The Distribution of Mineral and Thermal Waters in Eastern and Western Georgia and Their Indicators

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Abstract: Mineral springs and thermal waters in the territory of Georgia have been considered a significant source of natural resources for centuries, both for medicinal and industrial uses, as well as for agriculture. The diverse geological and climatic conditions of Georgia's interior regions determine the distribution of mineral and thermal waters and the formation of their unique properties. Eastern and Western Georgia differ in terms of both geological formations and water sources. This paper presents an analysis of the distribution of mineral springs and thermal waters and their indicators (location, water discharge, temperature, etc.) in Eastern and Western Georgia.

The distribution and use of mineral springs and thermal waters in Eastern and Western Georgia play an important role in the country's economy and tourism development. Proper utilization of these resources can not only improve public health but also increase the economic potential of the region.

It is expected that the proper planning and management of the use of these resources will gain greater popularity, which will give Georgia greater competitiveness in the international resort market.
Keywords: Mineral waters, thermal waters, indicators.

Introduction

Eastern Georgia is a region abundant in natural resources, particularly thermal and mineral water sources, which have been utilized for centuries due to their therapeutic and industrial value. These natural springs play a significant role in the region's economy, tourism, and health sector. Thermal water sources, with their diverse temperature range and high flow rates, offer opportunities for energy production and balneotherapy, attracting both local and international visitors. Alongside these, the numerous mineral water sources have established Georgia as a prominent player in the global mineral water market, contributing to both domestic consumption and export.

Despite the wealth of water resources in Eastern Georgia, the region faces critical challenges related to the uneven distribution of water. With water reserves that should, in theory, be sufficient for local needs, the region still grapples with issues of water scarcity, particularly due to climatic conditions and the disproportionate water consumption by agriculture and industrial activities. The agricultural sector, heavily reliant on irrigation, is the largest consumer of water, posing a substantial challenge to the sustainable management of water resources in the face of increasing demand and climate change impacts.

This introduction aims to explore the significance of the thermal and mineral water sources in Eastern Georgia, the challenges posed by water distribution, and the implications for water

management in a region that faces growing demands and environmental constraints. Understanding these issues is crucial for developing strategies that ensure sustainable water use and secure the region's future water supply.

Main Part

The territory of Eastern Georgia is rich in natural resources, particularly thermal and mineral water sources. The thermal water sources, with a total flow rate of 1250 liters per second (L/s) and temperatures ranging from 20-65°C, are of significant interest both for their therapeutic properties and for various industrial applications. These geothermal sources are especially valuable for their potential to be used in balneotherapy (thermal baths) and energy generation. The therapeutic properties of these waters are widely acknowledged in the region, and they are often utilized in spas and resorts that attract both local and international tourists. Additionally, these thermal springs have the potential to be harnessed for heating purposes in the colder months, offering a sustainable and renewable energy source for local communities.

In addition to thermal waters, Georgia is home to up to 1,000 mineral water sources. The significance of these mineral waters is primarily linked to their therapeutic benefits, which have been recognized for centuries. These waters are believed to have healing properties for various ailments, ranging from digestive disorders to skin conditions. The industrial use of mineral waters is also widespread, particularly in bottling for commercial distribution. These waters are an important part of the local economy, both for their domestic consumption and export potential, contributing significantly to the country's tourism industry. The bottling and sale of mineral water have become a major economic sector, providing jobs and supporting the local economy.

Despite the abundant water resources in Eastern Georgia, the distribution of these resources is not uniform, and this presents significant challenges for water management. The total water reserves in Eastern Georgia are estimated to be 28.827 cubic kilometers (km^3), a considerable amount that, in theory, should be sufficient to meet the region's needs. However, the uneven distribution of these resources remains a critical issue. The amount of surface runoff in Eastern Georgia is four times lower than in the Western part of the country, where rainfall and water availability are more abundant. This disparity creates significant challenges for the management and allocation of water resources across the country, especially when considering the increasing demand in the east (Jordanishvili, I., & Jordanishvili, K. (2009); Jordanishvili, I., & Jordanishvili, K. (2008).

Eastern Georgia has a higher concentration of water-consuming facilities, such as industrial plants, agricultural irrigation systems, and urban areas. These facilities collectively use 2.0 times more water than those in the Western part of the country. The largest consumer of water in the region is irrigation, accounting for 60% of water usage. The agricultural sector is heavily reliant on irrigation due to the relatively dry climate in Eastern Georgia, where rainfall is not sufficient to support large-scale crop production. This over-reliance on irrigation puts additional pressure on already limited water resources, especially in times of drought or when surface runoff is at its lowest.

The agricultural sector's high-water demand poses significant challenges for the sustainable management of water resources. As climate change continues to impact global weather patterns, Eastern Georgia may face even drier conditions in the future, exacerbating the problem of water scarcity. With irrigation systems consuming such a large proportion of the available water, there is an urgent need for more efficient water use strategies, such as improved irrigation techniques and the development of water-saving technologies. Additionally, the region will need to explore alternative sources of water, such as wastewater treatment and reuse, to meet the growing demand for water without depleting natural reserves (Mikadze, L., & Tsetskhladze, S. (2014); Kakabadze, Z. (2017).

Furthermore, the unequal distribution of water resources has led to disparities in access to water between the Eastern and Western parts of Georgia. While the Western region benefits from higher levels of rainfall and more abundant water resources, the Eastern region often faces challenges related to water scarcity, particularly during the dry season. This imbalance has implications for both agriculture and urban development, as water stress in Eastern Georgia limits economic growth and exacerbates regional inequalities (Tables 1,2,3,4).

Table 1. Thermal Water Indicators of Western Georgia

#	Name of the Thermal Water	Location	Debits (L/s)	t°C
1	2	3	4	5
	Tkvarcheli and Khojali	Svaneti	57,0	29-35
2	Gagra, Bichvinta, Bzyb	Bzyb	10,5	34-95
3	Sukhumi	Kodori	111,1	24-100
4	Zugdidi, Tsaishi, Menji, Nakalakevi	Samegrelo	231,4	25-91
5	Qughvis, Poti, Chaladidi, Khorgi	Colchis	30,1	46-95
6	Tskaltubo, Mekvena	Tskaltubo	270.9	29-39
7	Simoneti, Zestafoni, Sviri, Ajameti	Argveti	1,7	44-62
8	Makhindzhauri, Tomasheti, Sheubani, Zekari, Chokiani	Adjara-Triatlti	16,0	22-25

Table 2. Hydrological Indicators of Mineral Waters in Western Georgia

#	Name of the Mineral Waters	Location	Water Debit (L/day)
1	Avadhkhari	Abkhazia	8,0 L/min
2	Utsera	The Rioni River Valley	0,005 L/min
3	Tkvarcheli	The Ghalidzga River Valley	3,5-6,7 L/min
4	Lugela and Skure	Valleys of Khobis-Tskal River and Chanis-Tskal River	1,25 L/min
5	Sukhumi	Beslet river valley	11,8 L/min
6	Menji	Senaki	0,3 L/min
7	Tskaltubo	The Tskaltubo River Valley	250,0 L/min
8	Sairme	Tsablis-Tsqali River Valley	1,05 L/min
9	Nabeglavi	The Gubazouli River Valley	1,0 L/min
10	Makhindzhauri	Near the city of Batumi	4,5 L/min

Table 3. Thermal Water Indicators of Eastern Georgia

#	Name of the Thermal Water	Location	Debits (L/s)	t°C
1	2	3	4	5
	Torgva's Baths	Mtiuleti	65,0	27-37
2	Kavtiskhevi, Kheiti, Gori Jvari, Martkopi, Ujarma	Kartli	15,1	24-53
3	Kila-Kupri	Iori-Shiraqi	681,0	65
4	Tskaltbila, Atskuri, Akhaltsikhe, Abastumani, Aspindza	Akhaltsikhe	60,0	22-48
5	Dvir, Likani, Sadgeri, Akhaldaba, Tashiskari, Baniskhevi, Kvishkheti, Rveli, Kvibisi, Zanavi, Vashlovani, Papa, Mitarbi, Nunisi, Nikabeti	Trialeti	134,0	26-41
6	Tbilisi	Tbilisi	260,0	27-52
7	Artvin-Armenia	Bolnisi	40,0	41

Table 4. Hydrological Indicators of Mineral Waters in Eastern Georgia

#	Name of the Mineral Waters	Location	Water Debit (L/day)
1	Bagiani	River Didi Liakhvi Gorge	14500,0 L/day
2	Pasanauri	River Tetri Aragvi Gorge	700,0 L/day
3	Vazhas-tskaro	River Pshavi Aragvi Gorge	0,8 L/min
4	Javi	River Didi Liakhvi Gorge	6,0 L/min
5	Borjomi	River Mtkvari Gorge	1800 L/day
6	Zvare	River Chkherimela Gorge	15000 L/day
7	Tbilisi	River Mtkvari Gorge	74,0 L/min
8	Vardzia	River Mtkvari Gorge	22,0 L/min

Conclusion

In conclusion, while Eastern Georgia is rich in thermal and mineral water sources, and its water reserves are considerable, the region faces significant challenges related to water distribution and consumption. The uneven distribution of water resources, coupled with the high demand from irrigation and other sectors, has made water supply a critical issue in the region. As Georgia continues to develop, it will be crucial to adopt more sustainable water management practices, improve water use efficiency, and explore new sources of water to ensure that both current and future generations can meet their water needs (Nadiradze, G., & Sajaia, T. (2011).

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საქართველოს ტექნიკური უნივერსიტეტის ცოტნე მირცხულავას სახელობის წყალთა მეურნეობის ინსტიტუტი[1,2,3]

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საქართველოს ტერიტორიაზე მინერალური წყაროები და თერმული წყლები საუკუნეების განმავლობაში ითვლებოდა მნიშვნელოვანი ბუნებრივი რესურსების წყაროდ როგორც სამკურნალო, ისე სამრეწველო და სოფლის მეურნეობის გამოყენებისთვის. საქართველოს შიდა რეგიონების მრავალფეროვანი გეოლოგიური და კლიმატური პირობები განსაზღვრავს მინერალური და თერმული წყლების განლაგებასა და მათი უნიკალური თვისებების წარმოქმნას. დასავლეთ და აღმოსავლეთ საქართველო განსხვავდება როგორც გეოლოგიური ფორმაციების, ისე წყაროების თვალსაზრისით. ნაშრომში წარმოდგენილია აღმოსავლეთ და დასავლეთ საქართველოს ტერიტორიებზე მინერალური წყაროებისა და თერმული წყლების განლაგების და მათი მაჩვენებლების (ადგილმდებარეობა, წყლის დებიტი, ტემპერატურა დ .ა.შ.) ანალიზი.

აღმოსავლეთ და დასავლეთ საქართველოს მინერალური წყაროებისა და თერმული წყლების განლაგება და მათი გამოყენება ჯანმრთელობისთვის მნიშვნელოვან როლს თამაშობს ქვეყნის ეკონომიკისა და ტურიზმის განვითარებაში.

ამ წყარების სწორად გამოყენებით შესაძლებელია არა მხოლოდ ადამიანთა ჯანმრთელობის გაუმჯობესება, არამედ რეგიონის ეკონომიკური პოტენციალის გაზრდა.

მოსალოდნელია, რომ ამ წყაროების გამოყენების დაგეგმვისა და მართვის სწორად განხორციელება მათ უფრო დიდ პოპულარობას მოუტანს, რაც საქართველოს საერთაშორისო კურორტების ბაზარზე მეტ კონკურენტუნარიანობას მიანიჭებს.