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HYDRO-GEOGRAPHICAL EVALUATION AND DEVELOPMENT POTENTIAL OF WATER RESOURCES IN THE NORTHEASTERN REGION OF THE REPUBLIC OF MONTENEGRO

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ABSTRACT

This paper explores the hydro-geographical characteristics and development potential of surface water resources in the northeastern region of the Republic of Montenegro. Focusing on an area of 2,557 km², the study emphasizes the environmental, economic, and socio-cultural importance of rivers, streams, and springs within this relatively underdeveloped mountainous landscape. Drawing from descriptive regional geography and thematic literature, the paper discusses the spatial distribution of watercourses, seasonal flow variations, and the qualitative aspects of local water sources. Particular attention is given to the ways in which traditional settlements and agricultural practices are shaped by proximity to water. In addition, the study reflects on the challenges posed by pollution, insufficient infrastructure, and the effects of demographic and economic decline. The author advocates for a sustainable and integrative water management strategy that aligns environmental preservation with regional development goals. While the methodology is primarily qualitative and discursive, the paper contributes to a better understanding of water's multifaceted role in shaping rural geographies in southeastern Europe.

Complex use of water resources as a factor of development requires the development of strategies for their use planning. Creating a strategy for the use of water resources as a factor of development, must respect technological, economic, social and political aspects.

Keywords: Water resources management, Northeastern Montenegro, Hydro-geographical analysis, Surface and groundwater, Sustainable development, Lim River basin.

INTRODUCTION

On the way to membership in the European Union Montenegro face a number of challenges which in scope and complexity, the fundamental role of solving problems in the field of environmental protection and sustainable management of water resources (Goran and Jelisavka, 2016; Jelisavka and Goran, 2018).

The low cost of water often encourages wasteful and uneconomical usage. As a result, water is consumed irrationally and frequently polluted without regard for environmental consequences. This pattern of irrational and wasteful water use significantly contributes to the rise of non-revenue water (NRW), representing substantial losses for utilities through leakage, theft, and unbilled consumption (Hariri Asli and Hozouri, 2021)

In addition, it is important to pay close attention to economic development, sustainable and efficient water management system (Faye, 2016; Jayasena et al., 2021; Kezzar and Souar, 2024), optimizing the management of drinking water supply networks (Boutebba et al., 2014; Berrezel et al., 2023), and monitor the growth of individual standard, which causing an increase of water consumption, and this leads to increasing investment to protect water quality and quantity (Bouchemal and Achour, 2015), as well as monitoring and optimizing drinking water treatment processes (Achour and Chabbi, 2014). On the other hand, agricultural resources, economic assets, key buildings, and critical infrastructure represent areas that require a higher degree of protection against water and flooding (Boulghobra, 2013; Jelisavka et al., 2019; Benslimane et al., 2020; Aroua, 2020; Ben Said et al., 2024). In the process of economic development water resources is one of the basic elements, which offer limited and for which there is no substitution (replacement) in the development of life processes (Group author, 2005; Boubou-Bouziani, 2015; Aroua, 2018). A sustainable long-term city development plan must be intrinsically linked to a comprehensive water strategy, as the availability, management, and protection of water resources are fundamental to urban resilience and growth (Aroua, 2022; Aroua, 2023).

Wastewater reuse presents a compelling opportunity to address growing water scarcity, yet it also poses significant challenges related to public health, infrastructure, regulatory frameworks, and societal acceptance—factors that must be carefully balanced to ensure safe and sustainable implementation (El Hmaidi et al., 2015; Aroua-Berkat and Aroua, 2022; Zaidi et al., 2023)

The water crisis is reflected in a range of issues, most notably through the following problems: (1) Increasing difficulty in providing adequate quantities of water for all types of use, especially under the effects of climate change (Ouis, 2012; Nichane and Khelil, 2015; Ouhamdouch et al., 2016; Nakou et al., 2023; Chadee et al., 2023), (2) Intensifying challenges in protecting against the harmful effects of water, such as flooding (Ezz, 2025), erosion (Riahi et al., 2020; Chabokpour and Azamathulla, 2025), waterborne diseases (Baba Hamed, 2021; Ihsan and Derosya, 2024; Khodaparast et al., 2024), salinization (Abdeslam et al., 2019; Shokri et al., 2024), (3) Heightened risks to human health and the environment due to water pollution (Djabri et al., 2015; Lin et al., 2022), and the degradation of aquatic ecosystems. The degradation of aquatic ecosystems is increasingly

linked to marine pollution caused by the discharge of hypersaline brine from desalination processes, which alters salinity levels, disrupts marine biodiversity, and threatens the delicate balance of coastal environments (Ugrinov and Stojanov, 2012; Belkacem et al., 2017; Amitouche et al., 2017).

The last decade of the last century was marked by the awakening of environmental awareness, the implementation of complex measures to protect the environment and create a new philosophical approach to the use of water resources in the further development of civilization (Zerkaoui et al., 2016; Remini, 2020a; 2020b). Launched on the model of 'sustainable development" (Petković, 2001). Geography uses the results of hydrological research, because the water in the man's activities has varied use water for drinking and personal hygiene, food source (fish) for the preparation of food (Bulatović and Rajović, 2002a; 2002b), housing and urban hygiene, in agriculture (Hamimed et al., 2017), in transport, in industry, in energy for recreation and tourism.

In order to could evaluate the quantity and quality of available water resources in this part of north-eastern Montenegro, great importance should be given the real and complex assessment of water resources in the geographical context of its exploitation and use (Rajović and Bulatović, 2012). However, water resources are not that represent a permanent support of economic development, than just the base for appropriate selection of production orientation. Complex use of water resources as a factor of development requires the development of strategies for their use planning. Creating a strategy for the use of water resources as a factor of development, must respect technological, economic, social and political aspects.

RESEARCH METHODOLOGY

This research aims to provide a review of the hydro-geographical values northeastern Montenegro. Objective of this study it was possible to realize the combined use of different research methods. The core methodological procedure used in this study is the geographic (spatial) method, whose scope of research has related to the municipality Berane, Andrijevica and Plav. It is in fact geographical unit which comprises 10.8 % of the total area of Montenegro (13.812 km²), that is, living in the territory, 8.12% (54.658 population) of the population compared to the total population of Montenegro in 2003 (673.094) (Rajović and Bulatović, 2013; Rajović and Bulatović, 2013). Place in the research I have found their following methods: descriptive, a causal, comparative method and theoretical analysis. Descriptive and causal methods were used to detect the cause consequential link between the territorial distribution and the quantitative and qualitative characteristics of water resources. Methods of theoretical analysis encompassed theoretical basis of the research. The combination of these methods it is possible to validly defined achieve the research goals, which refers to the basic hydro-geographical values in northeastern Montenegro, for example, the municipality Berane, Andrijevica and Plav. For of data collection related to the analysis of basic hydrologic parameters, we used the statistical method, i.e., the data Hydrometeorological Office of Montenegro (HMOM, 1993). Were studied and written documents on the internet. In the scientific explanation

of terms, have applied the two methods are used: the method of analysis and synthesis methods. The method of analysis we were able to deconstructed the complex notions and courts in research and bring out conclusions as to their simpler components and elements. Synthesis methods included is way of systematization of knowledge according to the laws of formal logic, a process of theoretical knowledge in the direction of special to general (Rajović and Bulatović,2013; Rajović and Bulatović, 2014).

Analysis and Discussion

Economic-geographical evaluation of water resources in the context of a complex evaluation of natural resources, has a special place, because there is almost no activity that is not under the influence of more or less water, whether natural sources, either as natural conditions of material production and human life in general. The basic premise of solving this problem is the analysis of the territorial distribution of quantitative and qualitative characteristics of water resources.

Much of the north-eastern Montenegro, in the example municipalities Berane, Andrejevica and Plav belong to the Hydrographic rich areas. Water resources include groundwater and surface water (rivers, lakes). "The latest time collecting water originating from rainfall has become more important in the world. As a way to supply water rainwater collection are adhered to before the year 8000 in South Asia, and then in ancient Palestine, ancient Greece and Rome. Today, collecting rainwater mostly used in India. The advantage of this technique lies in the fact that the cost of building a swimming pool, storage tanks, apparatus for collecting prices, relatively low (Damjanov et al., 2011).

Testing and monitoring of groundwater and surface water deals with the Hydrometeorological Office of Montenegro (HMOM, 1993). Water monitoring is done through a network of hydrological stations for quality, including sampling and analysis of physical, chemical, biological, bacteriological and radiological quality indicators, as well as detection of hazardous and harmful substances. Based on these results, carried out an assessment of are state of water and their classification. Therefore, whether and how to use good is split into four classes: I class : water that is in a natural state, with possible disinfection, can be used for drinking and food industry, and surface water for the cultivation of edible fish (salmonid); **II**class : water which in its natural form can be used for bathing and recreation, for sports, for the cultivation of other species (cyprinids), or water that is the usual methods of treatment (coagulation, filtration, disinfection ...) can be used for drinking and food industry; **III** Class: water that can be used for irrigation, and after the usual treatment methods and the industry besides the food industry, **IV**class: water that can be used for other purposes only after appropriate treatment; V class - outside of class status.

From the point of evaluation of groundwater, they have different meanings. Their importance is mainly determined by quantitative characteristics and accessibility for use, and much less qualitative characteristics. According to the basic hydro geological characteristics of the territory of the observed geographic space, according to modern hydro division, we can distinguish the following types of aquifers: Karts aquifers and

aquifers crack. Karts aquifers represent a specific type of aquifer that coming out on the surface of the limestone cracks and cave channels. Issued from cracks occurs in terrains built of aquatic geological formation, which cause the formation of branched surface hydrographic network. In addition to these types of karts springs in this part of north-eastern Montenegro, we highlight in a second group of sources - mineral water, since their evaluation and the possibility of using very different from the other aquifer water.

Groundwater as well as surface water is common resources that are available to man and they use every day. However, groundwater water, generally speaking, as resources are represented approximately 20%, the lower depths are much easier to pollute through rinsing of pollutants from the soil, while the deep groundwater cleaner and the most convenient source of drinking water. Groundwater resources in this part of north-eastern Montenegro have favorable physical, chemical, biological, bacteriological and radiological features. Yield of the spring the moving: "Manastirsko source" 1000 l/s, "Merića source" 200 l/s, Dapsićko source" 49 l/s „ Aluvion Đuričke River“ 15 l/s, „Ali Pašini sources“ 800-1000 l/s, “Bajrovića sources” 20-200 l/s, “Savino Oko” 50 l/s, Krkori 100 l/s ... Reduction levels groundwater and surface water, reducing the flow of water is evident on the Lim River and its tributaries, as well as karts sources and springs of. Therefore, it is necessary to carry out interdisciplinary research detailed in this part of north-eastern Montenegro in order to collect data for studies and projects to protect against these adverse effects. Although the waterways are possibilities for the development of recreation and water sports in the direction of contemporary European trends, unless the condition is sporadic examples (Regatta "Cup of Plavsko Lake" competition kayaks, swimming across Lake Plavsko), unsatisfactory and needs to be in the water management basis significantly stimulated. In relation to the economic situation before 2000 in the area of the catchment is due to the termination or significant reduction of industrial facilities, and reduce the number of inhabitants and their living standards, reduced total water pollution (Faye, 2017). However, no significant progress in are construction of sewage treatment plants and wastewater, which is a water management problem. Surface water and groundwater in Berane, Andrijevica and Plav are threatened many “wild" dump. Mineral water allocated we are in a second group of sources, since their valorization and the possibility of using very different from other aquifer water. In this part of north-eastern Montenegro, there are a small number of mineral springs but unexplored so neither valorized. Among them the attention it deserves, the thermal mineral springs in the village of Kralje. Taking into account classification (Leko et al, 1922) as well as minimum and gases in groundwater in establishment group mineral, thermal mineral springs in are village Kralje belongs to the sulfur waters. These are water in which the boundary between fresh and mineral water is around 0.001 and the minimum for inclusion in the thermal waters of 0.010, which is very fitting parameters of this fracture sources. Certainly, this and other thermo-mineral springs that requires special attention and work on their tourist valorization.

For the effective valorization of surface water flows, it is necessary to analyze fundamental hydrological parameters such as rainfall intensity (Houichi, 2017), water level, especially under the effects of climate change (Ouis, 2012; Rajput et al., 2023), discharge (Achour and Amara, 2021; Achour and Amara, 2022), water balance (Cherki,

2018; Boutoutaou et al., 2020), and groundwater recharge (Qureshi et al., 2024). These analyses provide answers to key questions regarding the quantity of available flowing water resources in this part of northeastern Montenegro, as well as their spatial and temporal distribution.

The backbone of the hydrographic network considered geo-space makes the Lim River and its many tributaries (Zlorečica, Kraštica, Gradišnjica, Šekularska River, Bistrica, Ljuča, Đurička River, Komarača) and less (Velička River, Murinska, Vinicka, Dapsićka, Lješnjica…). Lim river basin covers an area of 2,557 km2. Of these, the northeastern part of Montenegro belongs approximately 1304.1 km^2, or about 51% of the total basin area. Lim springs from Plavsko Lake and flows through the considered Geospace on length of 57 km and a total drop are 265 m, respectively 6 m / km. On Lim have two water measuring stations in the Plav and Berane. Lim and its tributaries belong to the Dinaric Macedonian variant with the highest water in May, then April, June and March, and the lowest water in October and September. Annual water level on Lima amounts code Plav 71 cm, 128 cm code Berana. Maximum monthly mean water level ranges from 106 cm on gauge station Plav in May, to 184 cm also in the month of May, on gauge station Berane. The minimum medium monthly water is the code Plav (48cm) and Berana (89 cm) out in September. The mean annual amplitude of water level code Plav is 58 cm, and 95 cm code Berane. Fig.1 shows River Lim as a recreational swimming zone.

Figure 1: River Lim - bathing on Lima is true experience (www.montenegro.travel)

Absolute amplitude of the quite distinct and give Lim character real spate. For example, the relationship between is absolute maximum water level of 276 cm was registered on water gauge station Plav 17.11.1979 and the absolute minimum, which appeared 05.10.1974 years (25 cm), amounts 251 cm, and is on water gauge station Berane was 577 cm. In other words, the Lim with absolute maximum water level on disposal station

Plav with 11.04 times, or at the station Berane 28.48 times the height of the level water than with absolute minimum water level. From the agricultural perspective production significantly is knowledge of the extreme maximum and minimum water level. When are extreme maximum water levels on unregulated and unprotected parts of the river bed, then comes to spills rivers and flooding of agricultural land. Flood waves usually last a few days. Extremely low water levels recorded in the late summer and early autumn.

Flow allows determining of available water quantities for irrigation in a given period of time. The movement of flow during the year largely the coincides with the water regime. And flow is water levels in this part of north-eastern Montenegro, characterized by temporal and spatial variability. Thus, on the river Lim, the month with the highest average discharge is about six times more water than a month with a minimum flow. In the period January-June River courses elapses 65-70% of the total annual discharge. Already after June flow the extremely reduced. The period with a small flow without is held until October, and the lowest is in August and September. During the summer months (July, August, September) river during are elapses 9-12% of the annual flow. On the water gauge station Plav, a month with maximum flow (May, 40.6 m^3/s) has 6.6 times more water than a month with minimum flow (September 6.2 m^3/s). In Berana, the relationship between the months with maximum and minimum monthly flow without was 7.3 times higher. Temperature regime of surface water flow is a function of temperature air crashes on longitudinal profile, ways feeding surface flows…The annual water temperature of the river Lim code Plav is 8.1°C, code 8.4°C Berana. Absolute maximum water temperatures measured in Plav amounts to 20.2°C (measured 7/8/1984) in Berane 24.0° S (26.07.1989). The average minimum water temperature of the river Lim amounts code Plava 2.4° C (January) and code Berana 3.2°C (February).

Rivers are a significant factor in natural resources, because in addition to Lima as the largest in this part of north-eastern Montenegro, there are about 20 other smaller rivers. However, on majority of these streams have no hydrological observations and measurements, so that today we have no data on the characteristics of their catchments. We believe that you should start preparing new registry list streams in this part of north-eastern Montenegro. Such built cadastre rivers, springs, lakes, that is, all watercourses could each user to provide the necessary information on the river basin and sub-basin in each smaller the investigated basin.

Lake analyzed geographic space are a special type of hydrographic objects, and tourist attractions which have their place and role in the tourist industry.

Due to the isorganized development of tourism on the hydrographic objects lack of statistical monitoring of phenomena and processes, it is difficult to compare with other tourist values and determine their place in the tourist trade. In the previous development tourism these motives are not particularly respected. The lack of documentary material on air temperatures, isolation, rainfall height and duration of snow cover, cloudiness, and winds, water temperature is a particular difficulty in making the best of conclusions and concrete proposals for major tourism development. On the lake there is not even registering the service of tourists, tourist structures, and tourist traffic. Northeastern Montenegro, in the example municipalities Berane, Andrejevica and Plav is rich in lakes,

mainly Glacier Lake by origin. As the largest and most important stands out the Plavsko Lake (Fig. 2), and subsequently follows: Ridsko, Visitorsko, Pešića Lake, Great and Little Šiško, great and Little Ursulovačko. Plav Lake is lies between the mountain Prokletije and Visitor at an altitude of 906 meters, and provides the direction North-South in length of 2.16 km. It covers the area of 1.9 km². Maximum width is 0.92 km and the depth of 9 meters.

Figure 2: Plavsko Lake-the largest glacial lake in Montenegro (www.plav.montenegro.travel)

According to Stanković (1975) maximum precipitations is in December and a minimum in August. Maximum water level on Lake Plavsko occurs in May and reaches 110 cm. After the May maximum water level gradually declines until October, when there is a minimum monthly water level (47 cm). Secondary monthly maximum water level appears the in December (75 cm). The mean annual water level is 72 cm. Absolute minimum water levels on Lake Plavsko recorded 16 November in 1946 years (255 cm), with the absolute minimum of 6 January in 1937 years (19 cm). The absolute amplitude of the water level is 236 cm. The highest average monthly temperature of Plavsko Lake is in August (16.2° C). The lowest mean monthly water temperature is in January (3.1° C). Minimum monthly temperatures of the surface layer ranging from 3.0° C (January) to 15.0° C (August). In contrast to of these, the maximum monthly temperature in winter is 4.6° C (February), and in August reached 17° C. Humidity is highest in the spring, and the winds are strongest during the winter.

Ridsko- Hridsko Lake (Fig. 3) is located in the mountain massif Prokletija, near the border with Albania, at an altitude of 1970 meters. It is located between the peaks of little and Big Reed beneath the top of the hilly karts (2,358 m.n.v) so is and got its own name. It is considered one of the most beautiful lakes in Europe.

Surface area is 33,376 m^2. The lake is 295 m, width 175 m, depth 5.1 m. Ridsko Lake is usually under the ice from mid-November to mid-May, when you experience true winter idyll, but the real challenge for nature and adventure lovers. The water temperature in July and August heated above 15° C and the air temperature is between 17-21° C.

According to (www.photomontenegro.me) the largest amount of water from precipitation runs by lake in spring and smallest in summer. The maxima are spring and late autumn and minima in summer and winter. The annual amplitude of water level is 1.5 m.

Figure 3: Ridsko (Hridsko Lake) - considered being one of the most beautiful lakes in Europe (www.panoramio.com)

Visitorsko Lake (Fig. 4) is situated on the mountain Visitora according to which is obtaining behalf. It is located on 1,820 meters above sea level. Surface lake amounts to 4,212 m^2, length 92 mm, and width of 73 m and a maximum depth of 4.1 m. According Stanković (1975) the maximum temperature of is lake in July and August, ranging between 18-20°S. Length of coast of the line is about 300 m. For Visitorsko lake is characterized that the rapidly heats and cools quickly. At high water levels, the lake surface is increased to more than 5,000 m^2. Maximum water levels are in April and May, and a minimum in August and September.

"Special curiosity of are lake is presence former" floating island". Legend says that are him raise cattle breeders of cut trees for raft. During the night, on a raft would with cattle go from the coast. Raft is overgrown with grass, with the mainland is connected felled by pine trees "(www.montenegro.travel).

Figure 4: Visitorsko lake- belongs group mountain lake better known as "mountain eyes" (www.stazeibogaze.info)

Pešića Lake (Fig. 5) is the second by size Lake in the area of the National Park Biogradska Forest on the mountain Bjelasica. It is located at the foot of Crne Glave (highest peak Bjelasica), then Zekova Glave, Borove Glave and Cmiljeve Glave. The maximum width of the lake is 165 m, the average depth of 3.2 m (maximum about 8.4 m).

Area of the lake during low water level is 37.400 m^2. Length coast lines in are summer ranges from 750 m to 800 m (www.mojacrnagora.com).

Great Šiško Lake the located in the area known by are name Šiška, after which the lake obtain behalf. It is located at an altitude of 1,660 m long is about 400 m and the depth of the lake at high water is about 3 m. It is surrounded by beautiful forests and summer pastures. Surface Great Šiško Lake is 29,080 m^2. Temperature surface layer water in summer reaches about 20 ° C, and during the winter the lake under the ice. Near of Great Šiško Lakes (about 1 km) findings the little Šiško lake. Name itself indicates on is small lake about 105 m in length, width of 65 m. The maximum depth is 1.7 m. The lake surface is approximately 6,200 m^2. Surface layer water temperature is around 20 ° C, while during the winter under the ice and snow (www.photomontenegro.me).

Figs. 6 and 7 show both Great Šiško lake and Little Šiško lake, respectively.

Figure 5: Pešića lake-paradises for soul and eyes (www.panacomp.net)

Figure 6: Great Šiško lake-picture speaks more than words (www.panoramio.com).

Figure 7: Little Šiško lake - mystical silence the magnificent nature (www.visokogorcicg.com).

Great Ursulovačko Lake (Fig. 8), while Fig. 9 shows little Ursulovačko Lake, is situated near the rural settlement Kurikuće, therefore is also known as Kurikućko Lake. The area mountain Bjelasica in which lake is located, is called Ursulovac, by the lake obtain behalf. It is located at an altitude of 1,895 m. length of the lake is 162 m, width of 106 m. The average depth is 2.9 m. Surface are Great Ursulovačko Lakes amounts to 12,200 m^2. About large above height, the lake water is cold, under the ice for about three months a year. Surface layer water temperature ranges from 12 ° S to 14 ° S. little Ursulovačko Lake is known as Blatina. Length of the lake is about 175 m, while the width is about 90 m. During the summer maximum Depth Lake is 2.2 m. Area of the lake varies from 5,000 m^2 to 10,000 m^2. Temperature surface layer of lake water is around 17 ° C never not dries up, although the lake threatened by extinction. Lake serves as water trough for cattle (www.photomontenegro.me).

Figure 8: **Great Ursulovačko Lake - located the highest altitude on the mountain Bjelasica (www.visokogorcicg.com).**

Figure 9: Little Ursulovačko lakes - most inaccessible but and the most beautiful lakes on the mountain Bjelasica (www.mojacrnagora.com)

Thanks to the natural and men created conditions, primarily, the attractiveness of rivers and lakes, tourism in this part of north-eastern Montenegro has a long tradition. However, tourism is not a significant factor in its economic and ecological developments (Jelisavka et al., 2019), as potential tourist actors are not fully utilized, nor were they adequately exploited the potential of integrated development of tourism and other economic sectors. Travel demand is primarily are relies on recreational tourism and to some extent on cultural manifestation and pupil, excursion tourism.

CONCLUSION

This study highlights the hydrological and geographical characteristics of northeastern Montenegro, revealing the complexity of water availability and its critical importance for regional development. The analysis demonstrates that while the area is relatively rich in surface water resources, their spatial distribution and seasonal fluctuations necessitate careful management. Given the vulnerability of the local environment and the significance of water for agricultural, economic, and ecological sustainability, it is imperative that regional authorities prioritize integrated water resource planning. Although this study provides a foundational hydrological assessment, future work should incorporate advanced spatial analysis tools and assess potential impacts of climate variability. Such efforts will support a more adaptive and resilient approach to water governance in the region.

Our research record based on similar researches Biswas (1994), Gardiner (1995), Stanković (1996), Hey (1997), Đorđević (1998), Petković (2001), Počuča (2008), Flint (2010), Song et al. (2010), Bajčetić and Stojanović (2011), pointed out is in first, several important conclusions, when are in terms of renewable energy sources:

1. Like all the less developed countries, and Montenegro are plenty of non-economic and non-ecological behaves according to water reserves. It is estimated that the loss in terms of irreversible swelling of unused water is as high as 5-10 cubic meters per second. The relatively low price of tap waters well as enormously high consumption of water for European conditions (consumes the double the amount of water per month inhabitant than, say, French), contribute to the deterioration of the situation. Water is analyzed Geospace inappropriately used for watering gardens, washing cars and street ...
2. Water management presents a complex section of human action that is an expression of many foundations and processes given the synthetic certain elements. The bases on which they are based systems for water management and service elements of the various legal, technical, economic, social and scientific characteristics and traits. For the structural development of water management are of vital importance segments (disposal, use, protection and protection of water), ownership (public, private and mixed), property and property relations (right to manage, use, disposal and acquisition of resources to meet needs, using water and services) and management (public and business management, bureaucratic and corporate).

3. Then, the basis for water management related to the types of infrastructure facilities, technical systems, technological basis of certain specific technical, economic and organizational factors of objects (mechanical, electrical, manual, information technology) and inputs for service delivery, operation and profile properties. In developing water management starts with the kind of services as water and natural and economic goods that are in demand of high intensity weak market flexibility and to establish a supply demand for the service with the lowest cost.
4. The last decade of the last century was marked by the awakening of environmental awareness, the implementation of complex measures to protect the environment and create a new philosophical approach to the use of water resources in the further development of civilization. Launched is theory of "sustainable development". Ecological approach to the development and use of natural watercourses includes several important postulates: (a) river system, with a river basin, flood plains and zones of groundwater, represents hydrological, geo-morphological and ecological continuum. Hence is required an integrated approach to activities drainage basin and watercourse - "catchment scale", (b) Hydrologic potential of the basin and the hydraulic capacity of the watercourses I can the human activities have increased or decreased, but should not be reduced below the "environmentally acceptable minimum" (extended concept "biological minimum"), (c) from ecological point of view, it is more desirable variability hydrological, hydraulic and morphological parameters watercourses.
5. Drainage basin Lima has a very unbalanced flow measured during the year and over a period of years. Consequently, rivers are torrential regime and as such during the flood causing major damage settlements, commercial objects, roads, agricultural areas. Erosion land in river courses and lakes on them, reaches an increasing amount of sediment. The lakes are significantly showered, and some basins are slowly destroyed. Emphasized by the disparity in the amount of water in certain parts of the north-eastern part of Montenegro, and the real results economy and valorization watercourses and lakes on them, could be achieved by building reservoirs, it is keeping the spring and autumn water period summer (July-August). Basic economic value of surface water in this part of north-eastern Montenegro derived from their water management plan, exploitation for irrigation, municipal and industrial water supply, and tourism purposes.
6. More attention devotes waters of the north-eastern part of Montenegro as tourism values that emerge from their recreational function, the beauty of the landscape, as well as construction appropriate tourism and hospitality facilities. This inasmuch before them should valorize together with immediate and distant environment which would allow the rich and varied stay of tourists. Aggravating circumstance represents the fact that for many rivers and lakes missing data specific hydrological measurement range of indicators and the generalization does not produce good results.

Modern approach to regulating watercourses must be based on the harmonization of socio-economic, commercial and water- environmental goals. Sustainable use of water

resources involves their planned, rational use, so that there is no violation of the natural ecosystem and the denial of natural resources for future generations. It is therefore essential that all together we engage in the preservation of nature and its inhabitants, because country we have not inherited from our ancestors, but is loaned from our descendants.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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