LAW OF UKRAINE

On approval the Whole-State Program for Development of Mineral Resource Base of Ukraine for the Period to the year 2030

(unofficial translation along with UkrSGRI Project # 682 supervised by B.I.Malyuk with additional explanatory remarks indicated in italic if any).
Notes: in purposes of this Law the term "mining" is often being used in a wide sense meaning as mining as petroleum activities; the used term "tons" means metric tons, and Mt – million of metric tons respectively.
Abbreviations used:
CMU – the Cabinet of Ministers of Ukraine,
MRB{U} – the mineral resource base {of Ukraine if added};
SCMR – the State Commission of Ukraine on Mineral Reserves;
SCU – the Supreme Council of Ukraine (Verkhovna Rada) or parliament,
SBU – the State Budget of Ukraine;
SECU – the specially entrusted central units of executive power on geological study and rational use of subsurface;
UAH – Ukrainian Hryvna (national currency)

The SCU **decides**:

1. To approve the Whole-State Program for Development of Mineral Resource Base of Ukraine for the Period to the year 2030 (hereinafter – the Program) (annexed).
2. The CMU:
- shall ensure implementation of the Program;
- preparing the drafts of the SBU for respective year shall prescribe assignment of respective financing defined by the Program having regard to the financial capacities of the SBU.
3. This Law becomes effective since the day next to the day of its publication.

President of Ukraine V.Yanukovych
Kyiv City, April 21, 2011
N 3268-VI

APPROVED
by the Law of Ukraine
N 3268-VI of April 21, 2011

Whole-State Program for Development of Mineral Resource Base of Ukraine for the Period to the year 2030

Section I. GENERAL STATEMENTS

Secure supply of national economy needs with mineral resources and their efficient use comprise one of the major factors to overcome the critical state in economy of Ukraine. The MRB is the totality of explored and preliminary evaluated mineral reserves and concomitant components which may be used in economy branches under provisions of economic benefit at the level sufficient for the expanded reproduction ensuring economic security of the state.

The MRBU is pretty valuable in the world context. About 20 thousand deposits and occurrences of 117 mineral types are discovered in the subsurface of this country, of which 8290 deposits and 1110 inventory objects by 98 mineral types are of commercial value and recorded in the State balance of mineral reserves, and 3349 deposits are in production.

The mineral industry contributes significantly to the country GNP. The mineral extraction and use account for 48 percents of the country industrial potential and up to 20 percents of labor resources. These figures resemble those of the developed countries with strong extractive industry where 20-40% of total investments and up to 20% of labor forces is concentrated.

Nowadays Ukraine produces considerable amounts of coal (1.7% of the world), saleable iron (4.5%) and manganese (9%) ores, uranium, titanium, zirconium, graphite (4%), kaoline (18%), bromine, sienna, industrial metallurgy raw materials (quartzite, flux limestone and dolomite), chemical raw materials (native sulfur, rock and potassium salt), facing stones (granite, gabbro, labradorite), glass sand, etc. Ukraine also produces hydrocarbons, brown coal, peat, cement raw materials, infusible and refractory clays, construction raw materials, iodine, boron, diverse mineral waters, precious stones and gemstones, piezo-quartz, etc. The nickel ores, gold, scandium, hafnium, amber, zeolite, phosphate raw materials are also being produced in relatively minor amounts.

Deposits of non-traditional for Ukraine mineral types – chromium, lead, zinc, copper, molybdenum, beryllium, lithium, tantalum, niobium, REE, fluorspar, apatite, combustible shales, bischofite, and others, are studied in various extents.

Over last 5-10 years the real possibilities are confirmed to grow further reserves of hydrocarbons, to discover and explore deposits of new for Ukraine minerals – gold, chromium, copper, lead, zinc, molybdenum, rare and rare-earth elements, lithium, niobium, tantalum, phosphorites, fluorite, gemstones, etc. Mining and enhanced extraction of these minerals provides opportunities to increase the export potential of the state.

However, because of the hard situation in the national economy suffering geological mapping, prospecting and exploration works, the rate and amount of the own MRB reproduction do not match the country demands.

Insufficient funding is resulted in the decreasing of exploration works by 3-4 times. Ever since 1994 explored reserve growth of most strategic minerals does not offset their extraction. Further delay in efficient measures will cause deficiency of some own minerals and decreasing national interests security. Besides traditional import of oil, gas, some base and rare metals, coking coal, magnesite, fluorspar and feldspar, Ukraine already brings in from abroad the sulfur, commodity which prior to 1992 was exported from Ukraine in amount of 1.5-2.9 Mt per year.

The hard economic situation of Ukraine since the independence time is mainly caused by the lack of own cheap energy sources. To date, the only way out from this situation is priority development of new energy technologies based on essential Ukrainian reserves of hard and brown coal, rich in organic matter shales (“shale gas”), peat, and considerable increasing in the non-conventional and alternative energy sources usage.

The complex geological study of the territory of Ukraine (including Ukrainian parts of the Black and Azov seas) and natural and anthropogenic changes of geological environment with permanent monitoring are also important.

In view of the global trends in mineral consumption, the challenges in secured mineral supply for economy are related to the following factors:

- value and non-recovery of natural mineral resources requires their rational and efficient use. Extensive methods of mining, processing and consumption of minerals based on novice achievement of science and technology are the integral components of the global technical revolution;
- scientific and technical progress in all branches of mineral industry and strong competition between mineral producers in the countries with market economy preclude, despite of all forecasts, transition to active use of low-grade ores. Conversely, over last 10-20 years the trend for extensive mining and processing of the highest-grade ores is observed in these countries for most mineral types;
- further growth, even slowed, of total consumption of minerals and their processed products in the countries with market economy, despite of their more rational use. Experience of developed countries (Japan, USA, South Korea, Italy, and others) indicates that increasing in the general social-economic development rate is inevitably accompanied by the increasing in mineral consumption. Their consumption per capita does slowly but progressively rise up and this trend, according to the expert assessments, will be retained in the coming decades. This is why these countries continue investments in the geological exploration in the own territories and the territories of developing countries;
- the global trends over last 10-15 years indicate that the highest rate in the mineral extraction and consumption is characteristic for the energy resources, alloying metals and some base and rare metals, precious metals and diamonds, as well as agricultural raw materials.

Section II. PROGRAM OBJECTIVES

The goal of the Program is securing national economy demands in minerals through own mining, reducing dependence of Ukraine from the import of mineral resources and increasing the country export potential from the own extraction of minerals highly demanded in the world market.

The Program goal completely corresponds to the modern European principles of sustainable development – securing contemporary mineral demands ensuring future generation demands.

By the industrial-economic value the mineral types of the MRBU are subdivided in the following categories:

Category A – mineral types which are extensively being mined in Ukraine, with considerable explored reserves of mineral and components, and are subject to export or can be expected to become export ones aiming currency revenue and SBU revenue within short time;

Category B – mineral types, which are currently being mined in Ukraine in limited amounts, whose operating expenses ensure marginal economic profitability level, development is complicated by environmental problems, explored reserves in deposits are insufficient or exhausted, new deposits are weakly studied, but demands for these minerals are caused by industrial development. Deficiency in these mineral types is covered by the import;

Category C – mineral types, whose deposits are known in Ukraine, their reserves (including significant) are explored, but mineral production is limited or lacking at all. According to the technical-economic calculations, the given mineral types in the current national economic situation is not competitive in comparison to the imported minerals and cannot be profitably processed at the domestic enterprises under available technologies. At the same time, demands for these minerals can be restored through the novice technologies of beneficiation or preliminary processing of respective ores;

Category D – mineral types, whose deposits are currently out of production in Ukraine, weakly studied, but in perspective may become important for the national economy in view of demands from other industry branches.

Ways and approaches to solve problems

The challenge of MRBU development as the material ground for the national economy growth requires reliable system approach, where the best version assumes balanced resources of the state and private business coupled with innovative-investment mechanism establishment in subsurface use. This will make possible increasing efficiency of the state influence on the development of geological sector, introducing new efficient business forms, employment increasing in the mineral industry, increasing its contribution to the national economy, reducing its dependence on the import of some mineral types, and strengthening the country export potential.

It is expected to solve the problems by means of:

- focusing efforts, including financial resources, in the priority directions of MRB development, in prospecting and exploration of mineral deposits, first of all those strategically important for the national economy;

- accelerating geological studies using modern tools for collection, management and processing of geological information, introducing new methods and technologies in the mineral deposits prospecting and exploration;
- differential approach to assessment of mineral reserves and perspective resources, introducing rational mining methods for complex mineral deposits and extraction of concomitant components, reproduction of resource potential in the regions with extensive mineral extraction;
- accelerating international cooperation in the field of geological study, rational use and protection of subsurface.

Section III. PROGRAM TASKS AND ACTIVITIES

The major Program task is sustainable priority-driven securing of mineral supply for the increasing national economy demands. There is developed MRB of many mineral types in Ukraine and essential perspectives for MRB growth, significant geological sector, extractive and processing industries, considerable potential of skilled, highly-qualified labor forces. Under conditions of increasing integration processes and globalization, further development of the national geological sector is required.

The major Program tasks are defined by the priority-driven directions of MRB development. Consolidated figures of mineral reserve growth and funding required are shown in the Annex 2 to the Program.

1. Energy resources

Oil, gas, condensate

These are Category A mineral types. Three oil-gas-bearing regions are distinguished in Ukraine: the Eastern region (Dniprovsko-Donetska Depression and north-western portion of Donbas); the Western region (Volyno-Podilska Plate, Fore-Carpathians, Folded Carpathians, and Trans-Carpathians); and the Southern region (Prychornomorya, Crimea, and offshore in the exclusive (marine) economic zone of the Black and Azov seas).

The State balance of mineral reserves does record the reserves of oil, gas and gas condensate of 381 deposits. Most (211) are located in the Eastern region, and remaining are in the Western (112) and Southern (45) regions.

Over last years the annual production of hydrocarbons was amounted in average to 4 Mt of oil and condensate and 18-20 billion m^3 of gas which comprises respectively 10 and 20% of the country consumption.

In the Eastern region, by January 1, 2010, the total initial hydrocarbon resources are estimated to 5425.4 Mt of oil equivalent, including gas (free and dissolved) – 4636.7 billion m^3, oil and condensate – 788.7 Mt.

The rate of total initial hydrocarbon resources development by the bulk amount of all hydrocarbons was about 54% by January 1, 2010. Unexplored portion of the total initial hydrocarbon resources by the bulk amount of all hydrocarbons is evaluated to 2565.2 Mt of oil equivalent, including 2181.4 billion m^3 of gas and 383.8 Mt of oil and condensate.

Thus, there is considerable potential in the Eastern region to increase oil and gas production. Making perspective prognosis for hydrocarbon reserve growth in the Eastern region, the trends and amounts over last five years were accounted.

The total initial hydrocarbon resources in the Western region by January 1, 2010 are amounted to 1464.2 Mt of oil equivalent, including 988.2 billion m^3 of gas and 476.0 Mt of oil and condensate. The rate of total initial hydrocarbon resources development is 41.8%. Unexplored (remained) portion is 867.4 Mt of oil equivalent. The actual amount of prognostic and perspective oil and gas resources, which may provide the ground for the discovery of new deposits and hydrocarbon reserve growth, is 2603.0 Mt of oil and 157.7 billion m^3 of free gas. In the Western region the potential for hydrocarbon reserve growth and production is also significant.

In the Southern region (Prychornomorya, Crimea, and offshore in the exclusive (marine) economic zone of the Black and Azov seas) just 4.4% of the total initial hydrocarbon resources are released, specifically 2619.6 Mt of oil equivalent, including 2208.0 billion m^3 of gas and 411.6 Mt of oil and condensate.

In general, it is planned for 2011-2020 to grow hydrocarbon reserves by 127 billion m^3 of gas and 32.5 Mt of oil and condensate, and over 2021-2030 – 160 billion m^3 of gas and 40 Mt of oil and condensate.

The annual resource growth increment for the period to the year 2030 is 2 percent and is caused by available hydrocarbon resources. Making estimation of cost for the reserve unit preparation the 2044-2009 average value of 30.9 UAH is taken. The planned reserve growth (taking into account consumption price index) requires: in 2011-2020 – 72032.35 UAH million (including SBU share of 5460.03 UAH million), in 2021-2030 – 104225.73 UAH million (including SBU share of 7863.19 UAH million). The SBU share in the gross funding of the works for hydrocarbon deposits prospecting and exploration is 8% (ration reached over last 10 years).

In total by this direction, it is prescribed in 2011-2030 at the SBU expenses to ensure reserve growth of free gas in amount of 287 billion m^3, oil and condensate – 72.5 Mt.

Coal

This is Category A mineral type. Coal in Ukraine comprises the only energy source whose reserves are potentially sufficient to ensure national energy security. Coal mining and processing into saleable coal production for the target period remains the major energy source to cover Ukrainian demands.

The needs to engage external sources to meet national economy coal demands is caused by insufficient amount of the own coking coal mining and high sulfur content therein, as well as by the gas-group coal deficiency required for the Ukrainian heating power stations. The major importers include Russia (almost 97%) and Kazakhstan. Consumers of the imported coking coal include enterprises of the metallurgy complex of Ukraine, and the energy coal – heating power stations and enterprises of other industries.

The total coal resources in Ukraine: balance, balance-off, prognostic (by January 1, 2010) are estimated to 117.12 billion tons, including explored reserves – 56.25 billion tons, of these coking-class – 17.21 billion tons (30.6%), anthracites – 7.60 billion tons (13.5%).

In addition, the natural mining conditions of coal deposits in Ukraine are hard enough and available shafts are essentially depreciated while their technical facilities are mainly outdated, making domestic coal industry unprofitable and requiring government support.

Development trends of metallurgy, electricity industry, other industries and social sphere cause pretty steady demands for coking coal and highly increasing demands for energy coal.

It is foreseen in this direction:

- extended exploration of deposits in production to expand their exploitation terms and reconstruction of operating enterprises;
- prospecting-evaluation and exploration works in the most perspective fields and coal deposits.

Methane of coal deposits

This is Category B mineral type. Important additional hydrocarbon resource potential is related to the methane traps in coal deposits of Donetskiy and Lvivsko-Volynskiy coal basins. By January 1, 2010, the balance reserves of categories $A+B+C_1$ and C_2 are estimated to 313.9 billion m^3 of methane in coal deposits (in the balance of operating shafts – 140.8 billion m^3).

It is foreseen in this direction:

- developing the methods of methane reserves study and evaluation;
- geological exploration aiming methane reserves and resources evaluation at certain sites;
- developing commercial methane gas reserve categories in coal deposits to ensure its extraction in amount of 8 billion m^3 in 2020 and 16 billion m^3 in 2030.

Shale gas

This is Category D mineral type. Shale gas reserves by January 1, 2010, in the State balance of mineral reserves are not recorded. No organization in Ukraine was undertaking theoretic and practical researches of the problems and opportunities to extract the natural gas from shale rocks.

In the natural conditions shale gas is highly disseminated, the rock gas saturation is from tenth to some percents, thickness of productive seams varies considerable up to hundred meters and depth up to 3000 m and more, and this gas is hard-extractible. Shale gas traps are related to shales (argillites) of oil-gas-bearing basins, including those of central-basin type, as well as deposits of combustible shales in Ukrainian Shield, Volyno-Podillya and Prychornomorya.

It is foreseen in this direction:

- fundamental and applied scientific and thematic studies for scientific prognosis and proving the perspective zones of shales with high organic matter content, which are major gas extraction targets in all oil-gas-bearing basins of Ukraine, Ukrainian Shield, Volyno-Podillya and Prychornomorya;
- evaluation of prognostic and perspective shale gas resources in the oil-gas-bearing basins of Ukraine, Ukrainian Shield, Volyno-Podillya and Prychornomorya;
- developing the draft program with technical-economic reasons to conduct regional prospecting-exploration and exploration works and development of shale gas resources;
- identification and preparation of objects for the first-order geological exploration aiming shale gas deposits discovery;
- study of world experience in the field of shale gas problems and extractive technologies;
- pilot project realization for prospecting, exploration and extraction of shale gas in the most perspective object.

Uranium

This is Category A mineral type. After the Ministry of energy and coal industry of Ukraine, more than 202 billion kilowatts of electricity is produced in 2010 in Ukraine, of which 47.4% is produced at the nuclear power stations.

The general state of uranium MRB is thought to be appropriate. It is based on the large in reserves deposits in Kirovogradskiy ore camp, where uranium ores by quality are ordinary and low-grade. The second rank by commercial value belongs to the deposits in carbonaceous-sandy Paleogene sediments of Dniprovskiy basin, suitable for mining by underground leaching in place. Although individual deposits of this type are small in reserves, their total resources are sufficient.

Reserved deposits include small-scale deposits in Ukrainian Shield – Yuzhne, Lozovatske and Kalynivske, where ores together with uranium contain thorium, molybdenum and rare-earth metals. In addition, there are perspectives in Ukraine to discover deposits with high-grade uranium mineralization making able essential MRB upgrade.

It is foreseen in this direction:

- growing and improving structure of commercial uranium reserves in Novokostyantynivsko-Dokuchaevskiy mining complex;
- growing commercial reserves in Kirovogradskiy uranium-ore camp through detailed exploration and entering Aprelske, Partyzanske, Kirovske and Litne uranium deposits into economic development;
- exploration and preparation to economic development of Krynychanske, Novoguryivske, Khutorske and Olenivske uranium deposits for their mining by underground leaching, as well as preliminary testing, together with Eastern mining-beneficiation plant, the beneficiation method by oxygen-soda technology in Safonivske deposit;
- identification of prospective sites for uranium mineralization in volcano-tectonic structures of Ukrainian Shield.

2. Metal mineral resources

F e r r o u s m e t a l s

Iron ores

This is Category A mineral type. In total, there are recorded 54 iron ore deposits in Ukraine of which 22 are in production. The rich iron ores and ferruginous quartzites are being mined in the deposits of Kryvorizkiy, Kremenchutskiy and Bilozerskiy iron-ore basins. Explored (proven) reserves are amounted to 28 billion tons. The highest proven reserves in the world (more than 10 billion tons) are known in four countries: Russia, Ukraine, Brazil and China. Their total share in the world proven reserves is 67.2% (139 billion tons).

With the saleable iron ores Ukraine not only completely secured the own strong metallurgical complex but had also exported iron ores to other countries in large amounts.

It is foreseen in this direction:

- geological exploration in the high-grade iron ore deposit Sukha Balka;
- exploration and entering into economic development of mainly oxide ferruginous quartzite deposits and extended study in the flanks of deposits in production;
- study of hydrogeological conditions in the southern part of Kryvorizkiy basin to undertake efficient measures preventing water inflows;
- extended study of narrow alkaline metasomatism zones in iron ore deposits which may become the source for scandium, vanadium and rare earths;
- preparation of small-scale, high-quality, easy-beneficiating magnetite quartzite deposits in Kryvorizkiy basin (Far western bands, Pravoberezhni magnetic anomalies), Middle Pobuzhzhya and Pryazovya (probably engaging foreign investors).

Manganese ores

This is Category A mineral type. Ukraine, with its developed ferrous metal metallurgy and available considerable manganese ores, is the world leader in manganese consumption and production (ferro-manganese, silico-manganese, metallic manganese, etc.). By the total manganese resources Ukraine is ranked second in the world after South Africa and is first by the proven reserves. Commercial manganese ores are concentrated in South-Ukrainian manganese-ore province including deposits of the biggest in the world Nikopolskiy manganese-ore basin.

Manganese ore mining and processing in Ukraine is being conducted by Ordzhonikidzevskiy and Marganetskiy mining-beneficiation plants.

Numerous iron-manganese and manganese iron ore occurrences encountered in Middle Pobuzhzhya in the field adjacent to Khashchuvatske deposit may comprise the reserve for manganese ore industry. These ores are normally oxidized and easy-beneficiating making them profitable for processing.

Existing structure of reserves and technology of manganese ore beneficiation cannot meet increasing demands of the ferrous metallurgy in highest grades of manganese concentrates, low-phosphorus first of all. It is also becomes important provision of the chemical industry with so called peroxide high-quality concentrates which used to import from Georgia. One of the solutions of these problems can be found in preparation to the commercial exploitation of Fedorivske deposit located nearby Nikopolskiy basin. The ores in the deposit contain 98% of oxide and carbonate-oxide varieties. They are suitable for beneficiation and high-quality concentrate production (manganese content up to 49%) and metallic manganese manufacturing.

It is foreseen in this direction:

- definition the prospective areas of economic manganese ores in between the rivers Ingoul and Ingoulets;
- evaluation of carbonate manganese ore resources in between the rivers Ingoul and Ingoulets;
- prospecting in Kostromska site of Dnipropetrovska Oblast;
- discovery the new manganese ore bodies in the eastern and western flanks of Nikopolske deposit;
- conduction of hydro-geologic regime observations in the territory of Nikopolskiy basin;
- prognostic evaluation of resource potential of the ore camps that include Velyko-Tokmatske and Fedorivske deposits;
- geological-economic re-evaluation of manganese deposits taking into account conditions of market economy.

Chromium ores

This is Category D mineral type. So far Ukraine does not have own chromium MRB which annual demand is 300-330 thousand tons (recalculated to 100% of Cr_2O_3). In the coming years Ukraine can reduce chromium concentrate import from Kazakhstan and Russia (Donskiy and Saranskiy mining-beneficiation plants) by means of exploration and entering into production Kapitanivske chromite deposit in Ukrainian Shield. Exploitation of this deposit will make possible partially meet demands of domestic metallurgy industry with the own chromium and chromium-nickel raw materials. The ores of Kapitanivske deposit and other perspective objects in Pobuzhzhya require further studies in term of economic concentrations of gold, platinum-group metals and metallic rhenium.

It is foreseen in this direction:

- continue thematic works for analysis and interpretation of geological-geophysical information and assessment of perspective chromite resources;
- prospecting-evaluation works in the most perspective objects of Kapitanivske ore field and exploration of two best of them upon definition of Kapitanivske deposit economic value;
- preparing to commercial exploitation and reserve approval in particular blocks of Kapitanivske deposit;
- prospecting assessment and exploration of Pushkivske, North-Lypovenkivske and Lypnyagivske deposits in Middle Pobuzhzhya;

- accompanying assessment of chromium ores for gold, platinum-group metals, bauxites, vermiculite;
- prognosis-prospecting works in the perspective areas of Ukrainian Shield.

B a s e a n d a l l o y i n g m e t a l s

Aluminum

This is Category C mineral type. Meeting domestic industry demands in aluminium raw materials is a great challenge although considerable resources are known in Ukraine. Mykolaivskiy alumina plant (alumina capacity is about 1300 thousand tons per year) and Zaporizkiy aluminium plant (alumina capacity – 250 thousand tons, primary aluminium – 100-110 thousand tons) are supplied with the imported high-quality bauxites. Potential internal resources of aluminium-bearing raw materials (ferruginous bauxites of Vysokopilske deposit in Dnipropetrovska Oblast, nepheline ores in Pryazovya, Transcarpathian alunites, kaolin etc.) according to the preliminary technical-economic evaluations are thought to be not competitive in comparison to the import commodities and cannot be profitably processed in domestic enterprises using common technologies.

Feasibility study of Vysokopilske deposit is required, with multi-scenarios for aluminium-bearing raw materials utilization, to complete the economic evaluation of this deposit where total resources are evaluated to 72 Mt and explored reserves – 17 Mt.

Transcarpathian alunites can be considered as potential aluminum-bearing commodity under conditions of their complex treatment. In the State balance of mineral reserves there are recorded two large deposits – Biganske and Beregivske with explored reserves of alunite ores respectively 290.3 Mt and 51.4 Mt. Besides that, in Beregivske ore field there are known up to 10 other alunite occurrences related to the secondary quartzites.

It is foreseen in this direction:

- prospecting works for bauxites in Middle Prydnistrovya;
- extended geological study and evaluation of economic reserves of the ferruginous bauxite ores in Vysokopilske deposit.

Copper

This is Category D mineral type. According to the expert forecasts, the annual demands of Ukraine in copper for the coming years will reach 200 thousand tons.

Ukraine does not have economic copper ore reserves despite of high enough prognostic resources. These are related to three regions: Donetska and Volyno-Podilska metallogenic copper-ore provinces, and Ukrainian Shield. In the latter the native copper mineralization is encountered in the flood-basalt formation of Volynskiy ore camp where most perspective Rafalivskiy and Girnytskiy ore fields are already defined. In total, more than 150 copper occurrences are known in Ukraine and some of them can be considered as potential deposits.

One also should account the reliable perspectives for copper ores in distinct copper-zinc sulphide mineralization of greenstone complexes in ancient shield (Ukrainian Shield first of all) where in typical world-class deposits of this type copper grade is 3-4% and zinc 8-10% (with minor lead). Additional copper resources can be expected from chalcopyrite zones in the gold-productive poly-sulphide mineral complex in gold deposits like Sergiivske.

It is foreseen in this direction:

- concentration of geological exploration for native copper occurrences in the flood-basalt formation in Volynskiy ore camp;
- prospecting and prospecting-evaluation works in Rafalivskiy and Girnytskiy ore fields aiming preparation of prospective ore occurrences (deposits) to the exploration;
- exploration of one of the best deposits encountered and its preparation to the commercial exploitation with tentative reserves 1 Mt of copper;
- prospecting-reassessment and prospecting-evaluation works in prospective ore occurrences of Donetskiy basin in the south-western limb of Bakhmutska depression;
- geological-economic evaluation of prospective copper deposits in the territory of Volynskiy ore camp and prospective ore occurrences of Donetskiy basin in the south-western limb of Bakhmutska depression;
- targeted thematic and prospecting studies to develop prognostic-prospecting criteria for copper mineralization related to greenstone complexes (Dnipropetrovska Oblast).

Nickel and cobalt

These are Category B mineral types. To date, actually all internal demands for nickel and cobalt are covered through the import mainly from Russia and Western Europe countries.

Like most other countries, cobalt in Ukraine is not observed in the individual deposits and is contained in the nickel ores and products of their processing (ferro-nickel – from silicate ores, nickel concentrate – from sulphide ores).

Deposits of both metals in Ukraine include silicate ores in weathering crust of ultramafic rocks and are located in two areas: in Middle Pobuzhzhya (Kirovogradska Oblast) and in Middle Dniprean (Dnipropetrovska Oblast). Remained active nickel reserves in Middle Pobuzhzhya are amounted to more than 60 thousand tons and Pobuzkiy nickel plant is backed with raw minerals for 9-10 years. Some new deposits and prospective areas with total perspective resources 52 thousand tons are found in around the mentioned plant.

Perspectives for nickel sulphide mineralization in Ukraine are limited although some evidences for the nickel sulphide deposits are known. Non-traditional for Ukraine source of nickel-cobalt ores could be greenstone belts and ultramafic massifs in Ukrainian Shield where probability is high enough to discover economic objects of Western-Australian type (in komatiites) and related to the layered dunite and peridotite intrusions.

It is foreseen in this direction:

- exploration in the most prospective Zakhidnolashchivska and Pivnichnolypovenkivska areas and continue prospecting and prospecting-evaluation works in prospective areas to discover new deposits located nearby Pobuzkiy nickel plant;

- additional technological trials in the Prutivske deposit of copper-nickel sulphide ores;
- prospecting-evaluation works in the north-western part of Ukrainian Shield and in Middle Dniprean area;
- study of mafic-ultramafic massifs and stratified meta-komatiite flows of meta-komatiite-tholeiite formation (Surska Suite) and the lower and upper meta-komatiite formations (litho-tectonic analogues of Chortomlytska Suite and Talc Horizon of Kryvorizka Series respectively) in Precambrian granite-greenstone terrains in the course of special thematic studies; in case of positive results – prospecting-evaluation works over there.

Lead and zinc

These are Category D mineral types. Despite of lacking own lead-zinc MRB, Ukraine possesses considerable capacities for lead and zinc ware manufacturing. Kostyantynivskiy plant "Ukrzinc" (Donetska Oblast) is the biggest in Europe producer of lead (80-90 thousand tons per year), zinc (20-30 thousand tons), cadmium, indium and other concomitant components.

The lead-zinc relatively high-quality ores are known from two regions of Ukraine: in Transcarpathians and in the south-eastern part of Dniprovsko-Donetska depression. Mining perspectives for lead and zinc are related to the gold-polymetal deposits in Transcarpathians. However, exploitation of Muzhievske gold-polymetal deposit can secure the country needs partly only.

The most prospective objects are thought to be Biganske complex alunite-barite-gold-polymetal deposit in Transcarpathians and Bilyaivske deposit in Kharkivska Oblast.

In the Biganske deposit 381.1 thousand tons of zinc and 120.2 thousand tons of lead are estimated. The technological scheme of beneficiation is designed. Gold-bearing features of polymetal ores are defined.

In Bilyaivske deposit the ore block is encountered with shallow (up to 500 m) ore depth for possible first-order exploitation.

In the given block preliminary reserves of category C_2 are explored to 618 thousand tons of zinc and 265 thousand tons of lead.

Additional perspectives for ores of these metals are related to the greenstone complexes in Ukrainian Shield where galena-sphalerite ores are found in some mineralized zones of gold deposits like Balka Shyroka. The lack of spatial delineation of these ore zones remains the major problem.

It is foreseen in this direction:

- economic value assessment of Biganske, Novodmytrivske and Bilyaivske deposits;
- prospecting-evaluation works in Novodmytrivske ore occurrence and in case of positive results – exploration over there;
- prospecting-evaluation works in the flanks of Bilyaivske deposit;
- studies for spatial outlining the gold-galena-sphalerite ores in the jaspilite-type gold deposits and occurrences in greenstone belts of Ukrainian Shield and in the junction zone of Ukrainian Shield and Donetskiy basin (Komsomolskiy ore camp).

Titanium

This is Category A mineral type. In Ukraine, titanium metallogenic province more than 200 thousand km^2 in square encompasses the north-eastern part of Ukrainian Shield, Dniprovsko-Donetska depression, and part of the south-western slope of Voronezkiy crystalline massif. Therein 78 deposits of various study degrees are discovered. Of these, 19 are recorded in the State balance of mineral reserves. Seven deposits are at the various stages of economic development. The total reserves of deposits in production or prepared for exploitation exceed reserves of all economic deposits abroad. The strong titanium MRB is developed in Ukraine including 40 deposits of which one is unique, 13 are big and 10 are medium in size

Extraction of titanium (ilmenite) concentrates is being conducted by Irshanskiy mining-beneficiation plant in Zhytomyrska Oblast and Vilnogoskiy mining-metallurgy plant in Dnipropetrovska Oblast, with total productive capacity 700 thousand tons of concentrate per year.

Both plants are supplied with explored reserves of titanium ores for the long-term perspective. However, the problem concerns deficiency of the ores with fresh ilmenite which allow receiving the high-quality and competitive pigments by technology of operating sulfur-acid cycles in Sumy town and in Autonomic Republic of Crimea. Reserves of such ores are mainly confined to the large Stremigorodske hard-rock deposit prepared for commercial exploitation, and smaller in size Fedorivske deposit. Exploitation of these deposits will allow simultaneous receiving the deficient apatite concentrate as well as rare earths in the apatite concentrate, and vanadium and scandium – in the ilmenite concentrate.

Exploitation of these deposits requires capital construction of new mines and beneficiation plants that in turn requires significant investments and time.

It is foreseen in this direction:

- preparation for commercial exploitation of the objects of complex zircon-titanium ores in Tarasivsko-Tarashchanska field;
- prospecting-exploration works in Lykhivska site and Pokrovo-Kyriivska structure (Dnipropetrovska Oblast);
- prospecting and prospecting-evaluation works in the perspective objects of central and north-western regions of Ukraine.

Besides titanium it is also expected vanadium extraction from ilmenite and rutile concentrates. Technology of vanadium extraction is developed long time before but is not used in the industry yet.

Tin

This is Category D mineral type. Demands of the industry complex of Ukraine in tin and its alloys comprise 700-800 tons per year.

Minor cassiterite placers are known in the north-western part of Ukrainian Shield (Sushchano-Perzhanska zone), in the development area of lithophile rare minerals (beryllium, tantalum, niobium, rare-earth elements) where in their ores and host granitoids and metasomatites cassiterite is the common accessory mineral.

Expectations in discovery of economic tin deposits are related to the ore-bearing structures of Sushchano-Perzhanska zone. These include ore occurrences Karyer, Zakhidne, Girnyche and others.

It is foreseen in this direction:

- complex of drilling, mineralogy-petrographic and technological studies in the course of prospecting and prospecting-evaluation works;
- geological-economic evaluation and definition of exploration suitability in Zakhidne and Girnyche ore occurrences.

Tungsten

This is Category D mineral type. Ukrainian demands in tungsten production for the nearest perspective are estimated to 430-480 tons per year and will be covered through the import from Russia and Asian countries.

Some perspective tungsten occurrences are encountered over last years in the Eastern Pryazovya. Increased tungsten content in some parts of Sergiivske gold deposit in Prydniprovskiy area suggests for the potential to discover tungsten ores in this and similar occurrences (besides commercial molybdenum ores).

It is foreseen in this direction:

- prospecting works by litho-geochemical methods with surface mining workings and wells and the complex of geophysical survey in the perspective areas of Ukrainian Shield;
- thematic researches to assess perspectives of tungsten ore discovery in the rare-metal mineral complex of the gold deposits like Sergiivske under provisions of positive results obtained from prospecting and prospecting-evaluation works.

Molybdenum

This is Category D mineral type. Ukrainian steel industry demands in molybdenum are estimated to about 230 tons per year and covered by import exclusively. In minor amounts (up to 350 tons) Ukraine brings up molybdenum concentrates mainly from China and Russia.

Ukraine does not have explored molybdenum deposits although numerous occurrences are widespread in Ukrainian Shield. Three areas are distinguished highly-perspective for discovery of economic molybdenum deposits: the north-western part of Ukrainian Shield, Middle Dniprean area and Eastern Pryazovya.

The known objects include perspective fields and specific perspective occurrences prepared for prospecting-evaluation works, exploration and further development. These are first of all Verbynskiy and Ustynivskiy occurrences in north-western part of Ukrainian Shield and East-Sergiivskiy occurrence of Middle Dniprean area. The latter comprises the integral part of the vertical and lateral zonation of Sergiivske gold deposit which in some respect can be considered as the composite one (gold-silver-copper-molybdenum).

Occurrences of molybdenum, tungsten, bismuth, lead, silver and other metals are found over last years in the sub-volcanic units in East-Azovian block of Ukrainian Shield. Encountering the new prospective type of tungsten-molybdenum mineralization essentially increases perspectives of Ukraine for discovery of own economic tungsten and molybdenum deposits.

It is foreseen in this direction:

- continue prospecting and prospecting-evaluation works in the north-west of Ukrainian Shield in Ustynivske ore field and prospective Ustynivskiy, Vysokiy and other occurrences, and exploration of Verbynske deposit for its preparation to commercial exploitation;
- complete the complex of drilling works and technological studies in East-Sergiivske occurrence, prognostic geological-economic evaluation of occurrence and technical-economic calculation on the viability of mining-drilling exploration in paralle to the exploration of Sergiivske gold deposit;
- prospecting works to discover new and delineating of known objects in occurrences (areas) of East Pryazovya with further complex of evaluation works to define their economic value;
- prospecting and prospecting-evaluation works in the central part of Ukrainian Shield (eastern limb of Kryvorizko-Kremenchutska suture zone).

Rare and rare-earth metals

Tantalum and niobium

These are Category D mineral types. Ukrainian tantalum and niobium resource potential is the highest in Europe. To date tantalum-niobium raw materials are not produced in Ukraine. Available industrial capacities actually are out of operations because of reduced concentrate production in Russia. Ukraine is able to cover own needs in tantalum and niobium. Two large rare-metal regions of tantalum and niobium development are distinguished in Ukrainian Shield: Pryazovian and North-Western.

The objects in Pryazovya with essential resources and reserves as well as favourable mining-geological and hydrogeological conditions are studied in most details. Under conditions of complex use of these reserves (zirconium. nepheline, feldspar) deposits can be mined profitably. Tantalum and niobium are produced by Vilnogirskiy mining-metallurgical plant from the complex Malyshevske deposit in Dnipropetrovska Oblast.

The most studied is Mazurivske deposit located in Donetska Oblast nearby Donetskiy chemical-metallurgic plant.

Considerable resource potential is apparently related to the weakly-studied weathering crust in metasomatites of Sushchano-Perzhanska zone where rare earths, tantalum and other metals occur together with niobium.

Small-scale (but tantalum high-grade – 0.10-0.15%) occurrences are discovered in Gannivsko-Zvenigorodska zone (Mostove, Kopanky, Vys and other).

It is foreseen in this direction:
- exploration in Mazurivske deposit and reserves adoption in the SCMR;
- prospecting and prospecting-evaluation works in Gannivsko-Zvenigorodska zone to define the viability of further works for high-grade tantalum mineralization;
- prospecting and prospecting-evaluation works in the perspective areas of Ukrainian Shield.

Lithium

This is Category C mineral type. Ukraine does have essential lithium reserves and prospective resources. By the explored reserves and prognostic resources Ukraine can be considered most secured country in Europe (including European part of Russia). Ukraine is able to cover completely the own needs and ensure Western European market demands in lithium. There are pegmatite deposits studied at various levels: Shevchenkivske (spodumene ores), Polokhivske (petalite ores), Stankovatske (spodumene-petalite ores), Kruta Balka (complex rare-metal ores), as well as numerous occurrences of this type. Lithium in mica minerals with lithium oxide content 0.2-0.6 percent is known in significant targets in Donetskiy basin.

Ukrainian demands in lithium products (roughly 100-200 tons per year recalculated to metal) are covered by the import from Russia where the only Zavitynske lithium ore deposit in Trans-Baikal is almost exhausted and Russia does import lithium production itself. Demands in petalite concentrate for special glass and ceramics manufacturing are expected to increase up to some tens thousand tons. Perspectives to develop the own lithium MRB in Ukraine and transition from importer to the exporter of saleable lithium is high enough. These perspectives are related to the actual possibility to develop Polokhivske petalite ore deposit and Shevchenkivske spodumene deposit which requires extended exploration aiming determination of profitable ores of economic categories. Development of other fields of rare-metal pegmatites may give new deposit perspective for development.

It is foreseen in this direction:
- determining reserves of economic categories in Polokhivske deposit and Shevchenkivske ore field;
- exploration and preparation of deposit to commercial exploitation.

Rare earths and yttrium

These are Category C mineral types. Fifteen lanthanides and close to them yttrium comprise the group of rare earths or rare-earth metals. Demands for these metals steadily grow up. According to the experts, currently demands of Ukraine in rare earths are estimated hundreds of tons. Prydniprovskiy chemical plant used to produce 1500 tons of rare-earths. The raw materials included loparite concentrate which production is being ceased in Russia nowadays. Ukraine possesses industrial capacities and technologies to produce high-purity rare-earth metals and their compounds and alloys of widely use. Development of the own MRB for rare-earth metals, which are crucial for high-quality competitive steel and alloy manufacturing, becomes vital.

Some hundred points of rare-earth concentrations are found in Ukraine in the scales from deposits to occurrences which require evaluation. Their majority is located in Ukrainian Shield and adjacent fields. In general, this large territory is the biggest in Europe rare-earth metallogenic province where mineralization is found of almost all endogenous and exogenic rare-earth formations. Three major areas of rare-earth mineralization are distinguished in this province, which include deposits and prospective occurrences: South-Eastern, North-Western, and Central. The State balance of mineral reserves records Novopoltavske apatite-rare-earth deposit (Zaporizka Oblast).

In Pryazovian part of Ukrainian Shield Azovske deposit of rare earths is discovered which is currently being studied. By results of prospecting-evaluation works preliminary technical-economic consideration is designed.

It is foreseen in this direction:
- preparation to the trial-commercial exploitation of Azovske zirconium-rare earth deposit;
- resource evaluation in Shevchenkivske ore field, Anadolskiy occurrence and Khrystoforivska site;
- evaluation of rare-earth ores in weathering crust of Sushchano-Pezhanska zone;
- geological assessment of prospective ultramafic complexes in Ukrainian Shield.

Zirconium and hafnium

These are Category D mineral types. Zirconium and hafnium have similar physico-chemical properties (refractory, inert etc.). The hafnium does not have the own minerals but it is permanently contained as impurity in zirconium minerals at the average ratio of their oxides as 1:50.

By zirconium and hafnium resources and reserves Ukraine is one of the world leading countries. The complex placer zircon-ilmenite-rutile deposits in Sarmatian and Neogene Poltavska Suite terrigenous sediments are discovered and explored in various details in the central part of Ukrainian Shield and its slopes (Malyshevke, Volchanske, Voskresenske, Tarsivske, Krasnokutske and others). Large complex rare-metal, zirconium-rare-metal deposits are located in Pryazovya (Mazurivske, Azovske, Novopoltavske). Concomitant zirconium is encountered in Yastrebetske fluorspar-rare-metal deposit and Perzhanske beryllium deposit in the north-western part of Ukrainian Shield.

Consumption of zirconium and its compounds in Ukraine is estimated to about 90 tons per year, metallic hafnium – 0.5 ton, and is fully covered by the own production. Perspective demand in zirconium and alloys to the year 2020 is foreseen to be 320 tons, metallic hafnium – 0.7 ton.

Based on the reserves of Malyshevske placer deposit the Vilnogirskiy mining-metallurgy plant operates which supplies the zirconium concentrates and products of their primary processing.

It is foreseen in this direction:
- growing zirconium reserves by categories C_1 and B in Tarasivsko-Tarashchanska field;
- preparation for commercial development of the object in Tarasivsko-Tarashchanska field;
- additional study of hard-rock deposits in Pryazovya – rare-metal Mazurivske and rare-earth Azovske.

Scandium

This is Category D mineral type. By the scandium resources Ukraine is one of leaders in Europe. The State balance of mineral reserves records concomitant scandium reserves in four complex deposits: Zhovtorichynske, Stremygorodske, Torchynske and Zlobytske. These are located in Ukrainian Shield and related to Precambrian hard-rock complexes, their weathering crusts, and placers.

It is foreseen in this direction:

- preparation to exploitation of Zhovtorichenske deposit of scandium ores with vanadium and rare-earth impurities;
- continue development of domestic technologies of aluminum-scandium alloys manufacturing for domestic aircraft and rocket industries;
- continue development of domestic technologies for scandium extraction at chemical processing of ilmenite from the ores of Stremigorodske apatite-ilmenite deposit.

T r a c e e l e m e n t s

Rhenium

This is Category D mineral type. In Ukraine, large enough (up to 50 micron) phases of metallic rhenium and its natural intermetallic compounds are encountered for the first time of world geological practice in ultramafic massifs of Kapitanivska group. Rhenium is quite rare trace element with the lowest abundance ratio (7×10^{-8}) of all platinoids and lanthanoids. So far rhenium was only known in the isomorphic impurities and commercially produced from other minerals (molybdenite first of all). In some cases rhenium makes own minerals which are out of commercial value. Rhenium is the metal of the future. Its unique and still not completely known properties define the fields of rhenium use: electronics, electronic and electron-vacuum industry; petroleum refinery (high-octane gasoline); aircraft industry (essential reduction of engine resources); instrumentation; astronautics; metal-composite wares with unique physico-mechanic properties because of various rhenium impurity percentage (e.g. tungsten with rhenium 5, 20, 27 percents and molybdenum with rhenium 8, 20, 47 percents, as well as molybdenum-tungsten-rhenium alloys). These alloys and high-tech (good welding, very strong and ductile at the same time, thus, preserving their properties and shape under extreme conditions – high and super-high temperatures, pressure), they are being used in manufacturing of glowers with expanded lifetime, cathode heaters, thermocouples. Rhenium demands are unlimited. Nowadays it is consumed within production limits. According to the experts, rhenium demands will increase in time.

It is foreseen in this direction:

- geological-prognostic mapping of perspective territories;
- prospecting-evaluation works in the determined perspective sites to assess their resource potential and (under favorable conditions) spatial outlining of economic object therein.

P r e c i o u s m e t a l s a n d d i a m o n d s

Gold and silver

These are Category C mineral types. Three gold-bearing provinces are distinguished in Ukraine: Carpathians, Donbas and Ukrainian Shield.

Carpathians comprise one of the most studied provinces. Here are estimated the gold reserves in amount of about 55 tons – Muzhievske and Saulyakske deposits.

Muzhievske gold-polymetal deposit has been brought into production in 1999. Directly adjacent to Muzhievske deposit is Beregivske gold-polymetal deposits with ores of the same composition. Within the single mining allotment of Muzhievske shaft field the metal reserves can be upgraded up to 80-100 tons of gold, 1000 tons of silver and about 2.5 Mt of aggregated lead and zinc.

Saulyakske deposit is preliminary explored and reserves by categories C_1 and C_2 are approved to 10.1 tons.

According to preliminary estimates of specialists, the total resource of Carpathian province is about 400 tons of gold, 5500 tons of silver, 2.7 Mt of lead, and 5.3 Mt of zinc.

The gold mineralization in Donetskiy basin is being studied for a long time but due to lack of comprehensive studies there is no unequivocal evaluation yet. The total predicted resources of Donbas are estimated to 400 tons of gold. There is discovered the small-scale Bobrykivske gold-sulphide deposit.

The major gold-bearing province of Ukraine is Ukrainian Shield which total predictive resources are estimated to 2400 tons of gold. Six gold deposits are studied over there in most details: Mayske, Klyntsivske, Yuriivske, Sergiivske, Balka Zolota and Balka Shyroka. The aggregate resources over these objects are amounted to 620 tons of gold.

It is foreseen in this direction:

- extensive the geological exploration in Transcarpathians to secure reliable supply the Muzhievskiy gold-polymetal plant with gold ore reserves of economic categories and increase the prospective resources of this camp, and preparation to exploitation of Bobrykivske deposit in Donbas;
- accelerating prospecting and prospecting-evaluation works in Donbas to study the terrigenous-carbonate sequences in South Donbas prospective for the Carlin-type rich ores;
- continue prospecting and prospecting-evaluation works in the Ukrainian Shield in prospective structures of the known ore fields and zones (Verkhivtsevska, Surska and Chortomlytska greenstone structures in Middle Dniprean, Savransko-Kapustynske and Klyntsivsko-Yuriivske ore fields in gneiss sequences) and in potential ore fields of other areas, as well as in the newly-discovered greenstone structures (Andriivskiy, Sorokinskiy, Popelnastivskiy, Zelenodolskiy, Vilnokhutorskiy, Gaychurskiy, Kvitka, Orikhoviy, Kapustyanskiy, Pivdennopolyanytskiy occurrences);

- prospecting and prospecting-evaluation works in prospective blocks of Beregivske and Vyshkivske ore fields, as well as in the fields and blocks of Rakhivskiy ore camp, exploration of Beregivske deposit, as well as the flanks of Muzhievske deposit; study of black-shale piles in Donbas prospective for discovery of deposits like Kokpatas, Bakyrchyk, Murun-Tau;
- complex geological-economic evaluation of prognostic resources in discovered gold deposits of Ukrainian Shield (Balka Shyroka and Sergiivske in Dnipropetrovska Oblast; Klyntsivske, Gubivske and Yuriivske in Kirovogradska Oblast; Mayske in Odeska Oblast);
- continue geological study of gold deposits in Trans-Carpathians (including exploration in the flanks of Muzhievske and Saulyakske gold deposits; gold reserve growth in the main part of Beregivske deposit with by-product content of silver, lead and zinc; silver resources evaluation in Skhidnozhuravske and Berezivske deposits; preparation to commercial development and silver reserve estimation in Skhidnozhuravske and Berezivske deposits; discovery of new deposits in perspective structures of Ukrainian Shield).

Platinum group metals

This is Category D mineral type. The needs in evaluation of prospective geological formations of Ukraine for platinum group metals are caused by steady expansion of their use in various fields.

There are no explored reserves of platinum group metals in Ukraine for the time being. General perspectives of various geological formations in term of PGM are high enough. To date pretty reliable PRM resources seem to be related to the native copper ore formations in Volynian flood-basalts and copper-nickel sulphide ores of mafic-ultramafic massifs in the north-west of Ukrainian Shield and chromite-bearing ultramafic massifs of Middle Pobuzhzhya (Golovanivska suture zone).

It is foreseen in this direction:

- creation of the own laboratory base (equipped with ICP-MS spectrometer of NEPTUNE type) and provision of extensive targeted prospecting for the PGM in the course of all types the geological exploration works and geological-prognostic mapping;
- determination of PGM occurrence forms in ores and conduction of laboratory-analytical studies in the certified laboratories only;
- targeted prospecting works for encountering the PGM in the local fields and objects aiming evaluation of perspectives for their practical development;
- exploration of one of the PGM deposits or geological-economic evaluation by the high economic categories of concomitant PGM content in the complex deposit.

Diamonds

This is Category D mineral type. Three regions of kimberlite and lamproite magmatism (hard-rock sources of diamonds) are encountered in the territory of Ukraine – the north of Volyno-Podilska plate, the central part of Ukrainian Shield, and Pryazovian massif and its junction zone with Donetskiy basin.

By the perspectives for economic diamonds encountering, Kukhotsko-Serkhivska filed is thought to be of primary importance. It was Kukhotska Volya village where in 1975 the first kimberlite occurrence was found in Ukraine.

Recently in the central part of Ukrainian shield nearby Kirovograd city in Lelekivska and Shchorsivska fields the thin dyke-shaped kimberlite and lamproite bodies were encountered. Targeted works for diamonds were not conducted in this area.

In the Pryazovya there are encountered 7 kimberlite bodies, occurrences of lamproite magmatism, a number of ultramafic alkaline rock massifs and carbonatite-like rocks, as well as numerous findings of diamonds and their mineral-satellites are known in secondary collectors comprised of diverse-age (from Carboniferous to Quaternary time) terrigenous sediments.

Besides mentioned areas, it is thought to be the real expectations in term of economic diamonds encountering by the complex of geological-geophysical data in other areas but specialized prospecting works for diamonds do require significant investments. By these reasons conduction the broad-scale prospecting works on diamonds over entire territory of Ukraine is complicated nowadays.

It is foreseen in this direction:

- discovery of diamond-bearing fields by complex of methods;
- concentration of major amounts of prospecting works in already known fields, first of all in the Eastern Pryazovya, Volyno-Podilska plate, north-western and central parts of Ukrainian Shield.
- exploration works in the most perspective sites.

3. Non-metal mineral resources

Non-metal raw mineral commodities for metallurgy

The strong industry of mining and primary processing of non-metal raw materials is developed over more than hundred years history of the Ukrainian metallurgy. From all types of these commodities (limestones, dolomites, quartzites, refractory clays, alkali-earth bentotites) Ukraine up to recent had supplied oneself the own needs as well as in some extent the needs of metallurgy in Russian, Georgia, and partly Poland and Slovakia. But even now the challenges emerged caused by the general progress in metallurgy and significant strengthening the requirements to the quality of non-metal raw materials. Some types of non-metal minerals (magnesite, fluorspar, alkali bentonites) for metallurgy of Ukraine are being imported.

The major task in this direction is geological exploration intended for maximum supply the operating enterprises with own minerals of required quality.

Fluorspar

This is Category D mineral type. Major customers of fluorspar include the plants producing ferroalloys and sintered fluxes, as well as metallurgy plants, heavy engineering plants, shipbuilding and aluminum enterprises of Donetska, Dnipropetrovska, Zaporizka and Mykolaivska oblasts.

Significant fluorspar resources are known in the eastern part of Ukrainian Shield, on its south-western and northern slopes. Perspective occurrences are also encountered in the central part of Ukrainian Shield, in Kirovogradska tectonic zone.

The State balance of mineral reserves records two fluorspar deposits – Bakhtynske deposit in Prydnistrovya with reserves amounted to 18 Mt, and Pokrovo-Kyryivske in Pryazovya, as well as two deposits with concomitant fluorine content in apatite – Stremygorodske and Novopoltavske. All four deposits are not being exploited due to lack of required significant financing. Bakhtynske deposit in Prydnistrovya is explored and prepared for trial-commercial exploitation.

It is foreseen in this direction:

- prospecting-evaluating works within central part of Sushchano-Pezhanska zone for the special rare-earth fluorspar flux reserves preparation;
- preparation to commercial development in the Central site of Sushchano-Perzhanska zone;
- fluorspar reserve estimation in Pokrovo-Kyryivske deposit in Pryazovya;
- prospecting-evaluating works and exploration in the flanks of Bakhtynske deposit;
- geological assessment of perspective complexes in Ukrainian Shield (in case of positive results – exploration of deposits).

Flux limestones and dolomites

These are Category C mineral types. The operating mining enterprises are fully ensured with reserves of the flux raw minerals but most of these reserves are only being compatible with outdated blast and open-hearth furnaces. Converter and electro-won production of steel also require similar commodity but of higher quality (by chemical composition and mechanic strength).

In Ukraine large deposits of high-quality flux limestones are explored in Crimean and Donetska folded systems and in Indolo-Kubanskiy trough.

The State balance of mineral reserves records 14 deposits of flux limestones which general reserves comprise 2.46 billion tons, including 11 deposits of flux limestones (magnesium) and 3 complex non-magnesium and magnesium deposits. The balance does also record 7 dolomite deposits of which 4 are in production. Despite of essential reserves the country requires high-quality converter dolomites; their total reserves are amounted to 380 Mt of which 36 Mt only are of economic categories.

The problems of MRB also include the lack of explored tar dolomite reserves. The only deposit in the country – Stylske (Donbas) is closed nowadays due to hydrogeological problems.

It is foreseen in this direction:

- exploration of western block in Stylske deposit;
- evaluation of reserves and technological fitting to obtain the flux commodity of high-quality in term of chemical composition and mechanic strength from Rodnykivske deposit and from Balka Bezvodna block of Olenivske deposit for converter and electric-won steel production.

Bentonite clays

This is Category C and D mineral type. By the number of identified bentonite occurrence Ukraine is one of the CIS leaders. About 100 bentonite deposits and occurrences are known in Ukraine. Most valuable bentonite resources are located in Zakarpatska, Cherkaska, Ternopilska, Khmelnytska oblasts and Crimean Autonomic Republic. However, most of known bodies are not economic because of low bentonite reserves or complicated mining conditions.

Metallurgy enterprises of Ukraine do use in foundry purposes the bentonite clays from Dashukivska block of Cherkaske deposit (secured with reserves for more than 100 years). Since bentonites in Ukraine are mainly alkali-earth, these bentonites cannot be used in production of pellets from iron-ore concentrates and by these reasons some alkali bentonites are being imported from Azerbaijan.

It is foreseen in this direction:

- reserve and resource evaluation in the flanks of Cherkaske deposit which clays are similar to the Azerbaijan bentonites;
- prospecting-evaluating works in prospective fields aiming definition the active reserves for the needs of heavy industry in foundry commodities for pellet production.

Refractory raw materials

This is Category D mineral type. Ukraine possesses significant reserves of refractory clays and foundry sands explored in Donetska folded system, Dniprovsko-Donetska depression, and sedimentary cover of Ukrainian Shield. The State balance of mineral reserves records 18 deposits, including 4 clay reserve recording objects from complex deposits; 14 deposits are in production, including 1 recording object.

Nevertheless, reserves of high-quality refractory raw materials in large deposits (Chasivyarske, Novoselytske) are almost exhausted, the mining mineral grade decreases, mining-geological conditions getting worse, quarries become deeper, and as a result operating costs increase.

It is foreseen in this direction:

- securing reserve growth of economic categories in Volodymyrivske secondary kaoline deposit and Pologivske refractory clay and secondary kaoline deposit;
- exploration of Ryzhanivske (Cherkaska Oblast) and Balashivske (Kirovogradska Oblast) clay deposits with expected reserves 20 and 10 Mt respectively;

- study of perspective sites in Poltavska, Sumska and Kharkivska oblasts;
- prospecting works for Chasivyarskiy-type clays in Kalmius-Torezka and Bakhmutska depressions in Donetska Oblast;
- preparation to economic development and reserve estimation in Bantyshivske (eastern site) and Chasivyarske (northern site) foundry sand deposits;
- prospecting and prospecting-evaluation works in perspective areas of Ukrainian Shield and its slopes.

Magnesite

This is Category D mineral type. To date, there is actually no own magnesite mining MRB in Ukraine. Deposits of the major geological-economic type (crystalline magnesites of ancient sedimentary sequences) are not found in Ukraine. Magnesite bodies are known in Prydniprovskiy block of Ukrainian Shield.

Formerly serpentinite massifs were studied irreciprocally in Ukraine. Serpentinite weathering crust was studied first for silicate nickel ores and then nickel sulphide and chromite ores have been prospected whereas complex study of serpentinites was not conducted because of works specifics and insufficient financing. It is established that serpentinites comprise high-quality magnesium ores to produce both metallic magnesium (MgO – 97-98.8%) suitable for high-quality periclase refractory wares and magnesium oxide.

In Dnipropetrovska Oblast Pravdynske talc-magnesite deposit is explored, which exploitation will allow replacing imported magnesite in all case when magnesite powder is being used (up to 50% of total needs). Besides that, high-quality and valuable talc is being produced in the course of talc-magnesite beneficiation.

In metallurgy significant part of magnesite is being processed into forsterite refractory wares; the raw materials for the latter are being imported.

It is foreseen in this direction:

- exploration in Pobuzkiy ore camp (Kirovogradska and Mykolaivska oblasts) intended for replacement of the importing commodity of this type by the own one;
- prospecting-evaluation works in Taranavatskiy massif or other perspective object making sampling for laboratory-technological studies aiming extraction of magnesium oxide and metallic magnesium;
- assessment of iron-enriched sienna and nontronite in serpentinite weathering crust (except nickel) as the raw materials (naturally alloyed) for iron pellets. In this respect, Tarnavatskiy and Sukhokhutirskiy massifs are good examples, where average nickel and cobalt contents in serpentinite weathering crusts are (in percents) 0.81 and 0.04, and 0.78 and 0.05, respectively.

High-alumina raw materials

This is Category D mineral type. The State balance of mineral reserves records concomitant kyanite-sillimanite reserves in the sands of Malyshevske titanium-zirconium placer deposit, which is being mined by Volnogirskiy mining-metallurgical plant, and Vovchanske zircon-rutile-ilmenite deposit. The hard-rock bodies of andalusite-kyanite-sillimanite quartzites and gneisses are confined to Precambrian metamorphic units of Ukrainian Shield. Some areas in Pryazovya and northern part of Zhytomyrska Oblast (Sushchano-Pezhanska zone) are thought to be prospective in term of high-alumina raw materials deposits. To date the annual demands of Ukraine in kyanite-sillimanite concentrates are estimated to 400 thousand tons and these will increase in the future.

It is foreseen in this direction:

- exploration in Sushchanske kyanite deposit where in the first-order exploitation block about 5 Mt of reserves is expected to get;
- exploration in Solomiivske garnet-sillimanite deposit in Pryazovya where in the first-order exploitation block about 10 Mt of reserves is expected to get;
- prospecting and prospecting-evaluation works in perspective areas of Ukrainian Shield.

Fertilizer and chemical raw materials

Apatite

This is Category D mineral type. According to the information from the State agency of Ukraine on the government corporative rights and equity, the current annual economy demand in phosphorus raw materials is being estimated to 2.3-2.8 Mt recalculated to 100% of phosphorus pentoxide (recalculated to P_2O_5 phosphorus oxide), that is, 6-7 Mt of conditional apatite concentrate. The own deposits can supply only part of demands in phosphorus fertilizers. The import opportunity concerning apatite concentrates from Kola Peninsula is being sharply decreased due to exhausting the major open-cast mining reserves. Conclusions as to the import of phosphorite concentrates from North Africa and Middle East require certain care since phosphorites with increased content of cadmium, uranium, thorium and other harmful components predominate in these ores.

Aggregate reserves of apatite ores in Ukraine comprise 842.2 Mt of phosphorus anhydrite and are almost fully confined to Stremygorodske and Novopoltavske deposits. Exploitation of these deposits, however, requires significant investments and time.

At the same time, the smaller but yet weakly studied deposits of the same ores are known nearby Stremygorodske deposit; these minor ones are located at shallower depth and require much less capital investments for their exploitation. The best ones include Vydyborske and Fedorivske deposits.

It is foreseen in this direction:

- prospecting-evaluation works in Goloskivska area in Khmelnytska Oblast;
- exploration and approval of reserves by the SCMR for Vydyborske deposit of apatite-ilmenite ores;
- exploration of Goloskivske apatite deposit;
- exploration of Volodarske apatite deposit in Donetska Oblast;
- prospecting and prospecting-evaluation works in perspective areas.

Phosphorites

This is Category D mineral type. Deposits and bodies of grained phosphorites are discovered in Ukraine (Novopoltavske deposit – friable ores, grained phosphorites in Donetskiy basin, and nodular phosphorites in Volyn).

The arable lands in Ukraine comprise 27.5 million hectares. Annually upon agriculture harvest gathering the soils lose about 1 Mt of active substance recalculated to P_2O_5 (phosphorus pentoxide). Upgrading requires annual fertilizer input in amount of 60 kg/ha expressed in phosphorus pentoxide (assimilable). In fact, over last 2-3 years less then 10 kg/ha expressed in phosphorus pentoxide were introduced.

Over last years fertilizer consumption in agriculture of Ukraine has dropped by 4 times and phosphorus fertilizer use becomes 11.5 times less of the scientific-proven norms.

Analysis of traditional phosphate fertilizers use suggests for their low efficiency since the plants absorb just few percents of phosphorus while acid technology requires highest content of phosphorus pentoxide using high-grade ores only and high-quality reagents. To solve these problems the method is offered to get phosphorus fertilizer (containing calcium, magnesium and silica) avoiding sulfur acid and gypsum formation in waste through incomplete phosphate reduction by coal under heating to 800-1200^{o}C directly from phosphorus-bearing ores. In this way efficient environment and rational complex processing of phosphorus-bearing raw materials runs over producing melted insoluble phosphates. This approach allows commercial development of numerous minor phosphorite deposits where initial investments could be low and attract more investors.

It is foreseen in this direction:

- completing exploration of Zhvanske deposit;
- prospecting and exploration of phosphorite deposits, technogenic phosphorus-bearing objects and phosphate-bearing limestones in Zhvanske, Osykivske, Krolevetske, Kolkivske, Bilogirske deposits and occurrences of Kryvolutska mold;
- prognosis and assessment of perspective stratigraphic complexes.

Native sulfur

This is Category B mineral type. Ukraine was the world leader in the native sulphur production for a long time. Major sulphur production came from the open cast mining. Sulphur quarry extraction had caused irreversible ecological footprints while transition to the underground sulphur melting is resulted in sharp drop of sulphur production (70-80 thousand tons) well below Ukrainian demands. The annual demand of Ukraine in native sulfur for 98%-sulfur acid manufacturing comprises 2 Mt (at 6 Mt of the total operation capacity available).

All native sulfur reserves and resources are confined to the Fore-Carpathian sulfur basin which provides the major source of sulfur extraction for agro-chemical industry. To date the only relatively profitable source of sulfur in Ukraine is Yazivske deposit where remaining reserves comprise 17 Mt.

It is foreseen in this direction:

- complex exploration works in the fields adjacent to the ore bodies in production (Yazivske deposit) to design protection measures;
- prognostic-prospecting and research works to re-evaluate sulfur-bearing potential of the Fore-Carpathian basin as a whole;
- assessment of perspective fields for their development by underground melting after results of prospecting works;
- implementation of new domestic technologies of sulfur extraction from oil deposits of Ukraine.

Potash

This is Category B mineral type. Potash is mainly used in fertilizer manufacturing (potassium and complex fertilizers). Diverse potassium salts in natural deposits are often contained together with magnesium salt and at the same time they may occur in the double potassium-magnesium chloride and sulphate salts.

In Ukraine potassium salts are developed in Dniprovsko-Donetska depression and Fore-Carpathian marginal trough where one of the world largest provinces of sulfate type potassium ores (most valuable potassium ores) is located. Explored reserves estimated to 3.4 billion tons over there.

Reserves are mainly concentrated in two (of total 13) deposits – Stebnytske with 1626 Mt and Kalush-Golynske with 49.9 Mt of ores.

However, reserves of most deposits were defined as far back as 1948-1960 and nowadays they only comply with prognostic resources and partly – preliminary estimated reserves. It is therefore assumed to ensure the operating Stebnytskiy and Kaluskiy beneficiation plants with reserves of economic categories.

It is foreseen in this direction:

- reserve re-estimation in recalculation to K2O for the first-order mining in Piylo deposit;
- scientific prognosis and prospecting in Fore-Carpathian basin for new deposits with suitable mining-geological conditions;
- general re-evaluation of defined potassium salt reserves.

Other non-ore raw materials

Gemstone raw materials

These are Category D mineral types. These include traditional for Ukraine varieties: amber, topaz, beryl, rock crystal. Reserves of amber, marble onyx and rodonite are estimated. Occurrences of emerald, aquamarine, ruby, sapphire, garnet, amethyst and various gemstones are encountered but their perspectives are not clear yet.

The natural colored gemstones (precious, semi-precious and ornamental) in the market conditions may be one of the most profitable budget-supplying mineral commodities. Some types and deposits of such gemstones may pro-

vide essential income at relatively moderate money and time expenses for their exploration and development. To date amber is most competitive mineral of all types of natural colored gemstones of Ukraine. Selling of high-art amber wares may become reliable source of the state treasure revenues including foreign currency.

It is foreseen in this direction:

- prospecting works in Klesivska, Dubrovytska and Barashivska zones and in Volodymyretskiy area of Rivnenska Oblast;
- assessment of the fields prospective for opal and marble onyx deposits in the western region of Ukraine;
- prospecting assessment of perspective gemstone occurrences.

Primary kaolin and silica clay

These are Category B mineral types. Kaoline is mainly developed in Ukrainian Shield where one of the world leading provinces and richest in Europe is distinguished, about 950 km long and up to 350 km wide, extended from Polissya in the north-west to Azov Sea in the south-east.

Ever since 19th century Ukrainian kaoline was supplied for best grade porcelain and paper manufacturing to more than 50 countries in the world.

Experience of developed countries suggests that efficient mining of high-grade kaolin is being performed from the small deposits occurring in the simple mining-geological environments.

It is foreseen in this direction:

- exploration of Bezhbayratske and Oksanynske deposits of high-grade primary kaolin located in the central part of Ukraine;
- prospecting assessment of kaolines in perspective areas of Ukrainian Shield;
- evaluation of silica clay resources and reserves in perspective fields of Kharkivska and Sumska oblasts.

Limestones for sugar industry

This is Category B mineral type. Strong and chemically-pure carbonate rocks with CaCO3 content more than 93% are being used in technological purposes of sugar industry. Limestones of this type are developed in the southern part of Volyno-Podilska plate, on the south-western slope of Ukrainian Shield, where two reef ridges are known – Podilske and Eastern.

To meet sugar industry demands a range of deposits are being exploited with reserves securing operations of sugar industry enterprise of Ukraine for 15-20 years.

Due to sugar production drop in Ukraine limestone output for sugar industry has also decreased. In case of retaining and expansion the National nature park “Podilski Tovtry”, where majority of high-quality limestone deposits is located, the limestone reserves, in theory, will be exhausted within 13-15 years.

Prospecting and exploration of limestone deposits in Vynnytska and Khmelnytska oblasts is foreseen in this direction.

Glauconite

This is Category D mineral type. Important natural adsorbent, among the other substances, is the common glauconite being occurred as by-product of phosphorite ores as well as in glauconite deposits. Quartz-glauconite sands comprise the complex agriculture ore. Another direction of glauconite use, essential by turnover, may be ecologic one – reclamation of soils contaminated with radio-nuclides.

In Ukraine Neogene and Cretaceous quartz-glauconite sands are widespread in the territory of Volyno-Podilska plate, Ukrainian Shield and in the south-eastern part of Dniprovsko-Donetska depression. Their prognostic resources are roughly 5 billion tons. There are no explored glauconite deposits in Ukraine but in some regions quartz-glauconite sands with glauconite content up to 40-60% are widely developed.

It is foreseen in this direction:

- geological exploration for glauconite in the Middle and Left-Bank Prydnistrovya, Crimea and in Donetskiy region;
- preparation of deposits to commercial development (Crimean Autonomic Republic, Vinnytska, Khmelnytska, Chernivetska and Luganska oblasts) and reserves and resources estimation.

Barite

This is Category C mineral type. Beneficiated barite is being widely used in chemical, varnish-painting, electrotechnical, and petroleum industry.

In Ukraine barite is encountered in Carpathian folded system and in junction zone of Donetskiy basin and Pryazovian part of Ukrainian Shield. Barite ores in Trans-Carpathians occur in two deposits – Beregivske and Biganske but their evaluated reserves are not sufficient. The needs for own barite ores MRB become especially clear in the last years due to exhaustion of these ore reserves in deposits of Russian from where Ukraine has been importing the raw materials.

The major task of this direction comprises prospecting in the flanks of Biganske deposits to find out additional ore bodies aiming development the own MRB.

Gravel and aggregate quarry-stone materials

These are Category B mineral types. Ukraine possesses huge resources of various rocks which are being used for gravel, aggregate quarry-stone and developed over almost entire territory.

In view of future development the auto-transport system of Ukraine it is expected that construction will require production of the large amount of high-quality, strength gravel and aggregate materials.

In the explored deposits (in production and postponed) it is planned to establish production of mentioned materials in required amounts. The most prospective are granite deposits. Their exploitation will allow fast and cheap establishment of quarry-stone production.

It is foreseen in this direction:

- prospecting assessment of deposits perspective for reserve growth of strong aggregate grades in the western and central regions of Ukraine;
- preparation to commercial exploitation the prospective blocks of explored but postponed deposits perspective for reserve growth of strong aggregate grades.

Quartzites and quartz sand for metallurgy and glass manufactuing

These are Category D mineral types. Quartzites, quartzite-like sandstones and quartz sands are being used in Ukraine for refractory wares manufacturing (dinas, mullite, mortar, ferro-aloys and crystalline silica). They are encountered in various geological units of Ukraine and are being exploited.

It is foreseen in this direction:

- prospecting assessment of quartzite deposit resources in Sevostyanivska field of South-Donetskiy basin for ferrous metallurgy;
- high-quality quartzite reserves evaluation in Ukrainian Shield and its slopes for non-ferrous and base metal metallurgy of Ukraine;
- glass sand reserves and resources evaluation in perspective sites of Poltavska and adjacent oblasts.

Feldspar

This is Category D mineral type. Archean-Proterozoic feldspar rocks are widely developed in Ukrainian Shield. Pegmatites in 33 fields are confined to granite massifs of various complexes where they are mainly observed in the vein bodies 3-8 m thick in average, often with differentiated structure. The block and pegmatite zones of these veins are of economic interest as the feldspar raw materials.

Established MRB over many years did not meet industrial demands of Ukraine in feldspar raw materials and about 300 thousand tons of feldspar concentrate was annually imported from the rare-earth deposits of Karelia and Uzbekistan.

Deposits which are being mined in Ukraine supply low-quality raw materials. In order to solve the problems of feldspar raw materials the works on technology for alkaline kaoline beneficiation has to be done, as well as prospecting and exploration of new deposits of high-quality feldspar raw materials.

It is foreseen in this direction:

- prognostic assessment of raw materials in pegmatite deposits in production – Balka Velykogo Taboru in Pryazovya, and alkaline kaoline deposits – Prosyanivske in Dnipropetrovska Oblast and Dibrovske in Zhytomyrska Oblast;
- implementation of domestic technologies for alkaline kaoline beneficiation;
- prospecting and prospecting-evaluation works in perspective areas.

Graphite

This is Category C mineral type. Crystalline graphite deposits are encountered in Ukrainian Shield where they are grouped in the Ukrainian graphite-bearing province. The State balance of mineral reserves records 6 crystalline graphite deposits with total reserves estimated to 17.4 Mt of graphite.

The only Zavalyivskre deposit is in production with total reserves 6.8 Mt of graphite.

Balakhivske deposit is in preparation with total reserves estimated to 2.1 Mt of graphite.

Prospecting assessment of graphite reserves and resources in perspective fields and in flanks of known deposits is foreseen in this direction.

Technogenic raw materials

This is Category D mineral type. Industrial wastes including stripping rocks, flotation and gravity separation tails, phosphor-gypsum, lime, metallurgy slags, ash scoria, diverse slimes, mud, sewages, etc., accompany mining, beneficiation, processing, transportation, storage of minerals.

Annual amount of wastes in Ukraine, in solid phase only, attains 0.6 billion m^3.

About 8.6 billion m^3 (23-25 billion tons) of solid industrial wastes are accumulated over the square of more than 50 thousand hectares, of which 0.1-0.12 billion m^3 are being annually used in manufacturing of mainly construction materials and fertilizers while the rest is being remained in the dumps.

The reconnaissance works at the places of waste accumulation were performed in almost all regions of Ukraine over previous years.

It is foreseen in this direction:

- continue database development for technogenic deposits of Ukraine;
- geological-economic evaluation of technogenic accumulations in the State or municipal property.

4. Geological, ecological-geological and other studies of the territory of Ukraine

Geological mapping of the territory of Ukraine

Geological mapping of the territories makes possible to assess perspectives in MRB development, combine rational use of subsurface with ecological safety and establish conditions for sustainable development of the state.

Positive effect from hydrogeological, ecological and engineering-geological works and researches is only possible when these activities are conducted on the confident geological base of respective scale. In this respect, the geological maps of respective scale and precision comprise the necessary prerequisite for:

- prospecting-exploration works for various minerals;
- study of geology in the territories aiming strategic planning of the regions;
- specialized geological studies aiming over-ground and underground construction, including one not related to mineral deposit exploitation, determination of sites for harmful substances disposal, etc;
- evaluation of ecological-geological conditions and possibilities for emergency situations of natural origin over specific territory and prediction of changes for the future;
- targeted mapping of engineering-geological and hydro-geological features with assessment of their changes in space and time;
- assessment and forecasting the state of geological environment in technogenically-loaded territories, first of all in mining regions;
- development and prognosis for dangerous endogenous and exogenous geological processes and phenomena and detection the active geo-dynamic zones and zones of rock dilatation;
- regional prognosis for seismicity increasing under influence of engineering-geological condition changes in the regions with essential economic activity footprints over geological environment (mining areas, industrial-urban agglomerations, nuclear power stations, etc.);
- development and rational use of mineral resources in the regions (prospecting and development of new minerals including gas-hydrates in Black Sea water area).

Despite of achievements in solution of above problems and in securing the national economy demands, and in ensuring of ecological safety and knowledge base, obtained mainly in the course of extended geological study of previously mapped fields in the scale 1:200 000 (EGS-200) and expressed in the maps involved in the set of State Geological Map of Ukraine in the scale 1:200 000 (StateGeolMap-200), these achievements do not comply with the modern needs. At present about 75% of the territory of Ukraine are involved in the works related to StateGeolMap-200 (from preparatory period of EGS-200 to already published sets of maps). The medium-scale maps in some respects do not match the modern requirements. The maps in the scale 1:50 000 and higher are being published in the European Union member states. In view of this, priority-driven types of geological mapping in the territory of Ukraine include:

- completing EGS-200 works to compile StateGeolMap-200;
- geological mapping and extended geological study of the fields in the scale 1:50 000 to develop StateGeolMap-50 as the multi-purpose base for subsurface use and other business activities;
- publishing StateGeolMap-200 and StateGeolMap-50 sets, as well as consolidated small-scale maps of geological contents for territory of Ukraine and particular regions.

Aiming the study of potential ore-bearing structures and fields with regard to certain types of minerals, evaluation of their prognostic resources and definition of the fields (sites) prospective for mineral deposits, the geological-prognostic mapping is prescribed which major amounts will be conducted at the second stage of the Program realization.

It is foreseen in this direction:

- extended geological study of the fields in the scale 1:200 000 over the square of 120 thousand km^2;
- geological mapping in the scale 1:50 000 over the square 300 thousand km^2;
- geological-prognostic mapping in the scale 1:200 000 over the square of 50 thousand km^2;
- preparation of geophysical bases for extended geological study of the fields in the scales 1:200 000 and 1:50 000 over the square of 80 thousand km^2;
- hydrogeological and engineering-geological mapping in the scale 1:200 000 over the square about 190 thousand km^2;
- hydrogeological and engineering-geological mapping in the scale 1:50 000 over the square about 18 thousand km^2;
- compilation of geological-geophysical information by results of previous works with design the set of maps over the shelf of the Black and Azov seas in the scale 1:500 000;
- complex geological, hydrogeological and engineering-geological mapping of the shelf of the Black and Azov seas in the scale 1:200 000 with design the set of multi-purpose maps;
- geological mapping of the shelf in the scale 1:50 000 in coastal offshore areas of the Black and Azov seas.

Geological mapping will be conducted in complex with required amounts of geophysical (early and accompanying), geochemical, aero-space, laboratory-analytic and other surveys with their obligatory scientific-methodic forwarding by specialized and academic science.

The main results of the regional geologic, hydro-geologic, ecologo-geologic and geophysical works comprise the sets of maps of various scales and general and targeted contents intended for further exploration and nature protection works as well as in purposes of construction, agriculture, mining and other business activities.

In total, over period 2011-2030 the issue of StateGeolMap-200 sets by more than 100 sheets and StateGeolMap-50 by more than 600 sheets is anticipated.

Hydrogeological, engineering-geological and ecological-geological works

The groundwater share in household-drinking water supplying of Ukrainian citizens is about 30% only while in the EU member states public water supplying is mainly based on groundwaters whose share in the total public water supplying is 70%.

At the same time, explored groundwater deposits in Ukraine are developed by 20-25% only. A number of explored deposits are not used whereas some deposits are not suitable for use anymore because of building in the territory, gravel-pebble sediments extraction from Carpathian rivers, water-bearing horizons contamination in the irrigation systems, filtering accumulators, technogenic dumps, landfills, etc.

Mentioned conditions make necessary reassessment of groundwater prognostic and perspective resources and exploitation reserves to define the real perspectives securing country demands in ecologically clear drinking water.

The problems remain in quality drinking water supplying for the southern and eastern regions of the state as well as mining areas (Odeska, Mykolaivska, Khersonska, Zaporizka oblasts, Crimean Autonomic Republic, Donetskiy basin, Kryvorizkiy basin, Fore-Carpathians, etc.).

Further prospecting and exploration of new deposits of drinking, technical, mineral, thermal and industrial groundwaters is also important.

In the territory of Ukraine continues accumulation of solid household and industrial wastes, contaminated sewage waters discharge into water objects, air pollution from mining and industrial enterprises, which is some regions exceed the top admissible concentrations and protective capacities of soils, rocks and groundwaters. These factors caused groundwater contamination in major water-bearing horizons involved in household-drinking water-supplying (Donetskiy basin, Kryvorizkiy basin, Fore-Carpathians, Crimea, Pryazovya, Prydniprovya, etc.).

Over 80% of the territory of Ukraine the rocks in upper part of earth crust are broken by mining works, industrial-urban constructions, land irrigation, hydro-technical construction, resulted in groundwater resources contamination, development and activation of dangerous exogenic geological processes (slides, collapses, under-flooding, karst processes, etc.) and increased seismicity. Ecological-geological problems in many regions are strongly complicated by the negative impact from closure of mining enterprises, shafts and sections.

Influence of the tectonic zones, increased migration of radon, mercury vapors, methane, carbon dioxide on the living conditions is weakly studied at the regional level, as well as emerging geophysical fields and their influence on the rock stability and engineering-geological conditions, especially in the mining regions.

In view of above problems, in the direction of hydrogeological, engineering-geological and ecological-geological works is foreseen:

- reassessment of prognostic and perspective resources and exploitation reserves of groundwaters for household-drinking and technical water supplying, medical, thermal-energy and industrial needs;
- prospecting and exploration of drinking, technical, mineral, thermal-energy and industrial groundwaters for the country demands;
- annual drilling of artesian exploration-exploitation wells (in amount about 100) aiming provision the habitants with ecologically clear potable water, especially in the regions suffered from natural disasters, in the southern and eastern regions of Ukraine, in the regions with limited drinking water resources, and in the territories of extensive technogenic overloading;
- ecological-geological studies in the territories of extensive technogenic overloading to define the factors and numeric parameters of its influence on geological environment and developing the measures to mitigate this influence on the living conditions in respective territories;
- continue engineering-geological works to identify and assess dangerous geological processes, first of all under-flooding as the process of regional development facilitating activation of other dangerous geological processes (slides, collapses and subsidence, karst and suffusion, etc.) and increasing of seismic hazards;
- assessment of risk from regional changes of engineering-seismic-geological conditions in the mining areas of Ukraine, nuclear power stations, hydro-technical constructions, industrial-urban agglomerations;
- special studies to ensure rational and ecologically safe subsurface use, liquidation pumping in prospecting-exploration and exploitation wells to prevent groundwater contamination;
- monitoring of geological environment (geochemical state of landscapes, groundwaters with evaluation of their resources, exogenic geological processes, etc.);
- continue special ecological-geological studies in the coastal offshore of Black and Azov seas, especially in the areas of Danube River mouth, Dniprovskiy estuary, Zmiiniy and Tuzla islands.

Implementation of above tasks requires modern technical equipment, devices and units which should comply with the world technical level.

All mentioned works require scientific-methodic supervision by the sector and academic research institutions.

Geological exploration in the continental shelf and in the exclusive (marine) economic zone

Geological, geophysical and drilling works in many countries over last years have indicated that shelf zones and continental slopes are highly-perspective for a number of minerals, including oil and gas. These works confirm the practical opportunity to develop offshore and its economic value.

Ukraine as the marine state conducts various geological studies in the water area within the exclusive (marine) economic zone of Ukraine. Exploration strategy in continental shelf of Black and Azov seas includes medium- and small-scale (1:200 000 and 1:50 000 respectively) geological mapping of sea bottom. It is conducted to obtain complex and systematic geological (geological-geophysical) information required for respective base design ensuring solution to the problem of study and use of sea bottom (coastal zones), specifically, rational nature use, assessment of mineral resources, and all types of sea studies, environment protection, under-water construction, including oil and gas pipelines, constructions for hydrocarbon transportation, geological study, prognosis, prospecting and exploitation of minerals, in purposes of the Ministry for Foreign Affairs of Ukraine, State Border Survey of Ukraine, etc.

Aiming MRB growth through participation in the international projects for development of perspective sites of the World ocean the Government of Ukraine has submitted the formal application on the intent of Ukraine to join the international organization “Interoceanmetal”.

It is foreseen in this direction:

- in the Black and Azov sea water area: medium-scale geological mapping – over entire shelf territory; large-scale geological mapping – at coastal zones and in some sites; prospecting (accompanying) works for construction materials, sapropel, titanium and zirconium placers, precious and base metals, mineral salts and sludges;
- international cooperation in the field of geological study of the Black and Azov sea bottom;
- prospecting for hydrocarbons in the Black and Azov sea water areas, including gas-hydrates, sapropel, construction materials and gold;
- prospecting and exploration for polymetallic and iron-manganese concretions in the World ocean, development of technique, technology for their extraction and processing. These works are thought to be implemented using non-government investments which amounts at the second stage of the Program realization will exceed 7 UAH billion (Annex 2).

Study of deep subsurface

The last quarter of XX century in many countries (Russia, USA, Germany, Japan, Canada, France, Sweden, UK, China and other) was marked by realization of the new stage in the study of the Earth – continental drilling in scientific purposes. Results of continental drilling have allowed new approaching in solution the fundamental problems of the Earth’s crust evolution and some practical aspects of geo-mechanics and temperature regime of the rocks. It is planned to re-arrange all deep and super-deep wells upon drilling completion into the monitoring geological laboratories (geo-observatories) since these objects comprise unique artificial channels in the Earth’s crust which bring multi-purpose information to all branches of the Earth’s sciences.

It is foreseen in this direction to establish the monitoring geological laboratory in Kryvorizkiy basin based on the Kryvorizka super-deep well (5422 m). The major task of this laboratory is assumed to be the registration and collection of data on variation the diverse fields in the well over the depth interval 2800-5300 m and around to receive information on changes in parameters of geological environment at various depths and in time to be further taken into account in design and construction of underground objects for ecologically safe disposal of the active industrial wastes, as well as further used in solution of other theoretical and practical problems of geology.

Geophysical researches

Geophysical researches in forecasting the earthquakes

The seismic situation of environment in the regions where a number of mineral deposits and prognostic mineral resources are located, specifically, hydrocarbons in the Black and Azov sea offshore, requires proper seismic risk assessment. In order to operate the common network of hydro-geodeformation monitoring and geophysical fields variability required for the geodynamic situation in the territory of Ukraine long- and medium-term forecasting, hydro-geodeformation and other geophysical databank development for geodynamic risk assessment, safety increasing of industrial enterprises, including mining ones, and inhabitants living in the seismic-dangerous regions, it is foreseen in this direction for the period to the year 2030:

- regime seismic and related geophysical observations;
- seismic forecasts based on complex analysis of seismic and geological-geophysical data; express determination of the earthquake parameters in the territory of Ukraine and adjacent territories, major earthquakes over the planet, as well as nuclear explosions in the foreign trial polygons;
- express provision of the central and local authorities, Cabinet of Ministers of the Crimean Autonomic Republic, whose territories are located in the seismic-dangerous areas with the information on earthquakes and their possible consequences;
- development of the central bank of geophysical data, particularly for inter-regional and international geophysical information exchange;
- design of the maps of the territory of Ukraine seismic zonation;
- information support to the works in seismic subdivision of the territory of Ukraine, evaluation of the potential seismic risks, seismic-proof construction, as well as fundamental and applied researches intended for solution of the earthquake problems.

Regional geophysical surveys

The complex of regional geophysical surveys includes methods which allow information on the physical situation in lithosphere and its connection with tectonic structure of regions where mineral resources are developed. The complex of geophysical and geochemical methods includes seismic studies, gravity field studies, magnetic observations, etc.

The aim of regional geophysical (and geochemical) studies along the geo-traverses is to obtain preliminary information on tectonic structure, geology, internal structure and composition of geological units, prognosis of perspective sites and preliminary conclusions on the regularities in mineral distribution.

Aforesaid studies are also being conducted in mineral prospecting, including hydrocarbons, and also to solve particular tasks in the course of prognostic-geological studies. Combining of geophysical methods is being done in view of geology of the area, the depth of tectonic floor under consideration, etc.

Regional geophysical studies are planned to be conducted onshore and in the Black and Azov sea offshore together with geological organizations of other countries.

Technical upgrading

To date essential part of enterprises in geological sector is faced with the situation of significant depreciation and outdating by many points of technical equipment whose considerable portion is bought in the times of USSR. There is a trend of the sector retard by these parameters from the world leading countries and by some positions even from the CSI countries which essentially hampers MRB development in a whole.

It is foreseen by the Program to spend for the sector technical upgrading up to 30% of funding for geological exploration works within years 2011-2015. And up to 10% of funding for geological exploration works will be spent for the technical upgrading in the next years 2016-2030. The efforts are anticipated to be focused on the following directions:

- drilling rigs and equipment;
- geophysical devices and equipment, including seismic techniques, marine vessels, geophysical well logging and field geophysics;
- equipment for ecological-geological studies;
- other technological equipment for geological exploration, auto-transport for field works, as well as geodesy devices;
- laboratory equipment, including ICP-MS spectrometer of NEPTUNE type;
- hardware and software for data processing;
- operating premises reconstruction.

Section IV. MECHANISM OF PROGRAM IMPLEMENTATION

1. Legal framework

The Program implementation requires improvement in the legal acts, specifically, new edition of the Code of Ukraine on Subsurface, improvement in the calculation method for selling starting price of special permits for subsurface use, criteria for the winner determination in tender (auction) for subsurface use and the right for production sharing agreement conclusion, subsurface users' responsibility for breaking investment agreement, project documentation for deposit exploitation, subsurface use footprint mitigation, secondary sell-purchase operations for the subsurface use rights in accordance with the best practice of developed countries.

2. Scientific support

In line of scientific support to the Program it is foreseen:

- scientific forwarding to geological exploration starting from the prognostic assessment of the oil-gas-bearing areas up to prospecting and exploration of hydrocarbon deposits;
- scientific-methodical studies intended for efficiency increase in geological exploration of metal and non-metal minerals, coal, and coal-bed methane;
- development of new and improvement of current methods in regional study of subsurface;
- design of scientific approaches and methodic recommendations with regard to complex use of subsurface;
- development of novice technologic methods of ore beneficiation, improvement of technical tools for construction of core-drilling and deep exploration wells;
- scientific development and implementation the novice ecologically clear and safe technologies into the processes of mineral use and into the processes of reclamation the lands involved in mineral exploitation;
- development of new methods for groundwater prognostic and perspective resources assessment, groundwater reserves prospecting and estimation under conditions of technogenic loading over geological environment in Ukraine, as well as exploitation groundwater reserves aiming improvement of water supply with these reserves for public needs; development and improvement if methods, implementation of scientific support to the works for hydrogeological, engineering-geological and ecological-geological mapping and map production; monitoring of ecological state of geological environment, monitoring of geochemical state of landscapes, prognosis for exogenic progesses development under conditions of extensive land use, as well as scientific support in the course of aforementioned works.

3. Stages of Program implementation

The Program is to be implemented over period to the year 2030 and will include three stages.

Stage 1 – years 2011-2012

In the first stage, based on the formation and implementation of annual plans for social and development of Ukraine, the complex of the first-order organizational, legal and scientific-technical measures is foreseen intended to the solution of most important problems in secure supply of mining enterprise with raw materials, optimal sharing of tasks and programs for MRB development and use by each of four mineral type categories and by specific minerals, as well as favorable conditions to engage domestic and foreign investments in the geological study of subsurface.

In addition, essential technical upgrading is foreseen in the enterprises of the geological sector to ensure their successful and efficient activities under conditions of market economy.

Stage 2 – years 2013-2020

- development of balanced legal base for subsequent Program implementation;

- major measures intended for improvement of MRB structure and functions related to use of minerals strategically important for the economy of Ukraine;
- approval and implementation of programs, annual operating and financial indicators for MRB development and use by categories of minerals for the period until year 2020;
- revision and adjustment of the Program in 2019 to ensure its balanced implementation on the third stage (2021-2030);
- definition of priority-driven directions of the State mineral policy with regard to the minerals strategically important for economy of Ukraine concerning directions and mechanism of domestic and foreign investments engagement;
- developing perspective plans for the Program implementation financing and defining ratio of government financial resources, credit-bank resources, own funds of enterprises, organizations and entities of mineral industry, internal and external investments in the total amount of Program financing.

Stage 3 – years 2021-2030

- implementation of the major Program goals and tasks;
- accelerated MRB development, progressive increasing in the rate and amount of consumption of minerals strategically important for the economy of Ukraine;
- increased export of minerals, intermediate and final products of their processing;
- progressive decreasing of dependency from mineral import, including the works conducted by Ukrainian specialists overseas;
- transition of Ukraine into the state comprising important integral part of the world mineral industry by amount of consumption of strategically important minerals and by amount of foreign investments involved.

4. International cooperation

The international cooperation in the field of geological study and use of subsurface will facilitate harmonization the national legislation with the legislation of European Union.

Aiming solution of crucial problems of the CIS countries and development of the first-order actions concerning coordination and development of cooperation in the field of study, exploration and exploitation the mineral resources, the State Geological Survey of Ukraine does perform activities in the framework of the Inter-Government Council of the CIS countries. In order to study foreign, European first of all experience in the organization of geological surveys, awareness in the novice scientific-technical developments in the field of geological study of subsurface, harmonization of legislation in the field of subsurface use, the State Geological and Subsurface Survey of Ukraine will also participate in the EuroGeoSurveys, the Association of geological surveys of Europe.

Development of bilateral cooperation in the field of geology and subsurface use with other countries will facilitate efficient and complex use of mineral resources of Ukraine, engagement of new methods and technologies for geological study of subsurface, which are being applied by the geological surveys and exploration companies in developed countries, and also will allow prevention to many negative geological consequences related to mineral extraction and processing in the trans-border territories (Trans-Carpathians, Donetskiy basin, etc.).

5. Expected results of Program implementation

Expected results of the Program implementation are as follows:

- discovery and exploration of new deposits of the fuel-energy raw materials;
- domestic output of the strongly demanded mineral types which are being imported from other countries and which are vital for metallurgical and some other enterprises (chromium and chromium-nickel ores, fluorspar, phosphate raw materials, forsterite refractories).
- development of the own MRB for most important strategic mineral types (gold and other precious metals, scandium, lithium, rare earths etc.)
- preparation of new deposits for profitable exploitation in the future by the own Ukrainian industry using foreign investments;
- conducting diverse geological works (including exploration and exploitation) by the specialized State enterprises in the third countries;
- complex geological, hydrogeological, engineering-geological and ecological-geological assessment, mapping and cartography of the territory of Ukraine;
- reassessment of prognostic and perspective drinking groundwater resources, defining the real scheme for groundwater extraction which will allow outline perspectives of the fresh groundwater supply to customers in various regions of Ukraine and in this respect the practical plans for prospecting-exploration works to solve the problem of secured public water supply.

Section V. FUNDING AMOUNTS AND SOURCES

It is foreseen that total amount of the Program financing will comprise 189053.99 UAH million, of which:

SBU funds – 26 119.13 UAH million;
funds from other sources – 162 934.86 UAH million;

including (SBU and other funds respectively):

first stage of Program implementation (2011-2012) - 1 730.42 UAH million and 10 689.70 UAH million;
second stage of Program implementation (2013-2020) - 8 952.04 UAH million and 55 882.62 UAH million;
third stage of Program implementation (2021-2030) - 15 436.67 UAH million and 96 362.54 UAH million.

Annex 1
to the Program

PASSPORT
OF THE WHOLE-STATE PROGRAM FOR DEVELOPMENT OF
MINERAL RESOURCE BASE OF UKRAINE FOR PERIOD TO THE YEAR 2030

1. The Program concept is approved by the Resolution of the CMU of March 9, 1999, No. 338.
2. The Program is approved by the Law of Ukraine of April 21, 2011, No. 3268-VI.
3. State charterer – Ministry of Ecology and Natural Resources of Ukraine.
4. Program manager – Head of the State Geological and Subsurface Survey of Ukraine.
5. Program measures executive – State Geological and Subsurface Survey of Ukraine.
6. Terms of Program implementation: years 2011-2030.
7. Prognostic funding amounts and sources (in UAH):

Funding sources	Funding amounts	by years		
		stage I	stage II	stage III
SBU	26 119.13	1 730.42	8 952.04	15 436.67
Other sources	162 934.86	10 689.70	55 882.62	96 362.54
Total	189 053.99	12 420.12	64 834.66	111 799.21

Annex 2
to the Program

TASKS AND MEASURES
TO IMPLEMENT THE WHOLE-STATE PROGRAM FOR DEVELOPMENT OF
MINERAL RESOURCE BASE OF UKRAINE FOR PERIOD TO THE YEAR 2030

Task	Measure	Amounts					Action	Major budget fund holder	Funding sources (State, local, others)	Prognostic amount of funding, UAH million	by years			
		total	stage I		stage II	stage III					stage I		stage II	stage III
			2011	2012	2013-2020	2021-2030					2011	2012	2013-2020	2021-2030
Section 1. Fuel-energy resources														
1. Growth of oil. gas. condensate MRB	growth of reserves and resources of oil and condensate, Mt	72.5	3.0	3.1	26.4	40.0	exploration	MENR	SBU	7287.20	265.45	245.45	2487.29	4289.01
		538.57	22.29	23.03	196.11	297.14			others	88873.57	2822.73	3008.02	30481.43	52561.39
	growth of reserves and resources of gas. billion m^3	287.0	11.6	11.8	103.6	160.0			SBU	6084.73	223.26	204.55	2072.74	3574.18
		2056.83	83.13	84.57	742.47	1146.67			others	74061.30	2352.27	2506.68	25401.19	43801.16
							Total		SBU	13323.22	450.00	450.00	4560.03	7863.19
									others	162934.87	5175.00	5514.70	55882.62	96362.55
									subtotal	176258.09	5625.00	5964.70	60442.65	104225.74
2. Growth of hard coal MRB	reserves of economic categories, Mt	1000.0	10.0	20.0	470.0	500.0	exploration	MENR	SBU	186.12	5.06	6.33	64.14	110.59
	growth of reserves, Mt	572.4	25.0	30.0	206.4	311.0				204.73	5.57	6.96	70.55	121.65
	assessment of reserves and perspective resources, Mt	1602.6	70.0	90.0	571.8	870.8				223.34	6.08	7.59	76.96	132.71

Task	Measure	Amounts					Action	Major budget fund holder	Funding sources (State, local, others)	Prognostic amount of funding, UAH million	by years			
		total	stage I		stage II	stage III					stage I		stage II	stage III
			2011	2012	2013-2020	2021-2030					2011	2012	2013-2020	2021-2030
3. Growth of brown coal MRB	reserves of economic categories, Mt	100.0	4.0	6.0	40.0	50.0	exploration	MENR	SBU	148.89	4.05	5.06	51.31	88.47
	growth of reserves, Mt	103.0	1.5	4.5	41.0	56.0				55.84	1.52	1.90	19.24	33.18
	assessment of reserves and perspective resources, Mt	670.0	30.0	50.0	220.0	370.0				111.68	3.04	3.80	38.48	66.36
4. Growth of peat MRB	assessment of reserves and resources, Mt	17.0	1.0	1.5	8.0	6.5	prospecting and exploration in perspective sites of Kharkivska, Poltavska and Sumska oblasts	MENR	SBU	130.28	3.54	4.43	44.89	77.42
5. Growth of methane of coal deposits MRB	growth of reserves and resources, billion m^3	9.5	0.3	0.3	3.0	5.9	exploration and trial-commercial exploitation of deposit	MENR	SBU	186.12	5.06	6.33	64.14	110.59
	assessment of reserves and resources in some sites, billion m^3	23.4	0.7	0.7	10.0	12.0	exploration			223.34	6.08	7.59	76.96	132.71
Growth of hard coal, brown coal, peat, methane of coal deposits MRB							***Total***		SBU	1470.34	40.00	49.99	506.67	873.68
									others	-	-	-	-	-
									subtotal	1470.34	40.00	49.99	506.67	873.68

Task	Measure	Amounts					Action	Major budget fund holder	Funding sources (State, local, others)	Prognostic amount of funding, UAH million	by years			
		total	stage I		stage II	stage III					stage I		stage II	stage III
			2011	2012	2013-2020	2021-2030					2011	2012	2013-2020	2021-2030
6. Growth of uranium MRB	ensuring exploitation of deposits with reserves of economic categories, conventional units	11.4	0.5	0.5	4.2	6.2	exploration	MENR	SBU	335.35	8.67	11.42	115.72	199.54
	growth of reserves, conventional units	68.7	3.0	3.0	25.4	37.3	exploration and preparation to commercial development of Krynychanske and Novoguriivske deposits			670.70	17.35	22.84	231.43	399.08
	growth of reserves, conventional units	46.7	2.0	2.0	17.3	25.4	exploration and entering into commercial development of Aprelske, Partyzanske, Kirovske and Litne deposits			558.91	14.46	19.03	192.86	332.56
Growth of uranium MRB							***Total***		SBU	1564.96	40.48	53.29	540.01	931.18
									others	-	-	-	-	-
									subtotal	1564.96	40.48	53.29	540.01	931.18
Section 1. Fuel-energy resources							**Total**			**179339.1**	**5744.19**	**6067.98**	**61489.33**	**106030.6**
							including		**SBU**	**16397.23**	**569.19**	**553.28**	**5606.71**	**9668.05**
									others	**162934.87**	**5175**	**5514.7**	**55882.62**	**96362.55**

Task	Measure	Amounts					Action	Major budget fund holder	Funding sources (State, local, others)	Prognostic amount of funding, UAH million	by years			
		total	stage I		stage II	stage III					stage I		stage II	stage III
			2011	2012	2013-2020	2021-2030					2011	2012	2013-2020	2021-2030
Section 2. Metallic mineral resources														
7. Growth of ferrous metals MRB	growth of reserves of high-grade iron ores, Mt	850.0	50.0	50.0	300.0	450.0	exploration in “Sukha Balka” deposit	MENR	SBU	52.24	1.76	1.76	17.88	30.84
	growth of reserves of high-grade iron ores, Mt	5100.0	250.0	250.0	2000.0	2600.0	prospecting assessment of Grushkivskoe-Sekretarske and Novoselytske occurrences, exploration of Pishchanske, Savranske, Baybuzivske and Moldovske deposits in Middle Pobuzhzhya			62.70	2.12	2.12	21.46	37.00
	growth of reserves of high-grade iron ores, Mt	600.0	50.0	50.0	200.0	300.0	reassessment of resources of perspective objects in Pryazovya	MENR	SBU	36.59	1.24	1.24	12.52	21.59

Task	Measure	Amounts					Action	Major budget fund holder	Funding sources (State, local, others)	Prognostic amount of funding, UAH million	by years			
		total	stage I		stage II	stage III					stage I		stage II	stage III
			2011	2012	2013-2020	2021-2030					2011	2012	2013-2020	2021-2030
7. Growth of ferrous metals MRB	growth of reserves and resources of iron ores, Mt	690.0	50.0	50.0	240.0	350.0	exploration of Sergiivske, Novoukrainske, Pivnichno-Tersyanske and Pavlivske deposits (Zaporizka Oblast)	MENR	SBU	41.80	1.41	1.41	14.31	24.67
	growth of reserves and resources of iron ores, Mt	180.0	20.0	20.0	60.0	80.0	prospecting-evaluation works (Lenina sites No. 1, 2 and 3)	MENR	SBU	15.67	0.53	0.53	5.36	9.25
	growth of resources of manganese ores, Mt	30.0	2.0	3.0	5.0	20.0	assessment of resources of carbonate manganese ores in the area between Ingoul-Ingoulets rivers	MENR	SBU	31.35	1.06	1.06	10.73	18.50
	growth of resources of manganese ores, Mt	10.0	1.0	2.0	3.0	4.0	prospecting in Kostromska site in Dnipropetrovska Oblast	MENR	SBU	36.59	1.24	1.24	12.52	21.59

Task	Measure	Amounts					Action	Major budget fund holder	Funding sources (State, local, others)	Prognostic amount of funding, UAH million	by years			
		total	stage I		stage II	stage III					stage I		stage II	stage III
			2011	2012	2013-2020	2021-2030					2011	2012	2013-2020	2021-2030
7. Growth of ferrous metals MRB	growth of reserves and resources of chromite ores, Mt	11.4	0.5	0.5	4.2	6.2	preparation to commercial development, reserves approval for some sites in Kapitanivskiy ore camp	MENR	SBU	52.24	1.76	1.76	17.88	30.84
	growth of reserves and resources of chromite ores, Mt	4.6	0.4	0.4	1.2	2.6	prospecting assessment and exploration of Pushkivske, Pivnichno-Lypovenkivske and Lypnyagivske deposits in Middle Pobuzhzhya	MENR	SBU	26.12	0.88	0.88	8.94	15.42
Growth of ferrous metals MRB							***Total***		SBU	355.30	12.00	12.00	121.60	209.70
									others	-	-	-	-	-
									subtotal	355.30	12.00	12.00	121.60	209.70
8. Growth of non-ferrous and base metals MRB	growth of resources of bauxite ores, Mt	4.8	0.5	0.5	1.2	2.6	prospecting assessment of occurrences in paleodepressions in Prydnistrovya	MENR	SBU	7.81	0.25	0.26	2.68	4.62

Task	Measure	Amounts					Action	Major budget fund holder	Funding sources (State, local, others)	Prognostic amount of funding, UAH million	by years			
		total	stage I		stage II	stage III					stage I		stage II	stage III
			2011	2012	2013-2020	2021-2030					2011	2012	2013-2020	2021-2030
8. Growth of non-ferrous and base metals MRB	growth of reserves and resources of copper ores, Mt	6.8	0.5	0.6	2.0	3.7	evaluation of economic value and preparation to exploration of perspective sites, assessment of copper reserves and resources in Rafalivskiy ore camp	MENR	SBU	3.91	0.13	0.13	1.34	2.31
	growth of reserves and resources of copper ores, Mt	1.5	0.1	0.1	0.5	0.8	exploration of copper deposit in Volynskiy ore camp			46.89	1.52	1.59	16.07	27.71
	growth of reserves and resources of copper ores, Mt	1.2	0.1	0.1	0.4	0.6	exploration of copper deposit in Pivnichno-Ratnivska site			23.43	0.76	0.79	8.03	13.85
	growth of resources of copper ores, Mt	0.9	0.1	0.1	0.3	0.4	prospecting in perspective occurrences of Donbas (Bakhmutska depression) and greenstone structures (Dnipropetrovska Oblast)			11.73	0.38	0.40	4.02	6.93

Task	Measure	Amounts					Action	Major budget fund holder	Funding sources (State, local, others)	Prognostic amount of funding, UAH million	by years			
		total	stage I		stage II	stage III					stage I		stage II	stage III
			2011	2012	2013-2020	2021-2030					2011	2012	2013-2020	2021-2030
8. Growth of non-ferrous and base metals MRB	assessment and growth of resources of nickel, cobalt, concomitant PGM, gold, as well as bauxites, talc, vermiculite, thousand tons	650.0	10.0	20.0	270.0	350.0	exploration in Derenyukhinsko-Lypovenkivska zone in Middle Pobuzhzhya	MENR	SBU	27.33	0.88	0.92	9.37	16.16
	assessment and growth of resources of nickel, cobalt, concomitant PGM, gold, as well as bauxites, talc, vermiculite, thousand tons	120.0	0.4	0.6	50.0	60.0	preparation to commercial development, assessment of reserves and resources of economic categories in Zakhidnolashchivske and Skhidnolypovenkivske deposits	MENR	SBU	15.64	0.51	0.53	5.36	9.24
	growth of reserves and resources of sulphide copper-nickel ores, thousand tons	200.0	20.0	20.0	60.0	100.0	geological-economic assessment of economic value of Prutivske deposit and decision on its viable exploration	MENR	SBU	23.43	0.76	0.79	8.03	13.85

Task	Measure	Amounts					Action	Major budget fund holder	Funding sources (State, local, others)	Prognostic amount of funding, UAH million	by years			
		total	stage I		stage II	stage III					stage I		stage II	stage III
			2011	2012	2013-2020	2021-2030					2011	2012	2013-2020	2021-2030
8. Growth of non-ferrous and base metals MRB	growth of resources of nickel, cobalt and copper, thousand tons	1000.0	50.0	100.0	400.0	450.0	prospecting-evaluation works in Oleksandrivska and Avdotiivska sites in Dnipropetrovska Oblast	MENR	SBU	35.16	1.14	1.19	12.05	20.78
	assessment of perspective resources of lead and zinc, thousand tons	2400.0	300.0	300.0	1000.0	800.0	prospecting-evaluation works in perspective geological structures (Donbas, Carpathians, Dniprovsko-Donetska depression)			46.89	1.52	1.59	16.07	27.71
	growth of reserves and resources of lead and zinc, thousand tons	2300.0	200.0	300.0	500.0	1300.0	assessment of economic value of Bilyaivske and Novodmytrivske deposits	MENR	SBU	42.97	1.39	1.45	14.73	25.40
	growth of resources of lead and zinc, thousand tons	750.0	-	-	300.0	450.0	prospecting-exploration works in Komsomolskiy ore camp (Donetska Oblast)	MENR	SBU	31.25	1.01	1.06	10.71	18.47

Task	Measure	Amounts					Action	Major budget fund holder	Funding sources (State, local, others)	Prognostic amount of funding, UAH million	by years			
		total	stage I		stage II	stage III					stage I		stage II	stage III
			2011	2012	2013-2020	2021-2030					2011	2012	2013-2020	2021-2030
8. Growth of non-ferrous and base metals MRB	growth of reserves and resources of complex placer zirconium-titanium ores, conventional units	36.5	10.0	15.0	5.0	6.5	preparation to commercial development of objects in Tarasivsko-Tarashchanska field	MENR	SBU	19.52	0.63	0.66	6.69	11.54
	growth of resources of titanium, conventional units	36.0	-	-	32.0	4.0	prospecting-exploration works in Lykhivska site and Pokrovo-Kyriivska structure (Dnipropetrovska Oblast)	MENR	SBU	15.64	0.51	0.53	5.36	9.24
	growth of resources of tin, thousand tons	50.0	-	-	20.0	30.0	prospecting-evaluation works in Perzhanskiy ore camp			19.52	0.63	0.66	6.69	11.54
	growth of resources of molybdenum and tungsten, thousand tons	295.0	-	10.0	185.0	100.0	prospecting, evaluation of resources in Kaplanivskiy, Ustynivskiy, Novoselivskiy and Sergiivskiy ore fields	MENR	SBU	42.97	1.39	1.45	14.73	25.40

Task	Measure	Amounts					Action	Major budget fund holder	Funding sources (State, local, others)	Prognostic amount of funding, UAH million	by years			
		total	stage I		stage II	stage III					stage I		stage II	stage III
			2011	2012	2013-2020	2021-2030					2011	2012	2013-2020	2021-2030
8. Growth of non-ferrous and base metals MRB	growth of resources of molybdenum and tungsten, thousand tons	248.9	-	12.5	112.0	124.4	prospecting-evaluation works in perspective occurrences of Novoselivske ore field, assessment of economic value and decision on their exploration	MENR	SBU	39.06	1.26	1.32	13.39	23.09
	growth of resources of molybdenum, thousand tons	487.9	-	39.1	200.0	248.8	preparation to commercial development, estimation of reserves in Verbynske deposit			46.89	1.52	1.59	16.07	27.71
	growth of resources of molybdenum, thousand tons	85.0	10.0	10.0	10.0	55.0	prospecting-exploration works in the eastern limb of Kryvorizko-Kremenchutska suture zone	MENR	SBU	31.25	1.01	1.06	10.71	18.47
Growth of non-ferrous and base metals MRB							***Total***		SBU	531.29	17.20	17.97	182.10	314.02
									others	-	-	-	-	-
									subtotal	531.29	17.20	17.97	182.10	314.02

Task	Measure	Amounts					Action	Major budget fund holder	Funding sources (State, local, others)	Prognostic amount of funding, UAH million	by years			
		total	stage I		stage II	stage III					stage I		stage II	stage III
			2011	2012	2013-2020	2021-2030					2011	2012	2013-2020	2021-2030
9. Growth of rare and rare-earth metals MRB	growth of reserves and resources of tantalum and niobium, conventional units	58.5	-	-	20.0	38.5	preparation to commercial development, reserve estimation in Mazurivske deposit	MENR	SBU	44.00	1.29	1.49	15.13	26.09
	growth of resources of tantalum, conventional units	2.0	-	-	0.5	1.5	assessment of resources (Kopanky, Mostove, Vys and other sites)	MENR	SBU	6.28	0.18	0.21	2.16	3.73
	growth of reserves and resources of lithium dioxide, thousand tons	300.0	-	50.0	100.0	150.0	preparation to commercial development of Polokhivske deposit, assessment of resources in Shevchenkivske ore field			62.88	1.85	2.13	21.62	37.28

Task	Measure	Amounts					Action	Major budget fund holder	Funding sources (State, local, others)	Prognostic amount of funding, UAH million	by years			
		total	stage I		stage II	stage III					stage I		stage II	stage III
			2011	2012	2013-2020	2021-2030					2011	2012	2013-2020	2021-2030
9. Growth of rare and rare-earth metals MRB	growth of reserves and resources of rare earths and concomitant zirconium, conventional units	30.0	-	-	10.0	20.0	assessment and decision on exploration and trial-commercial development , reserves and resources estimation of Azovske deposit	MENR	SBU	25.15	0.74	0.85	8.65	14.91
	growth of resources of rare earths, thousand tons	27.0	-	-	10.0	17.0	assessment of resources in Anadolske occurrence in Donetska Oblast and Khristoforivska site in Dnipropetrovska Oblast			18.86	0.55	0.64	6.49	11.18
	growth of resources of rare metals, thousand tons	56.0	-	-	20.0	36.0	assessment of resources in flanks of Shevchenkivske ore field	MENR	SBU	31.44	0.92	1.07	10.81	18.64
	growth of resources of rare earths, thousand tons	487.9	10.0	20.0	209.1	248.8	assessment of resources in Sushchano-Perzhanska zone			75.44	2.21	2.56	25.94	44.73
Growth of rare and rare-earth metals MRB							***Total***		SBU	264.05	7.74	8.95	90.80	156.56
									others	-	-	-	-	-
									subtotal	264.05	7.74	8.95	90.80	156.56

Task	Measure	Amounts					Action	Major budget fund holder	Funding sources (State, local, others)	Prognostic amount of funding, UAH million	by years			
		total	stage I		stage II	stage III					stage I		stage II	stage III
			2011	2012	2013-2020	2021-2030					2011	2012	2013-2020	2021-2030
10. Growth of precious metal ores and diamonds MRB	growth of resources of gold, tons	2740.0	-	370.0	1000.0	1370.0	assessment of resources in Verblyuzka, Kamyanska, Krasnogirska, Kocherivska, Kompaniivska, Vilkhovatsko-Volyntsevska, South-Donetska and other sites (goldfields)	MENR	SBU	115.84	3.81	3.92	39.68	68.43
	growth of reserves and resources of gold, tons	500.0	20.0	20.0	200.0	260.0	preparation to commercial development, reserve estimation in Gubivske, West-Klyntsivske deposits, flanks of Muzhiivske, Beregivske and Bobrykivske deposits	MENR	SBU	94.78	3.12	3.20	32.47	55.99

Task	Measure	Amounts					Action	Major budget fund holder	Funding sources (State, local, others)	Prognostic amount of funding, UAH million	by years			
		total	stage I		stage II	stage III					stage I		stage II	stage III
			2011	2012	2013-2020	2021-2030					2011	2012	2013-2020	2021-2030
10. Growth of precious metal ores and diamonds MRB	growth of resources of gold and concomitant components, tons	173.0	10.0	20.0	100.0	43.0	assessment of reserves and resources in Andriivske, Sorokinske, Popelnastivske, Zelenodolske, Vilnokhutirske, Gaychurske, Kvitka, Orikhove, South-Polyanytske, Kapustyanske occurrences and flanks of known deposits	MENR	SBU	63.18	2.08	2.14	21.64	37.32
	growth of resources of silver and concomitant components, tons	1985.0	-	100.0	1000.0	885.0	assessment of East-Zhuravske deposit	MENR	SBU	105.31	3.47	3.56	36.07	62.21
	growth of reserves and resources of silver, tons	3860.0	-	130.0	2000.0	1730.0	assessment of East-Zhuravske and Berezivske deposits	MENR	SBU	94.78	3.12	3.20	32.47	55.99

Task	Measure	Amounts					Action	Major budget fund holder	Funding sources (State, local, others)	Prognostic amount of funding, UAH million	by years			
		total	stage I		stage II	stage III					stage I		stage II	stage III
			2011	2012	2013-2020	2021-2030					2011	2012	2013-2020	2021-2030
10. Growth of precious metal ores and diamonds MRB	growth of reserves and resources of silver, tons	1300.0	-	-	700.0	600.0	preparation to commercial development, reserve estimation in Zhuravske and East-Zhuravske deposits	MENR	SBU	84.25	2.77	2.85	28.86	49.77
	growth of reserves and resources of PGM, tons	85.0	-	-	40.0	45.0	assessment of economic value of some occurrences			52.65	1.73	1.78	18.04	31.10
	growth of reserves and resources of platinum, tons	60.0	-	-	25.0	35.0	preparation to commercial development of deposit (or complex deposit), reserve estimation			73.71	2.43	2.49	25.25	43.54
	assessment of resources of diamonds, conventional units	40.0	-	-	10.0	30.0	prospecting-evaluation works in East Pryazovya, Volyno-Podilska plate and Ukrainian Shield	MENR	SBU	105.31	3.47	3.56	36.07	62.21
Growth of precious metal ores and diamonds MRB							***Total***		SBU	789.81	26.00	26.70	270.55	466.56
									others	-	-	-	-	-
									subtotal	789.81	26.00	26.70	270.55	466.56
Section 2. Metallic mineral resources							**Total**			**1940.45**	**62.94**	**65.62**	**665.05**	**1146.84**
							including		**SBU**	**1940.45**	**62.94**	**65.62**	**665.05**	**1146.84**
									others	**-**	**-**	**-**	**-**	**-**

Task	Measure	Amounts					Action	Major budget fund holder	Funding sources (State, local, others)	Prognostic amount of funding, UAH million	by years			
		total	stage I		stage II	stage III					stage I		stage II	stage III
			2011	2012	2013-2020	2021-2030					2011	2012	2013-2020	2021-2030
Section 3. Non-metallic mineral resources														
11. Growth of non-metallic raw materials MRB for metallurgy	growth of reserves and resources of fluorspar, Mt	2.5	-	-	1.0	1.5	preparation to commercial development, reserve estimation in western flank of Bakhtynske deposit	MENR	SBU	8.52	0.28	0.29	2.92	5.03
	growth of reserves and resources of fluorspar, Mt	0.6	0.1	0.1	0.2	0.2	preparation to commercial development, reserve estimation in Central site of Sushchano-Perzhanska zone			2.13	0.07	0.07	0.73	1.26
	growth of reserves and resources of fluorspar, Mt	2.0	-	-	0.5	1.5	reserve re-estimation in Pokrovo-Kyriivske deposit (Donetska Oblast)	MENR	SBU	6.39	0.21	0.22	2.19	3.77

Task	Measure	Amounts					Action	Major budget fund holder	Funding sources (State, local, others)	Prognostic amount of funding, UAH million	by years			
		total	stage I		stage II	stage III					stage I		stage II	stage III
			2011	2012	2013-2020	2021-2030					2011	2012	2013-2020	2021-2030
11. Growth of non-metallic raw materials MRB for metallurgy	growth of reserves and resources of fluorspar, Mt	5.0	-	-	2.0	3.0	assessment of economic value, estimation of reserves and perspective resources of rare-earth fluorspar in Sushchano-Perzhanska zone	MENR	SBU	12.77	0.42	0.43	4.38	7.54
	growth of reserves and resources of flux dolomites, Mt	2015.0	-	-	1000.0	1015.0	preparation to commercial development, reserve estimation in Stylske (western site) and Kryvorizkogo (Frunzenske) deposits	MENR	SBU	25.54	0.84	0.86	8.75	15.09
	growth of reserves and resources of flux limestones, Mt	200.0	-	10.0	90.0	100.0	exploration of Rodnykivske, Olenivske (Balka Bezvodna site), Stylske (western site) deposits in Donetska Oblast	MENR	SBU	23.41	0.77	0.79	8.02	13.83

Task	Measure	Amounts					Action	Major budget fund holder	Funding sources (State, local, others)	Prognostic amount of funding, UAH million	by years			
		total	stage I		stage II	stage III					stage I		stage II	stage III
			2011	2012	2013-2020	2021-2030					2011	2012	2013-2020	2021-2030
11. Growth of non-metallic raw materials MRB for metallurgy	growth of reserves and resources of bentonite clays, Mt	94.0	4.0	5.0	35.0	50.0	assessment of reserves and resources in flanks of Cherkaske deposit where clays are similar to Azerbaijan bentonites	MENR	SBU	19.16	0.63	0.65	6.56	11.32
	growth of reserves and resources of bentonite clays, Mt	35.5	1.5	2.0	12.0	20.0	prospecting-evaluation works in perspective fields to discover active reserves			21.28	0.70	0.72	7.29	12.57
Growth of non-metallic raw materials MRB for metallurgy							***Total***		SBU	119.20	3.92	4.03	40.84	70.41
									others	-	-	-	-	-
									subtotal	119.20	3.92	4.03	40.84	70.41
12. Growth of refractory raw materials MRB	growth of reserves and resources of secondary kaolines, Mt	87.0	-	-	30.0	57.0	preparation to commercial development, reserve estimation in Volodymyrske deposit	MENR	SBU	12.03	0.40	0.41	4.12	7.10

Task	Measure	Amounts					Action	Major budget fund holder	Funding sources (State, local, others)	Prognostic amount of funding, UAH million	by years			
		total	stage I		stage II	stage III					stage I		stage II	stage III
			2011	2012	2013-2020	2021-2030					2011	2012	2013-2020	2021-2030
12. Growth of refractory raw materials MRB	growth of reserves and resources of secondary kaolines, Mt	120.0	-	-	60.0	60.0	assessment of economic value of some sites, reserve estimation at sites of operating mines in Cherkaska, Kirovogradska and Donetska oblasts	MENR	SBU	12.03	0.40	0.41	4.12	7.10
	growth of reserves and resources of magnesite, Mt	50.0	-	-	20.0	30.0	preparation to commercial development, reserve estimation of deposit in Pobuzkiy ore camp	MENR	SBU	9.35	0.31	0.32	3.20	5.52
	growth of reserves and resources of garnet-sillimanite ores and kyanite, Mt	22.0	-	-	10.0	12.0	preparation to commercial development, reserve estimation of Solomiivske garnet-sillimanite ore deposit and Sushchanske kyanite deposit	MENR	SBU	8.00	0.26	0.27	2.74	4.73

Task	Measure	Amounts					Action	Major budget fund holder	Funding sources (State, local, others)	Prognostic amount of funding, UAH million	by years			
		total	stage I		stage II	stage III					stage I		stage II	stage III
			2011	2012	2013-2020	2021-2030					2011	2012	2013-2020	2021-2030
12. Growth of refractory raw materials MRB	growth of reserves and resources of kaolines and refractory clays, Mt	120.0	-	-	60.0	60.0	preparation to commercial development of Volodymyrivske and Pologivske (1 and 2 sites) deposits	MENR	SBU	10.68	0.35	0.36	3.66	6.31
	growth of resources of refractory clays, Mt	475.0	-	-	425.0	50.0	study of perspective sites in Poltavska, Sumska and Kharkivska oblasts	MENR	SBU	13.35	0.44	0.45	4.57	7.89
	growth of reserves and resources of refractory clays, Mt	620.0	-	-	260.0	360.0	economic evaluation of some sites and resources in Kalmius-Toretska and Bakhmutska depressions	MENR	SBU	16.02	0.53	0.54	5.49	9.46

Task	Measure	Amounts					Action	Major budget fund holder	Funding sources (State, local, others)	Prognostic amount of funding, UAH million	by years			
		total	stage I		stage II	stage III					stage I		stage II	stage III
			2011	2012	2013-2020	2021-2030					2011	2012	2013-2020	2021-2030
12. Growth of refractory raw materials MRB	growth of reserves and resources of foundry sands, Mt	620.0	-	-	260.0	360.0	preparation to commercial development, reserve estimation in Bantyshivske (eastern site) and Chasivyarske (northern site) deposits	MENR	SBU	14.69	0.48	0.50	5.03	8.68
Growth of refractory raw materials MRB							***Total***		SBU	96.15	3.17	3.26	32.93	56.79
									others	-	-	-	-	-
									subtotal	96.15	3.17	3.26	32.93	56.79
13. Growth of MRB for chemical industry and agriculture	growth of reserves and resources of phosphorus anhydrite, apatite and apatite-ilmenite ores, Mt	43.0	-	-	20.0	23.0	preparation to commercial development, phosphorus anhydrite reserve estimation in Goloskivske and Vydybirzke deposits of apatite and apatite-ilmenite ores	MENR	SBU	25.78	0.85	0.87	8.83	15.23

Task	Measure	Amounts					Action	Major budget fund holder	Funding sources (State, local, others)	Prognostic amount of funding, UAH million	by years			
		total	stage I		stage II	stage III					stage I		stage II	stage III
			2011	2012	2013-2020	2021-2030					2011	2012	2013-2020	2021-2030
13. Growth of MRB for chemical industry and agriculture	growth of reserves and resources of phosphorites, technogenic deposits and phosphate-bearing limestones, Mt	47.0	1.0	2.0	22.0	22.0	preparation to commercial development, reserve estimation in Zhvanske, Osykivske, Krolevetske, Kolkivske, Bilogirske deposits, occurrences in Kryvolutska mold	MENR	SBU	28.66	0.94	0.97	9.82	16.93
	growth of resources of phosphorites, Mt	1.2	-	-	0.7	0.5	prospecting assessment of perspective sites in Kharkivska Oblast	MENR	SBU	8.59	0.28	0.29	2.94	5.08
	growth of reserves and resources of apatite, Mt	1.5	-	-	0.5	1.0	exploration of Volodarske deposit, Donetska Oblast	MENR	SBU	17.20	0.57	0.58	5.89	10.16
	growth of reserves and resources of potassium salts, Mt	460.0	-	-	210.0	250.0	reserve reestimation recalculated in K_2O for first-order development in Piylo deposit area	MENR	SBU	31.53	1.04	1.07	10.80	18.62

Task	Measure	Amounts					Action	Major budget fund holder	Funding sources (State, local, others)	Prognostic amount of funding, UAH million	by years			
		total	stage I		stage II	stage III					stage I		stage II	stage III
			2011	2012	2013-2020	2021-2030					2011	2012	2013-2020	2021-2030
13. Growth of MRB for chemical industry and agriculture	growth of resources of potassium salts, Mt	490.0	-	-	245.0	245.0	definition of sites with favorable mining-geological conditions, K_2O resources assessment in Fore-Carpathian potassium-bearing basin	MENR	SBU	34.38	1.13	1.16	11.78	20.31
Growth of MRB for chemical industry and agriculture							***Total***		SBU	146.14	4.81	4.94	50.06	86.33
									others	-	-	-	-	-
									subtotal	146.14	4.81	4.94	50.06	86.33
14. Growth of other non-metallic ore MRB	growth of reserves and resources of glauconite, Mt	70.0	-	-	20.0	50.0	preparation to commercial development of deposits (Crimean Autonomy, Vinnytska, Khmelnytska, Chernivetska and Luganska oblasts) and estimation of ore reserves and resources	MENR	SBU	19.27	0.61	0.65	6.61	11.40

Task	Measure	Amounts					Action	Major budget fund holder	Funding sources (State, local, others)	Prognostic amount of funding, UAH million	by years			
		total	stage I		stage II	stage III					stage I		stage II	stage III
			2011	2012	2013-2020	2021-2030					2011	2012	2013-2020	2021-2030
14. Growth of other non-metallic ore MRB	growth of reserves and resources of barite, Mt	50.0	-	-	23.0	27.0	assessment economic value of occurrences and decision on their exploration; reserves and resource estimation in flanks of Biganske deposit	MENR	SBU	12.85	0.41	0.43	4.41	7.60
	growth of resources of graphite, Mt	2.0	-	-	0.5	1.5	assessment of resources in Sachkynsko-Troitska perspective field in Donetska Oblast	MENR	SBU	3.21	0.10	0.11	1.10	1.90
	growth of reserves and resources of graphite, Mt	440.0	-	-	220.0	220.0	prospecting-exploration works in Sukhotashlytske and Stavkivske occurrences	MENR	SBU	38.53	1.22	1.30	13.22	22.79

Task	Measure	Amounts					Action	Major budget fund holder	Funding sources (State, local, others)	Prognostic amount of funding, UAH million	by years			
		total	stage I		stage II	stage III					stage I		stage II	stage III
			2011	2012	2013-2020	2021-2030					2011	2012	2013-2020	2021-2030
14. Growth of other non-metallic ore MRB	growth of reserves and resources of quartzite and glass sand, Mt	110.0	-	-	90.0	20.0	assessment of resources and reserves in perspective sites of Poltavska and adjacent oblasts	MENR	SBU	32.10	1.01	1.09	11.01	18.99
	growth of reserves and resources of limestones for sugar industry, Mt	40.0	-	-	20.0	20.0	prospecting and exploration of deposits in Vynnytska and Khmelnytska oblasts	MENR	SBU	9.63	0.30	0.33	3.30	5.70
	growth of reserves and resources of silica clays, Mt	110.0	-	-	45.0	65.0	assessment of resources and reserves in perspective sites of Kharkivska and Sumska oblasts	MENR	SBU	32.10	1.01	1.09	11.01	18.99
	growth of resources of amber, tons	450.0	4.0	6.0	200.0	240.0	prospecting in Klesivska, Dubrovytska and Barashivska zones and in Volodymyretskiy area of Rivnenska Oblast	MENR	SBU	38.53	1.22	1.30	13.22	22.79

Task	Measure	Amounts					Action	Major budget fund holder	Funding sources (State, local, others)	Prognostic amount of funding, UAH million	by years			
		total	stage I		stage II	stage III					stage I		stage II	stage III
			2011	2012	2013-2020	2021-2030					2011	2012	2013-2020	2021-2030
14. Growth of other non-metallic ore MRB	growth of reserves and resources of primary kaolines, Mt	240.0	-	-	160.0	80.0	prospecting-evaluation works in perspective fields in central part of Ukrainian Shield	MENR	SBU	35.33	1.12	1.20	12.12	20.89
Growth of other non-metallic ore MRB							***Total***		SBU	221.55	7.00	7.50	76.00	131.05
									others	-	-	-	-	-
									subtotal	221.55	7.00	7.50	76.00	131.05
15. Growth of MRB of technogenic raw materials	growth of reserves and resources of technogenic raw materials, Mt	32.0	2.0	3.0	12.0	15.0	geological-economical evaluation of technogenic accumulations	MENR	SBU	23.07	0.76	0.78	7.90	13.63
Section 3. Non-metallic mineral resources							**Total**			**606.11**	**19.66**	**20.51**	**207.73**	**358.21**
							including		**SBU**	**606.11**	**19.66**	**20.51**	**207.73**	**358.21**
									others	**-**	**-**	**-**	**-**	**-**
Section 4. Geological and ecological-geological studies of the territory of Ukraine aiming MRB growth														
16. Geological study of territory of Ukraine	study square, thousand km^2	781.4	39.5	46.0	271.3	424.6	extended geological study of the fields in scale 1:200000	MENR	SBU	920.88	30.88	31.11	315.26	543.63
	study square, thousand km^2	50.4	2.0	3.0	18.0	27.4	geological-prognostic mapping in scale 1:200000	MENR	SBU	383.69	12.86	12.96	131.36	226.51
	study square, thousand km^2	22.9	1.0	1.5	8.0	12.4	geological mapping in scale 1:50000	MENR	SBU	153.48	5.15	5.19	52.54	90.60

Task	Measure	Amounts					Action	Major budget fund holder	Funding sources (State, local, others)	Prognostic amount of funding, UAH million	by years			
		total	stage I		stage II	stage III					stage I		stage II	stage III
			2011	2012	2013-2020	2021-2030					2011	2012	2013-2020	2021-2030
16. Geological study of territory of Ukraine	study square, thousand km^2	228.9	12.0	13.0	79.5	124.4	preparation of geophysical bases for geological mapping in scales 1:50000 & 1:200000	MENR	SBU	613.91	20.58	20.74	210.17	362.42
Geological study of territory of Ukraine							***Total***		SBU	2071.96	69.47	70.00	709.33	1223.16
									others	-	-	-	-	-
									subtotal	2071.96	69.47	70.00	709.33	1223.16
17. Hydrogeological, engineering-geological and ecological-geological works	well drilling	2040	100	120	800	1020	drilling of artesian wells for drinking water supplying	MENR	SBU	1238.96	40.12	42.04	424.54	723.26
	hydrogeological and engineering-geological mapping:													
	study square, thousand km^2	18.3	-	-	9.1	9.2	in scale 1:50000			94.02	3.03	3.18	32.23	55.58
	study square, thousand km^2	162.9	11.0	9.0	60.6	82.3	in scale 1:200000			253.61	8.00	8.44	87.13	150.04
	growth of hydrogeological network, objects	14	-	-	7	7	prospecting and exploration of drinking, technical , fresh, mineral, thermal and industrial groundwaters			564.12	18.18	19.08	193.39	333.47

Task	Measure	Amounts					Action	Major budget fund holder	Funding sources (State, local, others)	Prognostic amount of funding, UAH million	by years			
		total	stage I		stage II	stage III					stage I		stage II	stage III
			2011	2012	2013-2020	2021-2030					2011	2012	2013-2020	2021-2030
17. Hydro-geological, engineer-ing-geological and eco-logical-geological works	study square, thousand km^2	34.6	1.3	1.5	14.5	17.3	geological and engi-neering-geological mapping in scale 1:200000 with geo-logical-ecological studies of Black Sea offshore	MENR	SBU	58.77	1.89	1.99	20.15	34.74
	observation points, thousand per year	4.0	1.0	1.0	1.0	1.0	groundwa-ter moni-toring at the State level			94.02	3.03	3.18	32.23	55.58
	observation points, sites per year	900	210	210	230	250	engineer-ing-geological works in monitoring of exo-genic processes			376.09	12.12	12.72	128.93	222.32
Hydrogeological, engineering-geological and ecological-geological works							***Total***		SBU	2679.59	86.37	90.63	918.6	1583.99
									others	-	-	-	-	-
									subtotal	2679.59	86.37	90.63	918.60	1583.99
18. Geological exploration works in continental shelf and exclusive (marine) economic zone							Azov and Black seas	MENR	SBU	256.88	8.00	8.70	88.16	152.02
									others	-	-	-	-	-
									subtotal	256.88	8.00	8.70	88.16	152.02
Section 4. Geological and ecological-geological studies of the territory of Ukraine aiming MRB growth							**Total**			**4751.57**	**155.83**	**160.65**	**1627.93**	**2807.16**
							including		**SBU**	**4751.57**	**155.83**	**160.65**	**1627.93**	**2807.16**
									others	**-**	**-**	**-**	**-**	**-**

Task	Measure	Amounts					Action	Major budget fund holder	Funding sources (State, local, others)	Prognostic amount of funding, UAH million	by years			
		total	stage I		stage II	stage III					stage I		stage II	stage III
			2011	2012	2013-2020	2021-2030					2011	2012	2013-2020	2021-2030
Section 5. Other studies of the territory of Ukraine, supervision and support of works intended for MRB growth														
19. Special studies intended for MRB growth	polygons, number	90	17	18	25	30	deep study of subsurface	MENR	SBU	52.82	1.61	1.79	18.14	31.28
	geo-traverses, km	4400	200	200	2000	2000	geophysical studies			177.32	5.39	6.01	60.90	105.02
20. Preparation and publishing of methodic materials for MRB growth	published materials, volumes	220	10	15	75	120	publishing of methodic guides for prospecting and exploration of mineral deposits and materials of scientific conferences, workshops, etc.	MENR	SBU	135.43	4.36	4.58	46.43	80.06
	published materials, sets of maps	195	7	8	80	100	preparation and issue of StateGeol Map-200 and StateGeol Map-50, other integrated maps			112.87	3.64	3.82	38.69	66.72
Preparation and publishing of methodic materials for MRB growth							***Загалом***		SBU	248.30	8.00	8.40	85.12	146.78
									others	-	-	-	-	-
									subtotal	248.30	8.00	8.40	85.12	146.78

Task	Measure	Amounts					Action	Major budget fund holder	Funding sources (State, local, others)	Prognostic amount of funding, UAH million	by years			
		total	stage I		stage II	stage III					stage I		stage II	stage III
			2011	2012	2013-2020	2021-2030					2011	2012	2013-2020	2021-2030
21. Scientific-methodic and technical support of works intended for MRB growth							research works	MENR	SBU	1004.65	32.00	34.00	344.54	594.11
							methodic support of works in subsurface use			722.56	23.12	24.45	247.76	427.23
Section 5. Other studies of the territory of Ukraine, supervision and support of works intended for MRB growth							**Total**			2205.64	70.12	74.65	756.46	1304.42
							including		**SBU**	2205.64	70.12	74.65	756.46	1304.42
									others	-	-	-	-	-
TOTAL OF PROGRAM							**Total**			**189054.05**	**6022.03**	**6398.10**	**64834.66**	**111799.25**
							including		**SBU**	**26119.18**	**847.03**	**883.41**	**8952.04**	**15436.70**
									others	**162934.87**	**5175.00**	**5514.70**	**55882.62**	**96362.55**

Annex 3
to the Program

EXPECTED RESULTS
IMPLEMENTING THE WHOLE-STATE PROGRAM FOR DEVELOPMENT OF
MINERAL RESOURCE BASE OF UKRAINE FOR PERIOD TO THE YEAR 2030

Direction	Units	Total	stage I		stage II	stage III
			2011	2012	2013-2020	2021-2030
1. Fuel-energy resources						
Growth of oil and condensate reserves and resources	Mt	72.5	3.0	3.1	26.4	40.0
Growth of natural gas reserves and resources	billion m^3	287.0	11.6	11.8	103.6	160.0
Approval hard coal reserves of economic categories	Mt	1000.0	10.0	20.0	470.0	500.0
Growth of hard coal reserves	Mt	572.4	25.0	30.0	206.4	311.0
Assessment of hard coal reserves and perspective resources	Mt	1602.6	70.0	90.0	571.8	870.8
Approval brown coal reserves of economic categories	Mt	100.0	4.0	6.0	40.0	50.0
Growth of brown coal reserves	Mt	103.0	1.5	4.5	41.0	56.0
Assessment of brown coal reserves and perspective resources	Mt	670.0	30.0	50.0	220.0	370.0
Assessment of peat reserves and resources	Mt	17.0	1.0	1.5	8.0	6.5
Growth of reserves and resources of methane of coal deposits	billion m^3	9.5	0.3	0.3	3.0	5.9
Assessment of reserves and resources of methane in some sites of coal deposits	billion m^3	23.4	0.7	0.7	10.0	12.0
Securing operating exploitation of deposits with uranium reserves of economic categories	conventional units	11.4	0.5	0.5	4.2	6.2
Growth of uranium reserves	conventional units	115.4	5.0	5.0	42.7	62.7
2. Metallic mineral resources						
Growth of reserves of natural high-grade iron ores	Mt	850.0	50.0	50.0	300.0	450.0
Growth of reserves and resources of iron ores	Mt	6570.0	370.0	370.0	2500.0	3330.0
Growth of resources of manganese ores	Mt	40.0	3.0	5.0	8.0	24.0
Growth of reserves and resources of chromite ores	Mt	16.0	0.9	0.9	5.4	8.8
Growth of resources of bauxite ores	Mt	4.8	0.5	0.5	1.2	2.6
Growth of reserves and resources of copper ores	Mt	10.4	0.8	0.9	3.2	5.5
Assessment and growth of resources of nickel, cobalt, concomitant PGM, gold, as well as bauxites, talc, vermiculite	thousand tons	770.0	10.4	20.6	320.0	410.0
Growth of resources of nickel, cobalt and copper	thousand tons	1200.0	70.0	120.0	460.0	550.0
Assessment of perspective resources of lead and zinc	thousand tons	2400.0	300.0	300.0	1000.0	800.0
Growth of reserves and resources of lead and zinc	thousand tons	3050.0	200.0	300.0	800.0	1750.0
Growth of reserves and resources of complex placer zirconium-titanium ores	conventional units	36.5	10.0	15.0	5.0	6.5
Growth of resources of titanium	conventional units	36.0	-	-	32.0	4.0

Direction	Units	Total	stage I		stage II	stage III
			2011	2012	2013-2020	2021-2030
Growth of resources of tin	thousand tons	50.0	-	-	20.0	30.0
Growth of resources of molybdenum and tungsten	thousand tons	1116.8	10.0	71.6	507.0	528.2
Growth of reserves and resources of tantalum and niobium	conven-tional units	60.5	-	-	20.5	40.0
Growth of reserves and resources of lithium dioxide	thousand tons	300.0	-	50.0	100.0	150.0
Growth of reserves and resources of rare earths and concomitant zirconium	conven-tional units	30.0	-	-	10.0	20.0
Growth of resources of rare metals	thousand tons	570.9	10.0	20.0	239.1	301.8
Growth of reserves and resources of gold	tons	3413.0	30.0	410.0	1300.0	1673.0
Growth of reserves and resources of silver	tons	7145.0	-	230.0	3700.0	3215.0
Growth of reserves and resources of PGM	tons	145.0	-	-	65.0	80.0
Assessment of resources of diamonds	conven-tional units	40.0	-	-	10.0	30.0
3. Non-metallic mineral resources						
Growth of reserves and resources of fluorspar	Mt	10.1	0.1	0.1	3.7	6.2
Growth of reserves and resources of flux limestones and dolomites	Mt	2215.0	-	10.0	1090.0	1115.0
Growth of reserves and resources of bentonite clays	Mt	129.5	5.5	7.0	47.0	70.0
Growth of reserves and resources of secondary kaolines	Mt	207.0	-	-	90.0	117.0
Growth of reserves and resources of megnesite	Mt	50.0	-	-	20.0	30.0
Growth of reserves and resources of garnet-sillimanite ores and kyanite	Mt	22.0	-	-	10.0	12.0
Growth of resources of refractory clays	Mt	1215.0	-	-	745.0	470.0
Growth of reserves and resources of foundry sands	Mt	620.0	-	-	260.0	360.0
Growth of reserves and resources of phosphorus raw materials	Mt	92.7	1.0	2.0	43.2	46.5
Growth of reserves and resources of potassium salts	Mt	950.0	-	-	455.0	495.0
Growth of reserves and resources of glauconite	Mt	70.0	-	-	20.0	50.0
Growth of reserves and resources of barite	Mt	50.0	-	-	23.0	27.0
Growth of resources of graphite	Mt	442.0	-	-	220.5	221.5
Growth of reserves and resources of quartzites and glass sand	Mt	110.0	-	-	90.0	20.0
Growth of reserves and resources of limestones for sugar industry	Mt	40.0	-	-	20.0	20.0
Growth of reserves and resources of silica clays	Mt	110.0	-	-	45.0	65.0
Growth of resources of amber	tons	450.0	4.0	6.0	200.0	240.0
Growth of reserves and resources of primary kaoline	Mt	240.0	-	-	160.0	80.0
Growth of reserves and resources of technogenic raw materials	Mt	32.0	2.0	3.0	12.0	15.0
4. Geological and ecological-geological studies of the territory of Ukraine						
Geological study of the territory of Ukraine	thousand km^2	1083.6	54.5	63.5	376.8	588.8
Drilling of wells	wells	2040	100	120	800	1020
Hydrogeological and engineering-geological mapping	thousand km^2	181.2	11.0	9.0	69.7	91.5

Direction	Units	Total	stage I		stage II	stage III
			2011	2012	2013-2020	2021-2030
Hydrogeological, engineering-geological and ecological-geological works	thousand km^2	34.6	1.3	1.5	14.5	17.3
Observations points	points per year	900	210	210	230	250
5. Other studies of the territory of Ukraine. supervision and support of works						
Deep study of subsurface	polygons, number	90	17	18	25	30
Geophysical studies	geo-traverses, km	4400	200	200	2000	2000
Printed materials	number of volumes	415	17	23	155	220