



MINING TODAY – STATE ECONOMY LOGISTICS

RUDARSTVO DANAS – LOGISTIKA DRŽAVNIH EKONOMIJA

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Abstract: *The Centre for Strategic Researches at the Moscow State Mining University has set out the complex goal to organise the statistical analysis of the general development of mining industry in the world and in Russia. This analysis has in fact a strategic importance, since its intention is to determine the basic short-term and long-term development trends in mining industry, which will provide to entrepreneurs an extensive data base that will enable a beneficial business orientation. Accordingly, such analysis will necessarily supply firm arguments and justify the orientation of state economy development. This paper presents some of the results achieved.*

Key words: *statistical analysis, world mining, development,*

Apstrakt: *U Centru za strategijska istraživanja u rudarstvu Moskovskog državnog rudarskog univerziteta je postavljen zadatak organizacije statističke analize razvoja rudarstva u svetu i Rusiji. Takva analiza, ustvari, ima strategijski karakter, pošto daje osnovne tendencije razvoja rudarstva, kako u najbližoj, tako i u daljoj budućnosti i daje mogućnost rudarskom biznisu da se pravilno orijentiše u pravcu konkretnog razvoja eksploatacije određenih mineralnih sirovina. Bezuslovno, takva analiza daje mogućnost veće opravdanosti za opredeljenost za razvoj ekonomike zemlje U ovom radu su dati neki rezultati ove analize.*

Ključne reči: *strategijska istraživanja, svetsko rudarstvo, razvoj,*

1 INTRODUCTION

In the attempt to reach the goals set several methodological approaches have been adopted. Mining is generally conceived as the human, engineering activity aimed at removing minerals from the earth's crust [1]. However, this aim is even broader since it also includes oil and gas underground constructions and other numerous activities related to the earth's crust. Without further elaboration it should be said that in world statistics it is not acceptable to consider separately the exploitation of solid minerals on the one hand and the exploitation of liquid and gaseous minerals on the other [2,3]. The reasons for such an approach are obvious: for example it is absolutely unproductive to consider separately

1 UVOD

Zapaženo je nekoliko metodoloških aspekata u prilazu rešavanja zadatka. Iz opštih postavki proizilazi da je rudarstvo ljudska inženjerska aktivnost u Zemljinoj kori [1]. Ipak to opredeljenje je veoma široko, pošto obuhvata i rad na nafti i gasu, podzemnu izgradnju i mnoge druge delatnosti čoveka u Zemljinoj kori. Bez daljeg elaboriranja ove teme, zapaža se da u svetskoj statistici odvojeno razmatranje eksploatacije čvrstih mineralnih sirovina, s jedne strane i tečnih i gasovitih – s druge strane nije prihvatljivo [2,3]. A razlozi za to su jasni: razmatranje napr. energetske mineralne sirovine (ugalj, nafta, gas, uran) odvojeno je

the minerals used for the production of energy (coal, oil, gas, uranium). Therefore, the analysis presented here will comply with the general rules of world mining statistics.

Which are the basic parameters used to define mining: production rate, quantities of produced minerals, number of mining enterprises, the number of workers employed in the mining industry or value of the final product? Fundamentally the answer to this question is clear: the best solution is to include all the parameters and generally broaden their scope in order to acquire better comprehension. However, the methodological or statistical basis required for such a task does not exist either in Russia or in the world.

On a global level it has become very important to establish the exact quantities of minerals that are produced in each particular country, economic communities and regions. Also, it is significant to determine the nature of the material flows and the way in which the distribution of mineral products is managed in the world.

2 SOME RESULTS OF THE ANALYSIS

With respect to the methodology set out for the statistical analysis of the mining industry it is necessary to bear in mind its specific features

- A wide scope of different minerals that are being mined [2,3]: according to statistics 56 products are presently produced in the world, of which 10 are ferrous metals, 16 are non-ferrous metals, 3 are precious metals, 22 are non-metals (industrial minerals) and 5 types of fuel or sources of energy.
- Large difference in production rates – from a few dozen (gallium, germanium) to several billion tons (coal, oil) per year [2].
- Huge difference in price – from 20 or 30 US dollars to 1200000 US dollars per ton.

Such a wide range of information represents an obstacle for a methodological presentation of mining parameters hence it is necessary to organise the parameters into groups to enable their better management.

potpuno neproduktivno. Zbog toga se ovde analiza vrši po pravilima primenjenih u svetskoj rudarskoj statistici.

Kakvim pokazateljima se definiše rudarstvo: obimom proizvodnje, količinom dobijenih mineralnih produkata, brojem rudarskih preduzeća, brojem zaposlenih radnika u proizvodnji, vrednostima dobijenih produkata? Principijelni odgovor na ovo pitanje je jasan: poželjno je obuhvatiti sve pokazatelje, i u opštem slučaju proširiti njihov krug u cilju većeg razumevanja. Pa ipak, za tako nešto, osim želje, kako u svetu u celini, tako i u Rusiji u pojedinostima, ni metodološki ni statistički nema osnova.

Sa globalnog aspekta kao veoma važna pojavljuju se pitanja: koliko mineralnih sirovina dobijaju pojedine zemlje, ekonomske zajednice i regioni u svetu, kakvi su materijalni tokovi minerala, koliko se upravlja sistemom raspodele mineralnih proizvoda u svetu.

2 NEKI REZULTATI IZVRŠENE ANALIZE

Govoreći o metodologiji statističke analize rudarstva, neophodno je imati u vidu njegove sledeće specifičnosti:

- široki spektar mineralnih sirovina koje se eksploatišu: u svetu [2,3] u sadašnjem trenutku statistički je fiksirana proizvodnja 56 produkata, od tog broja su 10 crni metali, 16 obojeni metali, 3 dragoceni metali, 22 nemetalične (industrijske) mineralne sirovine i 5 vidova energetskih sirovina;
- velika razlika u obimu eksploatacije mineralnih sirovina – od nekoliko desetina (galijum, germanijum), do nekoliko milijardi (ugalj, nafta) tona godišnje [2];
- ogromna razlika u ceni mineralnih sirovina – od 20 do 30 dolara do 1200000 US dolara po toni.

Takav spektar podataka predstavlja prepreku prikazivanju svodnih pokazatelja rudarstva metodološki, pa je ovde neophodno operisati grupama pokazatelja.

The methods presently used to assess the mining industry cannot be considered as innovative. There are several approaches that reflect the influence of a series of factors, of which the most important are geopolitical or numbers that are in accordance with geopolitics. The mathematical side of this assessment is not flawless and the group of experts who are in charge of this analysis are not always the most qualified.

At the current stage, the research is not focused on modern methods of mining analysis that could facilitate the practical calculations. Bearing in mind all these introductory remarks it is possible to present some results obtained.

Firstly, it should be emphasised that the most important parameter that determines the mining conditions in a country, economic community or geographical region is the quantity of minerals that are extracted. In the world there are 166 countries registered for mining activities. Of this number 107 countries extract from 1 to 10 minerals, while 18 extract only one type of mineral, 35 countries produce from 10 to 20 products, 14 countries from 20 to 30, 7 countries from 30 to 40 and finally 3 countries more than 40 products (Figure 1).

It can be noticed that the concentration of power in mining industry is based in the variety of minerals extracted. According to this parameter, in the world there are 10 leading countries with more than 30 mineral products. These countries are classified into the statistical list shown in Figure 2.

From the mining practice it is well known that the variety of extracted minerals is connected with a series of different problems since the mining process of each particular mineral has its specific properties, that is the structure of ore deposits, mining and technical systems, mining facilities etc.

The distribution of countries is also interesting, namely the countries are divided into several groups according to the minerals produced (Figure 3). It may be noticed that metals such as iron, copper, zinc, aluminium, lead, gold, silver are mined in more than 40 countries of the world. On the other hand minerals as tantalum, vanadium, bismuth, lithium, mercury, tellurium, gallium, germanium and platinum are extracted

Primena metoda ocene rudarske privrede u sadašnjem vremenu u svetu se ne može nazvati savršenom – postoji nekoliko prilaza, u kojima se odražava uticaj niza faktora, od kojih su najvažniji geopolitički i često su brojke u skladu sa geopolitikom. Matematička strana računa nije besprekorna, a takođe i ne uvek visoki nivo grupe eksperata koji vrše analizu.

Ali na sadašnjem stadijumu istraživanja ne stavlja se akcenat na savršenstvo metodologije analize rudarstva, s ciljem da se ne oteža zadatak praktičnih proračuna. Uzimajući u obzir sve ove uvodne okolnosti daju se neki rezultati analize.

Prvo, što se mora primetiti – to je da je najvažniji pokazatelj, koji utvrđuje stanje rudarstva u zemlji, ekonomskoj zajednici ili geografskom regionu, je količina mineralnih sirovina koje se eksploatišu. Ukupno u svetu je registrovano 166 zemalja u kojima se vrši rudarska eksploatacija. Od njih 107 zemalja eksploatišu od 1 do 10 mineralnih sirovina, pri čemu njih 18 eksploatišu samo jednu sirovinu; 35 zemalja eksploatišu od 10 do 20 proizvoda; 14 zemalja – od 20 do 30; 7 zemalja od 30 do 40 i 3 zemlje – više od 40 proizvoda (slika 1).

Može se primetiti da u svetu postoji koncentracija rudarske moći na osnovu spektra eksploatacije mineralnih sirovina. Ako se razmotre po tom pokazatelju evidentno je da postoje 10 zemalja lidera u svetu sa više od 30 mineralnih produkata. Oni su svrstani u statistički red, prikazan na slici 2.

Iz rudarske prakse je dobro poznato da je spektar eksploatisanih minerala u vezi sa količinom odgovarajućih problema, pošto eksploatacija skoro svake mineralne sirovine ima svoje specifičnosti – u strukturi ležišta, rudarsko-tehničkim sistemima, rudarskim postrojenjima.

Interesantan je i raspored broja zemalja, izdelenih u više grupa po eksploataciji mineralnih sirovina (slika 3). Vidi se da se metali kao što su gvožđe, bakar, cink, aluminijum, olovo, zlato, srebro eksploatišu u 40 i više zemalja sveta svaki, a tantal, vanadijum, bizmut, litijum, živa, telur, galijum, germanijum, platina – u 10 i manje zemalja svaki. Ova disproporcija, naravno, je povezana

in less than 10 countries. Such a disproportion is certainly due to numerous factors and a detailed analysis of each of these factors will exceed by far the scope of present researches but even a general orientation is very significant.

sa dejstvom mnogobrojnih faktora, a analiza ovih faktora bi odvela daleko van okvira sadašnjeg istraživanja, ali i načelna orijentacija u tim raspodelama je veoma važna.

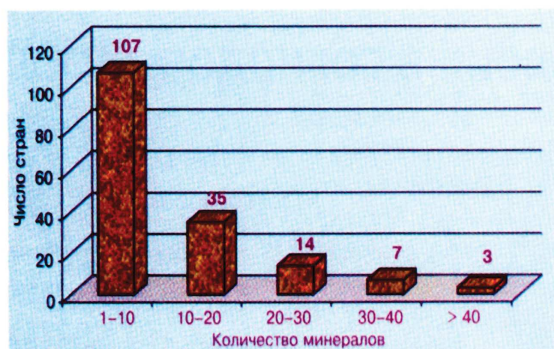


Figure 1 The number of countries classified according to the quantity of mineral products
slika 1 Broj zemalja po količini dobijenih mineralnih produkata

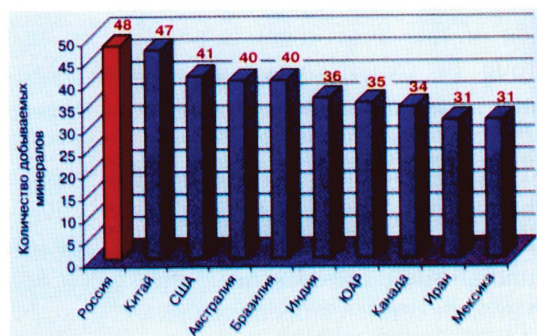


Figure 2 Distribution of principal mining industries classified according to the mining production rate
slika 2 Raspored osnovnih rudarskih zemalja po količini eksploatacije mineralnih sirovina

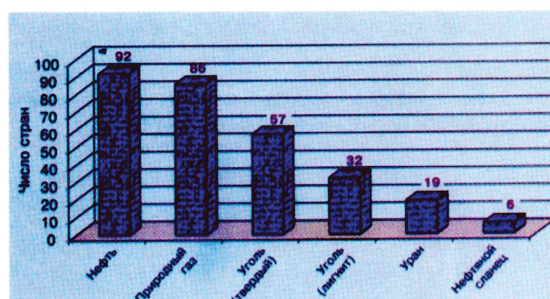
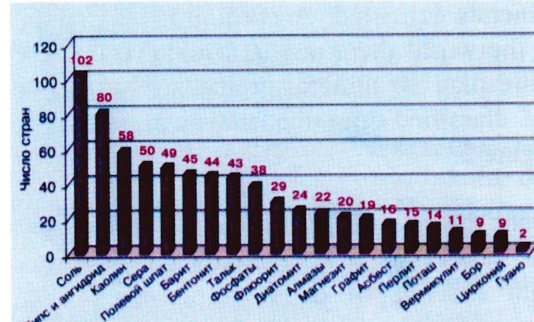
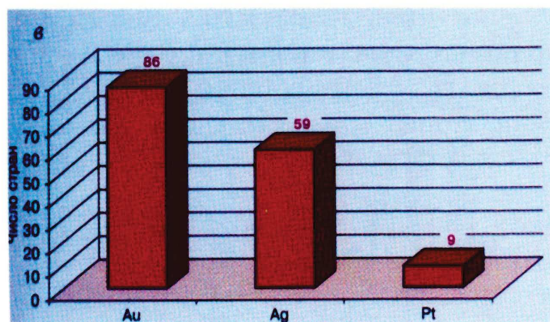
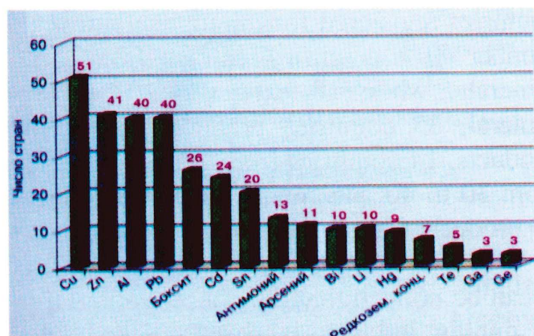
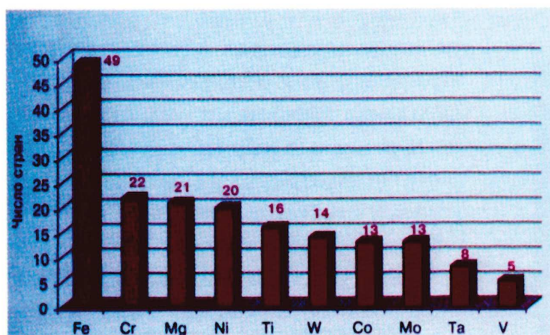


Figure 3 The number of countries producing different mineral products (a); ferrous metals (b); precious metals (c); non-metals (d); energy sources

slika 3 Broj zemalja koje eksploatišu različite mineralne sirovine: crni metali (a); obojeni metali (b); dragoceni metali (c); nemetalne mineralne sirovine (d); energetske sirovine (e)

For the sake of comparison it is perhaps also important to take into consideration the distribution according to the mining production rate (Figure 4). Here it may be observed that on a global level the annual production rate of different minerals amounts to about 12 billion tons. It is well known that world mining industry is generally oriented towards the energy sources due to the huge influence that energy has on the foundations and growth of the entire civilisation. Namely, fuels make more than 86% of the total mineral production in the world. Besides, they are produced at a pace that highly exceeds the production rate of all the other mineral resources. These facts demonstrate not only the large potentials of economic growth that exist in Russia, but also show the serious dangers that may arise from possessing huge energy resources at the present stage of progress of the society. The development and the realisation of a mineral strategy and its principal part – Russian energy strategy within the system “resources – mining – requirements” is still a complex and unsolved problem that seriously affect the future development of Russia.

It is interesting to investigate the correlation between the mining production rate and the quantity of mineral products in different countries and regions that occupy a leading position according to the parameters shown (Figures 5 and 6). It may be noticed that there has been a redistribution of positions between the three leading mining countries; USA, China and Russia. These countries produce approximately 41% of total mineral products in the world. In general, the first 10 mining countries, determined according to the quantities of extracted minerals, produce 63,7% of the total mining production rate. Of this amount 87,1% are ferrous metals (Brazil being the leader with 28,9%), 61,1% are non-ferrous metals (Australia with 31%), 43,7% are precious metals (Australia with 11%), 61,8% are non-metals (China with 15,9%) and 62% are fuels (USA with 17%).

Therefore, it may be concluded that the position of Russia in the world mining industry is highly influential and stable. With the production of 9,7% of the total solid, fluid and gaseous mineral products Russia is today capable of securing a high position in the world economy. However, unlike the countries of the Western Europe and Japan, which have reached a high level in the consumption of mineral products thus securing

Možda je važnije da se pri poređenju rasporeda zemalja po količinama dobijenih mineralnih sirovina uzme u obzir analiza rasporeda po obimu njihovih eksploatacija (slika 4). Ovde se vidi da opšti obim godišnje proizvodnje mineralnih sirovina u svetu iznosi oko 12 milijardi tona. Poznato je da energetske sirovine dominiraju u rudarstvu sveta usled ogromnog uticaja energije na svim stranama postanka i razvoja civilizacije. Ipak ta okolnost da energetske mineralne sirovine čine više od 86% opšteg svetskog obima korisnih iskopina i da po tempu eksploatacije prednjače nad svim drugim delovima mineralnog sektora ekonomike, govori ne samo o širokim mogućnostima ekonomskog razvoja Rusije, nego i o ozbiljnoj opasnosti posedovanja ogromnih energetske resursa u sadašnjem trenutku razvoja civilizacije. Izrada i realizacija mineralne strategije i njenog glavnog dela – energetske strategije Rusije u sistemu “resursi – eksploatacija – potrebe” i dalje je za Rusiju složen i nerešen problem, koja ima najozbiljniji uticaj na njen budući razvoj.

Interesantno je ispitati u kakvoj su korelaciji obim eksploatacije s količinom eksploatisanih mineralnih produkata u raznim zemljama i u delovima zemalja, koje zauzimaju leaderski položaj prema datim pokazateljima (slike 5 i 6). Može se videti da je došlo do preraspodele zemalja, u ovom slučaju i među trojkom lidera rudarstva: USA, Kina i Rusija koje zauzimaju prva tri mesta. Ove zemlje eksploatišu oko 41% mineralnih sirovina u svetu. Uopšte gledano, prvih 10 rudarskih zemalja, određenih po količini eksploatisanih mineralnih sirovina, eksploatišu 63,7% svetskog obima tih proizvoda. Od toga su 87,1% crni metali (lider Brazil sa 28,9% eksploatacije), 61,1% - obojeni metali (Australija sa 31%), 43,7% dragoceni metali (Australija – 11%), 61,8% - nemetalne mineralne sirovine (Kina – 15,9%), 62% energetske sirovine (USA – 17%).

Prema tome se može konstatovati da je položaj Rusije u rudarskom svetu uticajan i veoma stabilan. Proizvodnjom 9,7% svih čvrstih, tečnih i gasovitih mineralnih proizvoda, Rusija je danas sposobna da obezbedi najviši nivo sopstvene ekonomike. Ipak, za razliku od zemalja Zapadne Evrope i Japana, koje obezbeđuju visok nivo potrošnje mineralne produkcije i, prema tome, visok nivo

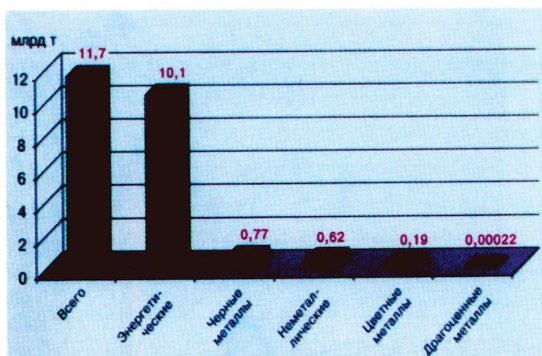


Figure 4 World mining production rate classified into principal groups of mineral products
slika 4 Obim svetske eksploatacije po grupama mineralnih sirovina

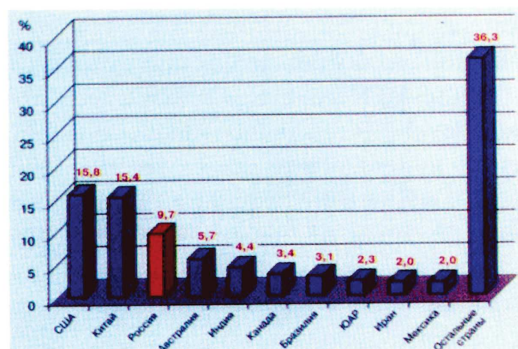


Figure 5 Leading world mining industries according to mining production rate
slika 5 Vodeće zemlje u svetu po opštem obimu eksploatacije mineralnih sirovina

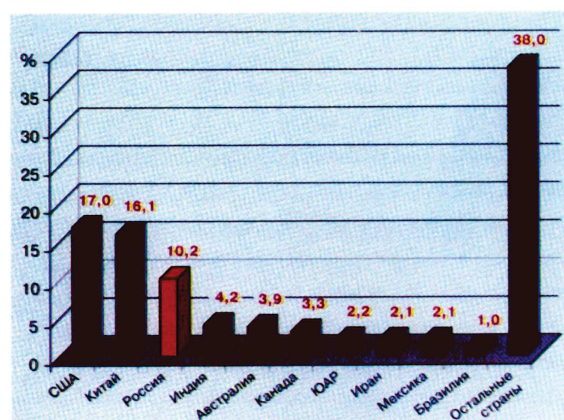
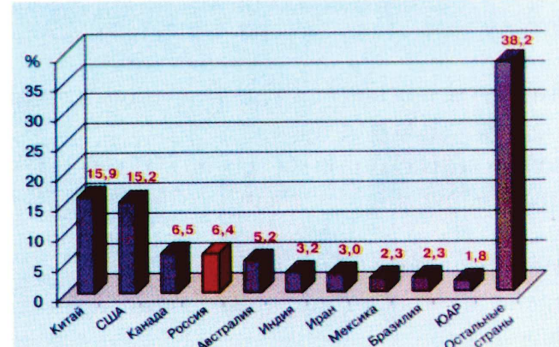
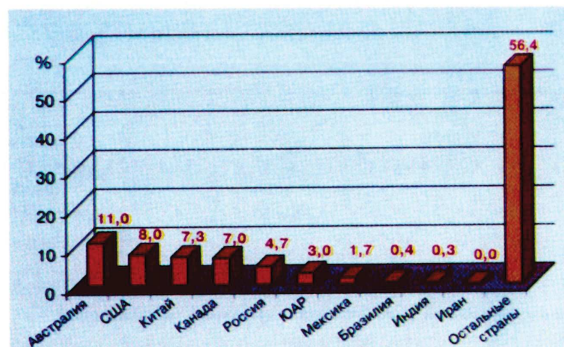
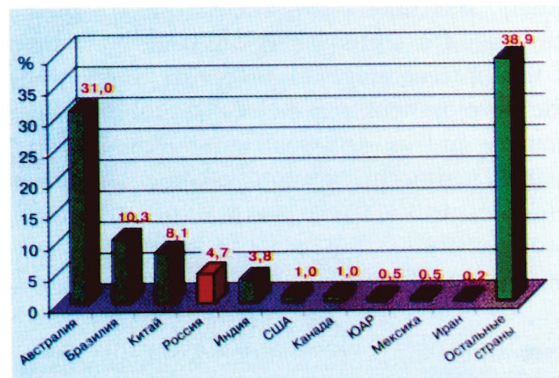
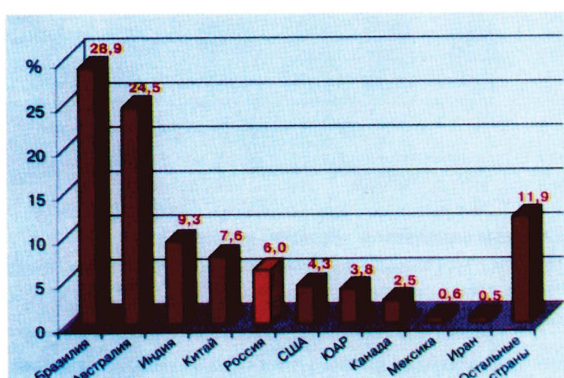


Figure 6 Countries that are among the first 10 industries according to the production rate of particular mineral products with reference to the world production, expressed in %: ferrous metals (a), non-ferrous metals (b), precious metals (c), non-metals (d), fuels (e).

slika 6. Zemlje koje se nalaze među prvih 10 po obimu eksploatacije pojedinih grupa mineralnih sirovina u odnosu na svetski obim u %: crni metali (a), obojeni metali (b), dragoceni metali (c), nemetalne mineralne sirovine (d), energetske sirovine (e).

economic growth and advanced standard of living practically without proper mineral resources, in Russia the consumption of mineral products is at a very low level, i.e. the production of commodities, which have a direct effect on different areas of real economy and life. This fact is well known among the highest Russian leadership but no substantial steps have been taken to develop and adopt a serious economic policy that would promote the growth of the manufacturing industry.

However, the tendencies and the dynamic of the world progress require immediate implementation of global economic policy for fast development of the manufacturing industry and that goal should be closely connected with the structure and the nature of exports. In other words, a certain percent of the sum obtained by exporting mineral products should be made in the country by developing new manufacturing facilities.

To evaluate the position of Russia in the mining industry on a global level it is necessary to consider that mineral production per capita is generally on the decline. In 1985 global, per capita production of mineral products reached 2038t while in 2002 it dropped to only 1872t. This huge disproportion in mineral products supply and demand is one of the major instability factors in the world.

3 CONCLUSION

For every country that possesses mineral resources it is very important to follow and observe the circumstances in countries with developed mining industry and analyse the current world trends regarding specific mineral production. This may be achieved with the help of statistical analysis, which should include all the crucial mining parameters. These analyses will provide the groundwork for state strategy and policy making in the area of mineral production.

ekonomike i standarda stanovništva, faktički pri odsustvu sopstvene mineralne baze, Rusija se nalazi na veoma niskom nivou potrošnje ove proizvodnje, tj. proizvodnje robe direktno potrebnih u različitim sferama realne ekonomike i života. Ova činjenica je bezuslovno dobro poznata najvišem rukovodstvu Rusije, ali nikakva ozbiljna ekonomska politika, koja bi bila urađena za razvoj prerađivačkih grana privrede se ne nazire.

Međutim tendencije i dinamika svetskog razvoja neodložno zahtevaju sprovođenje globalne ekonomske politike za ubrzani razvoj prerađivačke industrije, i taj cilj je neophodno tesno vezati sa strukturom i karakterom izvoza mineralnih proizvoda. Drugim rečima, suštinski deo sredstava, koji se dobija izvozom mineralnih proizvoda, je neophodno realizovati u zemlji u vidu najnovijih prerađivačkih kapaciteta.

Pri oceni mesta Rusije u rudarskom svetu treba uzeti u obzir da se u celom svetu se opaža sniženje eksploatacije mineralnih sirovina po glavi stanovnika: u 1985. godini se na svakog stanovnika Zemlje dobijalo 2 038 t različitih mineralnih sirovina, a u 2002 – samo 1 872 t. Ta okolnost, koju prati ogromna disproporcija u potrošnji mineralnih proizvoda, je jedan od glavnih faktora nestabilnog razvoja sveta.

3 ZAKLJUČAK

Za svaku zemlju koja ima mineralne resurse je veoma važno da prati šta se dešava u zemljama sa razvijenim rudarstvom. Takođe je neophodno analizirati tendencije u celom svetu u pogledu eksploatacije pojedinih mineralnih sirovina. To se postiže statističkom analizom, koja treba da obuhvati sve najvažnije pokazatelje u rudarstvu. Na osnovu takvih analiza donose se strategije i vodi politika mineralne ekonomije i razvoja zemlje.

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