MINERAL RESOURCES **IN ALBANIA**

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II. MINERAL RESOURCES IN ALBANIA

Albania is distinguished for its mineral resources. Most of them have been discovered and exploited from ancient times up to date. There are also other deposits for which a careful study and evaluation of geological reserves should be conducted.

II.1. A General Overview in Mining Industry

Albania is a country rich in mineral resources. Mineral exploration, exploitation and processing constitute a key component of the Albanian economy, due to a traditional mining industry, that has been a solid foundation to the country economic sector, generating substantial revenues. Chrome, copper, iron-nickel and coal, are some of the minerals mined and treated in Albania.

Mining industry development in Albania has passed through three main stages:

The first stage includes the period up to the end of World War II, marked by two important events. In 1922, has been compiled the first Geological Map of Albania, which was even the first of its kind in the Balkans. In 1929 has been approved the first Mining Law of the Albanian Kingdom, which paved the way to the exploration and/or exploitation of mineral resources in Albania;

The second stage (1944-1994), marks the period when the mining activity has been organized in state-owned enterprises and the concept of mining privatization did not exist.

The third stage includes the period 1994 up to date. It began the mining's privatization, after the approval of Albanian Mining Law.

II.2. Licensing

The licensing process initiated in 1994, upon approval of the Albanian Mining Law.

Up to November 1st 2011, there were issued 752 mining permits out of which were 673 exploitation permits, mostly in Bulqiza, Kruja, Berat, Tirana and Librazhdi districts.

Out of 673 exploitation mining permits:

211 permits for chrome ore;

231 permits for limestone;

32 permits for clay;

34 permits for iron-nickel and nickel-silicate;

43 permits for tabulated limestone;

30 permits for massive and flaglic sandstone.

Fig.1 The map of Albania with mining permits according to the districts

The rest of exploitation licenses belongs to over 10 different kinds of minerals and rocks.

Distribution of mining permits per district and annum is illustrated in the Fig.1 and charts 1, 2, as below:

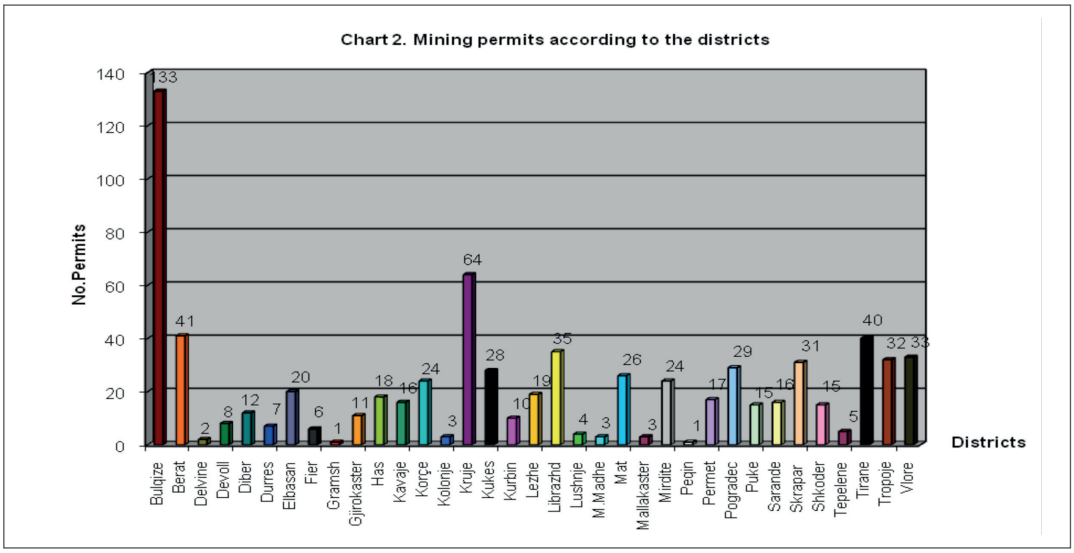


Chart 1. Number of the mining permits according to the districts

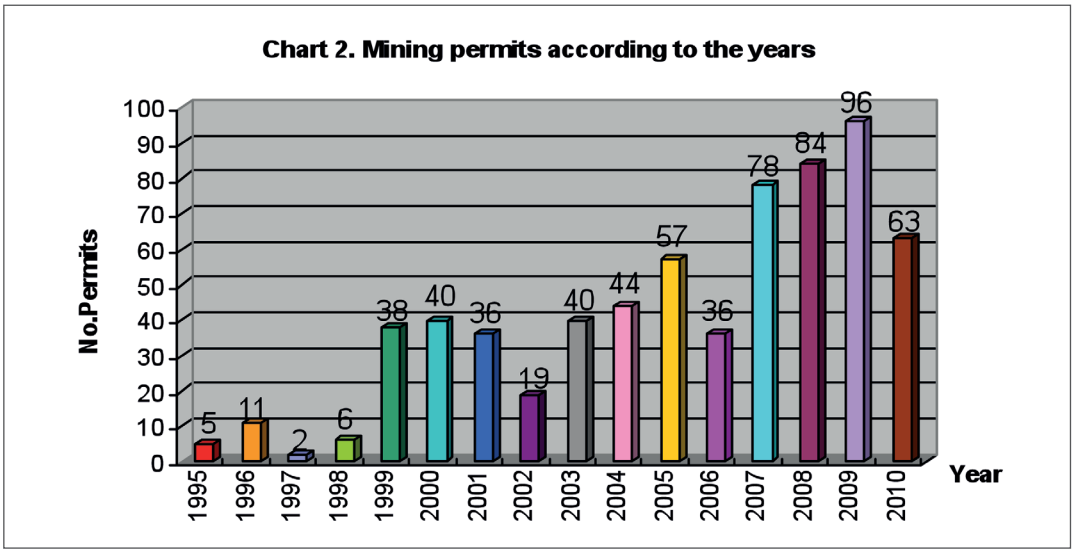


Chart 2. Mining permits according to the years

II.3. Concessions

The privatization process continued with the approval of the Law “On Concessions”, and giving by concession of certain parts of mining industry (of this branch).

The mining objects given in concession so far, are as below:

- Bulqiza chromium mine and ferrochrome smelters of Burrel and Elbasan Cities;
- Chromium Mines in Kalimash, Kukës district, Vlahnë, Has district and Kalimashi dressing plant;
- Munella, Lak Rosh Karma 2 copper mines and also the dressing plant in Fush Arrëz town;
- Selenica Bitum mine, Vlora district mine and its bitum smelting furnace.

II.4. Albanian Mining Potential

Through many studies and exploration-prospecting geological works carried out, from 1945-1995, are concretised a lot of useful metalliferous and non metalliferous mining deposits, industrial and for construction use and as decorative stone.

Some of the typical qualitative features of the main minerals are as below:

No	Minerals	Composition
1.	Chromite	Cr_2O_3(15-48%);FeO(10-12,5%);SiO_2(11-18%);MgO(23-27%);Al_2O_3(7-9%)
2.	Iron-Nickel	Fe(38.5-47,2%);Ni(0.9-1,1%);Co(0.06-0,08%);SiO_2(7,1-17%);Cr_2O_3(3,1-4,6%)
3.	Níckel-Silicate	Ni(1,07-1,32%);Fe(14-18%);Co 0,045%;SiO_2(37-39,7%);Cr_2O_3(3,3-8,5%)
4.	Copper	Cu(1.35-1,85%) average 1.6%
5.	Coal	Calorific power 3100-5100 KCal/Kg; S(2,9-3,2%); Ash (21,6-65%)
6.	Bitumen	The softening point 120°C; S (3,5-7,5%)
7.	Bituminous sands	bitumen concentrate (8-10)%
8.	Limestone	CaO(50-55,3%); MgO (0,25-0,76%); S_iO_2(0,2-1,6%); Fe_2O_3(0,04-0,7%)
9.	Dolomites	CaO(29-35%); Fe_2O_3(0,14-0,5%); MgO(17,6-21%); SiO_2(0,04-1,25%)
10.	Trepele	CaO (0,03-0,35%); Fe_2O_3(0,41-1,5%); MgO (18-28%); SiO_2(1,5-4,9%)
11.	Travertines	CaO(30-56%); MgO(0,6-3,6%);SiO_2(0,43-8,9%); Fe_2O_3(0,4-1,59%)
12.	Carbonatic Decorative Stones	CaO(47,5-56,1%);MgO(0,26-2,7%);SiO_2(0,43-0,95%);Fe_2O_3(0,6-0.94%)
13.	Siliceous-Sandstone Decorative Stones	SiO_2(46,8-53,6%);Fe_2O_3(1,6-2,1%);Al_2O_3(4-13%);CaO(11,7-21%);MgO(1,8-7,8%)
14.	Phosphorite	P_2O_5(10-12%); CaO (48-50%); SiO_2 (5-8.5%); U_3O_8(0.005-0,03%)
15.	Clays	SiO_2(43-64%);Al_2O_3(9,6-16,4%)Fe_2O_3(0,4-7,8%);CaO (0,3-13,2%);MgO(2-7,2%)
16.	Kaolin	Al_2O_3(29-35%);Fe_2O_3(1,1-5%);CaO(1,4-1,9%);MgO(2,8-3,8%);SiO_2(43-47%)
17.	Volcanic tuff	$Al_2O_3$13,21%;Fe_2O_3(3-4,16%);CaO3,6%;MgO(2,2-3,14%);SiO_2(60-62%)
18.	Quartzose Sand	SiO_2(75-85%);Al_2O_3(5-13%);Fe_2O_3(0,8-2,6%);CaO(0,1-1,15%);Mg(0,4-0,6%)
19.	Gypsum	CaO(30-33,4%);SO_2(36,9-44%);H_2O(13-20,4%);$CaSO_4$ $2H_20$> 86%
20.	Rock Salt	NaCl(80-82%);$CaSo_4$ 4,9%;CaO 1,1%;SO_3 2%
21.	Olivinites	MgO (44,6-50%); SiO_2 (36-39%); Al_2O_3(0,18-0,82%);Fe_2O_3(5,2 -10,2%)
22.	Volcanic Glass	SiO_2(63-66%); Fe tot (3,3-6,5%);Al_2O_3 (9,9-10.7%);MgO(0.4-0.9%); CaO(4,6-5,04%)
23.	Magnesites	MgO 39,6%;SiO_2 11,34%;Fe_2O_3 1,9%;CaO 3,67%
24.	Feldspat	SiO_2 71,21%; Na_2O 3,47%; K_2O 4,42%; Al_2O_3 17,74%
25.	Albitophyre	SiO_2 77,05%; Na_2O 5,79%; K_2O 2.58%; Al_2O_3 12,48%
26.	Pyrophyllite	SiO_2 68,4%; Al_2O_3 18,58%;CaO 0,37%;MgO 1,09%)
27.	Fluorite	CaF_2 39,82%;SiO_2 39,43%
28.	Troctolite	SiO_2(40-44%);MgO(8,9-20,5%);Fe_2O_3(0,83-4%);CaO(2,2-13,3%)
29.	Basalt	SiO_2>40%;Al_2O_3(12-17%);MgO(4-9%);CaO(9-17%)
30.	Harcburgite	SiO_2 40,42%; MgO 37,6%; Fe_2O_3 3,06%;CaO 2,73%
31.	Plagiogranite	SiO_2 67,5%; MgO 3,3%; Fe_2O_3 3%;CaO 4,3%

Table1. Average contents and compositions of the most important minerals

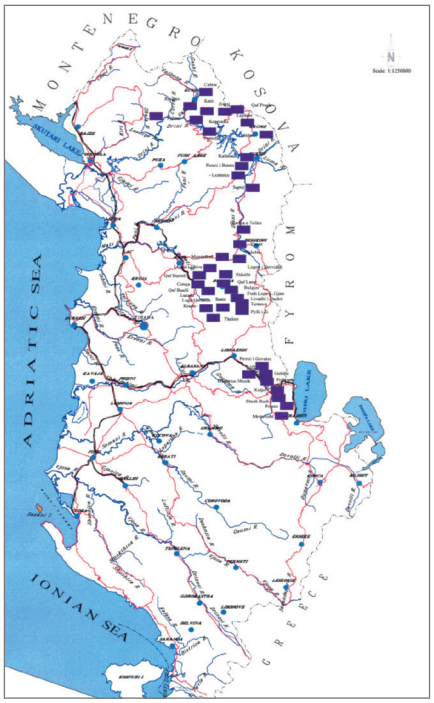
-Raw mining production

For the period 2007-2010, the production of some main minerals, raw materials used for construction, inerts and cement and decorative stones of sedimentary rocks type, is given in the chart below:

No.	Sort of mineral	Unit	Annual Production			
			2007	2008	2009	2010
1.	Chrome	tonnes	202371	225373	283558	328322
2.	Copper	tonnes	98000	105000	114286	139926
3.	Iron-Nickel and Nickel-Silicate	tonnes	369559	353320	68840	269300
4.	Coal	tonnes	4000	1500	2000	-
5.	Limestone	m^3	1716122	3837529	3271617	2363445
6.	Slab Limestone	m^3	29263	27900	39749	34132
7.	Massif Limestone	m^3	2505	3964	5403	7331
8.	Bedded Sandstone	m^3	7100	25237	45415	22902
9.	Clays	tonnes	764674	648760	796241	795126
10.	Gypsum	tonnes	53629	87261	71276	77400

Chart 2. Production and export of some main minerals and decorative stones

II.4.1. Chromium ore



Albania is well known for its high potential in chromium ore, comparing to other Mediterranean and Balkans countries. The main chromium deposits are located in the Ophiolites of the Eastern Belt area, to Tropoja-Kukës-Bulqiza-Shebenik-Pogradec direction.

In the Ophiolites of the Western belt is identified less development in the chromium ore deposits.

From the geographic perspective, there are three main regions where chromium ore is located:

- North-eastern Region (Tropoja and Kukës Ultrabasic Massifs);
- Central Region (Bulqiza and Lura Ultrabasic Massif);
- South-eastern Region (Shebenik-Pogradec Ultrabasic Massif).

Fig.2 Chromium ore deposits

Bulqiza Ultrabasic Massif is the biggest chrome-potential massif, where is located Bulqiza chromium ore mine. This is a rare mine in its kind and has good quantitative and qualitative features.

Some perspective areas for chromium ore prospection-exploration are:

- The depth of North Bulqiza deposit, Qaf Buall deposit, Batër-Lugu i Gjatë-Fushë Lopë area, Liqeni Sopevë-Thekën-Tërnov area and the depth of Thekën deposit;
- The areas around Kalimash 1,2,3 and Përroi i Batrrës deposits;
- Mineralized occurrences in Shebenik-Pogradec massif and Katjel-Shesh Bush-Pojskë area.
- Lura massif in Dibra region etc.

II.4.2. Copper

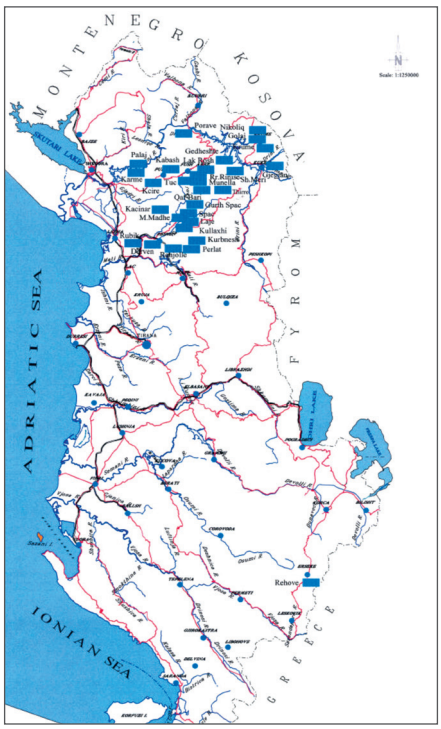


Fig.3 Copper's deposits

Copper deposits are located in six districts: Korça, Mirdita, Puka, Shkodra, Kukës, and Has regions (Fig. No.3)

Mirdita and Puka regions have a high copper potential considering the annual production and number of the mining deposits.

Based on the geologic conditions, their morphology, genetic and mineralogical components, there are distinguished three main types of copper deposits:

- Plutonic type, quartz-sulphur - this type includes deposits located in Nikoliq 1, 2, Golaj, Krumë, Gdheshtë, Thirë, Shëmri, Tuçi Lindor, Kurbnesh, Kabash, Kçirë, Turec regions and a lot of mineralized occurrences in plutonic, gabbror and plagiogranite intruzives rocks.
- Volcanogenic type, includes deposits such as Perlat, Munellë, Lak Roshi, Tuç, Palucë, Qaf Bari, Gurth 1,2,3, Spaç, Kaçinar, Derven, Rehovë, Bregu i Gështenjës, Dushku i Trashë, etc. And mineralized occurrences around these deposits.
- Volcanogenic-sedimentary type includes deposits in Gjegjan, Poravë, Palaj, Karma, Rubik and other mineralized occurrences around these deposits

Some perspective areas for copper exploration and/or exploitation may probably be alongside and in the depth of Munella, Gurth, Perlat, Karma and Rehovë deposits.

II.4.3. Iron-nickel and Nickel-Silicate minerals

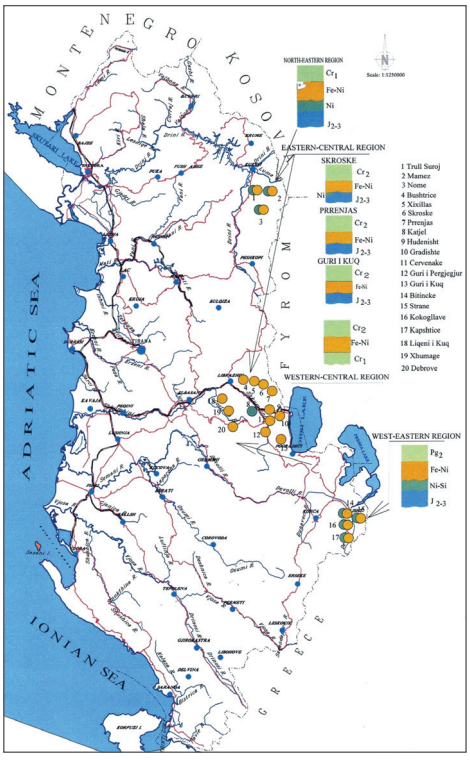


Fig.4 Nickel's deposits

Iron-nickel and nickel-silicate are located near the East border of our country, from the North-East to the South-East area. (Fig.4)

- The deposits are located as below:
- North-East region (Kukës): Trull Surroi, Mamëz, Nome deposits;
- East Central region (Librazhd-Pogradec regions): Përrenjas, Skorskë, Xixillas, Bushtricë, Gur i Kuq, Cërvenakë, Guri Përgjegjur, Hudënisht and Gradisht deposits.
- West Central region includes deposits of the group of laterite-redeposited type. Liqeni i Kuq, Xhumagë, Debrovë, that have lower qualitative properties than the other groups.
- South-East region deposits, iron-nickel and nickel-silicate deposits of Devolli region: Bitinckë, Kapshticë, Stranë, Kokogllavë, and a few less studied objects such as Vërniku, Shkoza etc.

Perspective areas for iron-nickel and nickel-silicate exploration and prospecting can be:

- Kukës-Has-Cahan region;
- Trull-Surroi-Nome-Lurë area;
- Skroskë-Bushtrica-the depth of Prrenjas deposit area;
- Bilisht-Kapshtica area in Devolli region ;

No.	Region	Fe%	Ni%	SiO_2%	Co%
1.	*Devolli*				
	Nickel-Silicate	16,60	1,20	35,12	0,0397
	Iron-Nickel	38,66	1,074	12,2	0,056
2.	*Kukës*				
	Nickel-Silicate	21,73	1,057	40,12	0,053
	Iron-Nickel	37,22	1,029	26,93	0,0547
3.	*Librazhd-Pogradeci*				
	Iron-Nickel	44,72	0,97	17,22	0,074

Table 3. Average content of nickel-silicate and iron-nickel according to the regions

Feni Korçe- Fe-Ni

2. Devoll Korçe

II.4.4. Coal

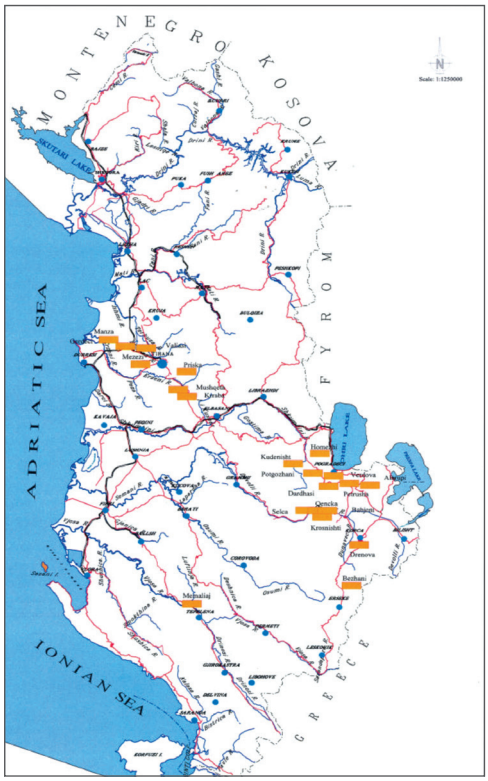


Fig.5 Coal deposits

The coal discovered and exploited in Albania are of the lignite type. The geologist through the mining works for exploration-prospecting, have fixed 14 (fourteen) coal-bearing deposits expanded all over the territory, from Tropoja to Saranda district.

In the coal-bearing deposits of Morava, Gorë-Mokra, Tirana, Erzeni, Memaliaj, Bezhan and Alarupi are located 19 coal deposits, that are exploited up to 1995, (Fig. 5).

In the coal-bearing deposits of Goliku, Galush, Burrel, Devoll, Fushë Korça, Tropoja and Xara, have mainly mineral occurrences with poor coals and limited size.

Coal occurrences are found in other places as well as: Lushnjë, Kuçovë etc. These occurrences have not been evaluated for their quantitative and qualitative features.

From the total geological reserves discovered, that are evaluated to be some hundreds million tonnes, approximately 85% of the reserves are located in Tirana coal-bearing deposit, approximately 9,2% in Morava and Gorë-Mokër deposits and approximately 4.4% of the reserves in Memaliaj deposit. A complete and comprehensive study is needed to define the possible fields of coal use.

II.4.5. Peats (turfs)

Some peats zones are found along the moors of Adriatic seaside, beginning from Shkodra to Vlora and in Korça fields and Vurgu as well.

The moors where peats are found, have generally small size but not to be underestimated. Peats occurrences are also found near Jon seaside, in Butrint region.

An important deposit is discovered in ex Maliqi moor, in Korça field. The peats discovered in this deposit are over 100 million $m^3$1,1% of Sulphur content and 38,6 volatileves content.

II.4.6. Bitumen

In this group are included concentrations that in world literature are known as “Selenica Asphalt”. Bitumen concentration in Selenica deposit is in pocket form, tubes, branching, disordered and with different shapes veins. Their exploration-prospecting procedure was difficult due to their disordered morphology.

Pirobituminos *(Bituminous gravel)*

Pirobituminos are bitumen materials that do not dissolve completely in organic solvents and do not melt in during heating process. “Pirobitumen” is the only scientific name. They are associative of bitumen in Selenica deposit and the area around it. The bodies have veins shape, with strike up to 100-200 m up to 400-500m. It releases a calorific power of 5300 KCal/Kg.

Bituminous sands

These are compact or sedimentary friable rocks that contain crude natural oil as bitumen. In our country are found large deposits in Vlora and Fier districts. Considerable deposits of bituminous sands are discovered in some oil drillings in Makaresh and Thumanë. The most important ***Bituminous sands*** are those of Kasnica and Treblova regions.

II.4.7. Non-Metalliferous Minerals

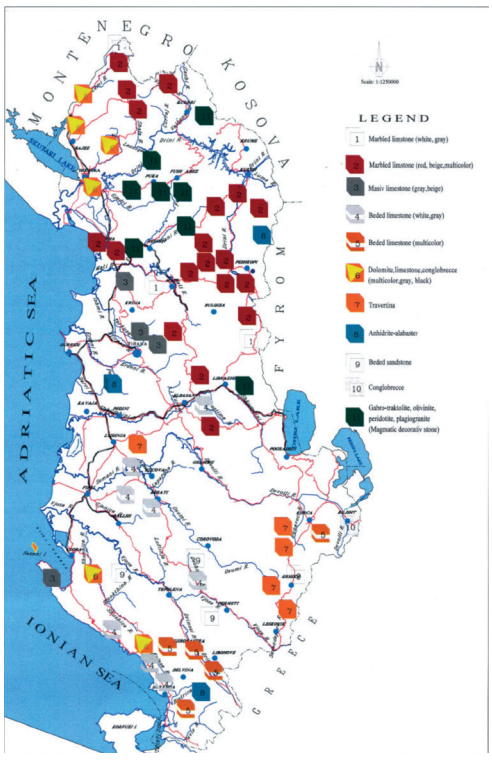


Fig.6 Deposits of rocks and non-metalliferous industrial minerals

Albanian Geological Survey, during its fifty years of activity (1945-1995), through the exploring-prospecting geological works and its general studies, has given data for approximately 32 different kinds of rocks and non-metalliferous industrial minerals, expanded all over the country, in 438 deposits and mining objects. The evaluations completed so far show considerable reserves and with an open perspective for lots of them, guaranteeing Albanian economy empowerment

Limestones

Limestones represent the carbonatic raw material, of different geological ages, in the form of massifs, layers and belts, in almost all districts of the country.

There are recognised about 58 deposits of limestones, with approximately 490 million m3 geological reserves, with an open perspective to enlarge.

Dolomites

Dolomites are widely spread in Albania. They are located in Albanian Alps, Has, Korab, Kruja, Kurbin, Tomorr, Elbasan, Gramsh, Vlorë, Himarë, Delvinë and Gjirokastra districts. Based on chemical composition, dolomites located in Dukat (Vlora region), Delvina, Himarë and Mali i Gjerë (in Gjirokastra region), have high technological qualities with an average content of MgO, 20-21 %.

There is an open perspective for 8 deposits with approximately 160 million m^3 geological reserves.

Travertins

Travertins are carbonatic_porous rocks with cavity,_located in Tropojë, Has, Dibër, Bulqizë, Elbasan, Gramsh, Lushnjë, Librazhd, Korçë, Kolonjë, Përmet, Gjirokastër, Delvinë and Saranda districts. The mix of dolomites-limestones-travertines create high quality decorative deposits as for example the deposit of Kosova (Lushnja district). With the travertines of Kosova deposit are the colons of the Palace of the Congress, the squares in front of the National Museum and the International Culture Centre and also lots of other villas, buildings etc. From the evaluations completed in 18 deposits and objects, are calculated to be approximately 23 million m^3 geological reserves. The travertins of Kruma, Burizanë, Gollobordë, Bajram Curri, Malësia e Shkodrës etc. remain to be evaluated through geological works.

Carbonatic Decorative Stones

A lot of buildings, colons, statues and relics discovered during archaeological researches testify that Albania has a tradition of thousands of years for the stone elaboration and decorative stones use.

The decorative carbonatic stones are represented from:

-Marbled limestones of Triassic-Jurassic

They represent the group with the highest decorative quality. They are distinguished for the high level of crystallization, colours diversity, massive construction and exploitation in blocks. They are located in: Tropoja, Kukës, Dibër and Bulqizë districts, with a red colour to pink and white hue and other marbled limestone with white colour in Qaf Shtamë, pink ones in Elbasan and Pogradec and grey ones in Devoll districts. From the evaluations completed in approximately 20 deposits, are calculated to be 100 million m^3 geological reserves. The most important deposits are Muhuri, Gjurasi, Kovashica and Qafshtama regions.

- Massive limestone of Cretac and Cret- Paleogen

They are located in Lis and Burgajet of Mati district, Vithkuq and Polena of Korça district, Gërmenj of Kolonja district with a red and pink hue, conglomeratic appearance and diverse decoration; In Milot, Laç, Mamurras etc. of Kurbin district, Zall Dajt and Qaf Priskë of Tirana district, with white and grey colours and good decorative characteristic. From the evaluation of the above mentioned group are calculated to be approximately 143 million m^3 of geological reserves. In the deposits of Milova (in Skrapar district are produced white limestone blocks.

4. Milove- Massive limestones

-Tabulated limestone

The tabulated limestone are actually exploited in 11 regions of Albania. From the calculations completed are approximately 42 million m^3 geological reserves, not including the Novaj area (Skrapar district) for which there is no data for the calculated reserves

Novaj- tabulated limestone

-Conglomeratic limestone

The Conglomeratic limestone are mainly located in Librazhd, Pogradec, Korçë and Devoll districts. They are multicolour with carbonatic cementation, with a big strength and very difficult to be cut and elaborate. There is not any mining permission issued so far. From the evaluations completed are approximately 9.6 million m^3 of geological reserves. Petrusha, Bitincka and Vithkuqi are perspective mining objects.

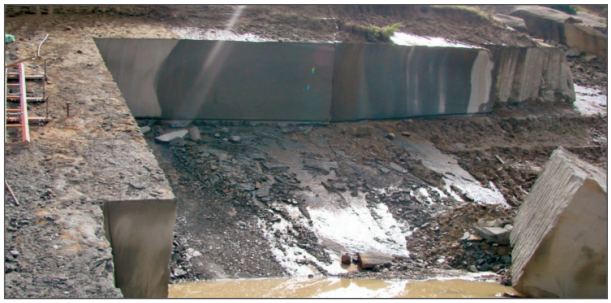
- Decorative stones connected with sandstones

Massive and flaglike sandstones have a huge expansion in 9 (locations) districts of our country. Their exploitation has begun since 2005 and there are mainly produced blocks and flags. Despite the expansion in Korçë, Kolonjë, Përmet, Skrapar, Vlora and Berat districts, there is no geological study of the reserves so far.

PERSPECTIVE ZONES ARE:

- Plovisht-Mesmal, Korça districts;
- Leskovik-Përmet-Këlcyrë-Ballaban zone;
- Corovodë-Bogovë-Polican Berat zone;
- Vodicë-Drashovicë-Kot-Gjorm-Tërbaç-Vranisht zone, along Shushica Valley River.

5. Berat- massive silicous sandstones



Sandstones, Berat

Phosphorites

The industrial mineralization of phosphorites is connected to the phosphoregnics Jurassic and Cretac epochs.

Based on the geological works carried out up to the year 1991, are discovered and evaluated 10 deposits connected to the phosphotic horizon of Crete and 2 phosphotic uranium-bearing deposits of jura in Fushë-Bardhë and Bogaz regions. From the evaluations completed in 12 studied deposits, are calculated to be 57 million tonnes of geological reserves and an open reserve for their enlargement.

Clays

Clays that are produced in Albania are used for tiles production, majolica tiles, bricks, artistic production and cement production.

Considering the areas of use and the clays' qualitative characteristics, in Albania can be classified 9 kinds of clays discovered.

Up to date, from the calculation carried out in 46 deposits and objects, are calculated to be approximately 260 million tonnes of geological reserves. The most important deposits are: Tarabosh and Drisht in Shkodër district, Fushë- Krujë, Brar and Vorë in Tirana district, Shën-Vlash in Durrës district, Bradashesh in Elbasan district, Virovë in Lushnjë district, Qaf Topi in Vlorë district etc.

Volcanic tuff

Volcanic tuffs are located in Shkodra district, Librazhdi area, Vrap (Tirana district), Mallakastër and Qerret (Gramshi district). There are evaluated 4 million tonnes of geological reserves so far, with a perspective to be quadruple or quintuple.

The volcanic tuffs are valued as a huge reserve in cement industry and a deeper study is needed because of their importance and their wide use.

Quartzite and siliceous rocks

In Quartzite and siliceous rocks are included the raw quartz materials as quartz, sandstones and quartz sands.

The most studied types of quartz are: Shishtaveci's and Kallabaku quartz, sandstones and quartz sandstones of Tirana and Bilishti districts. A deeper study is needed because of their importance and their wide use. From the evaluations carried out in 28 deposits and objects, are calculated approximately 200 million tonnes geological reserves.

Gypsums and anhydrites

Gypsums and anhydrites occurrences are in Dibër, Kavajë, Elbasan, Vlorë, Gjirokastër, Delvinë and Sarandë districts. Through the geological studies carried out, Dibra's district gypsums, are with the highest qualities. The evaluations carried out in 34 deposits and objects are calculated approximately 84 million tonnes geological reserves and they have a good enlargement perspective, especially in Dibra district.

Rock Salts

The deposits of rock salts are discovered near the gypsum deposits except Dibra's district deposit. The most studied deposits are Mengaj deposit (In Kavaja district) and Dhrovjani deposit (in Delvina region), in which their exploitation lasted up to 1991.

Huge rock salts reserves are discovered during the oil drillings in Dumre diapir, in Dhrovjan, Kardhiq diapir etc.

Olivinites

Olivinites are ultramaphic, monominerals rocks with a composition of 95% of olivines. They are mainly located in the two ultramafic belts of our country. The biggest deposits are the deposits of Kalimashi and Çobrati that are located in eastern Belt Ophiolits, respectively in Kukës and Tropoja massifs.

Oilvionites occurrences discovered in the western Belts massifs have weaker qualities and are smaller