

## EARTH SCIENCES AND GEOGRAPHY

DOI: <https://doi.org/10.36719/2707-1146/44/41-46>

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### NATURAL AND RECREATION RESERVE POTENTIAL OF DUZDAG

#### Abstract

The article talks about the Duzdag salt reserve in the territory of the Nakhchivan Autonomous Republic, the geology of the area where the deposit is located, the history of production, the economic-geographical importance of the salt reserve, as well as therapeutic recreation.

Salt reserves in the Duzdag field in the Babek region are estimated at 1 billion tons. A branch of the Duzdag massif is located in the southwest of Jahri village, southeast of Gulshanabad village.

The use of salt reserves in the Duzdag massif has an ancient history. For the first time, scientific research on the salt deposit was found in an article by G. Voskaboynikov in 1830. Q. Abix (1857), Q.Q. Chulukidze (1869), K.N. Paffengols (1930), K. Nikitin (1882), S. Zelinski, P. Nadezhdin, and other researchers reported about the deposit. At the same time, V. Muradov wrote a monograph on the production and sale of salt.

According to the information received from the enterprise, 4189.4 tonnes of rock salt and 1995.5 tonnes of ground salt were produced in the first 10 months of the current year. 1467.3 tonnes of produced rock salt and 2164.9 tonnes of ground salt were sold. According to calculations, if only the salt reserve of the Duzdag mine is used to meet the demand for salt, the reserve of this deposit will reach approximately 150 years.

The height of Duzdag above sea level, the existing weather conditions in the mines, temperature, humidity, atmospheric pressure, and the percentage of oxygen and bacteriological composition make the treatment of patients suffering from asthma and allergies here ideal.

At the end of the article, there is information about the impact of the opening of the "Zangazur Corridor" on the economic life of Nakhchivan.

**Keywords:** *Nakhchivan AR, rock salt reserves, Duzdag, therapeutic recreation, Zangezur Corridor*

#### Introduction

The territory of Nakhchivan AR, with an area of 5502.75 km<sup>2</sup>, is rich in mineral resources, including rock salt resources. This wealth has never been used effectively.

Due to the occupation of 20% of the territory of the Republic of Azerbaijan, the territory of Nakhchivan MR has been put under blockade. This has severely affected the economic life of the Nakhchivan Autonomous Republic. The 44-day Patriotic War ended the 30-year occupation and ensured the integrity of the country's territory. In this regard, the solution to the important local, regional, and intercontinental Zangezur Corridor problem has become one of the most important issues. Thus, solving the problem of the Zangezur corridor will increase the use of natural resources in Nakhchivan, including salt resources, and will have a great impact on the economic life of the autonomous republic, including the increase in the volume of foreign trade and the development of tourism. From this point of view, the article is dedicated to an actual issue.

**Natural reserve potential.** Nakhchivan Autonomous Republic is rich in underground resources as well as surface resources. This wealth in the autonomous republic of ore, non-ore, construction materials, etc. opens wide opportunities for the application of a number of resources in various fields of the national economy. Among the non-ore mineral resources of Nakhchivan MR, rock salt resources occupy an important place. The rock salt reserves of the area are located in the foothills

and plains. In the territory of Nakhchivan AR, salt reserves are more common in the western part of the territory.

Rock salt reserves are spread around Duzdag, Nehram village, Sust Tazakend in Kangarli district, Pusyan village in Sharur district, etc. The reserves of Duzdag and Sust fields are 97 million tonnes, and the reserve of the Nehram deposit is 1.5–2 billion, more than a tonne (Mins, 1972: 257). The Duzdag massif, which is the area with the largest concentration of rock salt resources, is almost devoid of underground and surface water. The only surface river in the massif is Shorsuchay. This river is a dry river; there is water only during the rainy season. However, the river is a brackish river because it passes through saline soils. During the hot season, the river dries up, and a thick layer of salt remains in the river valley. As a result of academician A.G. Guluyev's research, kahriz remains were also identified in the northern part of the deposit.

In order to obtain more extensive information about the geological structure of the area, a large-scale geological map of the Nakhchivan depression was drawn up in 1949–1951. It was determined that the area of the Nakhchivan depression is composed of Upper Miocene and IV-period rocks. Upper Miocene sediments consist of two main layers: the first layer consists of Lower and Middle Sarmatian sediments, and the second layer consists of Upper Sarmatian sediments. Lower and Middle Sarmatian layers in the Duzdag mining zone consist of reddish-brown, brown-brown, brown-grey, grey, green-grey, yellow-grey clays, sandstones, sedimentary rocks mixed with clay and lime, marls, limestones, siltstones, and volcanic sands.

The Duzdag syncline stretches along the southeastern slope of the Duzdag plateau, stretching in the direction of 90–800 northeast from the territory of the Dash-Başı railway station (Rusanov, 1987: 196). Then, from where the last crease ends in the east, this arrow turns in the northwest direction and extends to the village of Gulshanabad. Along the southeastern and eastern slopes of Plato, it extends to the village of Jahri. In the southwestern part of Jahri village, it is due to the effect of this wing that bitter-salty water comes out of water wells dug 20–25 metres deep (Azizbekov, 1961: 502).

The Duzdag syncline approaches the Boyukduz antisyndline in the northwest. It runs almost parallel from southwest to northeast. The antisyndline is clearly visible at the northern end of the Duzdag plateau. This part is covered with post-Pliocene sedimentary rocks, passes under the western slope of the plateau, and extends to Boyukduz. The Boyukduz part is covered with sedimentary rocks from the IV period. The joint excavations of Azerbaijani and French archaeologists have proven that the beginning of stone salt production in the field dates back to BC. It dates back to the 3rd millennium, which means that the Duzdag field is the oldest salt mine in the world.

The history of using the Duzdag rock salt deposit is much older. So, the salt deposits here have caused salt settlement. For the first time, G. Voskaboynikov collected information about this deposit known to people, and in 1830, detailed information about the deposit was given in the article "Notes on the Nakhchivan stone salt deposit." In the following years, G. Abix (1857), G. G. Chulukidze (1869), K. N. Paffengols (1930), and others wrote about the mines researchers reported. The history of the use of salt here goes back to ancient times due to stone tools. The territory was widely used during the Shah Abbas period. Oven-like holes were opened on the bed, and salt was extracted here. In later periods, the salt reserve was used by the method of freezing (Nakhchivan Autonomous Soviet Socialist Republic-75, 1975: 358).

**Date of salt extraction.** Salt is one of the most important components for the lives of humans and living beings. People living in all places, especially in countries with hot climate conditions, sweat more when moving or working, and at this time, salt, which is constantly used in various physiological processes in the body, is excreted from the body together with sweat. If this loss is not replaced, serious health consequences can occur. For this reason, people have used salt since ancient times. The reserve of this salt is estimated to be about 1 billion metric tonnes, and it has a history of extraction dating back two millennia.

Therefore, in order to meet the demand for salt, salt rocks formed as a result of natural processes were used in different places, and as a result, salt mines were formed. One of them is the salt mines located 12 kilometers northwest of the city of Nakhchivan. Here, salt deposits extend to Jahri and the former village of Sust in the north. One of the legends about Prophet Noah among the population of the region says that Prophet Noah, who settled in Nakhchivan after the Great Flood, taught the people a number of crafts, including salt extraction. Based on those narratives, K. Nikitin, the inspector teacher of the Nakhchivan city school, wrote in 1882 that Noah was the first worker in the Nakhchivan salt mines.

In the 70s of the 19th century, Beyer, who worked as the head of mines in Duzdag, found several stone axes and adzes, followed by I. Polyakov in 1879, who discovered several stone axes around the salt mines. Analysing those finds, I. Polyakov came to the idea that these axes were used to break and crush salt and noted that they were tools belonging to the people of the first metal age, perhaps even more ancient times. S. Zelinski, P. Nadejdin, and I. Chopin also gave interesting information about Nakhchivan Salt Mountain. I. Jafarzade, the first Azerbaijani archaeologist who studied the stone tools found in Duzdag; M. Huseynov, an outstanding expert on the Stone Age; and economist-scientist M. Valiyev (Baharli), are of the opinion that salt was extracted here in the Stone Age.

In 1967, a mine used by ancient people was discovered as a result of an avalanche in Duzdag. In 1976, when an explosion was carried out to extract salt, another mine was discovered here. Both the first and second mines, which have a very interesting structure, have material and cultural samples, as well as archaeological materials discovered during the research conducted in Duzdag since 2007, including stone hammers, hearth traces, ceramic products, remains of deer antlers, etc., which confirm that people used these salt mines in the VI-II millennia BC. In 2008, the employees of the French National Centre for Scientific Research, conducting joint research with local archaeologists in the Nakhchivan salt mines, obtained very successful results by analysing the material and cultural samples obtained as a result of the research. Based on these results, it was determined that the Nakhchivan salt mines are one of the first salt mines in the world. About this, the international scientific community was informed about the discovery of the world's oldest salt mine in Azerbaijan in articles published in France. Apparently, the obtained results confirm that Duzdag is the oldest salt mine in the world (Hasanov, 2018: 246).

It should be noted that the salt supplied in Duzdag, in excess of the needs of the population of Nakhchivan and other nearby settlements, was taken from here to neighbouring countries for the purpose of exchange. Before the Silk Road, the Salt Road extended from the territory of Nakhchivan to the countries of the Middle East. The people of Jahri village in Babek district, which has played an important role in extracting salt from Duzdag since ancient times, still call the road from Jahri to the ancient salt mines "Duzdag road." Nakhchivan salt was one of the cargoes of trade caravans passing through Nakhchivan to the east and west. Because salt was exported to the neighbouring countries of the South Caucasus and the Middle East in addition to meeting the needs of the local population (Babayev, 1999: 226).

**History of salt production.** Salt extraction and production in Duzdag, which began in ancient times, continued intensively during the Middle Ages. The sources contain information about the production of excellent salt in Duzdag in the 10th and 14th centuries and the export of a certain part of the finished product to a number of countries. Vidadi Muradov wrote a monograph on the production and sale of salt. He notes in this monograph that at the end of the 19th century and the beginning of the 20th century, a new stage began in the production of salt in Nakhchivan. The reason is that the iltizam system existed until the mentioned period. Based on the sources, the scientist says that the exploitation of Nakhchivan salt mines was concentrated in the hands of the state. Taking into account the increase in demand for salt, the government started the operation of two more mines near the villages of Sust and Jannat at that time. The government, which could not cope with the demand on its own, was forced to involve individual entrepreneurs in this work. Thus, since 1907, the company "Kalbalikhanov brothers and K" started to operate Sust mines. However,

its activities were restricted. The appeals of Haji Khudadat Khan, the head of the "Kalbalikhanov brothers and K" company, to the tsar's government to allow the production of salt from Sust mines to 200,000 pounds were rejected for a long time, and it was allowed only after a few years. After the tsarist government lifted the ban on local companies, the volume of salt production increased significantly. In 1911, the volume of salt produced by the "Kalbalikhanov brothers and K" company from the Sust mines was 304,261 pounds. Research conducted in this field shows that salt production in Nakhchivan reached its highest level in 1911–1913. According to estimates, 600–800 thousand pounds of salt were produced from salt mines per year. However, it was not possible to fully meet the demand for salt. It is enough to note that in 1912, 9,000 tonnes of salt produced in the salt mines operating in Nakhchivan were 4.2 times less than the demand for salt in the South Caucasus. However, the outbreak of the First World War in 1914 did not allow for maintaining this level. During the time of the Soviet Union, salt production in Nakhchivan stood out due to the use of new opportunities in the industry compared to previous times. However, after the restoration of our independence, our people became the real owners of this underground wealth. In recent times, the establishment of "Nakhchivan Salt Production" Limited Liability Company and the provision of the enterprise with new technological equipment have allowed salt production in the autonomous republic to enter a new stage. The new production areas put into use are the first modern production areas established in the history of the exploitation of salt deposits in Nakhchivan. Today, there are four salt processing areas equipped with new technological equipment in the salt mine. "Nakhchivan Salt Production" Limited Liability Company, which has a daily production capacity of 40–45 tonnes of rock salt and 20–25 tonnes of ground salt, produces 18 types of salt, and these products are used in the household, animal husbandry, and chemical industry. The products are sold under the trademark "Duzdag." According to the information we received from the enterprise, 5391 tonnes of rock salt and 2206 tonnes of ground salt were produced here last year (7) 2340 tonnes of rock salt and 2129 tonnes of ground salt were sold by the enterprise (8). In the first 10 months of the current year, 4189.4 tonnes of rock salt and 1995.5 tonnes of ground salt were produced. 1467.3 tonnes of produced rock salt and 2164.9 tonnes of ground salt were sold.

**The importance of salt flats for therapeutic recreation.** The protection of human health is one of the most important human tasks. In this regard, sanatorium and resort treatment using natural resources has been one of the most effective methods since ancient times. In modern times, the fact that medical tourism, which is a widespread type of tourism, is rapidly developing and has a volume of approximately 14 percent worldwide, shows that it is of great importance.

Speleotherapy, the treatment of asthma by natural methods in a salt cave, which is suffered by many people in the world, is an important achievement of modern medicine. However, the geographic location of Nakhchivan Salt Mine, the volume of salt reserves, and the quality of the applied treatment are different. In general, Duzdag's altitude above sea level, current weather conditions in the mines, temperature, humidity, atmospheric pressure, and the percentage of oxygen and bacteriological composition make it possible for the treatment of patients suffering from asthma and allergies to give ideal results here (Geography of the Nakhchivan Autonomous Republic, Volume II, Economic and Social Geography, 2018: 383). Thus, the fact that people can directly enter the salt mine, which stretches up to 300 meters without any phobia, the constant temperature of the air here at 18–20 degrees throughout the year, and the extremely minimal level of toxic gases are the main factors that increase the effect of salt treatment.

With the increase in the number of people on the planet and the aggravation of weather and climate conditions in many places, the spread of asthma increases interest in this type of treatment. Thus, in the current annual report of the Global Asthma Network, which is headquartered in New Zealand and has representation in 135 countries, it is reported that approximately 339 million people worldwide suffer from asthma, and about 1,000 people die from this disease every day. Therefore, the treatment of asthma based on the stone salt caves in Nakhchivan, which occupies an important place among the natural resources of our country, is very remarkable for its medical-biological and humanitarian importance.

Looking at the history of treatment and recreation in Duzdag, the Duzdag Physiotherapy Centre has been operating for 42 years. Thus, the role of this treatment centre can be noted as a strategic issue in the implementation of measures necessary for the country's national economy during the political activity of the great leader Heydar Aliyev, which still belongs to the former Union period. It is a fact that this centre, distinguished by its economic and social nature, has been operating since 1979 as an expression of the diversification of the health and tourism prospects of our country, and this was possible at the initial stage as a 50-bed hospital in the base of the Nakhchivan salt mine. Of course, the effective organization of the service in this area also conditioned the connection of the processes calculated for the regulation of the demand formed in the later stages. For this purpose, in 1983, the number of beds for the treatment of diseases was increased to 100. However, Duzdag Physiotherapy Centre, whose construction was completed in 2008, attracts attention with its 450 beds, patients, and medical staff working here.

Undoubtedly, the modern infrastructure created in recent times—the nearby five-star Duzdag hotel, regular bus services from Nakhchivan, catering and gift sales offered at the entrance of the mine, and most importantly, the care of the medical staff for patients, both for those who come for treatment and those who accompany them—creates such opportunities. The cities of Baku and Sumgait, as well as Guba, Gusar, Gabala, Shamkir, Goranboy, Barda, and Yevlakh, as well as the citizens of Lankaran and Masalli who use the services of the centre, are Turkey, Ukraine, Iran, Russia, Tajikistan, Georgia, Kazakhstan, Germany, Great Britain, Holland, and Austrian tourists also agree with the miraculous healing potential of Duzdag (Let's get to know Nakhchivan: Collection of articles, 2017: 356). Treatment courses lasting up to 12 days for children and 18 days for adults lead to the recovery of patients without the use of drugs (11).

As it is clear from the above, modern conditions have been created for patients suffering from respiratory tract diseases at the Duzdag Physiotherapy Center. On May 16, 2019, the "Duzdag" Physiotherapy Centre's 40th Anniversary" Decree was one of the most important steps taken in the direction of the development of medical tourism (12). In addition to the economic and social importance of the decree, its advantages in the development of public cultural areas are also very great. Among the essential issues of Duzdag are:

- The importance of salt flats and salt has become the object of scientific research by scientists.
- Wide use of Nakhchivan salt in industry, household, nature, and medicine;
- Highlighting its medical importance;
- Taking into account the increasing importance of the role of Duzdag in the development of medical tourism in the autonomous republic, other necessary factors are included (13).

### **Conclusion**

Rock salt reserves in the territory of the Autonomous Republic were assessed by experts by categories, and their exact reserves and chemical composition were given. However, there has been no assessment of the years it will reach according to the per capita volume and production volume. The reserve of the Duzdag field alone is estimated at 1 billion tonnes. 10.6 metric tonnes of rock salt fall per person in Azerbaijan, and more than 234,150 metric tonnes in Nakhchivan AR. When conducting an economic assessment based on the volume of production, it should be noted that, according to experts' calculations, 700,000 tonnes of rock salt are required annually in our republic to meet the demand of the fields. In this regard, if the Duzdag stone salt reserve is used alone, the reserve of this deposit will reach 150 years.

There is a great need for the construction of production facilities and chemical plants in the area for the use of Dashduz (rock salt) resources. The realization of the "Zangezur Corridor" will create conditions for the natural resources of Nakhchivan to go to world-scale trade markets and production enterprises, and at the same time, the Duzdag therapeutic recreation area will increase in world importance. Keeping this in mind, measures should be taken now to meet future demands.

### References

1. Mins, A. (1972). Economic assessment of mineral resources: Moscow, 257 p.
2. Rusanov, D. (1987). Economic assessment of mineral resources: Moscow, 196 p.
3. Azizbekov, Sh. (1961). Geology of the Nakhichevan Autonomous Soviet Socialist Republic: Moscow, 502 p.
4. Nakhchivan Autonomous Soviet Socialist Republic-75. (1975): Baku, 358 p.
5. Hasanov, A. (2018). Natural resources of the Nakhchivan Autonomous Republic and ways of using them: Baku, 246 p.
6. Babayev, S. (1999). Physical geography of Nakhchivan Autonomous Republic: Baku, "Elm", 226 p.
7. <https://report.az/senaye/bu-ilin-naxcivan-mr-de-3926-1-ton-das-duz-istehsal-edilib/>
8. <https://marja.az/72752/duzun-istehsal-ve-satisini-artirmaq-meqsedile-yeni-muessise-qurulur>
9. Geography of Nakhchivan Autonomous Republic. Volume II, economic and social geography. (2018): Nakhchivan, 383 p.
10. Let's get to know Nakhchivan. Collection of articles. (2017): Baku, "Translator", 356 p.
11. <https://tehran.mfa.gov.az/az/news/3114/naxcivan-duzdag-fizioterapiya-merkezi>
12. [https://azertag.az/xeber/duzdag\\_fizioterapiya\\_merkezinin\\_40\\_illik\\_yubileyi\\_munasibetile\\_elmi\\_konfrans\\_kechirilib-1286604](https://azertag.az/xeber/duzdag_fizioterapiya_merkezinin_40_illik_yubileyi_munasibetile_elmi_konfrans_kechirilib-1286604)
13. <http://duzdag.nakhchivan.az/index.php/x-b-rl-r>

Received: 19.03.2024 Accepted: 28.04.2024