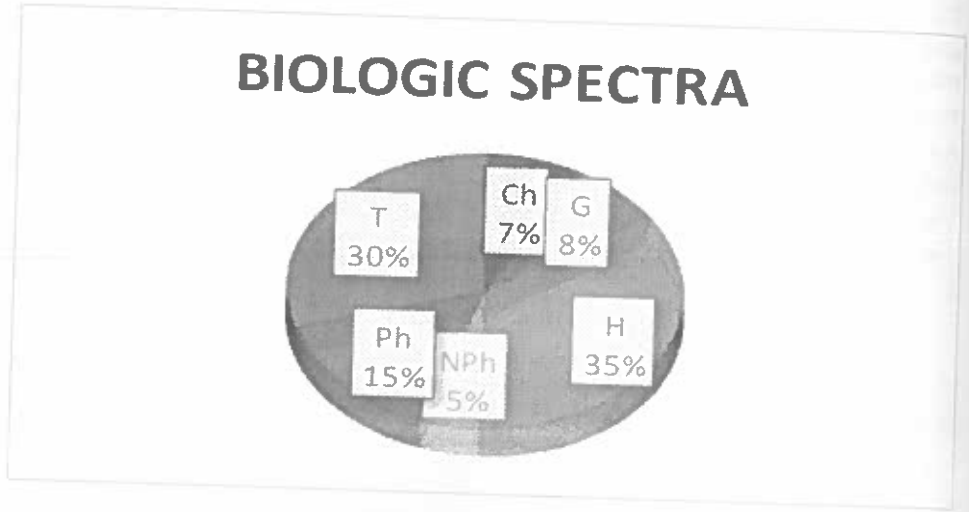


Since the climate in the areas in which the study was conducted is Mediterranean, the plants with the highest percentage belong to the Med (Mediterranean) form with a prevalence of 31%. Also based on the chorological spectrum, EuMed (Euro-Mediterranean) plants have a large spread with 20%, Paleotemporal species occupy 13% of the floristic surface, Euro-Asiatic and Eu occupy 10% of the surface and Asiatic species corresponds to 8% of their spread.

CONCLUSIONS

- According to this study, during the field observation data, a wide spread of aromatic and medicinal plants was observed in Shiroka, Zogaj and Fshati paqes.
- 41 types of aromatic-medicinal plants with great values in the field of medicine and cosmetics have been identified, which belongs to 10 families.
- Of these plants, the *Lamiaceae* family was the most widespread, accounting for 17% of the total number of plants growing in these areas.
- The life form spectrum shows 7% Ch, 8% G, 35% H, 15% Ph, 30% T and 5% nPh. This spectrum gives high percentage of Hemicryptophytes and presence of Geophytes, which shows a degradation and drought soil of the studied territory.

Figure 2. Biological spect



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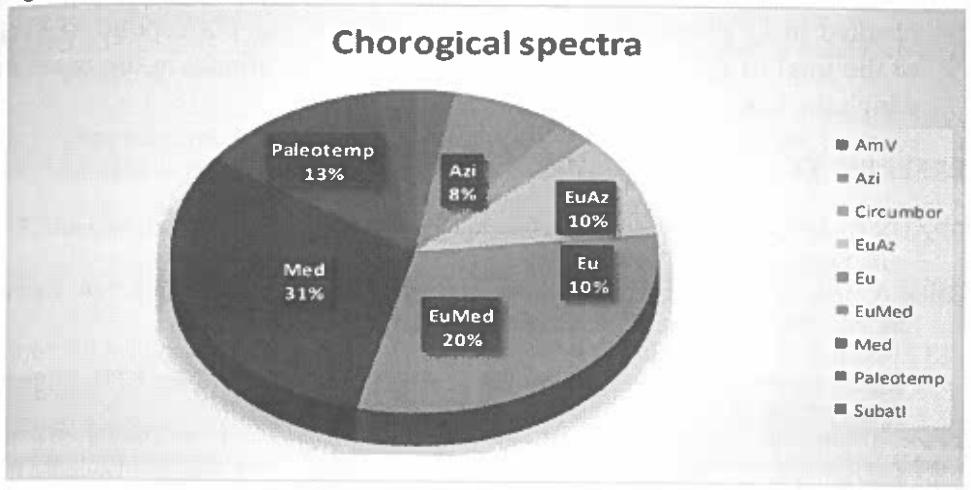

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- The study of plant origin according to the chorological spectrum resulted in 12 plants of Mediterranean origin which correspond to 31% of the total of these plants which shows that the climate in the areas in which the study was conducted is Mediterranean.

REFERENCES

BRAUN BLANQUET, J. 1964: Pflanzensoziologie. Grundzüge der Vegetationskunde. 3. aufl. Springer Verlag, Wien, pg 865.

DHORA, DH. 2016: Review of the characteristics of Shkodra Lake with a new vision. Buletin Shkencor Ush. Nr 66. Seria e Shkencave të Natyrës.

ELLENBERG, H. & MÜLLER-DOMBOIS, D. 1967: A key to Raunkiaer plant life forms with revised subdivisions. Berichte des geobotanischen Institutes der ETH, Stiftung Rübel 37, 56-73.

KOÇI, A. 2013: Floristic analyses of the areal of *Punica granatum* L. in Albania. The 1st International Conference on "Research and Education – Challenges Towards the Future". ICRAE 2013. Shkodra, Albania.

KOÇI, A. 2015: Spectral floristic analyses on the area of Punica Granatum L. in Albania 2014. International Conference on Soil (ICOS), Agricultural University of Tirana, Albania.

KOÇI, A. & MERSINLLARI, M. 2015: Studim mbi llojet bimore me vlerë praktike në arealin e shegës së egër në Shqipëri. Buletini i Shkencave të Natyrës. BSHN (UT) 19/2015

KOÇI, A. 2016: Të dhëna mbi arealin, florën dhe bimësinë e llojit *Punica granatum* L. (shega e egër) në vendin tonë. Dizertacion. Tiranë.

KOKALARI, P., SIMA, Z., XINXO, P. 1980: Bimët mjekësore në familje. Tiranë. fq.442.

MEHMETAJ, SH. & RAKAJ, M. 2017: Diversiteti dhe përhapja e bimëve mjekësore dhe aromatike të luginës së Shkrelit. Universiteti i Shkodrës "Luigj Gurakuqi" Bul. Shk., Ser. Shk. Nat., Nr. 67: 102-119.

MEHMETI, A., SHERIFI, E., DEMAJ, A., 2007: Bimët mjekësore. Prishtinë, fq. 60.

MILLAKU, F. 2015: Atlas i bimëve mjekësore dhe aromatike dhe i kërpudhave. Prishtinë.

PAPATHOPULI, G. 1976: Bimët mjekësore dhe aromatike të Shqipërisë. 8 Nëntori, Tiranë, fq.392.

PAZARI, F. 2014: Vlerësimi ekonomik dhe ekologjik i bimëve mjekësore dhe aromatike të Shqipërisë në funksion të zhvillimit të ekonomisë rurale. Univerisiteti i Tiranës, Tiranë, fq. 236 (Dizertacion).

QOSJA, XH., PAPARISTO, K., DEMIRI, M., VANGJELI, J. 1992: Flora e Shqipërisë. vol. 2. Akademia e Shkencave e RPS të Shqipërisë, Qendra e Kerkimeve Biologjike; Tiranë, fq. 446.

QOSJA, XH., PAPARISTO, K., VANGJELI, J., RUCI, B. 1996: Flora e Shqipërisë. vol. 3. Akademia e Shkencave e RPS të Shqipërisë, Qendra e Kërkimeve Biologjike; Tiranë, fq. 331.

RAKAJ, M., DHORA, DH., SMAJLAJ, RR., 2015: Habitatet dhe speciet më të rëndësishme të makrofiteve, peshqve, shpendëve, etj, të liqenit të Shkodrës. Raport i projektit "Mbështetja e menaxhimit të qëndrueshëm afat gjatë të liqenit ndërkufitar të Shkodrës". Instituti për Ruajtjen e Natyrës në Shqipëri.

RAUNKIÆR, CH. 1934: The Life Forms of Plants and Statistical Plant Geography. Oxford University Press, Oxford. Fq. 632.

VANGJELI, J. 2003: Udhëheqës fushor i Florës së Shqipërisë. Akademia e Shkencave, Tiranë, fq. 598.

VANGJELI, J., RUCI, B., MULLAJ, A., PAPARISTO, K., QOSJA, XH. 2000: Flora e Shqipërisë. vol. 4. Akademia e Shkencave e Republikës së Shqipërisë, Instituti i Kërkimeve Biologjike; Tiranë, fq. 502.

SOCIALLY RELATED SDGs – CROSS-COUNTRY ANALYSIS

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Abstract

In line with its commitment to sustainable development, with an emphasis on environmental protection, climate change mitigation and social welfare, the European Union has proposed a Green Deal Platform (2019), including plans to boost the circular economy and create new jobs. . Due to the global impact of the Covid 19 crisis, the EU has defined the EU Recovery Plan (2021), with developed mechanisms for the transition to a circular economy, while encouraging employment.
The main goal of the paper is based on the need to, in order to successfully implement the planned activities, pre-assess trends in the labor market, which is influenced by a large number of various factors. A particular challenge is the analysis in developing European countries, which face large fluctuations in employment. Namely, these are countries in which certain foreign direct investments are placed, but with an unknown impact on employment, while at the same time a large number of able-bodied people migrate from those same countries to EU countries, with an indefinite degree of migration from other parts of the world. For the purpose of comparison, and for the purpose of gaining insight into the possible consequences of specific decisions of the state, in the sample, in addition to the countries of the Balkan Peninsula, Romania, there are also Turkey and Israel. The paper presents an assessment of the employment rate in relation to selected factors: foreign direct investment, inequality-adjusted Human Development Index, Total Debt and Migration Rate for the period from 2010 to 2019. The observed indicators were selected in accordance with the goal of the work, and they observe the trends in the period during the migrant crisis, which hit Europe in the mentioned period, and which can be expected in the future as well.

The results showed that there is a medium correlation between the employment rate and the inequality-adjusted Human Development Index and a small correlation between the employment rate and the migration rate in the mentioned period for the observed countries.
The paper indicates the changes that can be expected in the labor market with an intensive transition to circular economy, as well as indicates policy recommendations in this area.

Key words: Employment; migrations; Human development index; developing countries.

INTRODUCTION

Sustainable development (SD) is opportunity for all the nations worldwide to they return to humanity and the nature from which human being originated. SD is presented through 17 goals (SDGs).
In the paper authors stressed on the goal 8 (Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all) with an accent on employment in selected countries, as well as some of factors that could be connected to it.
"Decent work, employment creation, social protection, rights at work and social dialogue represent integral elements of the new 2030 Agenda for Sustainable Development. Furthermore, crucial aspects of decent work are broadly rooted in the targets of many of the other 16 goals."(SDGs, 2021)
In 2015, United Nations Member States adopted The 2030 Agenda for Sustainable Development (Agenda). Agenda, provides a shared blueprint for prosperity as well as peace for both people and the planet, from then on. 17 Sustainable Development Goals (SDGs) are base representing urgent acting call for acting countries globally.
Sustainable Development Goal 8 represents the main SD (sustainable development) main achievement of decent work for all aiming to *"promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all"*.
Creation of employment, decent work, social protection, rights at work and social dialogue represent general elements of the Agenda, and they are widespread in the other SDGs.
The Agenda retell, in various sections, the necessary of generating employment for vulnerable (urban poor, women, unemployed rural labor force and low-income urban residents).

Employment Policy is in line with National Development Policy, because it is a so the National departments of labor Planning all over EU. It is social policy and depends of national strategy of each member state. EU goals and recommendations present basis which is shaped by employment strategies and national action plans, not only in member states, but in candidates for EU membership and Israel as well.

It is important to be mentioned although that in the 2030 Agenda, the natural environment is a crucial component, the Human Development Index (HDI), or other composite human development indicators, do not touch on environmental concerns, authors of the paper used connection between SDGs (employment in goal 8) and HDI in the research.

HDI and SDGs

"The Human Development Index (HDI) HDI was created to emphasize that people and their capabilities should be the ultimate criteria for assessing the development of a country, not economic growth alone" (UNDP, site 2021). Also, this index can be used to explore national policy choices, asking how 2 countries with the same level of Gross National Income per capita can end up with different human development outcomes. These contrasts may stimulate debate of priorities of government policy.

According to the UNDP:"HDI is a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and have a decent standard of living. The HDI is the geometric mean of normalized indices for each of the three dimensions".

This index simplifies and captures just part of what human development is. What HID doesn't't reflect on are: inequalities, human security, poverty, empowerment, etc. The United Nations Human Development Report Office presents the other composite indices representing some of the key issues of human development, gender disparity, inequality and poverty.

Many links could be found between the 2030 Agenda and the human development approach. Although those are different things- SDGs are a globally agreed tool for reaching development progress and human development is lens or a philosophy, but 2 things make it suitable for making the nations' policies for achieving the SDGs. 1. SDGs are 'integrated and indivisible', HDI approach put accent on the weightiness of integrated thinking and the connecting to nature of development. 2. All nations have agreed on weightiness of the SDGs, but every nation has it pursue for reaching them. HDI can be used as broader for the 2030 Agenda

(applying it in different places, people, and ways for reaching some of SDGs).

Green jobs and circular economy

The White Paper on Growth, Competitiveness and Employment (1993) to The Europe 2020 strategy, employment policies were more and more developed, but all as suggestions to national employment plans in term of rising employment rates.

Green jobs are defined as follows: ''they reduce the consumption of energy and raw materials, limit greenhouse gas emissions, minimize waste and pollution, protect and restore ecosystems and enable enterprises and communities to adapt to climate change. In addition, green jobs have to be decent''.(ILO, ,53, 2018).

According to Eurostat from 2017, in 2014, almost 4.2 million people (full-time equivalent - FTE) in EU worked in the environmental economy.

Representing a great chance for making higher employment, circular economy supports ecological protection and budget savings.

Writing about labor policies in EU, it is important to be mentioned: ''the sole competence for employment policy remains, however, with the Member States. The inclusion of a 'social protocol' in the Treaty enhanced the involvement of the social partners'' (European Parliament, pg. 13, 14, 2018).

In the paper from 2019, Vukadinovic and Jesic presented green jobs as a chance for employment growth in the Republic of Serbia (Serbia) in the circular economy (the 21 century concept and model).

In Israel, circular economy (CE) is still in infancy. In the past few years, both the Israeli Ministry of Environmental Protection (IMoEP) and the Israeli Ministry of Economy and Industry (IMoE&I) have started consolidating a great number of plans toward reaching CE.

Degradation of environment and climate change present threat to the world and Europe. These challenges can be overcome, by the **European Green Deal concept** that will change EU into resource-efficient, competitive modern economy, ensuring:

- no net emissions of greenhouse gases by 2050.
- economic growth decoupled from resource use.
- no person and no place left behind'' (EC,2019).

The European Green Deal (the Deal) is lifeline out of the COVID-19 pandemic too, and **third** of the **1.8 trillion euro** investments from the NextGenerationEU Recovery Plan, and the EU's 7 - year budget will finance the Deal.

More than a recovery plan is NextGenerationEU (EU Recovery plan 2021) emerging stronger from the pandemic of COVID-19, transforming economies, creating chances and jobs for the Europe.
Having the vision and the plan, and agreement for investment of 750 billion euro together to recover from COVID-19 consequences. Amount of €1.8 trillion will be used for a post-COVID-19 Europe recovery, including almost €100 billion for a program SURE that supports jobs and keeping people in work.
The number of pages may vary depending upon the topic of research work but generally comprises up to 10 pages.

MATERIALS AND METHODS

The IBM SPSS (Statistical Package of Social Science) software package version 25 was used for statistical data processing and analysis. Statistical methods such as: correlation analyses, regression analyses and independent sample t-test were used for processing data.

RESULTS AND DISCUSSION

As there are different methods of data collection for research in this area, we emphasize that for the work of Siegrist J., et al. deal with the measurement of wellbeing the sample method used, as authors of the paper did as well.

Table 1. HDI ranks and indexes for selected countries 2010-2019

HDI Rank	Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
69	Albania	0.65	0.658	0.668	0.677	0.681	0.682	0.691	0.711	0.705	0.708
73	Bosnia and Herzegovina	0.574	0.644	0.661	0.675	0.657	0.66	0.671	0.653	0.665	0.667
56	Bulgaria	0.699	0.701	0.717	0.713	0.721	0.722	0.713	0.709	0.711	0.721
43	Croatia	0.691	0.699	0.7	0.737	0.759	0.763	0.765	0.769	0.778	0.783
32	Greece	0.777	0.757	0.765	0.774	0.767	0.768	0.759	0.761	0.774	0.791
19	Israel	0.783	0.791	0.793	0.808	0.788	0.788	0.791	0.796	0.818	0.814
48	Montenegro	0.723	0.75	0.747	0.752	0.737	0.744	0.748	0.749	0.755	0.749
82	North Macedonia	0.619	0.624	0.638	0.649	0.629	0.634	0.64	0.67	0.669	0.681
49	Romania	0.708	0.704	0.702	0.723	0.727	0.724	0.724	0.726	0.732	0.73
64	Serbia	0.684	0.703	0.701	0.693	0.705	0.701	0.676	0.676	0.714	0.705
22	Slovenia	0.828	0.844	0.833	0.841	0.841	0.841	0.85	0.856	0.868	0.875
54	Turkey	0.564	0.584	0.593	0.662	0.67	0.673	0.684	0.688	0.685	0.683
	Human Development		..	..	..	..	..	..	..	..	..
	Very high human	0.764	0.766	0.774	0.77	0.776	0.785	0.784	0.792	0.796	0.8
	development										
	High human development	0.548	0.556	0.562	0.573	0.579	0.584	0.595	0.619	0.615	0.618
	Medium human development	0.408	0.42	0.422	0.432	0.438	0.449	0.456	0.466	0.507	0.465
	Low human development	0.303	0.312	0.313	0.325	0.331	0.338	0.345	0.347	0.349	0.352
	Developing Countries	0.474	0.484	0.487	0.491	0.497	0.504	0.512	0.533	0.547	0.535

Source: http://hdr.undp.org/en/data ,[june 2021.]

Pearson's correlation analysis examined whether there was a significant correlation between the employment rate and direct investment, IHDI, total debt and the migration rate for the period from 2010 to 2019 for 12 countries of the Balkan Peninsula.

- In order to examine the strength of the relationship between the mentioned variables, the value of the correlation coefficient was observed. The strength of the correlation coefficient is determined based on the following scale:

• 0 to 0.5 - small correlations between the observed parameters,
• from 0.5 to 0.8 - mean correlations between the observed parameters,
• greater than 0.8 - high correlations between the observed parameters.

Table 2. Correlation coefficients between the observed variables.

Variable	Employment to population rate
	Correlation coefficient
Foreign direct investment	-0.083
Inequality-adjusted HDI (IHDI)	0.594**
Total debt service	0.109
Migration rate	0.385

* Statistical significance at the level of 0.01

Based on the results shown in Table 2, we see that there is no significant correlation between the employment rate and foreign direct investment, total debt and the migration rate. Total debt was observed for eight debt-holding countries. A significant mean correlation exists between the employment rate and IHDI. A positive correlation between the two observed variables means that with an increase in the employment rate there is an increase in the IHDI parameter.
This is important as a fact by which we conclude that more employment effect better wellbeing.

Regression analysis was applied in order to predict the employment rate based on IHDI and migration rate. The variables direct investment and total debt were omitted from further research because there is no correlation with the employment rate. Regression analysis yielded a statistically significant model ($p = 0.002$) based on which we conclude that the employment rate can be predicted based on IHDI and migration rate. The coefficient of determination is 0.461 and the obtained model explains 46.1% of the total variance.

Since we found that the IHDI parameter has a significant contribution to the prediction of the employment rate, we tried to find out whether there is an external factor that affects the strength of the relationship between the independent and dependent variables. In our case, we chose the percentage of the urban population as a moderator. The percentage of urban population has a significant correlation with the employment rate ($p < 0.0005$, $r = 0.472$) and the IHDI parameter ($p < 0.0005$, $r = 0.305$). Regression analysis yielded a statistically significant model ($p < 0.0005$) based on which we conclude that the employment rate can be predicted based on IHDI and the percentage of urban population. The coefficient of determination is 0.446 and the obtained model explains 44.6% of the total variance. The individual contribution to the model of independent variables, IHDI ($p < 0.0005$) and the percentage of urban population ($p < 0.0005$), is statistically significant. Along with the obtained model, an additional model was determined where, in addition to the mentioned independent variables, the joint influence of IHDI and the percentage of urban population was taken into account. The new model is statistically significant ($p < 0.0005$), but the individual contribution of the percentage of urban population ($p = 0.218$) and the variable representing the combined contribution of IHDI and the percentage of urban population ($p = 0.385$) is not significant, based on which we conclude that the percentage of urban population is special a factor that significantly affects employment rate prediction but does not significantly affect the strength of the relationship between employment rate and IHDI parameters.

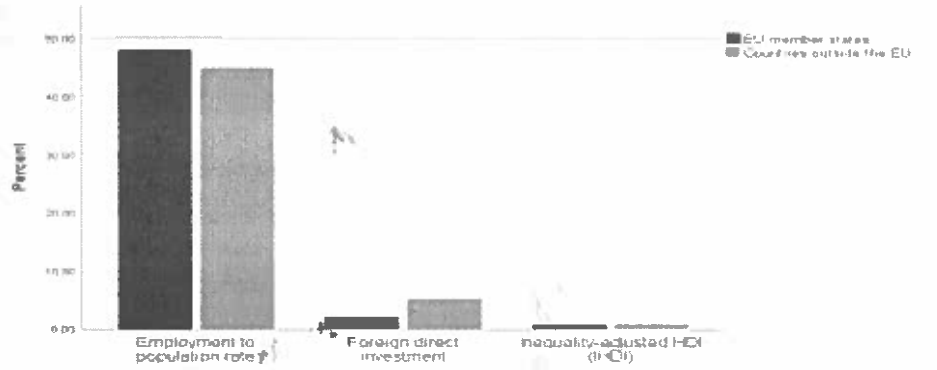
We compared the variables of interest in relation to the membership of countries in the European Union. The *t* test of independent samples was used to compare the employment rate, direct investment, IHDI and migration rate. The total debt was not observed because Greece, Croatia and Slovenia, EU member states, do not have debt. From Table 3 we see that there is a statistically significant difference in the employment rate, direct investment and IHDI index in relation to EU membership.

Table 3. Razlike između zemalja članica Evropske Unije i ostalih posmatranih država

Variable	EU članice (N=5)	Zemlje van EU (N=7)	p value
Employment to population rate	47.99 ± 4.93	44.87 ± 7.58	0,012*
Foreign direct investment	2.09 ± 1.17	5.37 ± 3.85	<0,0005*
Inequality-adjusted HDI (IHDI)	0.75 ± 0.052	0.69 ± 0.058	<0,0005*
Migration rate	-1.98 ± 3.41	-2.37 ±6.39	0,862

* Statistical significance at the level of 0.05

Graph 1. The observed parameters of the analyzed areas according to the criteria of EU membership



The authors emphasize the need to observe the analyzed parameters according to the criteria of EU membership, and the analysis is shown in Figure 1. The answer is that more foreign capital was invested in the observed countries outside the EU in the observed period, but that employment is higher in the observed countries. EU member states, and that the HDI is somewhat higher in the observed EU member states.

CONCLUSIONS

Topic of sustainable development is very important for the globe. Green economy is obligatory. What is one of the key measures for increasing of (green) employment is the state aid for helping nations to shift to green way of behaving and business.

Model of indicate planning, that could be vehicle for not only sectorial but macroeconomic growth of the country could help non EU countries on as a economic growth.

As Farmer in 20202 mentioned, developing of circular economy covers sets out a series of actions focusing on resource efficiency, improved waste management and support for innovation.

Research in the paper gives as not only proof of connection of the employment rate and HDI, but could be a direct consequence of nations wellbeing, that all of humans desire.

This research can be base for next research on the topic of socially related SDGs.

REFERENCES

DASKAL S., AYALON O. 2020: Circular Economy—Situation in Israel. In: Ghosh S. (eds) Circular Economy: Global Perspective. Springer, Singapore. https://doi.org/10.1007/978-981-15-1052-6_10

FARMER A. 2020: Developing the Circular Economy in the European Union. In: Ghosh S. (eds) Circular Economy: Global Perspective. Springer, Singapore. https://doi.org/10.1007/978-981-15-1052-6_20

SIEGRIST J., ET AL.: 2007_*European Journal of Public Health*, Volume 17, Issue 1, Pages 62–68, https://doi.org/10.1093/eurpub/ckl084

VUKADINOVIĆ, S., JEŠIĆ, J. 2019, Green jobs – potential for employment in Republic of Serbia, Anali ekonomskog fakulteta u Subotici, Univerzitet u Novom Sadu, Ekonomski Fakultet u Subotici, vol. 55, str. 115 – 129,

EUROPEAN PARLIAMENT 2018 Department responsible: Unit for Coordination of Editorial and Communication Activities, Brussels pg. 13,14. https://www.europarl.europa.eu/RegData/etudes/PERI/2017/600416/IPOL_PERI%282017%29600416_EN.pdf

Eurostat https://ec.europa.eu/eurostat/web/products-eurostat-news/-/EDN-20170529-1 .[10.sept.2021.]

European Commission, European Green Deal concept, Brussels ,2019. https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en . [12.sept.2021.]

EU Recovery plan 2021
https://ec.europa.eu/info/strategy/recovery-plan-europe_en [June 2021.]

ILO, World Employment and Social Outlook 2018: Greening with jobs International Labour Office – Geneva, 2018, pg.53.

SDGs https://sdgs.un.org/goals/goal8.[15.sept.2021.]

SDGs
https://sdgs.un.org/topics/employment-decent-work-all-and-social-protection [June 2021.]

UNDP: http://hdr.undp.org/en/content/human-development-index-hdi [10.sept.2021.]

http://hdr.undp.org/en/content/human-development-and-sdgs [June 2021.]

http://hdr.undp.org/en/data ,[june 2021.]

EVALUATION OF GENE EFFECTS ON THE GRAIN YIELD AND KERNEL OIL CONTENT IN MAIZE (*ZEA MAYS* L.)

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Abstract

Selection of the best breeding technique for the development of new maize hybrids is based on knowledge of gene effects type responsible for the expression of quantitative traits. Thus, the goal of this study was to evaluate gene effects on the grain yield, as the most important agronomic trait, as well as for kernel oil content, one of the major characteristics of maize quality.

Genetic material used for the determination of gene effects consisted of four inbred lines: 1109/IV NS, 568/II NS, 922 NS and A-1. Inbred line 1109/IV NS is high oil inbred line, and 568/II NS, 922 NS A-1 are lines with a different type of seed: dent, semi-dent and flint, respectively. Six basic generations were produced: parental inbred lines (P_1, P_2), first and second filial generations (F_1, F_2) and backcross generations (BC_1, BC_2). Two years experiment was performed at the experimental field of the Institute of Field and Vegetable Crops, Novi Sad, Serbia (Rimski Šančevi) using a completely randomized design with eight replicates. Evaluation of gene effects was performed by generation mean analysis.

Obtained results indicated that dominant gene effect had a higher influence than additive in inheritance of the grain yield. The significant presence of duplicate type of epistasis was recorded in all test-cross combinations. For kernel oil content dominance was more important than additive gene action for almost all studied test-crosses. Additive gene effect was higher than dominance only for hybrid 1109/IV NS × 568/II NS. Moreover, a significant presence of duplicate type of epistasis also was detected for kernel oil content.

The significant role of the dominant gene effect in the inheritance of grain yield and kernel oil content in almost all test-cross combinations indicates

that inbreding-hybridization method is a useful method for the development of better hybrids.

Key words: maize, kernel oil content, grain yield, generation mean analysis.

1. INTRODUCTION

Maize is one of the most grown cereal crops in the world (**Erenstein, et al., 2021**) and is mostly used as quality fodder, in human nutrition, as well as raw material for industrial processing.

Maize has been extensively used in developed countries as livestock feed (**Laurie, et al., 2004**). Precisely, the energy value of high-oil hybrids (884 kcal/100g) is about 10 times higher than the energy value of standard hybrids (86 kcal/100g). Furthermore, quality of the maize kernel is estimated on its germ oil content as well as proteins. Increased content of oil is mainly connected with germs of larger dimension thus resulting in content of better-quality proteins. For this reasons, high-oil maize hybrids can be successfully utilized as a substitute for expensive sources of fat and protein in animal feed.

Although the highest percent of total maize production in developed countries is used as animal feed or as an industrial raw material, in developing countries, particularly in Africa and Central America, consumption of corn and derivates are a functional food in human diet (**Bañuelos-Pineda, et al., 2018**). Maize oil is also one of the most valued oils for human utilization, with low content of saturated fatty acids compared to the content of unsaturated fatty acids (11% palmitic and 2% stearic acid against 24% of linoleic acid). Besides, it is also one of the most stable oils due to its low linolenic acid content (**Singh, et al., 2014**).

Due to the increasing need for maize which could be used, whether as human food, fodder or industrial raw materials, there is a necessity for developing new maize hybrids. New hybrids should be better regarding yield, stability and adaptability. In order to achieve this goal, it is necessary for breeders to know main agronomic traits genetic mechanism of inheritance. Generation mean analysis is one of the simplest methods for studying genetic effects. It is developed on the basic works of Fisher (1918), and enables a significant shift in the understanding of the nature of the inheritance of quantitative traits (**Hallauer, et al., 2010**).

Thus, the main goal of this work was to estimate gene effects responsible for grain yield inheritance and gene effects in charge of phenotypic expression of kernel oil content.

2. MATHERIAL AND METHODS

Genetic material used for determination of gene effects consisted of four inbred lines: 1109/IV NS, 568/II NS, 922 NS and A-1. Inbred line 1109/IV NS is high oil inbred line, and 568/II NS, 922 NS and A-1 are lines with different type of seed: dent, semi-dent and flint, respectively. Six basic generations were produced: parental inbred lines (P_1, P_2), first and second filial generations (F_1, F_2) and backcross generations (BC_1 and BC_2). Two-year experiment was performed at experimental field of Institute of Field and Vegetable Crops - NS Seed, Novi Sad, Serbia (Rimski Šančevi) using a completely randomized design with eight replicates. Each plot consisted of three 5 m long row. The standard growing technique was used and harvesting was done by hand. All genotypes were sowed in three rows and measurements were done in middle row. The data for grain yield per plant was recorded from 10 randomly chosen plants, and kernel oil content was determined in bulk sample.

Evaluation of additive and non-additive gene effects was performed by generation mean analysis (**Mather, K. & Jinks**, I. L. **1982**). Significance of additive-dominant model with three parameters was done by Scaling tests and Chi-square test. As model with three parameters was not adequate for gene effects explanation than model with six parameters was used. Significance of parameters was tested by t-test.

3. RESULTS AND DISCUSSION

The mean values and standard errors for grain yield per plant and kernel oil content for all studied generations (parents, filial generation 1 and 2 and back-cross generations) are presented in Table 1 and 2, respectively.

The highest mean value, for grain yield per plant, in all test-cross combinations, were recorded in F_1 generation. This result was expected due to the manifestation of heterosis. Inbred line 1109/IV NS, as well as inbred lines in semi-dent (922 NS) and flint (A-1) kernel type, had higher mean values in the first year of testing, while line 568/II NS achieved higher yield in the second year. In the segregating generations, in all three test-cross combinations higher mean values for grain yield per plant were achieved in the first year of testing.

Table 1. Mean value and standard errors for grain yield per plant.

	1st year	2nd year	1st year	2nd year	1st year	2nd year
	1109/IV NS × 568/II NS		1109/IV NS × 922 NS		1109/IV NS × A-1	
P_1	65.6±2.3	58.8±2.8	65.6±2.3	58.8±2.8	65.6±2.3	58.8±2.8
P_2	71.1±2.6	94.1±3.0	77.1±2.6	75.3±3.1	65.4±2.4	43.9±2.9
F_1	176.5±7.6	157.4±7.3	170.9±7.6	168.6±7.2	187.0±7.4	140.8±7.5
F_2	163.3±8.6	135.2±8.2	152.3±8.9	117.2±8.1	161.6±8.6	119.9±8.0
$BC_{1.1}$	137.7±7.9	100.7±7.3	148.6±8.8	121.7±7.4	148.6±7.7	114.7±7.5
$BC_{1.2}$	162.8±7.8	108.9±7.4	152.1±8.0	125.3±7.3	130.4±8.3	111.7±7.4
$LSD_{0.05}$	29.2		21.9		24.4	
$LSD_{0.01}$	40.0		30.1		33.4	

Inbred line 1109/IV NS, had a higher kernel oil content in the second year of testing. Between testers, the highest kernel oil content was determined in a tester with the dent kernel type. In the F_1 generation, a higher oil content was recorded in the second year of testing in all test-cross combinations, while in the segregating generations, the highest kernel oil content was recorded in the backcross with inbred line 1109/IV NS. By comparison of mean values of the same generation, kernel oil content did not show a significant difference.

Table 2. Mean value and standard errors for kernel oil content

	1st year	2nd year	1st year	2nd year	1st year	2nd year
	1109/IV NS × 568/II NS		1109/IV NS × 922 NS		1109/IV NS × A-1	
P_1	11.39±0.14	12.53±0.32	11.39±0.14	12.53±0.32	11.39±0.14	12.53±0.32
P_2	3.34±0.06	5.18±0.14	5.18±0.12	6.02±0.20	5.67±0.08	6.28±0.22
F_1	7.99±0.17	8.48±0.24	8.60±0.13	9.21±0.33	8.43±0.13	8.76±0.32
F_2	7.59±0.27	7.94±0.50	8.03±0.32	9.48±0.42	7.83±0.28	8.85±0.53
$BC_{1.1}$	9.62±0.21	9.15±0.41	10.19±0.18	11.82±0.32	10.15±0.15	11.26±0.38
$BC_{1.2}$	5.80±0.12	7.88±0.40	6.97±0.10	7.53±0.41	7.08±0.16	7.48±0.48
$LSD_{0.05}$	1.80		1.66		1.22	
$LSD_{0.01}$	2.46		2.27		1.67	

In order to evaluating the genetic effects responsible for the expression of grain yield per plant, first additive-dominant model with three parameters was performed. Based on the results of the Scaling test and Chi-square test,

the inadequacy of the additive-dominant model with three parameters was established (Table 3). Therefore, evaluation of gene effect responsible for grain yield inheritance was performed using a model with six parameters (Table 4).

A highly significant estimated values of additive genetic effects in almost all combinations of crosses were obtained. The only exception was test-cross combination 1109/IV NS × A-1 in first year of examinations. In practical breeding, the significant additive gene effects are very important, because it can be fixed and passed to the next generation. The estimated values of dominant gene effect also showed significance and were higher in relation to the estimated values of additive gene effects. Duplicate type of epistasis was found in all three test-cross combination. The results of our research comply with the results of many authors. **Ilyas, et al. (2020)** have studied mechanism of inheritance of grain yield and some components of grain yield under water deficit and normal irrigation conditions. They concluded that dominant gene effect is more important in inheritance of grain yield, both in normal and drought condition. Epistasis also played significant role in inheritance of grain yield. In order to determine genes responsible for grain yield and maturity trait inheritance, **Akinwale, et al. (2020)** studied one late-maturing population. Population consisted of ninety - one elite varieties. They found significant additive and non-additive gene effect, whereas non-additive gene effect is determined as more important in inheritance of grain yield which is relation with our results.

Table 3. Additive-dominant model with three parameters, Scaling test and Chi-square test for grain yield per plant

	1st year	2nd year	1st year	2nd year	1st year	2nd year
	11109/IV HC × 568/II HC		11109/IV HC × 922 HC		1109/IV HC × A-1	
m	111.8**±3.8	96.6**±3.6	118.1**±4.1	95.8**±3.7	104.1**±3.9	86.8**±3.6
d	-51.2**±3.6	-16.5**±3.5	-51.5**±3.9	-34.4**±3.5	-47.1**±3.8	-37.1**±3.5
h	-3.7±6.3	-8.2±6.6	-18.9**±6.6	6.0±6.6	12.04±6.35	-1.7**±6.6
A	78.0**±6.2	-33.6**±5.9	56.2±6.4	6.7**±5.9	44.6**±6.1	29.8**±6.0
B	33.4**±6.2	-14.8*±5.8	60.7**±6.8	15.9**±5.9	8.4±6.5	38.8**±5.9
C	163.6**±13.4	72.9**±12.8	124.6±13.8	-2.5**±12.7	141.2**±13.3	95.4±12.6
χ^2	226.8**	227.2**	195.8**	182.9**	228.6**	151.9**

* Significant at 5% level of significance; ** Significant at 1% level of significance

Contrary to our research **Assefa, et al. (2017)** and **Sunday, et al. (2020)** found that additive gene action is more important in inheritance of grain yield. These authors use open pollinated populations in their research, that can be reason for the contradiction in the results. Namely, over the years, numerous authors have done research to establish genetic mechanism of inheritance of the most important agronomic traits. In studies where open pollinated varieties were used, it was found that the additive gene effect was the main effect of genes that affected the phenotypic expression of quantitative traits. On the other hand, the authors who used highly selected genetic material (inbred lines) in their research concluded that the nonadditive effect of genes was more important for the expression of quantitative traits **(Assefa, et al., 2017; Moharramnejad, et al., 2018; Kumar et al., 2019; Akinwale, et al., 2021)**. In this study inbred lines were used, so it was expected that the non-additive effect of genes i.e., dominance and epistasis are more significant in inheritance of grain yield.

Table 4. Additive-dominant model with six parameters for grain yield per plant.

	1st year	2nd year	1st year	2nd year	1st year	2nd year
	1109/IV HC × 568/II HC		1109/IV HC × 922 HC		1109/IV HC × A-1	
m	120.5**±14.5	197.9**±13.7	79.0**±15.2	41.8**±13.7	153.7**±14.6	78.0**±13.6
d	2.7**±0.61	17.7**±0.7	5.8**±0.6	8.2**±0.7	0.1±0.6	7.5**±0.7
h	115.1**±34.0	-210.4*±32.1	201.1**±35.8	174.7**±32.1	-1.8±34.3	104.7**±32.0
i	-52.2**±14.5	-121.4**±13.7	-7.7±15.2	25.2±13.7	-88.2**±14.6	-26.7±13.6
j	44.6**±7.9	-18.8*±7.5	-4.5±8.5	-9.3±7.5	36.2**±8.1	-8.9±7.6
l	-59.2**±20.6	169.9**±19.5	-109.2**±21.7	-48.0**±19.4	35.2±20.8	-41.9*±19.5

* Significant at 5% level of significance; ** Significant at 1% level of significance

In terms of kernel oil content, for all three test-cross combinations both additive and non-additive gene effects had significant role in inheritance of kernel oil content. In hybrid combination 1109/IV NS × 568/II NS greater importance of additive genes in the inheritance of kernel oil content was established. This is in agreement with the results of **Rosulj, et al. (2002)**. Mentioned authors investigated two high oil synthetic maize population (DS7 and YuSSSu) after nine cycles of recurrent selection and found that additive genetic variation was more significant than dominant variation in both populations for kernel oil content. Furthermore, **Kahrinam, et al. (2018)**, who studied gene involved in inheritance of component of kernel

quality (oil content, protein content, oleic acid content, linoleic acid content, tryptophan content and carotenoid content), found highly significant influence of additive and non-additive gene effects in inheritance of all this trait, but additive gene effects were greater than non-additive. These results are partly in agreement with our results. Namely, in one test cross combination, we also found more significant role of additive gene action in inheritance of this trait, but in test-cross combination with inbred lines 922 NS and A-1 dominant gene effect was more significant than additive. Results of our research are also partly in agreement with results of **Fang, et al. (2019. 2021)**. They studied genetic base of nutritional traits of maize and found that additive effects play main role in genetic basis of kernel oil content.

Table 5. Additive-dominant model with three parameters, Scaling test and Chi-square test for kernel oil content.

	1st year	2nd year	1st year	2nd year	1st year	2nd year
	1109/IV NS ×568/II NS		1109/IV NS × 922 NS		1109/IV NS × A-1	
m	8.2**±0.1	8.3**±0.2	9.3**±0.1	9.8**±0.2	8.6**±0.1	9.9**±0.3
d	-0.8**±0.1	-0.5*±0.2	0.3±0.1	-0.3±0.2	0.1±0.1	0.2±0.5
h	-5.2**±0.2	-2.2**±0.4	-1.99**±0.2	-2.2**±0.4	-2.1**±0.2	-2.7**±0.4
A	-0.1±0.2	-2.7±0.3	0.2±0.2	1.9**±0.3	0.7**±0.2	1.2**±0.3
B	0.7**±0.2	2.1**±0.3	0.7**±0.2	-0.2±0.3	-0.2±0.2	-0.1±0.4
C	-0.4±0.4	-2.9±0.7	-1.7±0.5	0.9±0.7	-2.6±0.4	-0.9±0.8
χ^2	3113.0**	517.78**	1090.1**	407.8**	1398.6**	274.3**

* Significant at 5% level of significance; ** Significant at 1% level of significance

In addition to the significance of additive and dominant gene effects in the determination of kernel oil content, based on Scaling tests and Chi-square tests, the inadequacy of the additive-dominant model with three parameters was established i.e., the presence of epistasis was found (Table 5 and 6). In all test-cross combination duplicate type of epistasis was found, which reduces the phenotypic expression of the studied trait. Significant and highly significant values of i-type epistasis (additive × additive) were also established. This increases the possibility of selecting superior genotypes,

as well as j-type (additive × dominant) epistasis. In order to analyze the results of more than 100 years divergent long-term selection on chemical composition of maize (high oil and protein content and low oil and protein content) **Dudley, J. W. (2008)** used a quantitative genetic technique. One of the conclusions of this investigation was that additive × additive epistasis was one of significant source of genetic variation for kernel oil content. **Yang, et al. (2010)** studied recombinant inbred population derived between cross of standard inbred line (B73) and high oil inbred line (By804) and concluded that epistatic effects contribute to kernel oil content. In agreement with our conclusion, **Fang, et al. (2019, 2021)** also found significant epistatic effects between additive genes.

Table 6. Additive-dominant model with six parameters for kernel oil content

	1st year	2nd year	1st year	2nd year	1st year	2nd year
	1109/IV NS × 568/II NS		1109/IV NS × 922 NS		1109/IV NS × A-1	
m	6,5**±0,4	6,6**±0,8	5,7**±0,5	8,5**±0,7	5,3**±0,5	7,3**±0,9
d	4,0**±0,0	3,7* *±0,1	3,1**±0,0	3,3**±0,1	2,9**±0,0	3,1**±0,1
h	3,0**±1,0	3,6±1,9	6,4**±1,2	3,3*±1,6	6,9*±1,1	4,7*±1,99
i	0,9*±0,4	2,3*±0,8	2,6**±0,5	0,8±0,7	3,2**±0,5	2,1*±0,9
j	-0,8**±0,2	-4,8**±0,4	-0,5±0,3	2,1**±0,4	0,9**±0,2	1,3**±0,5
l	-1,5*±0,6	-1,9±1,1	-3,5**±0,7	-2,6*±0,9	-3,8**±0,6	-3,3**±1,2

* Significant at 5% level of significance; ** Significant at 1 % level of significance

4. CONCLUSION

The choice of the appropriate breeding method is one of the basic preconditions for the success of any breeding program. Knowing the genetic mechanisms of inheritance for the most important agronomic traits is useful for designing appropriate breeding strategy. In this study a more significant role of the dominant effect of genes in inheriting grain yield per plant was established. For the second studied trait, the kernel oil content, in addition to the significant additive gene effect, the importance of nonadditive effects of genes in inheritance was also found. The significant role of the dominant gene effect in inheritance of grain yield and kernel oil content indicates that inbreding-hybridization method is a useful method for the development of better hybrids.

5. REFERENCES

AKINWALE, R. O., EZE, C. E., TRAORE, D. & MENKIR, A. 2021: Detection of Non-Additive Gene Action within Elite Maize Populations Evaluated in Contrasting Environments under Rainforest Ecology in Nigeria. Crop Breed Genet Genom, 3 (1):210003.

ASSEFA, T., ZELEKE, H., AFRIYE, T., & OTYAMA, P. 2017: Line × Tester Analysis of Tropical High Land Maize (*Zea mays* L.) Inbred Lines Top Crossed with Three East African Maize Populations. *American Journal of Plant Sciences*, **8:** 126-136.

BAÑUELOS-PINEDA, J., GÓMEZ-RODILES, C. C., CUÉLLAR- JOSÉ, R., & AGUIRRE LÓPEZ, L. O. 2018: The Maize Contribution in the Human Health. In Amanullah and Shah Fahad (ed): Corn - Production and Human Health in Changing Climate. IntechOpen, DOI: 10.5772/intechopen.78700. Available from: https://www.intechopen.com/chapters/62156

DUDLEY, J. W. 2008: Epistatic interactions in crosses of Illinois High oil × Illinois Low Oil of Illinois High Protein × Illinois Low Protein corn strains. Crop Sci., 48:59-68.

ERENSTEIN, O., CHAMBERLIN, J. & SONDER, K. 2021: Estimating the global number and distribution of maize and wheat farms. Global Food Security, 30: 100558.

FANG H, FU, X. Y., WANG, Y. B., XU, J., FENG, H. Y., LI, W. Y., XU, J., JITTHAM, O., ZHANG, X., ZHANG, L., YANG, N., XU, G., WANG, M., LI, X., LI, J., YAN, J. & YANG, X. 2019: Genetic basis of kernel nutritional traits during maize domestication and improvement. Plant J.,101(2):278–92.

FANG, H., FU, X., GE, H., ZHANG, A., SHAN, T., WANG, Y., LI, P. & WANG, B. 2021: Genetic basis of maize kernel oil-related traits revealed by high-density SNP markers in a recombinant inbred line population. BMC Plant Biology, 21:344-355

HALLAUER, A. R., CARENA, M. J. & MIRANDA FILHO, J. B. 2010: Quantitative genetics in maize breeding. Springer.

ILYAS, M. S., KHAN, A., AWAN, S. I., REHMAN, S., AHMED, W., KHAN, M. R., NAZ, R. M. M., KHAN, M. M. U. & HAFEEZ, S. 2020: Preponderant of dominant gene action in maize revealed by generation mean analysis under natural and drought stress conditions. SJA, 36 (1): 198-209.

KAHRIMAN, F, YILDIRIM, M., PINAR, G., ZEKAI, E. & EGESEL, C. Ö. 2018: Comparison of open and hand pollination methods on combining ability values for kernel quality traits in a maize diallel experiment. COMU J. Agric. Fac., 6 (2): 47–56.

KUMAR, S., CHANDEL, U., KUMAR GULERIA, S. & DEVLAS, R. 2019: Combining ability and heterosis for yield contributing and quality traits in medium maturing inbred lines of maize (*Zea mays* L.) using line × tester. IJCS; 7 (1): 2027-2034.

LAURIE, C. C., CHASALOW, S. D., LEDEAUX, J.R., CARROLLA, R. M. C., BUSH, D., HANGE, B., LAI, C., CLARK, D., ROCHEFORD, T. R. & DUDLEY, J. W. 2004: The genetic architecture of response to long-term artificial selection for oil concentration in the maize kernel. Genetics, 168: 2141-2155.

MATHER, K. & JINKS, I. L. 1982: Biometrical genetics. Third Edition. Chapman and Hall, London.

MOHARRAMNEJAD, S., VALIZADEH, M. & EMARATPARDAZ, J. 2018: Generation mean analysis in maize (*Zea mays* l.) under drought stress. FEB, 27 (4):2518-2522

ROSULJ, M., TRIFUNOVIC, S. & HUSIC, I. 2002: Nine cycles of mass selection for increasing oil content in two maize (*Zea mays* L.) synthetics. Gen. Mol. Biol., 25 (4):449-461.

SINGH, N., VASUDEV, S., YADAVA, D. K., CHAUDHARY, D. P & PRABHU, K. V. 2014: Oil Improvement in maize: potential and prospects. In: Choudhary D.P., Kumar S. & Langyan, S. (eds) Maize: nutrition dynamics and novel uses. Springer, New York, pp 77–82.

SUNDAY, I., BABATUNDE, A., STEPHEN, A., CHARITY, A. & KAYODE, O. 2020: Gene action in low nitrogen tolerance and implication on maize grain yield and associated traits of some tropical maize populations. Open Agriculture, 5: 801–805.

YANG, X. H., GUO, Z. Q., YAN, J. B., ZHANG, J., SONG, T. M., ROCHEFORD, T & LI, J. S. 2010: Major and minor QTL and epistatic contribute to fatty acid compositions and oil concentration in high oil maize. Theor. Appl. Genet., 120:665-678.

CLIMATE CHANGE AND MENTAL HEALTH IN CHILDREN

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ABSTRACT

Climate change is present today all over the world. Climate change is also associated with negative consequences in humans. Today there is an increase in awareness about the impact of climate change on the mental health of people and especially on children. The purpose of this paper is to highlight the link between climate change and mental health in children and to highlight the role of school in the early identification of students' mental health problems. The paper also aims to reflect models of school intervention. There is evidence that children are more vulnerable to climate change due to potential problems with their mental health, so one of the main reasons for choosing this topic is related to the awareness of parents and all actors working with children on this issue. It is a qualitative paper and is based on the use of literature related to mental health and climate change. Relevant conclusions are given, where, among other things, it is emphasized that It is the duty of the school to identify as early as possible the possible problems of the mental health of the students, to treat them. In this context, schools should design and implement models of early intervention and these models should be comprehensive, so they should include all key actors, such as: teachers, parents, psychologists, social workers, various agencies, etc.

Key words- mental health, climate change, school intervention.

INRODUCTION

Climate change and mental health are two of the most significant and pressing challenges facing societies across the world (Lawrance E., Thompson R., Fontana G., Jenning N., 2021, f.2).

Climate change is regarded as the biggest global health threat of the 21st century (Costello et al., 2009; Watts et al., 2017) (cited by Sanson A.V.,

Van Hoorn J., Burke S.E.L., 2019, p.202). According to the Australian Academy of Science (2021), ''Climate change is a change in the pattern of weather, and related changes in oceans, land surfaces and ice sheets, occurring over time scales of decades or longer''.

Climate change refers to relatively stable changes in the meteorological parameters like precipitation and temperature over a period of time in a given region. Such a climate change has been described as a critical global challenge, (McMichael AJ, Woodruff RE, Hales S., 2006; Pandve HT., 2008) (cited by Padhy S.K., Sarkar S., Panigrahi M. & Paul S., 2015), especially due to the fact that human activities have been contributory to changes in global climate.

The purpose of this paper is to highlight the link between climate change and mental health in children and to highlight the role of school in the early identification of students' mental health problems. The paper also aims to reflect models of school intervention. There is evidence that children are more vulnerable to climate change due to potential problems with their mental health, so one of the main reasons for choosing this topic is related to the awareness of parents and all actors working with children on this issue. It is a qualitative paper and is based on the use of literature related to mental health and climate change.

THEORETICAL TREATMENT

Climate change and mental health

Climate change has acute and chronic mental health impacts in a number of ways. Acute effects include anxiety, depression, post-traumatic stress disorder (PTSD) and substance abuse, all tending to increase after a disaster. The risk of psychological trauma and shock from injury and damage to or loss of homes, land and other property is significant in the aftermath of disasters (Neria P, & Schultz JM., 2012). While acute effects from shock and trauma may fade away if and when life returns to more normal conditions, and when security is re-established, PTSD may manifest as a chronic disorder. Other chronic impacts reported include higher rates of aggression, violence and a persisting sense of loss of, for example, personally important places (EASAC, 2019; Cunsolo Willox A, Harper S, Ford J, Landman K, Houle K, Edge V, & the Rigolet Inuit Community Government, 2012). More impacts mentioned in literature are survivor guilt, climate and ecological anxiety and grief, exacerbated psychosis, suicidal ideation, and suicide. Amongst those having been exposed to severe disasters, the likelihood of committing suicide is higher. People with

pre-existing mental health problems may be disproportionately affected (Cunsolo A, Ellis NR., 2018; Clayton S, Manning C., 2018; Berry HL, Bowen K, Kjellstrom T., 2010; Haines A, Ebi KL., 2019; Norris FH, Friedman MJ & Watson PJ., 2002) (cited by Nilsson M., 2020, p.2).

Moreover, climate change has direct impacts on mental health (e.g., heat stress) and indirectly affects social support systems, cultural traditions, and the environmental conditions (Filipova T., et al., 2020, p.3).

Children are also more susceptible to the indirect effects of climate change, such as food shortages, intergroup conflict, economic dislocation, and forced migration (Akresh, 2016). Particularly for younger children, dependency on adults can lead to health and psychosocial consequences related to the impacts of climate change on parents' well-being, family functioning, and economic status (Clayton et al., 2017) (cited by Sanson A.V., Van Hoorn J., Burke S.E.L., 2019, p.202).

According to the American Public Health Association and ecoAmerica,''More than 40 million adults in the U.S. suffer from a mental illness. Victims of natural disasters are at an increased risk of anxiety, depression, PTSD, and suicide. 25-50% of people exposed to an extreme weather disaster are at risk of adverse mental health effects. Up to 54% of adults and 45% of children suffer depression after a natural disaster. Forty-nine percent of the survivors of Hurricane Katrina developed an anxiety or mood disorder, and 1 in 6 developed PTSD. Suicide and suicidal ideation more than doubled. After a record drought in the 1980s, the suicide rate doubled, including more than 900 farmers in the Upper Midwest''.

According to WHO (2018), ''In the WHO European Region, there is a high and increasing rate of mental and behavioural health problems in adolescents at population level. • According to the latest Health Behaviour in School-aged Children survey, 29% of 15-year-old girls and 13% of 15-year-old boys in European countries reported "feeling low" more than once a week; also, more than one in ten adolescents were regular weekly drinkers by the age of 15 (9% of girls and 16% of boys). • Half of all mental health problems in adulthood have their onset during or before adolescence. • Depression and anxiety disorders are among the top five causes of the overall disease burden (measured in terms of disability-adjusted life years). • Suicide is the leading cause of death among adolescents (10–19 years old) in low- and middle-income countries and the second leading cause in high-income countries in the European Region. In 2015, there were over 4000 deaths from suicide among 10–19-year-olds in the Region, principally among boys. • Young people who are

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disadvantaged – including minorities and migrants – are particularly affected''.

Children are generally more vulnerable to climate change health impacts and are different from adults psychologically, cognitively, anatomically, immunologically, and physiologically, depending on the phase of development (Stanberry LR, Thomson MC, James, W., 2018). It has been reported that children can experience "changes in behaviour, development, memory, executive function, decision-making and scholastic achievement, caused by climate extremes" (Van Den Hazel P., 2017) (cited by Nilsson M., 2020, p.4).

Children and teens, with their developing bodies and brains, can be more vulnerable to the consequences of global warming than adults. These include:

-The spread of infections. As mosquitos and other animals spread to new areas, diseases such as the Zika virus can flourish. The Zika virus can cause intellectual disabilities to children in utero.

-Exposure to air pollution. Rising temperatures allow fossil fuel pollutants to form more quickly. Pollution, in turn, can lead to cognitive impairments and behavioral issues.

-Natural disasters. Children caught in hurricanes or forest fires are especially likely to develop mental health concerns. One study found half of preschool-aged children displaced by Hurricane Katrina met the criteria for posttraumatic stress (PTSD) (Swaim E., 2019).

As much as 88% of the disease burden attributable to climate change occurs in children below five years of age (Sheffield PE, Landrigan PJ., 2010). Even though children represent a vulnerable group they have received less research attention than adults. How climate change affects children's mental health and wellbeing is an under-researched area. However, it is reported that effects from extreme weather events affect children's psychological well-being with risk of developing different mental health consequences, such as depression, anxiety, PTSD, phobias, sleep disorders, attachment disorders, and substance abuse. This may disrupt emotional and cognitive development, and predispose for adult mental disorders (Burke S., et al., 2018; Majeed H and Lee J. T . (2017). According to studies from different parts of the world, most young people have some knowledge about climate change. Studies suggest that they are more interested in and concerned about climate change (Corner A., et al., 2015) and to a greater extent accept the scientific consensus that climate change is man-made compared to adults (Feldman L ., et al., 2015). Many

young people are concerned and express worry for their future lives related to climate change, including fear and anxiety (UNICEF UK, 2013). It is critical to understand how children and youth perceive, handle and cope with climate change as a potential stressor (cited by Nilsson M., 2020, p.3).

The many climate changes expected to occur in the coming century are expected to threaten children's wellbeing in a variety of both overt and subtle ways. Of particular concern are changes in environmental risk that could influence children's development both directly—through increasing levels of exposure to a given hazard—and indirectly: through intermediate effects on social and economic systems. For example, an increase in the number of heat waves threatens children directly by exposing them to higher temperatures, increasing their risk of heatstroke and other heat-related illnesses, and making it harder to learn, play, and exercise outdoors. Heat waves' indirect effects are more subtle. More heat waves will make crop failures more likely, driving up prices in market economies and potentially depriving children of food in rural parts of the world. Heat waves also interact with emissions from local industry and transportation systems to increase atmospheric concentrations of gases like ozone (the central component of smog) that harm children's health. And high temperatures increase rates of interpersonal violence such as murder and abuse, as well as group violence such as war.

Climate change's indirect effects are in many ways more worrisome than the direct ones because so much of children's wellbeing is conditioned by social and economic factors. The climate's influence on a child's life doesn't occur in isolation but, rather, in combination with specific social circumstances. For example, a middle-class child in the Midwestern United States might be well insulated from many of climate change's direct effects by technologies such as air conditioning and modern sanitation systems. The indirect effects, however, will include everything from changes to the global food system that threaten to raise prices and induce shortages, to geopolitical changes that occur because climate change destabilizes social relations, thereby increasing conflict and migration. Moreover, children will experience the indirect effects of climate change as people and institutions respond not only to actual changes but also to climate driven risks—from governments' decisions about urban development to families' decisions about where to rear children. Such adaptive choices are difficult to predict because they will be influenced by complex political, economic, and social factors (Oppenheimer M., 2013). Poverty and development add more complexity. Children in poor countries are particularly vulnerable and

exposed to climate-driven threats such as crop failures, heat waves, and tropical storms, and they won't be able to draw on the more sophisticated adaptation mechanisms available to children in rich countries. Moreover, in developing countries, families tend to rely more directly on the environment for their livelihoods- particularly through agriculture, meaning that climate change may cause serious harm to family livelihoods. In their article in this issue, Rema Hanna and Paulina Oliva cover the threats that climate change poses to children in developing countries (McLanahan S. et al., 2016, p.23).

Close to one billion children were classified as "extremely high-risk" with the climate crisis threatening their health, education, and protection, exposing them to potentially fatal diseases, a new climate report from the UN's children's agency (available from: https://www.dw.com/en/no-child-will-escape-the-impact-of-climate-change-unicef/a-58914515).

Children are potentially much more vulnerable than adults to environmental factors (for example, heat, pollution, or famine) because they are both physically weaker and less able to dissipate heat (Hanna R., Oliva P.,2016, p.116).

There is a growing recognition that attention to students' mental health functioning in school may promote learning and prevent the onset of the numerous negative consequences associated with untreated mental health problems (Ringeisen, Henderson, & Hoagwood, 2003) (cited by Levitt J.M. et al., 2007, p.165).

The role of school on promoting children good mental health

The mental, physical and emotional well-being of young people are all essential preconditions for successful learning, and can only be developed in close cooperation with the school as a whole. Academic achievements contribute to better health in general and mental health in particular. Simultaneously, educational settings and professional staff (including teachers and school psychologists) play an important role in protecting children's rights and providing the necessary support system to allow the early identification of social, emotional and mental difficulties and effective resolution of problems. Equally better health leads to better education. In turn, pupils who receive socio-emotional support and have access to preventive services tend to achieve more academically. School bonding, social and emotional skills and decision making abilities are also critical to improved learning. School-based mental health programs such as those promoting socio-emotional learning have successfully improved both

mental health and academic achievement (Jané-Llopis, E. & Braddick, F. (Eds). 2008, p.14).

School mental health services and supports are an effective means of addressing the mental health needs of children and improving the learning environment. Partnerships between schools, youth, families, and mental health providers can result in improved academic outcomes through: • Social and emotional support through building positive relationships; • School engagement with children being better prepared and able to concentrate on learning; • Families participating in their children's education; • Preparation of school staff to address students' mental health needs; • Early identification of mental health challenges through appropriate screening, assessment, and follow-up; • Emphasis on school attendance and reductions in dropouts; • Prevention and response to crises; • School climate that supports teaching and learning; and • Efforts to reduce stigma associated with mental illness by offering examples of people similar to students who share their personal stories of success and recovery (Evers T., 2015, p.4).

Children spend a large amount of time in schools. Schools not only establish the competencies for learning and other professional skills, they are an important setting for establishing identity, interpersonal relationships and other transferable skills. Every child has the right to education, health and security. The central role of schools is teaching and learning, but they are also a unique community resource to promote and foster the healthy development of children both, outside and within families. The school represents an easy access environment with direct day to-day contact with children and, often, their families. Because of this, the school is an ideal setting to build the protective factors that establish resilience, identify risk factors and support vulnerable individuals. "School systems are not responsible for meeting students' every need. But when the need directly affects learning, the school must meet the challenge" (Carnegie Council Task Force on Education, 1989) (cited by (Jané-Llopis, E. & Braddick, F. (Eds)., 2008, p.20). ''Effective practice has included approaches that combine traditional health education with more comprehensive, whole-school approaches that create a supportive physical, social and learning environment, and bring together the combined resources of parents, local communities and organisations'' (WHO, 2007) (cited by (Jané-Llopis, E. & Braddick, F. (Eds)., 2008, p.20).

Schools have a profound influence on children, families, and communities. School-based mental health services also have the potential to bridge the

gap between need and utilization by reaching children who would otherwise not have access to these services. These settings could provide an ideal environment in which programs for child mental health can be integrated in a cost-effective, culturally acceptable, and nonstigmatizing manner (Patel, Aronson, and Divan 2013) (cited by Scott et al., 2016).
Mental health interventions conducted in schools and in the communities start from the premise that the problems experienced by adolescents are determined by the interaction of individual, environmental and family factors (Manjula, 2015). Accordingly, schools and communities offer an optimal context to intervene as children and adolescents grow and develop through social interaction. Schools and communities can make the most of its environment to foster child and youth development and to promote good mental health (Weist and Murray, 2008). Many of the mental health programs implemented in schools promote the development of social skills, socio-emotional competences, and learning outcomes while at the same time reducing disruptive behavior (Dowdy et al., 2010; Moreira et al., 2010; Durlak et al., 2011; Suldo et al., 2014). The school environment and climate can therefore play a critical role in encouraging the promotion of protective factors for mental health, such as social-emotional competences and skills (Osher et al., 2012) (cited by Garcia-Carrion et al., 2019).
Over the past 20 years, two of the leading national centers for the promotion of school mental health, the Center for School Mental Health at the University of Baltimore, Maryland, and the University of California Los Angeles Center for Mental Health in Schools, have performed extensive research on school programs that promote development of a comprehensive whole-school mental health program model and development of school mental health programs that address prevention, early intervention, and treatment provision. These centers have promoted school mental health programs and partnerships with system of care communities. The Center for School Mental Health encourages partnerships between schools and system of care communities and states, "It is imperative that educators and mental health providers work together to create positive, supportive environments where children and youth can be indentified and connected to needed support services" (CSMH, 2007) (cited by Freeman, E. V. 2011, p.1).
The goal of promoting whole-school mental health programs is to develop community schools that are safe and healthy and provide a positive school climate to grow and learn. A mentally healthy student is a student who attends school ready to learn, is actively engaged in school activities, has

positive relationships, has supportive and caring connections with adults and young people, uses appropriate problem-solving skills, has non-aggressive behavior, and adds to the positive school culture. The whole-school mental health model addresses three tiers of prevention and intervention (Freeman, E. V. 2011, p.2).
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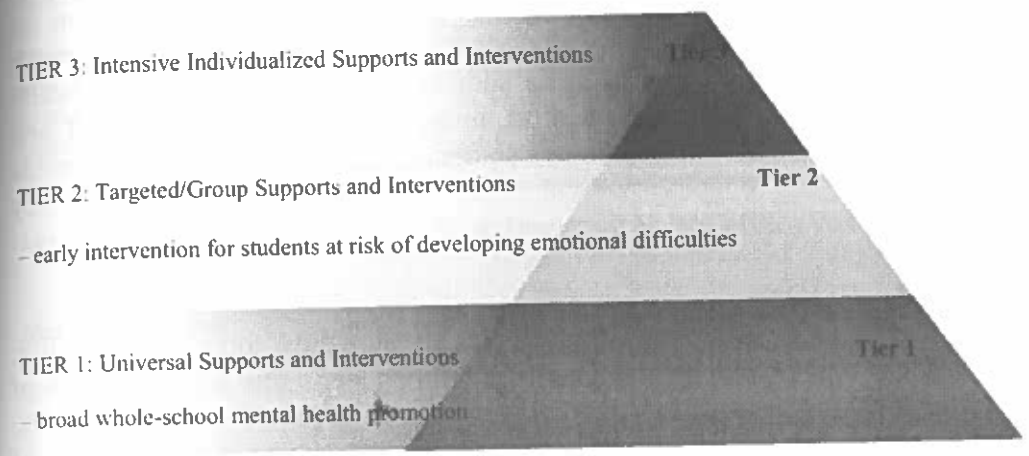

Tier 1: A key to development of comprehensive, whole-school approaches to provide universal supports and interventions in school mental health programs includes the provision of evidence-based programs that address the multiple needs of all students and their families through a whole-school prevention program. School mental health promotes healthy student emotions and behaviors through the use of whole-school, evidence-based programs such as Positive Behavior Interventions and Supports (PBIS). PBIS is an example of a universal program that promotes a positive school climate, positive teacher/school staff responses, and healthy student behaviors (www.pbis.org).
Tier 2: The development of targeted and group supports and interventions in school mental health programming includes early intervention programs in schools to provide staff and students with training and skill development toward healthier behaviors in order to address social issues, such as bullying, violence, safety, and substance abuse. The intervention programs will address student behaviors such as fighting, bullying, lack of social and problem solving skills and provide coping strategies and new skills to

address these behaviors. Often mental health providers assist school staff in training and development of early intervention strategies and programs.

Tier 3: This is the usual area of focus for the children and youth in system of care initiatives. Tier 3 offers school-based interventions to help children and youth to learn coping skills to address their mental health difficulties, to increase school success and, for those students in more restrictive settings, to move into less restrictive classroom settings in the whole-school approach to mental health prevention and intervention in Tiers 1 and 2. Development of intensive and individualized supports and interventions for students with emotional and behavior issues often includes mental health treatment services. These services address the more severe mental health diagnoses that may be needed to immediately address emotional and behavioral issues exhibited by students with the intent to provide immediate and ongoing individual and family interventions (cited by Freeman E.V., 2011).

CONCLUSIONS

Climate change poses a serious threat to humanity today. Human life, physical health and mental health are threatened. The consequences of climate change are also reflected in the mental health of children. It is the duty of the school to identify as early as possible the possible problems of the mental health of the students, to treat them. In this context, schools should design and implement models of early intervention and these models should be comprehensive, so they should include all key actors, such as: teachers, parents, psychologists, social workers, various agencies, etc.

REFERENCES

Australian Academy of Science, 2021: What is climate change? (Available from: https://www.science.org.au/learning/general-audience/science-climate-change/1-what-is-climate-change).

Evers, T. 2015: The Wisconsin School Mental Health Framework-Integrating School Mental Health with Positive Behavioral Interventions & Supports. The Wisconsin Department of Public Instruction. *Bulletin No. 16050* (Available from: https://dpi.wi.gov/sites/default/files/imce/sspw/pdf/mhframework.pdf).

Filipova, T., Kopsieker, L., Gerritsen, E., Bodin, E., Brzezinski, B. & Rubio-Ramirez. O.2020: Mental health and the environment: How European policies can better reflect environmental degradation's impact on people's mental health and well-being. Background paper by the Institute for European Environmental Policy (IEEP) and the Barcelona Institute for Global Health (ISGlobal).

Freeman, E. V. 2011: School mental health sustainability: Funding strategies to build sustainable school mental health programs. Washington, DC. Technical Assistance Partnership for Child and Family Mental Health (Available from: https://www.air.org/sites/default/files/Why-School-Mental-Health-Connections-to-Systems-of- Care-1.pdf).

Garcia-Carrion R., Villarejo-Carballido B., Villardon-Gallego L. 2019: Children and Adolescents Mental Health: A Systematic Review of Interaction-Based Interventions in Schools and Communities. *Front. Psychol.* https://doi.org/10.3389/fpsyg.2019.00918.

Hanna, R. & Oliva, P. 2016: Implications of Climate Change for Children in Developing Countries. *The Future of Children.* VOL. 26. NO. 1 (Available from: https://scholar.harvard.edu/files/remahanna/files/implications_of_climate_change.pdf).

Jané-Llopis, E. & Braddick, F. (Eds). 2008: Mental Health in Youth and Education. Consensus paper.

Luxembourg: European Communities (Available from: https://ec.europa.eu/health/archive/ph_determinants/life_style/mental/docs/consensus_youth_en.pdf).

Lawrance, E., Thompson, R., Fontana, G.& Jenning N. 2021: The impact of climate change on mental health and emotional wellbeing: current evidence and implications for policy and practice. Grantham Institute. *Briefing paper No 36.*

Levitt, J.M., Saka, N., Romanelli, L.H. & Hoagwood K. 2007: Early identification of mental health problems in schools: The status of instrumentation. *Journal of School Psychology* 45, 163–191.ELSEVIER.

McLanahan, S. et al. 2016: Children and Climate Change. *The Future of Children*. Volume 26, Number 1. Princeton Brookings (Available from: children_and_climate_change_26_1_full_journal.pdf (princeton.edu).

Nilsson, M. 2020: Climate change and its impact on mental health. European Parliament, Policy Department for Economic, Scientific and Quality of Life Policies Directorate-General for Internal Policies.

Padhy, S.K., Sarkar, S., Panigrahi & M., Paul S. 2015: Mental health effects of climate change. *Indian J Occup Environ Med.* Jan-Apr; 19(1): 3–7, doi: 10.4103/0019-5278.156997.

Sanson, A.V., Van Hoorn, J. & Burke, S.E.L. 2019: Responding to the Impacts of the Climate Crisis on Children and Youth. *The Climate Crisis and Children and Youth* Volume 13, Number 4, Pages 201–207, doi/pdf/10.1111/cdep.12342).

Scott, J.G., Mihalopoulos, C., Erskine, H.E., Roberts, J. & Rahman A. 2016: Mental, Neurological, and Substance Use Disorders: *Disease Control Priorities, Third Edition* (Volume 4). International Bank for Reconstruction and Development / The World Bank. USA (Available from: https://www.ncbi.nlm.nih.gov/books/NBK361938/).

Swaim, E. 2019: How Climate Change Can Affect Children's Mental Health. GoodTherapy.org. (Available from: GoodTherapy | How Climate Change Can Affect Children's Mental Health).

WHO, 2018: Adolescent mental health in the European Region. Copenhagen (Available from: https://www.euro.who.int/__data/assets/pdf_file/0005/383891/adolescent-mh-fs-eng.pdf).

https://www.apha.org/~/media/files/pdf/topics/climate/climate_changes_mental_health.ashx

https://www.dw.com/en/no-child-will-escape-the-impact-of-climate-change-unicef/a-58914515

CLIMATE CHANGE, FLOODING AND ECONOMIC IMPACT IN SHKODRA REGION, ALBANIA

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Abstract

As global warming continues to aggravate, we experience more extreme weather, sea level rise and as result flood are expected to grow by the century's end. Flood is one of the most problematical natural hazards in Albania. During the last decades, the flood situations constitute a great risk for people located in Shkodra region. These natural disasters cause many negative impacts on the live and economy of many people that lives in this region. They are associated with the loss of many lives, causing major impact on economic performance and social aspects as well as breaking the chain of macro and microeconomic balances.

The purpose of this study is to identify the economic impact of flood in Shkodra regions. This valuation is conducted using secondary data such as climate change, floods over the years in the Shkodra region, damage caused and management of these natural disasters. While primary data are provided through the qualitative method of structured interviews, designed to highlight the socio-economic impact of the flood on families in these areas, during 2021 flood.

Evaluating the recent flood disasters, it is probable to evaluate the current flood risk in some of the most challenging areas. Flood infrastructure is one of the most important elements in reducing the risk. Engineering measures are required to be evaluated for decrease of flood risk in Albania. In North-West Albania, the risk of flooding is high from river floods and from sea flooding. Flood damage has been assessed mainly after events and detailed flood protection models have been prepared mainly based on emergency responses. Residents affected by flood experienced damage and loss, and while seasonal rains begin, they are worried and fear for loss property and livestock.

Key words; Flood, Climate Change, Economic Impact, Social Impact, Shkodra Region.

Introduction

Shkodra is the region of Albania that is among the most vulnerable areas, affected by major geo -risk flooding. Intense precipitation and snowmelt discharge have led to more frequent and severe floods.

The region borders the Adriatic Sea in the west and includes the artificial lake "Vau i Dejes", two large reservoirs: Rragami and Shtodri, Shkodra Lake (the biggest Balkan Lake) and four smaller rivers Cemi of Shala, Gjader, Kir and Buna. Flooding is favored by the country's geomorphology and is encouraged because of climate change. The Drini-Buna Lowland in the Shkodra Region is prone to regular and severe floods which might increase in frequency and intensity due to climatic changes (GIZ 2014).

In addition to the floods in the years 1854, 1871 and 1897 in the city of Shkodra and in the Lowlands below Shkodra there were floods in the years 1905, 1916, 1937 and later in the years 1946, 1952, 1960, 1962-1963, 1970, 1971, 1979, 1994, 2004 to that of January 2010 as well as February 2010, 2018, 2021.

A major flood with a historical character of the Drin occurred during the dates 10-13 January 1963, due to the heavy rainfall that fell in its collecting basin. The rain was accompanied by the melting of heavy snow that had fallen days earlier as a result of high temperatures, and rainfall. So, in this flood was mixed - rain and melting snow. The level of Drini from the base of the bed reached 6.73 m of Buna reached 9.64 m. In the Buna and Drini basins, the Zadrima Plain of Shkodra and Lezha and the Buna Coast with a total flooded area of 18,600 ha were flooded, with an average underwater stay of 22 days (HIDMET 1964).

The 2010 flood, "one of the heaviest documented floods of the last 50 years", inundated 15,000 acres and led to the evacuation of 14,500 residents (Dirking et al., 2018). In March 2018, over 5,000 acres of both urban and rural lands were flooded, multiple villages were cut off for several days, and farmers lost crops and livestock (Davies, 2018). Much of the land is farmed, and flooding degrades soil quality, reduces agricultural productivity, and negatively impacts the livelihood of the rural population. The latest major floods occurred in January 2010, December 2010 and March 2013 resulting in high economic and environmental losses. The post disaster analysis of the Shkodra region areas affected by the flood of 2010, conclude that 14.100 ha of land were flooded, and 4.600 houses were submerged. Theft and burglary occurred when some took advantage of the situation. 12.150 people were evacuated, and the economic loss was

estimated at ALL 2,5 billion (EUR 18 million). Following these events, local and regional flood risk management plans were developed, including regional and local risk maps depicting the flood extent of 2010 (GIZ 2014). Frequent flooding, result in loss of livelihoods, production and other prolonged economic impacts and types of suffering can trigger mass migration or population displacement. Migration to developed urban areas contributes to the overcrowding in the cities.

Research question

How much natural disaster like floods impacts socio-economic aspects in Shkodra region?

Objectives

Objectives of this study is to.

- Identify the negative effect of climate changes.
- To make evidence of the factors, related to the flood.
- Evaluate the flooding impact in north Albania, specifically in Shkodra region.
- To measure some specific economic effect of flooding in Shkodra region.

Flood factors

Nowadays, in many developing countries, characterized by heavy concentration of people in restricted areas, poorly regulated urbanization and uncontrolled land use, a natural hazard can result in severe effects, even if its original impact was not so critical. (Tobin & Montz 2004; Paul 2011). Flood is one of these hazards which increases the probability and magnitude of floods in the Shkodër region due to a combination of sea level rise, earlier and concentrated snowmelt events, and variations in rainfall seasonality. Also, when man does not manage the environment well, as has happened and is happening all over the world, as well as in our country, then nature strikes hard, sometimes at one point and sometimes at another, sometimes with a negative atmospheric phenomenon and sometimes more another climatic phenomenon. A society that does not study and does not manage well is predisposed to be caught by surprise.

In this paper, based on data collected from the field, it was identified different factors that caused and favored the flood in area of Shkoder during these years.

1. **The Kir and Gjadër rivers** are a dangerous source of flooding due to the large sediments they carry with them. The Kir River has severely damaged its embankment, and, during heavy rains, it poses a serious danger

to the surrounding villages, but also to the city of Shkodra itself (Ziu and Krymbi 2010).

2. **The continuous rains**, often heavy, for several days without stopping aggravated the water situation. It should be noted that continuous rains, seemingly few, are more dangerous for floods than short and intense rains, the water of which passes faster because the roads are free, and the soil absorbs enough water to be saturated. On the contrary, the continuation of rainfall for a period of 10-15 days compacts the soil, no matter how dry, loamy and water-absorbing it results, further saturates it and it is forced to bring water to the surface instead of assimilation (Pazzi, Morelli, Fidolini, Krymi, Casagli, and Fanti 2016).

3. Another factor with a negative impact on the situation was the **snowfall** with a layer height of up to 1 m that covered the entire watershed of Drini and that Buna-lake (Alps, Puka-Mirdita Highlands, Korabi Range, Lura Mountains, Montenegro, Kosovo, Macedonia reaching over 22,000 km2).

4. The **combination of rain with snow**, accompanied by rapid decrease and rise in temperature, conditions that have affected the rapid melting of snow within few days. This happened in 1962-1963 but within a period of 2-3 months. Apparently global warming is making the climate more capricious, with more frequent expressions of changes and dangerous atmospheric phenomena combined (Ziu and Krymbi 2010).

5. **Swelling of Lake Shkodra that discharges water into Buna** due to its dominance by rain and snow of a wide and high hydrographic basin (most of the territory of Montenegro and the Western Alps, etc., an area known for rainfall very large in Europe), has led to the discharge of large amounts of water into the Buna. So, Buna had to withdraw the waters of the two big suppliers (Drini and Moraca + of Kirit and Gjadri), but that practically cannot do it due to the large volume and the permanent inability of Buna to withdraw.

6. **Continuous discharges of water from the territory of Macedonia** (waters of Lake Ohrid and two hydropower plants in the Drini i Zi near the border which discharged at the same time). In this case it should be studied what percentage have influenced this factor in the situation that was created in the area of Nënshkodra.

7. The **blowing of the Shirok wind** which is a very violent wind and continuous for many days. In such cases, this wind blows the sea water on the coast, causing large waves which cross the beach sand belt or lagoon cords or pierce them and supply water to the inland territory. This phenomenon is combined or coincides with the occurrence in this case of

tides higher than the perennial average (over 60 cm). Both phenomena cause the blockage of river discharges, in this case Buna at the estuary, due to the very small slope of the bed and the territory in general. In these cases, it happens that Buna flows for hours in the opposite direction, so the opposite current is created, in addition to the obstructed current. But it is enough just to block the flow and outflow into the sea, ie the obstructed current, for the waters in Buna to quickly increase the level and to spread rapidly through the low plains on both sides of it.

8. The **duration of the blockage of the discharge of the Lake through Buna** due to the high levels that are created and the role of the strong current of the Drini on it, greatly favors the further increase of the level of Lake Shkodra and the spread of water to the city of Shkodra and plains. low east of the lake. The lake reaches up to double its surface causing major flooding. It is a shallow lake, with low shores and reflects rapidly expanding far beyond the shores.

9. We can say that Shkodra Lake during the last 20 years has become even shallower, especially in the eastern and southeastern parts due to **atrophy processes that have occurred due to pollution**. Likewise, its final part near the Buna Bridge is filled with a lot of dumped aggregates in order to create territories for use for construction. Numerous constructions on its shores and in its bed have also occupied enough volume that should have belonged to the water, which is then forced to occupy other spaces towards the city by flooding a good part of the city as we have in the current case.

10. The field itself, the drainage canals and the **Buna bed have been filled with inert materials** especially during these last 25 years increasing the inability to attract water and their discharge into the sea. We can estimate that the drainage channels may have worked at 50% of their traction capacity. To these must be added many field interventions in the plain area such as many constructions in places that are low which play the role of barriers and occupy the volume of space that could belong to a part of the water mass.

11. On the slopes of the mountainous area, **large and uninterrupted interventions** have been made, without study, which have disturbed the balance relations between the various natural elements. In this context, we emphasize especially the massive cutting of high forests and the exposure of the territory to rainfall and rinsing. As a result, a considerable part of the land and the sub-forest layer has been removed, factors that impede surface flow and influence a large part of the water to infiltrate the underground roads.

Methods

In this research it has been used secondary data such as the factor causing these natural disasters like flood in Shkodra region, climate change, floods over the years in the Shkodra region, damage caused and management of these natural disasters. While primary data are provided through the qualitative method of semi structured interviews, designed to highlight the socio-economic impact of the flood on individuals and families in these areas, during 2021 flood.

The farmers from the regions of Obot, Dajc and Guri i Zi who experience the 2021 flood was interviewed. The farmer chosen for the interview were based on probability methods. The questions of these semi structured interview were about understanding the effects floods have on their crops and soil, how they prepare for flooding, and how flooding affects their farming practices. The number of farmers interviewed was 14.

Semi structured in-depth interviews are commonly used in qualitative research and are the most frequent qualitative data source on research. This method typically consists of a dialogue between researcher and participant, guided by a flexible interview protocol and supplemented by follow-up questions, probes and comments. The method allows the researcher to collect open-ended data, to explore participant thoughts, feelings and beliefs about a particular topic and to delve deeply into personal and sometimes sensitive issues (DeJonckheere and Vaughn 2019).

Results

To sustain this study, to answer the research question and to achieve the objectives mentioned above, it was undertaken semi-structured interviews with farmers from the regions of Obot, Dajc and Guri i Zi who experience the 2021 flood. These interviews allowed us to understand more specifically how flood 2021 effects them and their economies. The most relevant results from these interviews were showed in these paragraphs.

During the January, February 2021, due to heavy rain for few weeks, the situation in Shkodra is rapidly deteriorating. These happen due to Climate change and climate variability have been increasing the frequency, intensity, and impact of natural hazard events in Albania. Albania is vulnerable to the impact of climate change, due to its poor infrastructure and poverty in rural areas. Therefore, many natural hazards including hydro-meteorological ones (floods, droughts, forest fires and landslides) are becoming more and more frequent. Extreme weather events have significant impacts to the country's key sectors, its economy and

population. Shkodër's agricultural sector is significant to the regional economy and the livelihoods of its residents. Agriculture is the main source of income within the Shkodër region: Shkodër's agricultural sector is significant to the regional economy and the livelihoods of its residents. Agriculture is the main source of income within the Shkodër region: nearly 60% of Shkodër's residents live in rural areas and 43,246 residents of Shkodër were employed in the agriculture sector (Ibrahimaj, 2017; Filipi, 2014). Approximately 51,000 hectares of agricultural land is distributed between small private family farms ranging from 0.1 to 0.4 hectares where farmers grow wheat, maize, grapes, olives, tomatoes, watermelons, citrus, stone fruit, and alfalfa, which is used to feed livestock (Ibrahimaj, 2017). Shkodër's arable land is located on 64% of Shkodër's land area that is considered the lowlands surrounding the Buna River.

The farmers we interviewed all had experience with agricultural losses due to flooding. They described how flood waters had impact agriculture by wiping away newly planted seeds, matured crops and overall decreasing the soil quality by mixing nutrient-rich topsoil with the less nutrient-dense soils below.

The situation of floods in the territory of the Municipality of Shkodra, dated 10.02.2021, at 08.30.

From the periodic field monitoring on 10.02.2021, at 08.30, the situation of floods in the field continues to be as follows:

• Hydrometer in Dajç at 08.30, marks the quota of 6.78 m. (Quota max 6.30 m).

• The hydrometer of Lake Shkodra at 08.30, marks the quota of 8.95 m. (Quota max 8.70 m).

• The hydrometer of the Drin River at 08.30, marks the quota of 7.40 m. (Quota max 7.50 m).

Municipality of Shkodra Total flooded area 4005 Ha

1. Uncultivated land 795 Ha
2. Second forage, alfalfa 2905 Ha
3. Wheat 160 Ha
4. Ornamental plants 102 Ha
5. Orchard 40 Ha
6. 3 Ha Greenhouses Center Ana e Malit

The Obot road is impassable with high vehicles. The water level above the road reaches about 140 cm. In Obot village there is water presence in yards 100cm. Oblika 1 water supply, as a result of floods is out of order. UKSH Continues to supply drinking water to the inhabitants of Oblikë village. The

flooded land area is estimated at 1270 Ha, agricultural land in the villages Obot, Muriqan, Oblikë, Velinaj, Shtuf.

- Uncultivated land 220 Ha
- Second forage, alfalfa 960 Ha
- Wheat 45 Ha • Orchard 35 Ha
- Ornamental plants 7 Ha
- Greenhouses 3 Ha

Flooded houses 4.

In some lands the water level reaches 2. - 2.5 m. There is a risk of flooding of the Oblika Water Supply 2. Gorica Road is impassable with low vehicles. The water level above the road reaches about 40 cm. The situation has been aggravated by the floods in the Gallube neighborhood, Oblikë village. The situation has been aggravated by the floods in the neighborhood of Xhakaj, Kurtaliaj, Muriqan village.

Center Dajç 1. The flooded land area is estimated at 1650 Ha, in the misuse called "Dajç Marsh" (villages Mushan, Shirq, Suka-Dajç, Belaj, Rrushkull, Samrish i Ri, Darragjat, Pentar-plain area), of which:

- Uncultivated land 340 Ha
- Second forage, alfalfa 1120 Ha
- Wheat 95 Ha
- Ornamental plants 95 Ha

The road connecting the villages Shirq- Darrgjat is blocked. There is a presence of water about 150 cm. 3. 121 houses have water presence in the yards. In some lands the water level reaches 2 m. 5. The road in the neighborhood Mazia-village Suka Dajç is impassable with low vehicles.

Center Velipojë Flooded land area is estimated at 160 Ha plants villages Baks i Ri, Luarz. Ças, Rec i Ri.

- Uncultivated land 35 Ha
- Second forage, alfalfa 125 Ha

Center Guri i Zi The erosion of the soil from the river Drin continues in a place called Vukatan Mountain, Ganjollë village. Center Berdicë The flooded land area is estimated at 400 Ha, specifically in the villages Trush, Berdicë e Sipërme, Berdice e Madhe. The erosion of the soil from the river Drin continues in a place called Harku i Bërdicës, the village of Bërdicë e Sipërme. • Uncultivated 60 Ha

- Second forage, alfalfa 320 Ha
- Wheat 20 Ha

The flooded land area is estimated at 525 Ha, in the villages of Zues (lands in the Oblika plain), Shtoj i Vjeter, Shtoj i. Ri and Dobraç

- Uncultivated land 140 Ha
- Second fodder, alfalfa 380 Ha
- Orchard 5 Ha –

Conclusions

Due to Climate change and climate variability have been increasing the frequency, intensity, and impact of natural hazard events in Albania. Albania is vulnerable to the impact of climate change, due to its poor infrastructure and poverty in rural areas. Therefore, many natural hazards including hydro-meteorological ones (floods, droughts, forest fires and landslides) are becoming more and more frequent. Extreme weather events have significant impacts to the country's key sectors, its economy and population. Shkodër's agricultural sector is significant to the regional economy and the livelihoods of its residents.

The last two decades have brought considerable changes to the housing sector in Albania. In the flooded areas there are about 30% of the houses, illegal constructions, because of informal settlements and uncontrolled urban sprawl. The withdrawal of the State from maintenance and management of the existing housing stock, in particular the multi-unit stock, has led to a continuous deterioration of this stock, due to lack of investment in refurbishing or upgrading. On the other hand, about thousands illegal buildings were constructed during this period of time, part of them in risk prone areas all over the country. Effects on the environment include reference on of flooded contaminated sites and of waste along the rivers, especially from unofficial waste disposal sites. They cause water pollution in the rivers and down to the Adriatic Sea. Also, investments in rehabilitating flood protection infrastructure have been minimal.

Flood damage has been assessed mainly after events and detailed flood protection models have been prepared mainly based on emergency responses. Residents affected by flood experienced damage and loss, and while seasonal rains begin, they are worried and fear for loss property and livestock.

Recommendations

Some recommendations based on the results of research conducted about the impact and factors of flood in Shkodra regions, are.

- Safe and medium-term knowledge of possible inflows coming to the cascade and Lake Shkodra which pass through the Buna. We think there are noticeable changes in their regime in recent years.

- Study of the drowns of Buna and its increase by calculating the space off the coast to the protective embankments.
- High level scientific management of the cascade in accordance with the drowns of water through Buna, large canals and hydropower.
- Creation of the coastal embankment, not in a straight line along the straight sea line but with a zigzag, at a suitable distance from the coastline and leaving in relation to the sea all the lagoons, large or small, which serve as spaces for deflation and amortization of the sea force.
- Establishment of safe infrastructure for river flows, embankments on both sides of streams, large drainage canals, addition of hydropower plants to new points depending on the part of the amount of excess water to be drawn through them.
- The removal of all those constructions in territories that are dominated by waters which are not only endangered but also hindered, are barriers to water withdrawal and occupy the volume that should belong to the waters in such cases. It cannot be built in that space which is a low territory and created by the water itself because that territory, although dry, is a river basin, which in rare cases returns there and uses it.
- Maintenance with regulation approved by the government of all protective and attractive water infrastructure of the field.
- Consideration of climate change effects in government programs and policies.
- Designing a national economic strategy of natural disasters.
- Encouraging environment and climate education among the population.
- The realization of risk maps is an essential tool for planning effective measures of risk mitigation and nowadays several low -cost technologies are available for such a scope.

References

- Davies, R. (2018, March 9th). Albania: Heavy Rain and Melting Snow Cause Flooding in North. FloodList, Retrieved from www.floodlist.com
- DeJonckheere, M., & Vaughn, L. M. (2019). Semistructured interviewing in primary care research: a balance of relationship and rigour. Family Medicine and Community Health, 7(2).
- Dirking, V., Klockemann, L., Kranefeld, R., & Meincke, M. (2018). Albania: NAP Process Country Case Study. Bonn and Eschborn, Germany: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.
- Filipi, G. (2014, May). A New Urban-Rural Classification of Albanian Population: The EU Geographical Typology Based on Grid Data. Republic of Albania Institute of Statistics. Retrieved from http://www.instat.gov.al/media/2919/a_new_urbanrural_classification_of_albanian_population.pdf
- GIZ. (2015, June). Flood Risk Management Plan: Shkoder. Retrieved from http://mc3.lped.fr/IMG/pdf/region_shkoder_ang_.pdf

- HIDMET 1964: Ngjarjet e jashtëzakonshme hidrometeorologjike të dimrit 1962-1963 në
- Ibrahimaj, D. (2017). Regional Statistical Yearbook 2017. Institute of Statistics (INSTAT). Retrieved from http://www.instat.gov.al/media/3596/vjetari-statistikor-rajonal-anglisht-2017-dt13112017.pdf
- Paul BK. 2011. Hazards/disasters: special topics. In: Paul BK, editor. Environmental hazards and disasters: contexts, perspectives and management. Chichester: Wiley; p. 269306.
- Pazzi, V., Morelli, S., Fidolini, F., Krymi, E., Casagli, N., & Fanti, R. (2016). Testing cost-effective methodologies for flood and seismic vulnerability assessment in communities of developing countries (Dajç, northern Albania). Geomatics, Natural Hazards and Risk, 7(3), 971-999.
- Tobin GA, Montz BE. 2004. Natural hazards and technology: vulnerability, risk and community response in hazardous environments. In: Brunn SD, Cutter SL, Harrington JW, editors. Technoearth: geography and technology. Dordrecht: Kluwer Academic Publishers; p. 547570.
- Ziu,T and Krymbi,E (2010)-"Përmbytjet në Ultësirën Shkodër – Lezhë", botuar pranë Buletinit Shkencor të Universitetit të Shkodrës "Luigj Gurakuqi", Seria e Shkencave Natyrore, nr.60, Shkodër 2010.

ASSESSMENT OF THE WATER QUALITY OF SHKODRA LAKE THROUGH MICROBIOLOGICAL PARAMETERS

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Abstract

Albania posses many water resources with natural and biological values. In the Northwest of Albania lies Shkodra Lake, the largest in the Balkan Peninsula, and one of the many natural wonders of this part of the country. Shkodra watershed is exposed to various sources of pollutions, which are related with the industrial and urban pollution, agricultural activities, discharge of waste waters etc. The aim of the study is to evaluate the microbiological parameters in Shkodra Lake based on Directive of the European Parliament and and WHO legislation, given the importance of continuing studies of natural aquatic ecosystems.

Water samples were collected from 3 points of Lake Shkodra named stations. This research assesses the quality of water in Shkodra Lake, based on the microbiological analysis.

Heterotrophs include all microorganisms of the natural microflora of the aquatic environment and organisms extending to a wide range of pollution sources. They are found in large numbers in water sources and surface waters. Heterotrophic measurement is the detection of all microorganisms that give visible colonies on the surface of nutrient agar.

Stations of taking samples are presented by tables and graphics.

Key words: microbial contamination, Heterotrophs, water pollution, indicators, waste waters.

INTRODUCTION

Albania posses many water resources with natural and biological values, i.e. Shkodra lake, Ohrid and Prespa lakes, river valleys, coastal lagoons, etc. An overview of aquatic ecosystems and the related human impact is given by Cullaj et al. (2005). Lake Shkodra is the biggest lake of Balkan Peninsula. The water mirror surface of Shkodra Lake is 368 km2 ; from

which 149 km2 are placed inside of Republic of Albania territory, while the other part is placed in Montenegro (Lasca et al., 1981). The Shkodra Lake waters discharge into Adriatic Sea via Buna river bed, which is and one natural channel of this lake, the largest inflow is the Moraca River (Montenegro), which provides more than 62% of the lake water. At the southeast direction the watershed of Shkodra lake border on Drini watershed and on the south direction it border with Albanian West Lowland, in which is spreading the bed of Buna River. On the west direction, it border with water of Adriatic Sea. The most important tributaries of Lake Shkoder enter the lake from the north: Moraca, Crnojevica, Orahovstica, Karatuna, Baragurska River in Montenegro, and Rjolska and Vraka River in Albania. On the west side many small streams flow into Lake Shkoder. Shkodra watershed is exposed to various sources of pollutions, which are related with the industrial and urban pollution, agricultural activities, discharge of waste waters etc.. According to physico-chemical and biological elements values, ecological status of lake Shkodra can be classified as good to moderate, (Rakaj et al., 2009). Monitoring and evaluation of the quality of surface water, the level of pollution control and determination of the main pollutants emitted in them takes a special importance to recognize the situation and take measures to protection or rehabilitation of water facilities. Untreated organic matter that contains fecal coliform can be harmful to the environment. Aerobic decomposition of this material can reduce dissolved oxygen levels if discharged into rivers. (EPA,2008).

In Shkodra Lake, the wastewater is also discharged Koplik, Bajza, Tuzi in Montenegro and many inhabited places around the lake (Dhora, 2012). Microbiological analyzes of recent years have shown that the degree of saprobiosis of lake water is high (Bushati et al., 2010).

The treatment of waste water from cleaning and residues from production processes is mostly not in accordance with EU standards. The same goes for waste disposal systems for liquid and solid wastes of the meat-processing sector. All the leftovers are dumped in illegal landfills, with leachate running into nearby rivers (Çakalli et al. 2013).

Monitoring for the presence of pathogens bacteria is essential in the evaluation of water quality, where the direct of indirect use leads to serious human health. The aim of the study is to evaluate the microbiological parameters in Shkodra Lake. For the Shkodra Lake sampling stations were selected based on the influence of the source of anthropogenic contamination.

The term heterotrophic bacteria or also known as colony counts and previously known as standard plate count bacteria includes all bacteria that use organic nutrients for growth and certain amounts of inorganic nutrient salts for their development (Allena, Martin J, et., 2004). These organisms can be found throughout the environment in both natural and treated water, as they can also vary widely between locations and between seasons. The presence of heterotrophic bacteria in surface water has implications for public health, especially pathogenic organism (USEPA, 1986). These organisms can cause stomach and intestinal illness including diarrhea and nausea, and can be fatal.

MATERIALS AND METHODS

For the determination of microbial parameters, the water samples were collected monthly in three points of Lake Shkodra named stations during: April 2021- October 2021. This monitoring stations were selected based on the influence of the source of anthropogenic contamination in the Albanian part of the lake:

1. **Sterbeq station** –It is in the northern part of the Albanian part of lake. The territory in this area has a considerable agricultural surface which is very adapted for plants such vegetables, tobacco, fodder, viticulture, ether plants, etc. Also, in this side of lake, fishery and livestock breeding are developed as an economic activity. This activities are in a non problematic level in the area.
2. **Zogaj station** – It is in the southwest part of Albanian part of lake. In Zogaj area the main activities are agriculture and fishery.
3. **Shiroka station** –It is in the southern part of Albanian part of lake. There is an urban pressure. At Shiroka area the main activity is fishery and small tourism. Main impact on this partcomes from urban discharges.

Figure 1. The map of sampling stations (1-Sterbeq, 2-Zogaj, 3- Shirokë)

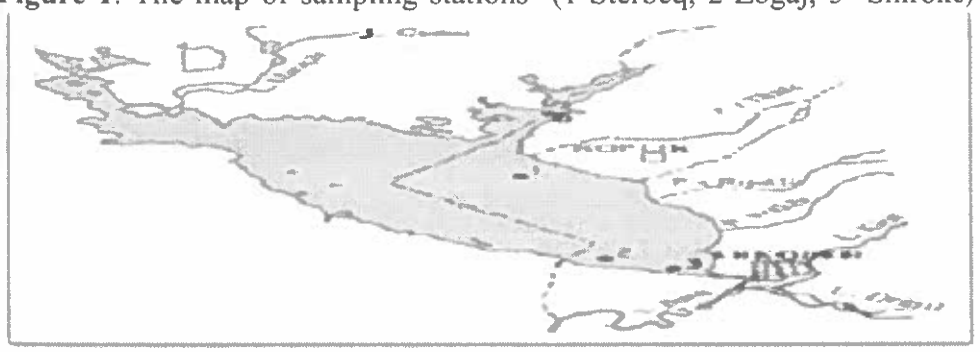


Table 1 Geographical coordinates of sampling stations

Nr	*Sampling Stations*	*Geographical coordinates*
1	Sterbeq station	N 42° 11' 44", E 19° 23' 0.29
2	Zogaj station	N42°11'26.33", E 19°23'36.38
3	Shiroka station	N 42° 04' 22.6", E 19° 24' 13.9

The water samples were taken by using Van Dorn bottle. Each sample is associated with the label and identification: the station where the sample is taken, the date and time of sampling and water temperature (Hysko M.2012). About 200- 250 ml of water was taken in each station using sterile polyethylene bottles .Water samples were transported in a chilly bin to the laboratory within the sampling day, and tested within 24 hours (ISO 5667-6:1990) so that doesn't changes parameters.

The analysis of water samples for microbiological parameters were done at the Microbiological Diagnostic Center "Wolfdieter Sixl", at the University of Shkodra "Luigj Gurakuqi" according to the Standard Methods, APHA 1992 and ISO. The heterotrophic bacteria testing were made by using the YEA Nutrient Media, using the Petri dishes plating; the incubation was in 37ºC, for 48 hrs, according to the Standard Methods for the examination of water and waste water. For this purpose, 1 ml is planted in each of the two sterile plates and 0.1 ml is poured into the other two for each water sample taken. Readings after 48 hours and the average of the colonies is calculated for all the dishes planted.

Table 2 Microbiological methods and nutritive terrain (APHA. 1992)

Test	Methods	Temp.and time of incubiation	Nutritive terrain
Heterotrophes	Plating	37°C for 48 h	YEA
Dilution	1/10	Room temp.	Pepton diluents

RESULTS AND DISCUSSION

During April 2021- October 2021 Shkodra lake is monitored periodically at three stations. For the stations are identifying values of heterotrophes . Data are shown in tables and graphics (figure). As seen from figure 2, the

largest number of heterotrophes is presented at Shiroka station during all monitoring periods, followed by Zogaj station. The minimal values of heterotrophic bacteria during September was at Sterbeq station with 3800 cfu/ml, the maximal value is presented in May 2021 at Shiroka station with 52400 cfu/ml (fig. 2). The lowest average value is in Sterbeq with 3800cfu / ml, while the highest average value is in Shiroka station with 34000 cfu / ml ml (fig. 3). Heterotrophic values are highest at Shiroka station, which is the most polluted. Factors that affect the increase of values in this station come as a result of anthropogenic activity, animal waste, restaurants and household waste. Meanwhile the less polluted is the first station in Sterbeq station as seen from the graphics (fig. 2, fig. 3).

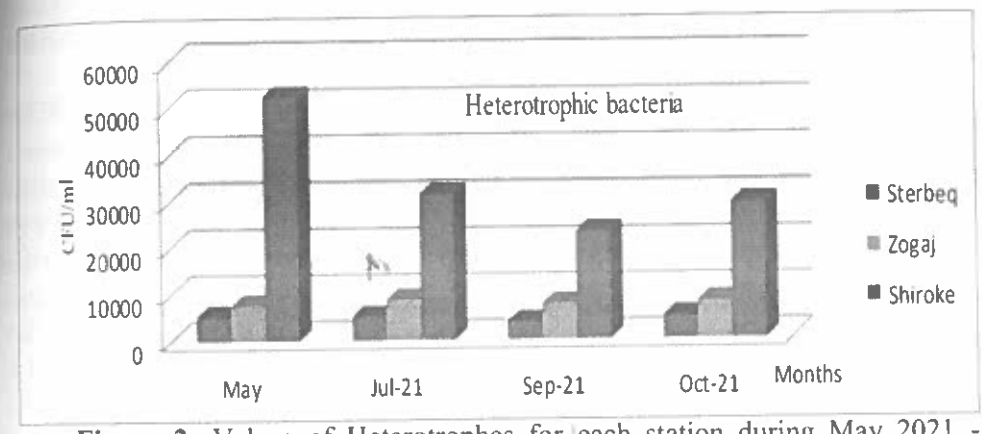
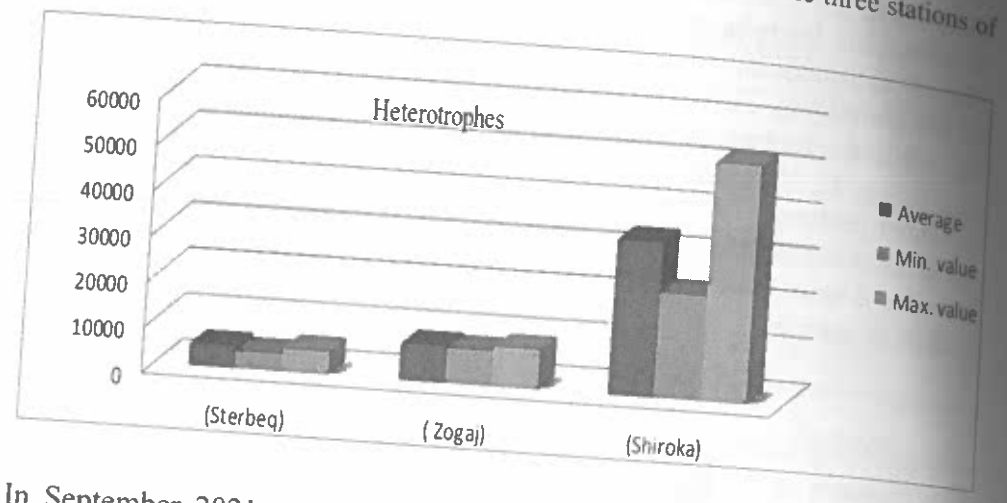


Figure 2: Values of Heterotrophes for each station during May 2021 - October 2021

Table 3: Average, min and max values of Heterotrophes in the three stations of Shkodra lake

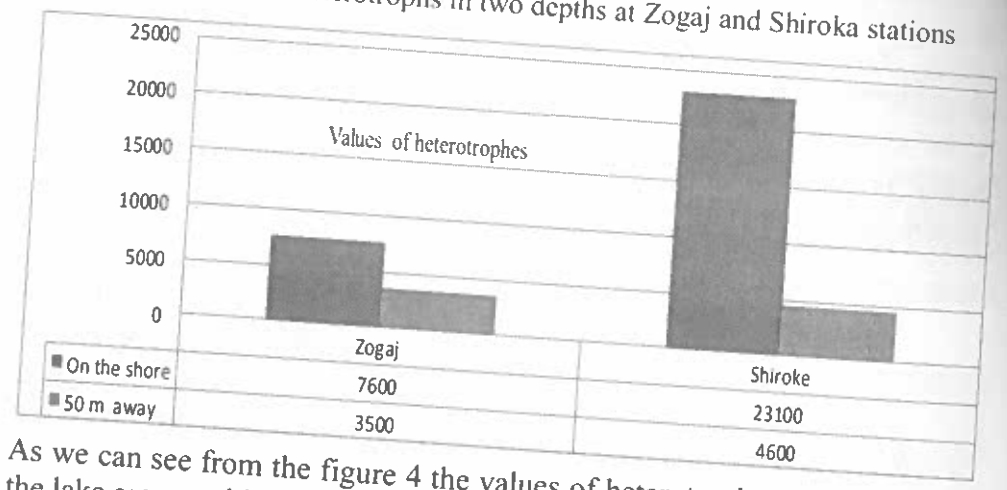
	Sterbeq	Zogaj	Shiroka
Average	4775	8000	34000
Min. value	3800	7600	23100
Max. value	5100	8700	52400

Figure 3: Average, min and max values of Heterotrophes in the three stations of Shkodra lake



In September 2021 sampling was conducted at two different depths: on shore and 50m away using a Van Dorn water sampler and sterile 1000 ml glass bottles at Shiroka station and Zogaj station. The values of Heterotrophes are presented in Figure 4.

Figure 4. Values of heterotrophs in two depths at Zogaj and Shiroka stations



As we can see from the figure 4 the values of heterotrophes on the shore of the lake are very high. Factors that affect the increase of values on the shore come as a result of anthropogenic activity, animal waste, restaurants and household waste.

CONCLUSIONS

This study provides an assessment of the water quality status of the Shkodra Lake basin based on microbiological parameters. Are tested and elaborated samples from the water of the three stations in Shkodra lake for the presence of Heterotrophes. Heterotrophic values are highest at the third station, which is the most polluted. Factors that affect the increase of values in this station come as a result of anthropogenic activity, animal waste, restaurants and household waste. However, because wastewater is discharged near to the outflow of the lake, pollution of the lake water body at large is somewhat limited. Meanwhile the less polluted is the first station in Sterbeq station. The minimum values were attributed in the September and October due to low temperature and less eutrophication, anthropogenic activities etc.

ACKNOWLEDGMENTS

Lake Shkodra is a highly vulnerable ecosystem affected by anthropogenic activity, animal waste, restaurants and household waste. Monitoring and evaluation of the quality of surface water, the level of pollution control and determination of the main pollutants emitted in them takes a special importance to recognize the situation and take measures to protection or rehabilitation of water facilities.

Although the results presented in this work are based only on observational analysis during May 2021- October 2021, they provide a picture of the water quality parameters and heterotrophic bacteria distribution of Shkodra Lake. Increasing the number of samples and monitoring water quality throughout the year for different parts of the lake will give better constraints on the environmental situation of the lake and on how best to manage the lake in the future.

REFERENCES

APHA/AWWA/WPCF, 1998: Standard Methods for the Examination of Water and Wastewater. 20th Edition. *Part 9010.* Microbiological examination. American Public Health Association, Washington.

Citation on the paper: APHA/AWWA/WPCF, (1998).

AMERICAN PUBLIC HEALTH (APHA). Eaton , A.D., Clesceri, L.S., Rice, E.W., and Greenberg, A.E(ed), standard methods for examination of water and wastewater.21st ed,American Water Work Association; Water Pollution Control Federation, Washington, D.C. 2005, 1368 p.

Citation on the paper: AMERICAN PUBLIC HEALTH (APHA, 2005).

ALLENA, MARTIN J., EDBERGB, STEPHEN C., AND REASONERC, DONALD J. Heterotrophic plate count bacteria—what is their significance in drinking water?. International Journal of Food Microbiology 92,2004,pp 265– 274.
Citation on the paper: ALLENA, MARTIN J., EDBERGB, STEPHEN C., AND REASONERC, DONALD J. (2004)
U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA). Washington, DC (2008). "Analytical Methods Approved for Drinking Water Compliance Monitoring under the Total Coliform Rule", June 2008.
Citation on the paper: U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)Washington, DC (2008)
BUSHATI, N., BUSHATI, F., 2006 Study of bacteriological qualities of Lake waters of Shkodra. Bio & Eco, Publication of the Shkodra Lake Sector, May 2006, No.6
Citation on the paper: BUSHATI, N., BUSHATI, F., (2006)
BUSHATI, N., NEZIRI, A. & HYSKO, M. 2010. *Investigation on physico-chemical and microbiological of the parameters of Lake Shkodra*. BALWOIS, 25, 29 May 2010, Ohrid, Republic of Macedonia.
Citation on the paper: BUSHATI, N., NEZIRI, A. & HYSKO, M. (2010)
CULLAJ A., Environmental Chemistry, Shblu, Tirana, 2005
Citation on the paper: CULLAJ A., (2009)
ÇAKALLI M, BUSHATI D, ULQINI D, DOÇAJ E (2012) Impact of agricultural activities and relatedindustries on Shkodra/Skadar Lake's pollution. IPA CrossBorder Programme Albania-Montenegro, 2007– 2013. Final Report, Tirana
Citation on the paper: ÇAKALLI M, BUSHATI D, ULQINI D, DOÇAJ E (2012)
CINARI. XH (2021) Master microthesis on "Data on microbiological parameters of the waters ofLake Shkodra and Lake Vau dejes", pg 15-38
Citation on the paper: CINARI. XH (2021)
DHORA, DH., 2012; Shkodra Lake 2012. CP, 130 f.
Citation on the paper: DHORA, DH., (2012)
RAKAJ, M., DHORA, DH., BEKTESHI, A., Evaluation of the ecological status of the lake Shkodra. Proceedings 2009, International Conference on Lakes and Nutrient Loads.
Citation on the paper: RAKAJ, M., DHORA, DH., BEKTESHI, A., (2009)
HYSKO. M, 2012. Handbook of Microbiology, Tirana
Citation on the paper: HYSKO. M, (2012)
USEPA,.Ambient water quality criteria for bacteria.USEPA, Washington, D.C. EPA, 1986, 440/5/84-002.
Citation on the paper: USEPA (1986)
DAVISA, KRISTAL., ANDERSONB, MICHAEL A., AND YATES, MARYLYNN V. Distribution of indicator bacteria in Canyon Lake, California, Water Research 39,2005,pp1277–1288.
Citation on the paper: DAVISA, KRISTAL., ANDERSONB, MICHAEL A., AND YATES, MARYLYNN V. (2005).

DETERMINATION OF PHOSPHORUS IN WATER OF SHKODRA LAKE

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Abstract

Phosphorus has been identified by many researchers as the limiting agent for algae growth in natural waters, a process that leads to the eutrophication of these waters. The role of aquatic phosphorus in promoting the lake eutrophication can be assessed more effectively on the basis of the content of different forms of phosphorus than its total content. The object of this study were the different forms of phosphorus in the waters of Shkodra Lake. Water samples were taken in Shirokë, Zogaj and Stërbeq in the period May-September 2021. In water, phosphorus comes in two forms: soluble and condensed. Separation of these forms is done by filtering with a 0.45 μm filter in vacuum. The method of digestion with potassium persulfate (APHA,1989) converts phosphorus TP and total dissolved P (DP) into DRP. The TP concentration was determined in the unfiltered water sample, and varies from 0.088 mg / L to 0.340 mg / L. The contents of the dissolved molybdate-reactive P (DRP) in the filtrate is determined and varies from 0.013 mg / L to 0.073 mg / L. The contents of total molybdate-reactive P (TRP) is determined in the unfiltered water sample. The high spatial and temporal variations in the proportions of these forms with respect to the TP concentration well-demonstrate the complexity of the P cycle and the involved P fractions and emphasize the need for an expanded monitoring approach. The potential of eutrophication could be underestimated if not all P categories were considered. Analysis of phosphorus content in water was done by colorimetry with ammonium molybdate and reduction of tin chloride solution, (APHA, 1989).

Keywords: phosphorus, the forms of phosphorus eutrophication, Shkodra Lake.

INTRODUCTION

Phosphorus is a chemical element found in nature as phosphate in both the biosphere and the minerals of the earth. It may be present in surface waters as organic phosphates, orthophosphates (inorganic phosphates) or as

condensed (solid) phosphates. Phosphates in the aquatic system serve as a nutrient (EPA 2015; Hochanadel 2010). Phosphorus enters surface waters from agriculture and urban runoff as well as from wastewater treatment plant, industrial and municipal.

Orthophosphates and inorganic phosphates enter the water from soil layers, industrial waste, detergents and biodegradation of organic matter.

Condensed phosphates are water soluble and consist of polyphosphates which when hydrolyzed are converted to orthophosphates.

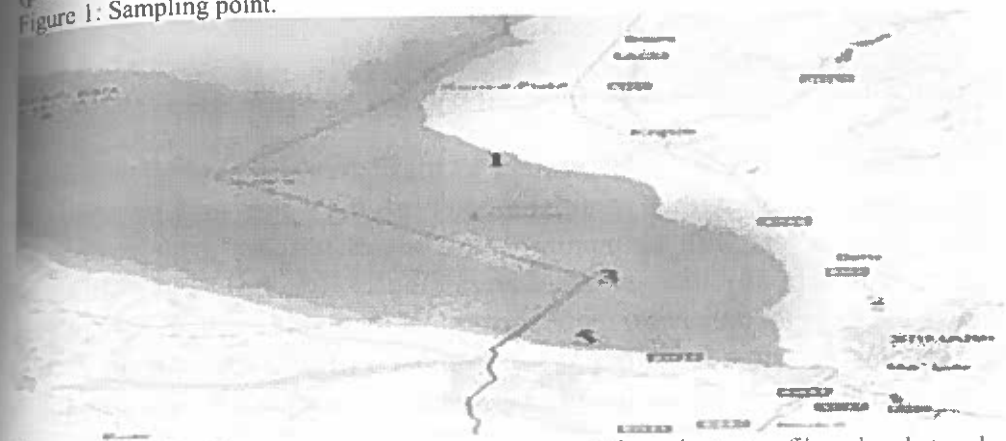
Organic phosphates are present in a variety of compounds and in living cells. Decomposition of organic matter yields orthophosphates. Particle phosphates are composed of suspended clay minerals and organic wastes present in water. It acts as an adsorbent for both organic and inorganic phosphates. These fractions are usually present in unfiltered water samples. Phosphorus content is often low in well-oxygenated lake waters, and low phosphorus levels limit primary production in them (Ricklefs, 1993). Excessive inputs of phosphorus as a result of human activity and biological developments seem to cause an imbalance in the "production versus consumption" of living material (biomass) in an ecosystem. This leads to the eutrophication of lakes, a sharp environmental problem.

This study was undertaken in the framework of the project "Assessment of ecological qualities (chemical, microbiological and biological) of the waters of Lake Shkodra according to EU standards and the Water Framework Directive" of the Water Study Center of Shkodra Region. The object of this study were the different forms of phosphorus in the waters of Lake Shkodra.

MATERIAL AND METHODS

The object of study was Lake Shkodra, the largest in the Balkans. The surface of the lake (as an average of many years) is 452 km2, of which 183 km2 lies in Albania and 269 km2 in Montenegro. It is a typical lowland lake with an average depth ranging from 7 to 10 m, the maximum depth is 44 m. The average total volume of water in Lake Shkodra is about 2.6 km3. The surface of the lake varies from 354 km2 when the water level is 4.71 meters altitude, to 505.8 km2 when the waters reach 10 m (Anonim, 1984) At the highest level, the depth of the lake is over 12 meters, while at the lowest level, 8 meters. Water samples were taken at three different points according to OWRB (2018) using a Van Dorn. The sampling points were: Zogaj (42°04'20.35 "N, 19°23'57.76" E) (point 1); Shiroka (42°05'5.53 " N, 19°27'58.42 "E) (point 3) and Sterbeq (42°12'3.199 "N, 19°22'57.46" E) (point 5) to figure 1.

Figure 1: Sampling point.



The samples were immediately sent to the laboratory where they were filtered and stored at -10 ° C (APHA,1989) the next day were analyzed according to the scheme in figure 1:

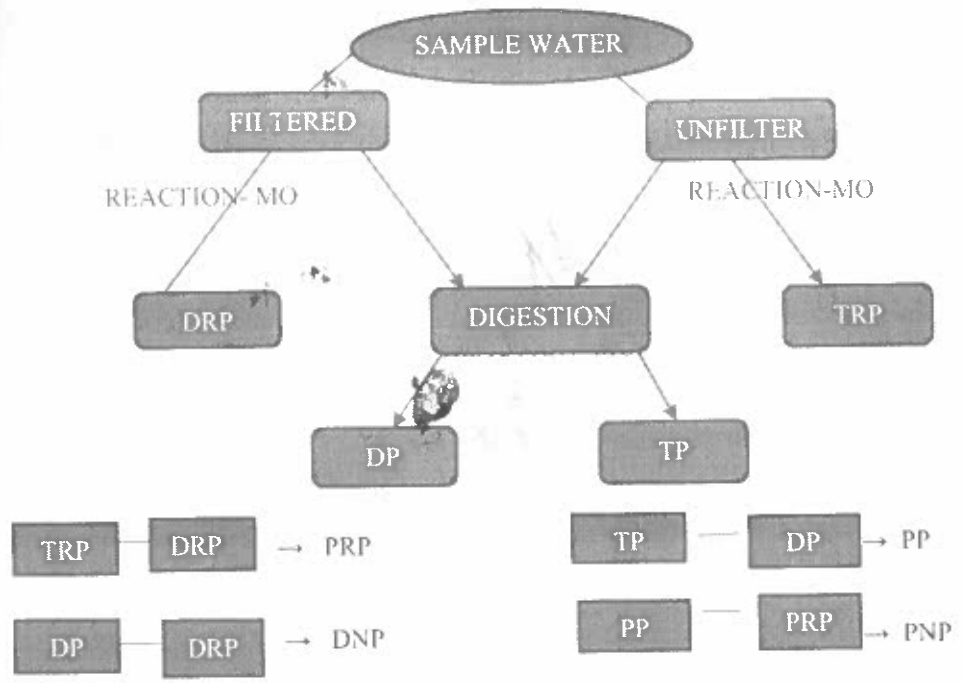


Figure 2. Scheme of analysis of different phosphorus (P) fractions. Reaction-Mo, reaction of phosphate with molybdate (blue phosphomolybdate complex is formed); TP (total P); DP (Total dissolved P); PP (total P in the form of particles); TRP (total reactive P); DRP (dissolved reactive P); PRP (particle reactive P); DNP (dissolved non-reactive P); PNP (particle non-reactive P). (Lisa Felgentreu1*, Günther Nausch, 2018).

Dissolved P (DP) in water samples refers to the P fraction passing through a membrane filter with a pore diameter of 0.45 μm. The content of DP after digestion with potassium persulfate (K2S2O8) (PIERZYNSKI, 2009), is analyzed by colorimetric method with ammonium molybdate and reduction of tin chloride solution (APHA, 1989).

Dissolved reactive P (DRP), refers to the P fraction passing through a membrane filter with a pore diameter of 0.45 μm and responds to colorimetric test with ammonium molybdates without prior hydrolysis or oxidative dissolution of the water sample. It is primarily a mass of dissolved orthophosphate, the P form most available to plants and algae, and thus is often regarded as the most critical fraction of P that contributes to accelerating surface water eutrophication. Its content is determined by the colorimetric method with ammonium molybdate and reduction of tin chloride solution (APHA,1989).

The difference between the TRP and DRP values is the amount of particulate molybdate-reactive P (PRP).

Total reactive P (TRP) refers to the P fraction in the unfiltered water sample. Its content is determined directly (without prior digestion) by the colorimetric method with ammonium molybdates and reduction of tin chloride solution (APHA, 1989).

Analysis for the TP content of water samples requires that all condensed and organic P, including particulate P, be initially converted (hydrolyzed) to orthophosphate so that they can be colorimetrically determined with ammonium molybdate and solution reduction tin chloride (APHA,1989). Digestion was performed according to (APHA 1989) with potassium persulfate (K2S2O8).

The total particulate P (PP) concentration was calculated as the difference between TP and DP.

RESULTS AND DISCUSSION

The table shows the phosphorus concentrations in all the forms described above and expressed in mg of phosphorus per liter of water.

Table 1. Concentrations of phosphorus forms measured in the waters of Lake Shkodra on 25 May 2021; (expressed in mg / l). Samples 1, 3, and 5 (surface); samples 2,4 and 6 (depth).

Samples No	Sampling point	TRP	TP	DRP	DP	PRP	DNP	PP	PNP
1	Zogaj	0.038	0.105	0.032	0.10	0.043	0.068	0	-0.043
2	Zogaj	0.040	0.122	0.035	0.08	0.005	0.045	0.042	0.037
3	Shiroka	0.078	0.270	0.073	0.178	0.005	0.105	0.092	0.087
4	Shiroka	0.076	0.340	0.066	0.158	0.010	0.092	0.182	0.172
5	Stërbeq	0.044	0.260	0.025	0.096	0.019	0.071	0.164	0.145
6	Stërbeq	0.050	0.272	0.026	0.10	0.024	0.074	0.172	0.148

Table 2. Concentrations of phosphorus forms measured in the waters of Lake Shkodra on 17 September 2021; (expressed in mg / l). Samples 1, 3, and 5 (surface); samples 2,4 and 6 (depth).

Samples No	Sampling point	TRP	TP	DRP	DP	PRP	DNP	PP	PNP
1	Zogaj	0.023	0.186	0.018	0.162	0.005	0.144	0.024	0.019
2	Zogaj	0.018	0.110	0.016	0.100	0.002	0.084	0.010	0.008
3	Shiroka	0.062	0.214	0.024	0.186	0.038	0.162	0.028	-0.01
4	Shiroka	0.050	0.240	0.021	0.168	0.029	0.147	0.072	0.043
5	Stërbeq	0.029	0.100	0.013	0.088	0.016	0.072	0.012	-0.004
6	Stërbeq	0.025	0.088	0.016	0.100	0.009	0.084	-0.012	-0.003

In traditional monitoring programs, only TP and DRP concentrations are measured. This does not reflect the diversity and complexity of the P cycle in the aquatic environment and consequently underestimates the potential of eutrophication. Determining P shapes is important both for comparing data reported in the literature and for mastering data for multi-year studies. Our results show that the different P forms that occur in aquatic systems depend on the season and hydrology. Moreover, an understanding of the function of individual components of P, such as their biological availability, it is important to determine and identify their contribution to eutrophication

Tables 1 and 2 show that the concentration of soluble reactive phosphorus (DRP) ranged from 0.013 to 0.073 mg PO4 / l while the concentration of total phosphorus (TP) ranged from 0.088 to 0.340 mg PO4 / l. The table shows that the highest value for soluble reactive phosphorus was observed in Shiroka at the end of May, while the lowest value during September in Sterbeq. Total phosphorus also showed a higher value during the end of May in Shiroka, while a lower value of 0.88 during September.

Samples nr.	DRP %	DNP%	PRP%	PNP%
1	32	68	43	-43
2	27	37	4	30
3	27	39	2	32
4	19	27	3	50
5	10	27	7	56
6	10	27	9	54

Table 3. Percentages of P shapes in about TP (25 May 2021)

Samples nr.	DRP %	DNP%	PRP%	PNP%
1	10	77	3	10
2	15	76	2	7
3	11	75	18	-4
4	9	61	12	18
5	13	72	16	-4
6	18	95	10	-3

Table 4. Percentages of P shapes in about TP (17 September 2021)

DRP contents has the highest value in May 32% and the lowest value 9% in September. The DNP contents has the highest value in September 95% and

the lowest value 27% in May. PRP contents fluctuate and do not show a trend. PNP contents have the highest values in May and the lowest in September.

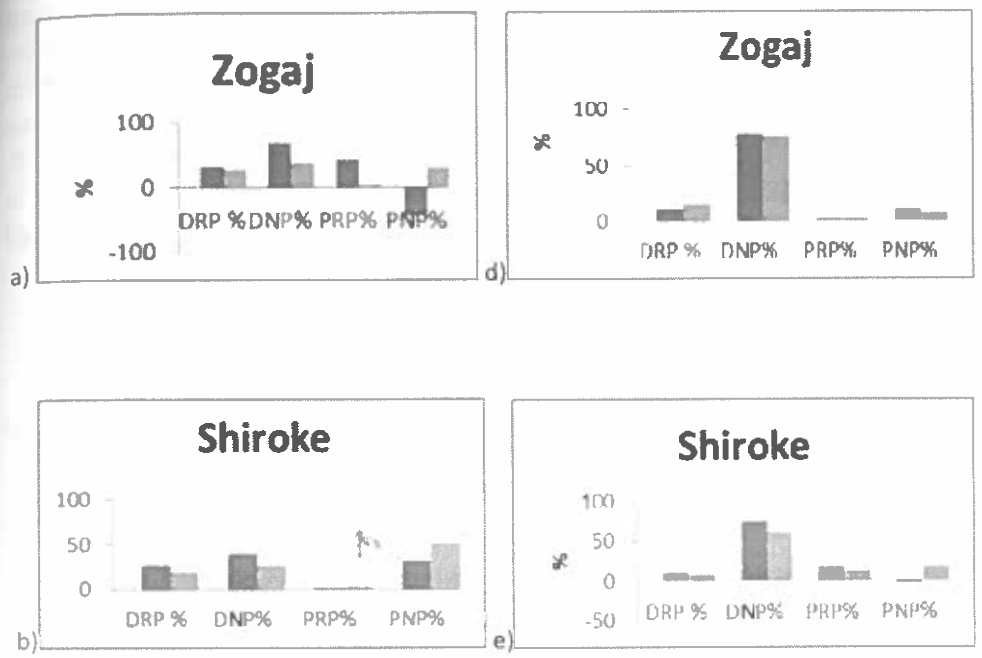


Figura 3: Percentages of P shapes in. connection to TP (25 May 2021)

Figure 4:Percentages of P shapes in connection to TP (17 September 2021)

CONCLUSION

Based on the results achieved, presented in this paper we can reach the following conclusions:
The water of Lake Shkodra are rich in phosphorus. From the high content of all P forms it turns out that Shiroka is the most polluted point of the lake. Shkodra Lake presents variability in phosphorus content in water in relation to the place and time of sampling. Water samples taken in September have the highest DNP content at all three points compared to other forms of P. This was not observed in the May samples. While PNP had higher values in the samples of May than those of September. PRP generally stood at small values.

RERERENCES

APHA, AWWA, WPCF, 1989: Standard methods for examination of water and wastewater.
17- th Edition. Washington D. **Citation on the paper: (APHA, 1989).**
LISA RÖNSPIEß & GÜNTHER NAUSCH:2018 Colorimetric Chemical Differentiation and Detection of Phosphorus in Eutrophic and High Particulate Waters: Advantages of a New Monitoring Approach Front. Mar. Sci., 19 June 2018
| https://doi.org/10.3389/fmars.2018.00212 Lisa Rönspieß, Günther Nausch.
Citation on the paper: LISA RÖNSPIEß & GÜNTHER NAUSCH:2018
J.L. KOVAR & G.M. PIERZYNSKI:2009 Methods of Phosphorus Analysis for Soils, Sediments,Residuals, and Waters Second Edition Southern Cooperative Series Bulletin No. 408 June, 2009. ISBN:1-58161-408x
Citation on the paper: (PIERZYNSKI, 2009)
OECD (1982). *Eutrophication of Waters: Monitoring. Assessment and Control*. Paris: Organisation for Economic Co-Operation and Development (Publié en français sous le titre "Eutrophication des Eaux. Méthodes de Surveillance, d'Evaluation et de Lutte"). **Citation on the paper: OECD, (1982).**
ANONIM:1984 Hidrologjia e Shqipwrisw. Tërwsia ujore, Liqeni i Shkodrës- Lumi Drin-Lumi Buna, Instituti Hidrometeorologjik, Tiranw.
Citation on the paper: ANONIM, (1984)
RICKLEFS:1993 Why phosphorus important. [on line] www.water-research.net/phosphate.htm. **Citation on the paper: RICKLEFS, (1993)**
OWRB. (2018). *Standard Operating Procedure for the Collection of Water Quality Samples in Lakes*. Oklahoma City: OWRB. U.S. Environmental Protection Agency. (1997). Method 445.0 In Vitro Determination of Chlorophyll a and Pheophytin a in Marine and Freshwater Algae by Fluorescence. Cincinnati, Ohio: National Exposure Research Laboratory, Office of Research and Development.
Citation on the paper: OWRB (2018).
Fagbohun A. B.*, Oluwasanmi A. O. and Olaitan O. J. SPECTROPHOTOMETRIC ANALYSIS OFDISSOLVED PHOSPHATES IN WATER: CASE STUDY OF RIVERS

IN SAGAMU TOWNSHIP Volume 6, Issue 7, 32-38 ISSN 2278 – 4357
Citation on the paper: (EPA 2015; Hochanadel 2010).
EPA.(2015) Nutrient Pollution. Cited Jan 27th, 2016.
http.//www.epa.gov/nutrientpollution/problem
Citation on the paper: (EPA. 2015)
Hochanadel Dave (2010). Limited amount of total phosphorous actually feeds algae, study funds. Lake scientist. Retrieve, June 10: 2012.
Citation on the paper: (Hochanadel, 2010)

ASSESSMENT OF THE SITUATION OF ENDANGERED MARKET FISH POPULATIONS IN SHKODRA LAKE

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Abstract

Fishes are the component that performs the transport of nutrients in the pelagic of the Lake Shkodra. They constitute one of the few links of the food chains, which in food regimes is dominated by herbivorous-detrital structures and which contribute to the ecological stability.
Market fishes constitutes the main biomass of the lake fish community, therefore the study of the situation of their populations is important in terms of problems and management, for a sustainable fishing. Situations of fish populations have been studied through the assessment of threatened species (CR, EN, VU), based on declining of catch (IUCN, Version 3.1 of Red List of Threatened Species, 2001 Categories & Criteria). The endangered marked fish species list is comprised by five species, where draws attention *Alburnus scoranza* and *Chondrostoma nassus* with most considerable decrease which shows the high level of risk for these species.
The fishing should be planned in accordance with the lake productivity, licensed for fishing in details by species, as well as controlled in details. More profound studies are needed for these endangered species and about the factors leading to the risk of their existence, such as water regime disturbance, the presence of pollutants, damage of the shore vegetation, erosion and especially illegal fishing.
Keywords - Shkodra Lake, fish market, endangered species, fishing, IUCN.

INTRODUCTION

Shkodra Lake includes a habitat complex that offer favorable conditions in the development of water fauna, in this aspect also the class of fishes as the most important group from the economic point of view. Historically the community of residents around the lake has been quite related to fishing using it as an alternative way for living. The fishing by itself as activity has been developing and growing in numbers. However 2-3 last decades it has been developed very fast and in many cases also outside the criteria,

influencing negatively in the lake fish populations. These fluctuations are reflected also in the fish market reducing some species and addition of some others.
In Shkodra Lake prevails macrophytic vegetation with roots, this because of its conditions and features where most important are superficiality, eutrophication and water clarity (DHORA et al, 2013, 2016). It has been ascertained that Shkodra Lake water quality stays in normal parameters. CARPENTER & COTTINGHAM (1997) in their study gives three main feedbacks that provides that normality:
- By the rise of the temperatures and water level drop, from the end of spring till in at the begining of autumn, a lot of macrophyte vegetation develops. These macrophytes are the main source of the nutrients. For this reason, this feedback has to do with the nutrient content in the water in front of humic production in wetland.
- As can be easily evidenced, in the on the lake shallow shores there are many forest areas, which from the ecological point of view inhibit the development of the macrophytes in the surfaces that are in the shadows. So, there is a feedback of the nutrient content in the water in front of productivity of the coastal forest habitats.
- The main factor in the transfer of nutrients from the coast in the pelagial waters is the fish component. In view of this fact, as a third feedback that enables the stability of lake waters in normal parameters are the structures of the food chain that transfer phosphorus in pelagial in front of biogeochemical mechanisms that inhibit recycling of phosphorus from sediment.
In a wider point of view we can conlude that macrophytes and fishes are the key compounds of Shkodra Lake.
Shkodra lake is characterized by a high resilience. This high resilience is held by slow variables, as long term climateric factors, trophic relationships, habitat structures, nutrient production, nutrient level in sediment, etc. Macrophytes with roots are a slow variable factor that promotes resilience. (DHORA et al, 2016). The transfer of the nutrients from litoral to pelagial is related to the fish food spectrum. The damage of the fish functional group and organic pollutants discharge may bring the loss of ecological resilience.
In this aspect, looking the important position of the fish community in water quality and keeping its parameters in normal levels and in general in its stability and maintenance of the lake resilience, I have realized this study on the marked fish populations situation in Shkodra Lake. The study

has been focused only on the endangered fish market species, assesment of their populations on the base of the fishing falls during 45 years as well as data are provided on water regimes and habitats.

MATERIALS AND METHODS

In this study is used the updated list of Shkodra lake fishes, published by DHORA (2020).

The list of fish market species of Shkodra lake is designed on the base of the market species that are evidenced in the state reports and statistics about the fishing during many decades, in both sides of the lake.

The data on fishing for the years 1986 – 1990 are taken from the archive of former Fishing Enterprise of Shkodra (ANONYMUS/1), while about the fishing for the period 1998 – 2002 from the Agriculture and Food Directorate of Shkodra district and that one of Malesia e Madhe district (ANONYMUS/2). These data are the same with those published by DHORA (2004). The data of the last years are taken from the Organization for Management of Fishing in Shkodra Lake.

There are used also two tables about fishing in Montenegrian part of Shkodra Lake for the period 1947 – 1976 published by STEIN et al. (1981), and also the table on average annual fishing in Montenegrian part of the lake, for several years periods 1937 – 2016 punlished by MARIĆ (2018) .

Biological features of market fish species as feeding, migration, habitats, etc., are taken from TACHOS et al. (2016), KOTTELAT & FREYHOF (2007), FISHBASE.ORG (VERSION 2020), PAVLOVA et al. (2012), POLJAKOV (1958), RAKAJ (1995) etc.

The assesment of the market fish populations situation, especially the endangered ones, is related directly with their ecological role in the stability of water lake quality, and also with the objective for a sustainable fishing in the lake.

The determination of the threat categories of the populations is not so easy to realize, especially in the fish case. During the last two decades the scientists have started to propose alternative criteria, which are related to the determination of population decrease, as reproductive potential, actual levels or exploitations potentials, effects of presented taxa, hybridization, pathogens, pollutants, parasites (SOWINSKA & KOLJEKO, 2019).

To soften this concern IUCN added "VERSION 3.1" in "RED LIST OF THREATENED SPECIES, 2001 CATEGORIES & CRITERIA", that include some from these criterions.

Below are presented, for three categories of endangered species (CR, EN, VU), summarized, Version 3.1, which is related with population reduction, based in actual or potential level of exploitation (fishing), which is used in this study.

Critically endangered (CR)

A taxon is critically endangered when the evidences indicate that it meets the criteria A: Reduction of population, based on actual or potential level of exploitation (d), in these cases:

1. Population decrease by 90% in the last 10 years, where the causes of reduction are clearly reversible
2. Decrease by 80% for 10 last years, where the reduction may have not finished
3. Decrease by 80%, predicted or suspected to be fulfilled inside of the next 10 years.
4. Observed, estimated, finished, predicted or suspected reduction of the population by 80% for every 10 years (till 100 years), where the time period should include the past and the future and where the reduction or ist causes may have not finished.

Endangered (EN)

A taxon is endangered when the evidences indicate that meets the criteria A: The reduction of the population, based on the actual or potential level of exploitation (d), in these cases:

1. Population decrease by 70% in the last 10 years, where the causes of decrease are clearly reversible
2. Decrease by 50% for 10 last years, where the reduction may have not finished
3. Decrease by 50%, predicted or suspected to be fulfilled inside of the next 10 years
4. Observed, estimated, finished, predicted or suspected reduction of the population by 50% for every 10 years (till 100 years), where the time period should include the past and the future and where the reduction or ist causes may have not finished.

Vulnerable (VU)

A taxon is vulnerable when the evidences indicate that meets the criteria A: The reduction of the population, based on the actual or potential level of exploitation (d), in these cases:

1. Population decrease by 50% in the last 10 years, where the causes of decrease are clearly reversible

2. Decrease by 30% for 10 last years, where the reduction may have not finished
3. Decrease by 30%, predicted or suspected to be fulfilled inside of the next 10 years
4. Observed, estimated, finished, predicted or suspected reduction of the population by 30% for every 10 years (till 100 years), where the time period should include the past and the future

The data has been colsulted also with the categories of these species given by IUCN (Red List), FREYHOF (2012), MARIĆ (2018) etc.

RESULTS AND DISCUSSIONS

The list of fish market species of Shkodra Lake

The list presents the fish market species of all Shkodra Lake, for an interval of the last 75 years.

Acipenser naccarii
Acipenser sturio
Alburnoides ohridanus
Alburnus scoranza
Alosa fallax
Anguilla anguilla
Carassius gibelio
Chondrostoma nasus
Chondrostoma scodrense
Ctenopharyngodon idella
Cyprinus carpio
Dicentrarchus labrax
Hypophthalmichthys molitrix
Hypophthalmichthys nobilis
Leucos albus
Leucos basak
Liza ramada
Megalobrama terminalis
Mugil cephalus
Mylopharyngodon piceus
Oncorhynchus mykiss
Pachychilon pictum
Parabramis pekinensis
Perca fluviatilis
Platichthys flesus
Scardinius knezevici
Squalius platyceps
Sander lucioperca

Salmo dentex
Salmo farioides

Two species, *Acipenser naccarii* and *Acipenser sturio* for a long time have become extremely rare and are considered critically endangered CR. For these species there are not found evidences for fishing.

Chondrostoma scodrense may be considered as extinct EX, because have not been found by some decades.

Ctenopharyngodon idella, Hypophthalmichthys molitrix, Hypophthalmichthys nobilis, Megalobrama terminalis, Mylopharyngodon piceus, Parabramis pekinensis are introduced fish species in the lake from '70 years. From some decades, the method of introduction has fallen and is stopped. The population of these species in impossibility of adaption for natural reproduction, have suffered fall and actually are almost extinct.

Only the species *Carassius gibelio* is adapted very well and is an important market fish.

Sander lucioperca is not found during fishing from many years. This species is found in Grizhë village, in a reservoir near the lake and this fact has been published by DHORA & HYSA (2000).

Leucos albus lives in the downstream of Moraça river in Montenegro and is considered vulnerable VU.

Biological features of endangered fish market species that are taken in the study

Legend:

Feeding	Insectivores	INSV
	Omnivores	OMNI
	Piscivorous	PISC
Migration	Long distance	LONG
	Potamodrom	POTAD
Reproduction	Lithophilic	LIT
	Phytophilic	PHY
Feeding habitat	Benthic	BENT
	Water column	WC

Table 1. Biological features of most important endangered fish market species in Shkodra Lake

Species	Feeding	Migration	Reproduction	Feeding habitat
Alburnoides ohridanus	INSV	----	LIT	WC
Alburnus scoranza	OMNI	----	LIT	WC
Chondrostoma nasus	OMNI	POTAD	LIT	BENT
Dicentrarchus labrax	PISC	LONG	----	WC
Platichthys flesus	PISC	LONG	----	

As can be seen, from 5 endangered fish market species, two are omnivores (OMNI). But this designation is much relative, because it depends by what the lake offer, and also by the feeding specific characteristics of fish species.

It can be noted that feeding diet of the lake fishes are dominated by the herbivore – detritic structures. This is related to the important role that have the populations of these fishes as macrophyte consumers and the distributors of the nutrients in pelagial.

In the other side, the first link, herbs and detrit, are used as food by herbivore and detritivore fishes, further with these fishes feed piscivorous fishes and birds. As it can be seen, this food chain has three links and this small number, based in CARPENTER et al. (1992), is considered as an important factor that affect in the maintenance of stability and hagh resilience of Shkodra Lake.

The detrit by itself, that is produced by macrophytes, constitute the food base of *Chondrostoma nassus*, but also as a food base for bentic invertebrates, with whom feed different fish species and many from juvenile forms of different species.

Some species are planktivores and as most important is *Alburnus scoranza*, also some other piscivorous where can be mention *Dicentrarchus labrax*.

The fishing of endangered fish market species in Shkodra Lake

Table 2. Fishing (in quintal) of *Alburnus scoranza* in Shkodra Lake, 1986 – 1990.

Species	1986	1987	1988	1989	1990
Alburnus scoranza	1429	1721	2132	3574	3591

Table 3. Fishing (in quintal) of *Alburnus scoranza* In Shkodra Lake, for 1998 – 2011.

Species	1998	1999	2000	2001	2002	2005	2007-11 every year
Alburnus scoranza	1700	1590	1210	700	650	530	700

Table 4. Fishing (in quintal) of *Alburnus scoranza* in Shkodra Lake, for 2017 – 2020.

Species	2017	2018	2019	2020
Alburnus scoranza	177	150	85	150

Table 5. Maximum and average by year, for three years periods, fishing (in ton), endangered fish market species in Montenegrian part of Shkodra Lake (MARIĆ 2018).

Period	A. scoranza	C. nassus
1937–1940	246	45
1947–1951	442	81
1952–1956	556	100
1957–1961	605	78
1962–1966	424	48
1967–1971	564	31
1972–1976	365	5
1977–1981	228	1.6
1982–1986	97	0.5
1987–1991	200	0.5
1997–2001	200	0
2002–2016	150	0
Maks/vit	811	227

The common nase, *Chondrostoma nasus* till the year 1970 the fishing was some hundreds of quintals. After that it was a rapid decrease, as much as every 10 years it has been reduced beyond that provides IUCN 200, version 3.1, on determination of the category CR, based on fishing, and further decrease is predicted that goes towards extinct EX.

The bleak *Alburnus scoranza* fishing in 1990 was 3591 quintals. In 2000 respectively 1210 quintals. So it is found that for 10 years it was a decrease by 66,4 % and for this reason it is defined very near EN. From 2001 till today there has been a decrease of 700 – 80 quintals. In 2012 fishing was 700 quintals, so with decrease of 42 % for 10 years, so again assessed near EN. In 2020 the fishing was 150 quintals, so comparing with 10 years before with a decrease of 78%, so endangered even more, which is very near with critical endangered, CR. In Montenegrian part the numbers for these three decades has moved from 2000, 2000, 1500 quintals, when four

decades before the fishing was 3430 – 6700 quintals, while for all the lake the fishing was calculated till 9000 quintals.
Some other fish species as *Alburnoides ohridanus, Chondrostoma nasus, Dicentrarchus labrax, Leucos basak, Oncorhynchus mykiss, Pachychilon pictum, Platichthys flesus, Scardinius knezevici, Squalius platyceps, Salmo dentex, Salmo farioides*, till in 2005 is decreased as population reflected in fishing till approximately 300 kv, and this low number because of the decrease of the fishing of *Alburnoides ohridanus, Chondrostoma nasus, Dicentrarchus labrax, Platichthys flesus*. Further fishing has increased, while these four last years the fishing goes about 5000 qunitals, for which as the key factor may be the increase of the fishing of Albanian roach *Leucos basak*.

Table 6. The endangered categories of most important fish market species of Shkodra Lake

Species	Based: Red List IUCN
Alburnoides ohridanus	VU
Alburnus scoranza	CR
Chondrostoma nasus	CR
Dicentrarchus labrax	CR
Platichthys flessus	CR

CONCLUSIONS

Shkodra Lake bleak *Alburnus scoranza* is quite endangered, so fishing should be limited applying rigorously the age and rules. May be as a better solution in such situation could be the ban of fishing for two years.
The biology of common nase *Chondrostoma nassus* should be studied deeply and in more details, especially migration and reproduction. On this base can be worked towards the return of this species in the lake.
The management of the lake should be realized favoring its natural characteristics. Also should be monitored the factors leading in negative developments. Such are the damage of water regime, pollutants, damage of coastal vegetation, erosion and especially illegal fishing.

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REFERENCES

ANONYMUS/1: Statistics of fishing in Shkodra Lake from Shkodra Fishing Enterprise for the years 1986 – 1990. Archive of Shkodra Fishing Enterprise.
Citation on the paper: ANONYMUS/1
ANONYMUS/2: Statistics of fishing in Shkodra Lake for the years 1998 – 2002. Directorate of Agriculture and Food, Shkoder. Directorate of Agriculture and Food, Malësia e Madhe.
Citation on the paper: ANONYMUS/2
CARPENTER, S. R., KRAFT, C. E., WRIGHT, R., HE, X., SORANNO, P. A. & HODGSON, J. R. 1992: Resilience and resistance of a Lake phosphorus cycle before and after food web manipulation. The American Naturalist, Vol. 140, No. 5: 781-798.
Citation of the paper: CARPENTER, et al. (1992)
CARPENTER, S. R. & COTTINGHAM, K. L. 1997: Resilience and restoration of lakes. Conservation Ecology [online], 1(1): 2. http://www.consecol.org/vol1/iss1/art2/
Citation on the paper: CARPENTER, S. R. & COTTINGHAM, K. L. (1997)
DHORA, DH. 2004: Vlerësimi i popullatave dhe menaxhimi i resurseve të peshqve më të rëndësishëm të liqenit të Shkodrës. Buletin Shkencor i Universitetit të Shkodrës "Luigj Gurakuqi", Nr. 54, Seria e Shkencave të Natyrës, 118 – 125.
Citation on the paper: DHORA, DH. (2004)
DHORA, DH. 2020: Listat e përditësuara të specieve të peshqëve të ujërave të ëmbël të Shqipërisë. Buletin Shkencor Nr. 70 / Seria e Shkencave Natyrore, fq. 46 – 74.
Citation on the paper: DHORA, DH. (2020)
DHORA & HYSA 2000: Peshku *Stzostedion lucioperca* (LINE 1758) në Liqenin e Shkodrës. Botim i Sektorit BIO & EKO të Liqenit të Shkodrës. Universiteti i Shkodrës "Luigj Gurakuqi", fq 19-21.
Citation on the paper: DHORA & HYSA (2000)
DHORA, DH., BEKTESHI, A. & RAKAJ, M. 2013: A new concept for recognizing of the eutrophication phenomenon in Lake Shkodra. Buletin Shkencor i USh "Luigj Gurakuqi", Nr. 63, Seria e Shkencave të Natyrës, fq. 66 – 84.
Citation on the paper: DHORA, et al. (2013)
FREYHOF, J. 2012: Threatened freshwater fishes and mollusks of the Balkan. Potential impact of hydropower projects. Unpublished raport, ECA Watch Austria & Euronatur, 81 pp.
Citation on the paper: FREYHOF (2012)
FISHBASE.ORG (VERSION 2020).
Citation on the paper: FISHBASE.ORG (VERSION 2020)
KNEŽEVIĆ, B. 1981: Fishes of Lake Skadar, General introduction. In: Biota and limnology of Lake Skadar, ed S. G. Karaman & M. A. Beeton. Institut for Biological and Medica Research in Montenegro, p. 311. Titograd.
Citation on the paper: KNEŽEVIĆ (1981)

KOTTELAT, M. & FREYHOF, J. 2007: Handbook of European freshwater fishes. Cornol, Switzerland. 646 p.
Citation on the paper: KOTTELAT & FREYHOF (2007)
MARIĆ, D. 2018: The Ichthyofauna of Lake Skadar/Shkodra: Diversity, economic significance, condition, and conservation status. The Skadar/Shkodra Lake Environment. Hdb Env Chem, 80: 363–382. ©Springer International Publishing AG 2018
Citation on the paper: MARIĆ (2018)
PAVLOVA, M., MILOSEVIC, D., TALEVSKA, A., PEHLIVANOV, L. & TALEVSKI, T. 2012: Structure and Functioning of Food Webs in the Fish Communities of the Ohrid, Prespa and Skadar lakes – a Qualitative Modelling Approach. BALWOIS 2012 - Ohrid, Republic of Macedonia - 28 May, 2 June 2012
Citation on the paper: PAVLOVA, et al. (2012)
POLJAKOV, G. D., FILIPI, N. & BASHO, K. 1958: Peshqit e Shqipërisë. UShT, Tiranë.
Citation on the paper: POLJAKOV, et al. (1958)
RAKAJ, N. 1995: Iktiofauna e Shqipërisë. ShBLU, Tiranë.
Citation on the paper: RAKAJ (1995)
SOWINSKA, B. & KOLJEKO, M. 2019: Extinction risk to lake monow (*Eupallasella percnurus*) due to habitat loss: Eastern Poland case study.. Environmental Monitoring and assessment, vol. 191, art. Numb. 571.
Citation on the paper: SOWINSKA & KOLJEKO (2019)
STEIN, R. A., MECOM, J. O. & IVANOVIC, B. 1981: Comercial explotation of fish stocks in Lake Skadar, 1947 – 1976. In: Biota and limnology of Lake Skadar. Ed. S. G. Karaman & M. A. Beeton. Institut for Biological and Medica Research in Montenegro, p. 343 – 354. Titograd.
Citation on the paper: STEIN, et al. (1981)
TACHOS, V., ZOGARIS, S., OIKONOMOU, E. & ECONOMOU, A. N. Dec 2016: Fitting a new assessment system for rivers in Greece using fish fauna to the results of the Med Gig - Annex Report. Unpublished Annex Report submitted to Wg Ecostat through the Special Secretariat for Water, Hellenic Ministry of Environment and Energy. Institute of Marine Biological Resources and Inland Waters, HCMR, Athens. 34 p.
Citation on the paper: TACHOS, et al. (2016)
The IUCN Red List of Threatened Species. 2001 Categories & Criteria (version 3.1) http://www.redlist.org/info/categories_criteria2001.html
Citation on the paper: IUCN Red List (2001)

MICROBIOLOGICAL INVESTIGATIONS FOR *ESCHERICHIA COLI* AND *ENTEROCOCCUS FAECALIS* IN SOME POINTS OF VAU DEJES LAKE AND LAKE SHKODRA

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ABSTRACT

Vau Dejes Lake is located just a few kilometers away from the city center of Shkodra and was built up using the Drini River Reserve with the construction of Vau Dejes hydropower plant. Vau Dejes Lake has an area of 24.7 km^2, with a maximum depth of 52 meters, formed by the Drini River catchment in 1971, where Vau Dejes hydropower plant was built. Vau Dejes Lake is used not only for various opportunities for tourists offering various excursions, but this lake is used also for bathing in its fresh and clean waters. Vau Dejes lake is used for transport, fishing, and tourism meanwhile Lake Shkodra is one of the lakes that is exposed to various sources of pollution, which are related to wastewater discharge, industrial and urban pollution, agricultural activities, etc. It was considered reasonable to study the microbiological quality of some points in Vau Dejes lake compared to Lake Shkodra, which has been the subject of studies by many scientists, since these lakes are often used for bathing. Surface water monitoring for the presence of pathogenic bacteria like *Escherichia coli* and *Enterococcus faecalis* is essential assessment of water quality, which directly or indirectly use leads to serious health problems of man. This study provides an assessment of the water quality status of Lake Vau Dejes and Lake Shkodra. The water quality assessment was carried out in accordance with Directives 76/160/EEC and 2006/7/EC of the European Parliament. *Escherichia coli* and *Enterococcus faecalis* were identified in accordance with these Directives. This study was conducted at the Center for Microbiological Diagnostication "Wolfdieter Sixl", at the University of Shkodra "Luigj Gurakuqi".

Keywords: *Escherichia coli. Intestinal enterococci*, bathing, wastewater discharge etc.

INTRODUCTION

Lake Shkodra and Vau Dejes lake are used for bathing, fishing, tourism and expedites' from different people but in some cases these lakes are exposed to various sources of pollutions, which are related to restaurants and agricultural activities, wastewater discharge, industrial and urban pollution etc. It was considered reasonable to monitor the microbiological quality of surface waters for *Escherichia coli* and *Enterococcus faecalis* in some points in Vau Dejes lake like; Koman, Drini, Stone Neck, Vau i Dejes and Restaurant Perla, compared to Shiroka and Zogaj part of Lake Shkodra, which have been the subject of studies by many scientists, since these lakes are often used for bathing. According to (BUSHATI. N., 2013), in terms of the trend *Escherichia coli* parameter has had the same progress over the years 2001-2009, while the *Enterococcus faecalis/Intestinal enterococci* parameter has experienced a slight increase over the years in Shkodra Lake and Drini River. Pathogenic organisms are normal components of all ecosystems, but microbiological contamination with fecal bacteria subsequent to anthropogenic activity is considered to be a crucial issue throughout the rivers and especially in the Drin River. Drin river water is used by people for fishing, swimming and irrigation of plants and the pollution of this river is a problematic issue in environment and human health. (BUSHATI. L., 2014) In addition to anthropogenic pollution, effluent generated by the industries, livestock, precipitations etc. are sources of pollution. According to World Health Organization mortality caused by diseases directly or indirectly related to water exceeds 5 million people per year. Two and a half billion people have no minimum hygiene conditions, and more than 1.5 million children die each year from diarrheal diseases. *Escherichia coli* and *Enterococcus faecalis* are resources for faecal contamination and increased confidence in the absence or presence of pathogens present in wastewater. (International Standard ISO 9308-2 was prepared by Technical Committee ISO/TC 147, Water quality). Pollution of our water bodies poses a great threat to humans and the aquatic ecosystem while marked population increase catalyzes climatic changes. (PALMATE. SS., 2017) Anthropogenic factors affecting water quality include impacts due to agriculture, use of fertilizers, manures and pesticides, animal husbandry activities, inefficient irrigation practices, deforestation of woods, aquaculture, pollution due to industrial effluents and domestic sewage, mining, and recreational activities. These anthropogenic influences cause elevated concentrations of heavy metals, mercury, coliforms and nutrient loads (KHATRI. N., 2014). Monitoring for

the presence of pathogen bacteria are essential water quality assessment, which directly or indirectly leads to serious problems to human health. *Enterococcus faecalis is* an indicator of an old faecal pollution (EN ISO 7899-2, 2000). The European Community (2006) recommended the following parameters: *Escherichia coli*/100 ml (500/1.000), and *Intestinal enterococci*/100 ml (200/400) categorized in the class A and B. Urban wastewaters are major sources for surface and groundwater pollution in the Shkodra lake basin.

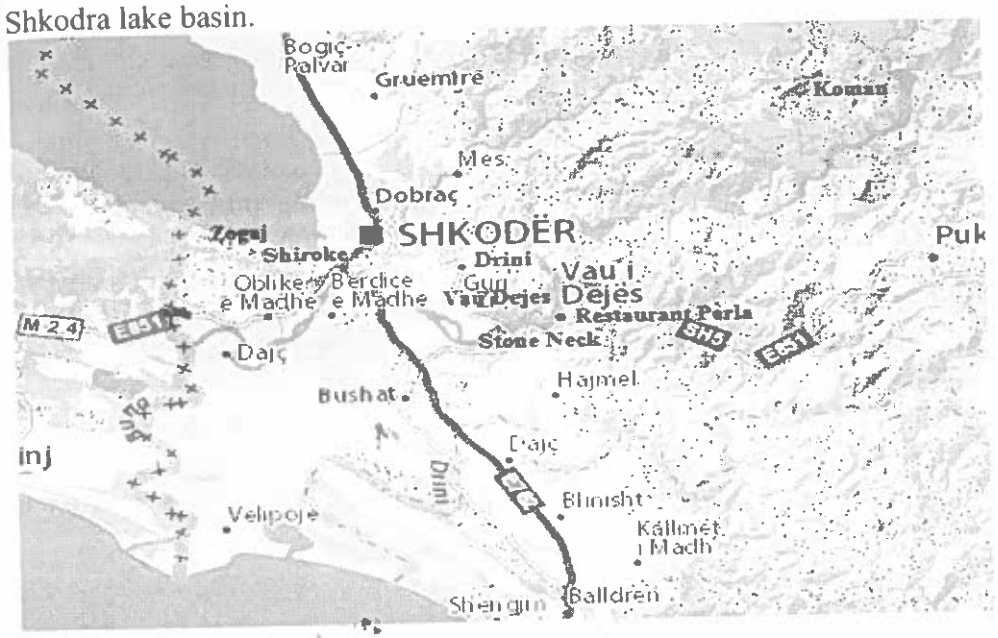


Fig. 1: P hoto from Google Map

Sampling sites: Drini, Vau Dejes, Stone Neck, Restaurant Perla, Koman, Shirokë and Zogaj

MATERIALS AND METHODS

Water samples from surface water were taken at five different points in Vau Dejes: Koman, Drini, Stone Neck, Vau Dejes and Restaurant Perla, while in Lake Shkodra water samples were taken in Shiroka and Zogaj points. (Fig. 1- Map of sampling points). Sampling was performed during the period of May, July and September 2021. Water samples were analyzed for bacteriological parameters such as: *Escherichia coli and Enterococcus faecalis.* Sampling points were selected based on anthropogenic factors of Lake Vau Dejes and Lake Shkodra. Techniques and methods of analysis

are done in accordance with standard norms. (ANNONYMUS 3, 1996), (APHA-AWWA-AWF 1995). Sampling was realized in sterile conditions at five different points of Lake Vau Dejes: 1) Drini, 2) Vau Dejes, 3) Stone Neck, 4) Restaurant Perla, 5) Koman as well as at two points of Lake Shkodra, Shiroka and Zogaj, Fig. 1.Water samples were taken in sterile 250 ml bottles, indicating the date and place of sampling. Samples were taken at depth of 30-50 cm from surface waters. The sampling period was May, July and September 2021. The samples were stored and transported in thermo boxes equipped with ammonia plates. The method applied was the method recommended by (APHA-AWWA-AWF 1995). European recommendations and WHO (World Health Organization) helped in a standard analysis. ISO 8199, (1987); ISO 8199, (1988); ISO 5667-2, (1995); ISO 7704, (1985) helped conduct sampling properly and water samples. American Public Health Association (APHA), (1992) recommended use of membrane filtration method where incubation temperature is 37ºC/44ºC and incubation time 48 hours. An appropriate volume of a water sample (100 mL water) was filtered through a 0.45-µm pore size nitrocellulose membrane filter that retains the bacteria present in the sample. Nitrocellulose membranes were placed than in the Endo-Agar, for 48 hours, temp 44ºC for *Escherichia coli*, while in the Chromogenic Enterococcus faecium lab agar base at temp 37ºC, for 24 hours was detected *Enterococcus faecalis*.

RESULTS AND DISCUSSIONS

Microbiological investigations for *Escherichia coli* and *Enterococcus faecalis* was carried out from May, July and September 2021. In the figure 2-a, the Stone Neck is presented with the highest load of *Enterococcus faecalis* for 100 ml of water. Based on the new Directive 2006/7/EC for surface water (table.1) the water at the sampling point Stone Neck is classified as sufficient quality with 466 CFU/100 ml, which classifies the water in class C at this point, while the other sampling points result as quality very good with a load lower than 200 CFU/100 ml, which classifies them as cleanliness waters. In the fig 2-b, for the month July 2021 the point of Stone Neck was presented with the highest load in terms of *Enterococcus faecalis* for 100 ml of water with 476 CFU/100 ml compared to other sampling points. Based on the new Directive 2006/7/EC for surface water (table.1) the water at the sampling point Stone neck is classified between good and sufficient quality, which classifies the water at class C and D at this point, while the other sampling points result as very good

quality with a load lower than 210 CFU/100 ml which classifies them as pure water belonging to class A. The fig 2-c show the histogram for *Enterococcus faecalis*, which has decreased in terms of bacterial loading for the month September 2021 by classifying it in class A for very good surface water quality.

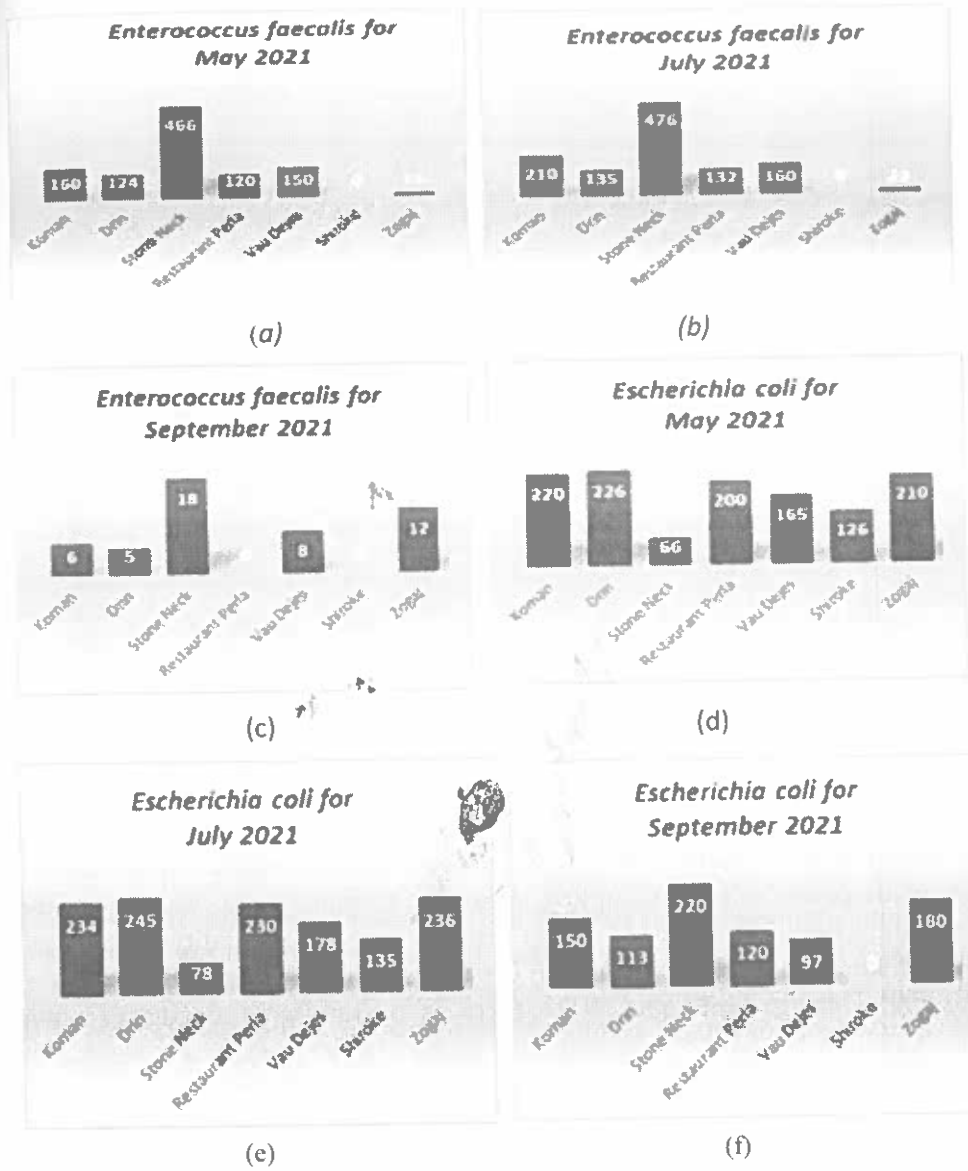
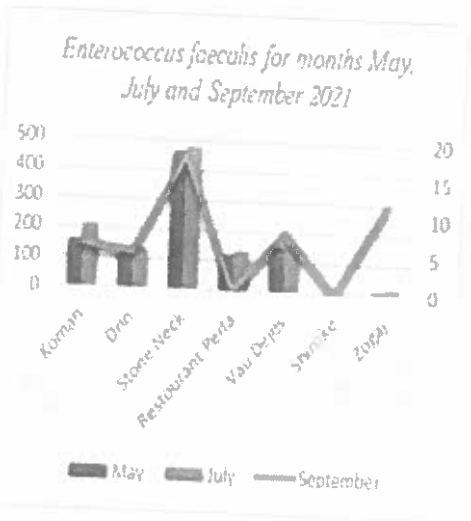


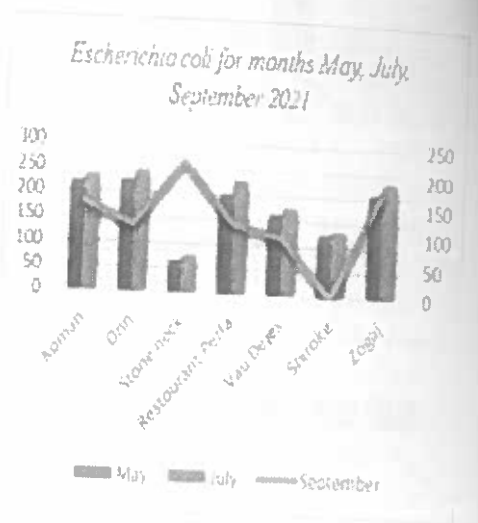
Fig. 2 a-f: Graphics with microbiological parameters for Escherichia coli and Enterococcus intestinalis

According to the microbiological results for *Escherichia coli* parameter in the figure 2-d,e,f based on the new Directive 2006/7/EC of surface water for *Escherichia coli* these waters are all classified as cleanliness for months May, July and September 2021. They belong to the Class A_on the new Directive 2006/7/EC (table.1) for surface waters while all samples result in bacterial load less than 500 CFU/100 ml.

Fig. 3g-h: Graphics with microbiological parameters for Escherichia coli and Enterococcus intestinalis for months May, July and September 2021



(g)



(h)

Based on Directive 2006/7/EC for surface water (table.1) water at the Stone Neck sampling point for May and July for *Enterococcus faecalis* is classified as good quality, which classifies waters in class B at this point fig 3.g, while points in other sampling sites like: Koman, Drini, Vau Dejes and Restaurant Perla, Shiroka and Zogaj result as very good quality with a load lower than 200 CFU/100 ml, which classifies them as cleanliness waters or class A. During September 2021 there is a significant decrease in the bacterial load for *Escherichia coli* and *Enterococcus faecalis fig. 3g-h*. The low bacterial loads that appear for the month of September indicate a very good quality of surface waters that have been taken in Lake Vau Dejes and Lake Shkodra. Waters for September 2021 are classified as very good quality or class A.

Table 1. Directive 2006/7/EC for inland waters for *Intestinal enterococci* and *Escherichia coli*

Intestinal enterococci Directive 2006/7/EC for inland waters					
1.	***A***	***B***	***C***	***D***	***E***
	Parameter	***Excellent quality***	***Good quality***	***Sufficient***	***Reference methods of analysis***
	Intestinal enterococci (cfu/100ml)	*200 cfu/100ml*	*400 cfu/100ml*	*330 cfu/100ml*	*ISO 7899-1 or ISO 7899-2*
Escherichia coli Directive 2006/7/EC for inland waters					
2.	***A***	***B***	***C***	***D***	***E***
	Parameter	***Excellent quality***	***Good quality***	***Sufficient***	***Reference methods of analysis***
	Escherichia coli (cfu/100ml)	*500(cfu/100m)*	*1000(cfu/100ml)*	*900 (cfu/100ml)*	*ISO 9308-3 or ISO 9308-1*

CONCLUSIONS

According to the microbiological parameters analysed and EU-Directive for surface waters (Quality of Bathing Waters, Directive 2006/7/EC) for *Enterococcus faecalis* the most polluted samples in Vau Dejes lake result Stone Neck with 466 CFU/100 ml in May and 476 CFU/100 ml in July, meanwhile there is an decrease of *Enterococcus faecalis* in this point in September. Sources of *Enterococcus faecalis* in recreational waters include: sewage, agricultural, populated urban area, boats, restaurants which contribute mainly in summer period in water pollution etc. The main factor for *Enterococcus faecalis* is also the favorable temperature of waters during the summer period. Stone Neck is classified as sufficient quality, which classifies the water in class C at this point, while the other sampling points result as quality very good with a bacterial load lower than 200 CFU/100 ml, which classifies them as cleanliness waters. According to the microbiological results for *Escherichia coli* parameter based on the new Directive 2006/7/EC of surface water for *Escherichia coli* these waters are

all classified as cleanliness for months May, July and September 2021. They belong to the Class A on the new Directive 2006/7/EC for surface waters because all samples result in bacterial load less than 500 CFU/100 ml for *Escherichia coli*. From the results taken during our study we can conclude that all sampling points of waters are classified in Class A with new Directive 2006/7/EC for surface waters.

REFERENCES

AMERICAN PUBLIC HEALTH ASSOCIATION (APHA). 1992. Standard methods for the examination of water and wastewater. 18th American Public Health Association, Washington, DC.

APHA, AWWA, and WEF 1995. Standard Methods for the Examination of Water and Wastewater, 17th Edition. American Public Health Association (APHA),American Waterworks Association (AWWA), and Water Environment Association (WEF).Washington, DC.

BUSHATI. N., 2013. Doctorate thesis. Assessment of water quality of Shkodra lake and Drini and Buna rivers through microbiological and physico-chemical analyses (Albanian part). University of Tirana 2013.

BUSHATI. L., HYSKO. M., 2014. Microbial Water Pollution of Drin River in Scutary Area, Albania. Albanian j. agric. sci. 2014; (Special edition).

DIRECTIVE 2006/7/EC OF THE EUROPIAN PARLIAMENT AND OF THE COUNCIL of 15 February 2006 concerning the management of bathing water quality THE MANAGEMENT OF BATHING WATER QUALITY AND REPEALING Directive 76/160/EEC, L64/37.

DRAFT INTERNATIONAL STANDARD ISO/DIS 8199, ISO/TC 147, Water quality, General guide to the enumeration of microorganisms by culture. International Organization for Standardization, 1986 prepared by Technical Committee ISO/TC 147.

INTERNATIONAL STANDARD ISO 9308-1:2000, was prepared by technical Commitee ISO/TC 147, SC 4. Water quality-Detection and enumeration of Escherichia coli and coliform bacteria, Part 1: Membrane filtration method, International Organization for Standardization 1996.

INTERNATIONAL STANDARD ISO 9308-2, first edition 1990-10-01, Water quality – Detection and enumeration of coliform organisms, thermotolerant coliform organism and presumptive Escherichia coli, Part 2: Multiple tube (most probable numer) method. International Standard ISO 9308-2 was prepared by Technical Committee ISO/TC 147, Water quality.

KHATRI. N., & TYAGI. S., 2014. Influences of natural and anthropogenic factors on surface and groundwater quality in rural and urban areas. Frontiers in Life Science Volume 8, 2015 - Issue1
https://doi.org/10.1080/21553769.2014.933716

LAKE SHKODER TRANSBOUNDARY DIAGNOSTICS ANALYSIS, ALBANIA & MONTENEGRO WORLD BANK (IBRD), 20 April 2006, Final.

PALMATE SS, PANDEY A, KUMAR D, PANDEY RP, MISHRA SK. Climate change impact on forest cover and vegetation in Betwa basin, India. Applied Water Science. 2017; 7; 1 – 12.

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