

# *Natural Resource Potential – Basis of Sustainable Development of Chechen Republic*

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**Abstract**—The article provides the generalized analysis of the current state of the natural resource potential of the Chechen Republic in order to implement the concept of sustainable development. The assessment of the current state of the natural resource potential is given, the possibilities of its effective use for the realization of economically beneficial possibilities of the already used resources implementation are considered. The main priority categories for the Chechen Republic of natural resource potential are determined, for which it is necessary to develop strategies in order to increase the effectiveness of their involvement in economic sphere. The solutions to the issues of rational use of the natural resource potential of the Chechen Republic are proposed.

**Keywords**—*natural resources potential; mineral resources; the Chechen Republic; mineral deposits; assesment; strategy*

## I. INTRODUCTION

The efficient extraction and use of natural resource potential is one of the most important bases of economic development of society. The fundamentals of environmental management are developed in various discussions. Thus, officially they became the subject of discussion at a meeting of the Club of Rome in 1972, where Dennis Meadows presented his report under the title “The Limits to Growth”. Gradually, the development of such issues reached a global level. One of the most important documents of the twentieth century related to environmental issues was Agenda 21.

One of its sections is devoted to the preservation and rational use of resources for the development of society. Special attention in the section is paid to the program areas related to the solution of issues on increasing the effectiveness of involving the natural-resource potential of the Earth in the development of economy. Numerous works of national and international researchers are devoted to the issues of global dependence on mineral resources and the consequences of mining [7–10].

Taking into account the modern possibilities of science and technology, as well as the need to revise the concept of mining

and processing of mineral resources, it is advisable to consider the possibility of the determination of priority categories of natural resource potential with a view to its rational use. In addition, it is necessary to take into account the possibilities of recycling waste and the possibility of preservation of available resources and the transition to the use of alternative energy sources.

The activity of modern society is accompanied by significant changes in nature, which is reflected in the external appearance of the Earth, as well as on the states of geosystems. Modern production is characterized by the involvement of significant deposits of natural resource potential. However, the effectiveness of its involvement and use is quite low.

The purpose of the article is to provide a generalized analysis of the available information about the natural resource potential of the Chechen Republic for the preparation of a basic framework for programs creation for the effective development of the region. For the transition to sustainable development, it is necessary to determine priority areas of the development, including the use of natural resource potential. The authors of the article give a general assessment of the existing volumes of the natural resource potential of the region; suggest highlighting priority categories for the development of the economic sector of the Republic.

Attention is paid to the fact that at present the oil sector and the building complex retain their leading positions in the economy of the republic and are among the key industries. They largely determine the solution of priority social, economic and engineering problems of the region development. In the history of development of the oil-producing and oil-refining industry, there are periods distinguished by the scale and methods of oil production and the methods of geological exploration. The most active period of oil production in the republic falls to 1930-1900. In this period, a full-scale system of oil and gas production was formed. It was accompanied by performing exploration,

research and thematic work, which were carried out by leading research and production organizations of the republic.

Noting the importance of studying the natural resource potential of the republic in the context of the economic development of the country, it is necessary to note that the economic and political crisis of the 1990s of the 20th century affected the mentioned industries in the most serious way. Thus, there was a sharp decline in the volume of oil and natural gas, the volume of production of construction materials. In some cases, the output of their certain types stopped altogether. In addition, there was a significant reduction in the volumes of exploration work necessary for development of the mineral resource base and the construction industry. At present, in the development of the republic's economy the priority is given to namely these sectors which must play a key role in overcoming the consequences of the crisis and transition of the republic's economy to a new level. In this regard, intensification of development of mineral resources, resumption of exploration works to increase the resource base acquire exceptional significance.

## II. METHODS AND MATERIALS

The material of the research is presented by statistical data and information from literary sources on the natural resource potential of the Republic. Comprehensive scientific analysis allows assessing the priority areas of the use of natural resource potential. Comparative analysis of data on the natural resource potential makes it possible to determine the trend of mining dynamics of certain types of minerals and assess the possibilities of their further involvement in the development of the economy of the Republic and country.

## III. RESULT AND DISCUSSION

Existing definitions of natural-resource potential reflect that this is a part of the natural resources of the Earth, which is involved in the economic turnover given under modern technical and socio-economic possibilities. In addition, the attention is paid to the observance of the condition – the care of geographical environment from the processes of destruction.

There is no doubt that the natural-resource potential, as an important element of the geographic environment, has a certain influence on the distribution of productive forces and the satisfaction of human needs in the natural-resource potential. However modern approaches to the assessment of human demand for elements of natural resource potential also need to be revised, because its volumes are not infinite: some types of natural resources are renewable (inexhaustible), others are non-renewable (exhaustible). As it is known, the existing classifications of natural resources are not universal. Frequently used classifications of natural resources are mainly related to their production use.

Despite the small area the Chechen Republic is characterized by the presence of various natural resources (solar energy, climate, water, land, mineral resources, plant, animal life, etc.).

Traditionally in the Republic, an important attention has been paid to the development of primarily the mineral resource base, which provides the needs of the economy and the population with oil products and gas, raw materials for the production of building materials and groundwater resources [2]. This article touches upon the issue of the categories of natural resources, which occupy priority positions primarily in the extraction, processing and further involvement in the economic sector. These categories should determine the future basis for the development of the region during the process of the transitions to sustainable development. For the Republic, the following categories of types of natural resources depending on industrial use can be determined:

- fuel and energy resources (oil, gas);
- solid non-metallic minerals;
- geothermal resources;
- hydromineral (ground fresh and saline water);
- land resources;
- recreational resources;
- solar and wind energy resources.

Traditionally in the republic, due attention has been paid to the development of primarily the mineral resource base, which provides the needs of the economy and the population with oil products and gas, raw materials for the production of building materials and groundwater resources [2].

The republic is also rich in plant resources (forests, medicinal plants, animals). However, they are not included in the investigated, since their active involvement in the development of the economy of the Republic must be considered separately.

### 3.1. Fuel and Energy Resources

The resources of this category have played an important role in the development of the economy of the Chechen Republic since the days of the Soviet Union, when the oil-producing complex represented the most important structural component of the economy of the Chechen-Ingushetia.

In geological petroleum respect, the territory of the region is represented by Terek-Sunzhensky oil and gas region. It belongs to Terek-Caspian oil and gas region of the North Caucasus-Mangyshlak oil and gas province [2]. There are local accumulations of oil and gas.

The surface oil and gas shows in the Caucasus have also been known since time immemorial. Thus, oil sources on the Absheron Peninsula were mentioned in the chronicles of the times of Alexander the Great's campaigns. Since the end of the 18th century in different regions of the Caucasus, including within the present territory of the Chechen Republic and the Republic of Ingushetia (in the Grozny and Mamakaevskaya beams, in Karabulak), well oil production begins, which continued almost until the beginning of the 20th century. In the initial period, artisanal oil production was carried out in places of its show on the surface and was, in fact, the only indicator of the presence of oil deposits in the bowels of the

earth. Since the second half of the 19th century the reconnaissance works on the study of the geological structure of the Eastern Ciscaucasia began.

Since the 17th century and, especially since the 18th century, when the demand for mineral raw materials was growing, the scale of geological prospecting works for various minerals - ores, precious stones, groundwater, oil, etc. Since the beginning of the 19th century numerous expeditions to various regions of Russia, including the North Caucasus, have been sent for geological research and mineral exploration. Since the middle of the 19th century a significant role in the study of the geological structure and mineral wealth of the Caucasus, including the territory of the modern Chechen Republic, belonged to well-known researcher G.V. Abih. At that time in his works, he expressed interesting thoughts concerning the features of the geological structure of the system of the Peredovoi Ridges of the Terek-Sunzhenskiy folded zone. At the end of the 20th century conclusions about the prospects for the oil-and-gas potential of Starogrozenskaya Square had already been made and confirmed. Drilling was carried out using a steam engine at the Yermolovsky site. In 1893 an oil gusher was obtained [2]. Thus, this and other petroleum results in the Grozny district attracted the attention of leading oil producers. And in the first half of the 20th century, geological studies of the territory of the North Caucasus, including the territory of the present republic, were carried out concerning oil-and-gas bearing capacity. Prospective areas of oil-and-gas production were identified.

At present, despite the absence of hydrocarbon processing plants for raw materials, these resources continue to play an equally important role in the regional economy. Thus, on the territory of the Republic, according to the data as of January, the 1<sup>st</sup>, 2016, 22 hydrocarbon fields of raw materials were at the development stage, 18 of them were oil, 3 were gas and oil, and 1 was oil condensate. Table I presents information on the status of oil reserves and resources as of January 1, 2016 [2].

TABLE I. THE CONDITION OF OIL RESERVES AND RESOURCES (OF JANUARY, THE 1<sup>ST</sup> 2016 [2])

Types of hydrocarbon raw materials	Cumulative production	Extractable reserves and resources by category, mln.t				Degree of developed reserves, %	Total initial resources, mln. t
		A+B+C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	D <sub>1</sub> +D <sub>2</sub>		
Oil+ condensate, mln.t	333.3	10.4	4.1	21.4	84.8	96.9	453.9
Gas, bln.m <sup>3</sup>	89.3	9.9	21.5	9.5	116.7	49.7	246.9
Total amount, mln.	421.0	29.2	29.2	27.6	224.2	–	728.3

The data on the volumes of oil production give general ideas about the situation in the region: in 2014, 447 thousand tons of oil was produced, in 2015 it was produced 370 thousand tons [2]. The current oil reserves at the current production rate will last about ¼ century [2].

According to the data as of January 1, 2017, [2] there are 15 oil fields under development (mostly these are small

deposits). Their total extractable reserves are presented in Table II.

TABLE II. TOTAL OIL AND GAS RESERVES IN THE TERRITORY OF CHECHEN REPUBLIC (AS OF JANUARY 1, 2017)

No.	Oil reserves categories	Reserves volumes, mln.t
<i>Total amount of deposits: 15</i>		
1.	AB <sub>1</sub> C <sub>1</sub>	10.2
2.	B <sub>2</sub>	1.5
3.	C <sub>2</sub>	2.6
4.	D <sub>0</sub> (prospective resources)	21.4
5.	D <sub>1</sub> +D <sub>2</sub> (undiscovered potential resources)	84.8

Nowadays, a number of problems are noted for the development of the oil and gas complex, the most significant of which are:

- The lack of replenishment of the resource base with new hydrocarbon fields of raw materials due to the slowdown in the development rate of geological exploration and the limited amount of their volumes;
- The complication of exploration conditions and tasks solved by them (such as, for example, increasing the depth of productive sediments, reducing the size of prospecting objects, etc.);
- The high depletion of the main hydrocarbon fields of raw materials and poor development of secondary methods for their production;

In addition to the existing exploited territories, the possibilities of developing new oil-and-gas promising areas and sites are being considered. The reason for this is the work of specialized agencies on generalization and interpretation of geological and geophysical materials on licensed and prospective objects. On the basis of these works, carried out in 2011-2012, recommendations for drilling exploratory Mesketin and East-Gudermes wells were provided. Drilling of the exploratory well in the North-Dzhalka area is considered inexpedient. Applications for inclusion in the list of licensing objects Nozhay-Yurtovo, North-Grozny, West-Grozny, East-Grozny prospective areas were filed to Rosnedra [2].

For the further effective development of the oil and gas industry of the republic, it is advisable to consider the implementation of the following measures:

- The additional development of fields with the introduction of high-tech methods of the intensification of oil production.
- Geological prospecting and exploration of oil and gas for the purpose of prospecting and additional exploration of oil deposits discovered in the Cretaceous sediments.
- The search for oil and gas deposits within the limits prepared for drilling structures as a result of generalization of geological and geophysical materials.
- The determination of new oil and gas prospective geological objects in the Meso-Cenozoic sediments of

both structural and non-structural type in the Miocene sediments and reefogenic structures in the Upper Jurassic sediments.

It should also be noted that, in addition to oil and gas, one brown coal deposit (in some sources it was called combustible shale) is known on the territory of the republic. It is located in the basin of the river Hulhulau. The depth of coal interlayers varies from 13 cm to 1.2 m. The shows of brown coal are traced along strike for 7–8 km. The estimated distribution zone is up to 50 km. Manifestations of brown coal were also found in the southeastern part and other places of the republic and in the upper reaches of the Sharo-Argun and Chanty-Argun rivers.

3.2. Solid Non-Metallic Minerals

After fuel and energy resources, this category of natural resources is also important for the economic development of the Republic. The territory of the Republic is characterized by the presence of rich deposits of limestone, brick and expanded clay, sand, building stone, etc.

The mineragenic potential of the Republic includes 15 types of solid non-metallic minerals belonging to the groups of mineral, construction and metallurgical raw materials. On the territory of the republic there are large deposits of cement raw

materials (limestone, gypsum, clay), sand and gravel mixes, building stones; medium and small deposits of construction sands, silicate and glass, clay, brick and expanded clays, limestones, bitumen-containing rocks, facing stones, etc. Besides, there are shows of dolomites, zeolite-containing and bentonite-like rocks. All known objects are located within the Shelkov, Naurs, Nadterechnoe, Grozny, Gudermes, Achkhoy-Martan, Urus-Martan, Shali, Nozhai-Yurt, Vedensk and Shatoi administrative districts of the republic.

The analysis of the state of the mineral resource base of the Republic and its resource potential as a whole allows concluding that there are significant reserves for both the growth in the extraction of solid non-metallic minerals and the involvement in the near future of such mineral raw materials as cement raw materials, polymetals, Celestine etc. It is also necessary to note the fact that the remaining reserves of all the reserves of solid non-metallic minerals accounted in the state balance are as of January 1, 1991. Since 1991, there is no information about the volumes of solid non-metallic minerals. Almost all known deposits are located in the undistributed fund of mineral resources.

Fig. 1 shows the ratio of balance reserves of categories A + B + C<sub>1</sub> (A) and C<sub>2</sub> (B) by type of non-metallic raw materials.

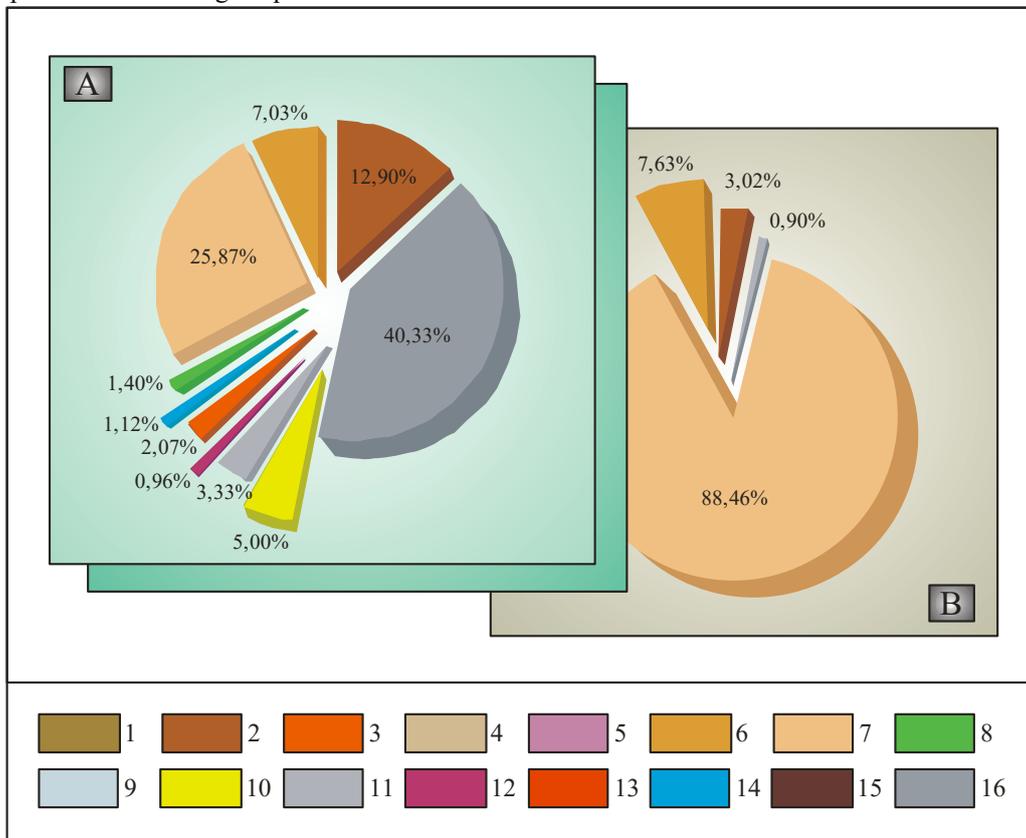


Fig. 1. The ratio of balance reserves of categories A + B + C<sub>1</sub> (A) and C<sub>2</sub> (B) by type of non-metallic raw materials.

Raw material types: 1 – bentonites and bentonite-like clays, 2 – brick and tegulate raw materials, 3 – expanded clay material, 4 – raw materials for metallurgy, 5 – multiuse dolomites, 6 – cement raw materials (clays), 7 – cement raw materials (carbonaceous rock), 8 – limestone for lime production, 9 – glass sand, 10 – building sand, 11 – sands, sandstones for silicate products, 12 – building stones, 13 – facing stones, 14 – gypsum, anhydrite, 15 – bituminous sandstone, 16 – sand-and gravel materials.

Works on the state-of-the-art of the problem of solid non-metallic minerals have been performed. There is a classification of the main geological and industrial types of non-metal deposits. It is represented by 14 different types of solid non-metallic minerals. Among them, cement raw materials are of priority. Thus, the conducted analysis allows concluding about the real possibility of production of building materials in the republic based on explored fields, determining their prospectivity and expected areas.

#### IV. CONCLUSION

Undoubtedly, the further development of the economy of the Chechen Republic is largely determined by the available natural-resource potential. The mineral resource base is focused primarily on the extraction of energy resources and solid non-metallic minerals.

The creation of a dynamically developing economy of the Republic will require a substantial replenishment of the resource base through additional exploration of existing deposits and the discovery of new mineral deposits. Therefore, one of the priority tasks for the Republic is the resumption of geological exploration in sufficient volumes using the latest methods and technologies. The development of the infrastructure of the Chechen Republic is largely determined by the development of the mineral resource base, which will positively affect the socio-economic status of the Republic.

In addition, sustainable development of the Republic requires the creation of a stable multi-vector energy that can meet the growing needs of the population and the economy of the region.

Beyond the discussion area there are questions concerning development of ore deposits, the potential of thermal power, mineral and healing waters and a number of other issues relating to the main categories of natural resource potential of the territory of the republic. But at this stage of the research, the primary task is to resolve issues related to the collection, analysis and revision of available information on the geological structure of the territory of the republic, its structural and tectonic peculiarities, forecasting and mineragenic assessment, conditions of occurrence of rocks, calculation of reserves and assessment of forecast resources,

etc. This necessity has been caused by the fact that the predominant part of all geological exploration on the republic territory was carried out in the 60-70s of the last century. Therefore, much of the information is outdated and requires updating.

The analysis of the current state of the natural resource potential of the Republic allows determining the main strategic directions of economic development of the Republic. In addition, in order to solve the socio-economic and environmental problems of the North Caucasus, a Comprehensive Noosphere Development Program of the North Caucasus is proposed — the North Caucasus Noosphere Region, a pilot project with an innovative model of socio-economic, environmental and cultural development [6].

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