

Irena Smolová, Martin Jurek

Palacký University of Olomouc, Department of Geography, Svobody 26, 771 46 Olomouc, Czech Republik

SELECTED PROBLEMS IN EXPLOITATION AND MINING OF MINERAL RESOURCES IN THE CZECH REPUBLIC AFTER THE YEAR 1989

Smolová I., Jurek M. **Wybrane zagadnienia eksploatacji surowców mineralnych w Republice Czeskiej po roku 1989.** Republika Czeska tradycyjnie należy do grupy znaczących państw eksploatujących surowce mineralne. Z historycznego punktu widzenia eksploatacja na terenach państwa czeskiego zmieniała swoje priorytety, co znalazło odbicie w jej intensywności, jak również skutkach z tego wynikających (zwłaszcza krajobrazowych). W średniowieczu w dużym stopniu eksploatowano rudy złota i srebra, w okresie powojennym XX w. intensywnie było przede wszystkim wydobywanie surowców energetycznych: węgla kamiennego, węgla brunatnego oraz rudy uranowej. Dzisiaj eksploatacja przemysłowa sięga 1,4% PKB i zatrudnia około 50 tysięcy pracowników, co – porównaniu z rokiem 1990 – oznacza spadek zatrudnionych o 2/3.

Mimo długotrwałej eksploatacji baza surowcowa Republiki Czeskiej jest ciągle na dostatecznym poziomie, przede wszystkim w zakresie surowców budowlanych i kopalini, z wyjątkiem rud. Ich wykorzystanie po 1989 r. zmieniało się w znacznym stopniu pod wpływem transformacji ekonomicznej, jak również wpływem zwiększonego zainteresowania społeczeństwa ochroną środowiska naturalnego. Spowodowało to, że rozwój eksploatacji surowców po 1989 r. był bardzo specyficzny.

W pierwszej fazie lat 90. XX w. odnotowano duży spadek eksploatacji w wyniku recesji gospodarczej i w wielu przypadkach także malej rentowności. Oprócz uranu wydobywanie pozostałych rud zostało zakończone. Pod koniec lat 1990. rozpoczęła się druga etap rozwoju, zgodnie ze wzrostem gospodarczym kraju. Bardzo widoczny był tutaj udział firm zagranicznych, których produkcja jest kierowana nie tylko na rynek krajowy, ale także na rynki zagraniczne. Na tym etapie zwiększa się przede wszystkim udział firm zajmujących się wydobywaniem surowców budowlanych, w tym również na terenach objętych ochroną środowiska naturalnego.

Pod koniec 2005 r. całkowita powierzchnia obszarów przeznaczonych do eksploatacji wynosiła 1480 km², co stanowi 1,96% powierzchni kraju. Na dzień 30 VI 2006 r. było zarejestrowanych 995 obszarów eksploatacji, w tym 603 czynne o łącznej powierzchni 801 km².

Można też stwierdzić, że po roku 1989 w znaczący sposób wzrosła eksploatacja ropy naftowej (Południowe Morawy), zaś wydobywanie innych surowców energetycznych (węgiel i uran) wyraźnie zmalało. Jednocześnie przemysł wydobywczy w nowych warunkach rynkowych oferuje gminom, na których terenach firmy prowadzą działalność gospodarczą, niemałe wpływy do ich budżetów. W ten sposób firmy wydobywcze przyczyniają się do rozwoju regionalnego, zwłaszcza w miejscach odległych od głównych ośrodków gospodarczych kraju.

Swego rodzaju specyfiką eksploatacji surowców mineralnych w Republice Czeskiej jest system prawny, kierujący wydobywaniem surowców energetycznych za pomocą limitów, ale niebawem mają być one zniesione. Powodem tego są duże złoża węgla brunatnego na terenie kilku gmin w północno-zachodnich Czechach, a także węgla kamiennego w północnych Morawach oraz zapotrzebowanie energetyczne kraju w przyszłości (w tym także interesy ekonomiczne lobby wydobywczego).

Смолова И., Юрек М. **Некоторые вопросы эксплуатации месторождений полезных ископаемых в Чешской Республике после 1989 года.** Чешская Республика традиционно принадлежит к странам с развитой горнодобывающей промышленностью. В историческом аспекте добыча полезных ископаемых претерпевала существенные изменения (приоритеты), что нашло свое отражение как в ее интенсивности, так и в последствиях, в том числе ландшафтных (в плане влияния на среду). В средние века добывались преимущественно золото и серебро, в послевоенные годы XX века – главным образом, энергетическое сырье: каменный и бурый уголь, урановые руды. В настоящее время на горнодобывающую промышленность приходится 1,4% от всего промышленного производства, в ней трудится около 50 000 человек, что в сравнении с 1990 годом означает сокращение на 2/3.

Несмотря на длительную эксплуатацию, запасы минерального сырья в республике остаются достаточно большими, особенно по отношению к стройматериалам и большинству ископаемых, за исключением рудного сырья. Их использование существенно изменялось в условиях экономической трансформации, а также в связи с усилением интереса общественности к природоохранным проблемам. Все это определило специфику развития горнодобывающей промышленности в период после 1999 года.

В первой фазе 1990-х зафиксировано существенное снижение эксплуатации месторождений в связи с экономическим регрессом, а во многих случаях также – в связи с малой рентабельностью. Добыча практически всех руд, кроме урановых, прекратилась. В конце 1990-х начинается второй этап – активизация добычных работ как в связи с экономическим подъемом, так и в связи с инвестициями иностранных фирм. Продукция горнодобывающих предприятий направляется не только на внутренний рынок, но и за границу.

На конец 2005 года общая площадь территорий, охваченных добычными работами, составила 1480 км², что составляет 1,96% площади страны. На 30.06.2006 зарегистрировано 995 добычных площадей, из которых 603 (801 км²) – действующие.

Можно также отметить, что начиная с 1989 года значительно возросла добыча нефти (Южная Моравия), в то время как добыча прочего энергетического сырья существенно уменьшилась. Добывающая промышленность в новых – рыночных условиях обеспечивает существенные поступления средств в местный бюджет, способствуя, таким образом, развитию регионов, особенно, расположенных вдали от крупных экономических центров.

Спецификой эксплуатации месторождений минерального сырья в Чешской Республике является законодательная база, предполагающая лимитирование добычи энергетических ископаемых, но в ближайшее время предполагается отмена лимитов. Связано это, прежде всего, с наличием крупных месторождений бурого и каменного угля на северо-западе страны и в Северной Моравии, а также с политикой энергетической безопасности страны в будущем и лоббированием интересов добывающих предприятий.

Abstract

In the last few years, structural changes in the Czech economy, especially in industry, have influenced both the role and importance of extracting and processing of minerals and materials of mineral origin. The changes are reflected by an index of mineral production share in GDP, which decreased from 3.7% in 1993 to 1.3% in 2005. Mining industry has many negative impacts on the environment; therefore production restrictions positively affect landscape and nature as well as other factors with environmental impacts. Very important is the decrease of mineral production in protected landscape areas. Mining volumes in these areas have dropped to one half in 2005 compared to 1993. However, in certain protected landscape areas restrictions have not been implemented and even the extent of mining has increased.

MINING AREAS IN THE CZECH REPUBLIC

As of December 31, 2005 there were 1,004 claimed mining spaces with a total area of 1,480 sq km in the Czech Republic (2% of the state territory; table 1). Delimitation of a mining area is the initial step in a procedure leading to an extraction permit,

entailing the beginning of anthropogenic transformation of relief. In accordance with Act No. 44/1988 Coll. on Protection and Utilization of Mineral Wealth (the Mining Act) as amended by Act of the Czech National Council No. 541/1991 Coll., mineral resources in the Czech Republic are property of the state. They consist of deposits of selected minerals claimed as “exclusive deposits”. Additionally, a “protected deposit territory” is established for exclusive deposits of mineral resources in order to prevent any construction activities unrelated to extraction of the exclusive deposit. Considering the fact that nearly 90% of mineral resources in the Czech Republic are extracted from opencast mines, the extent of anthropogenic influence on the landscape is evident. The extraction itself is controlled by the Czech Bureau of Mines.

At present, the importance of mineral resources extraction has been shifted from public interest to the interest of private mining companies that intend to economically profit from mineral resources of the territory. This leads to a variety of conflicts of interests between municipalities along with citizen-action associations and

Table 1. Mining areas in the Czech Republic (1990–2005)
Tabela 1. Obszary górnictwa w Republice Czeskiej (1990–2005)

| Raw material | Number of mining areas | | | | Total area of mining areas (sq km) | | | |
|---------------------------|------------------------|-------|-------|---------------------|------------------------------------|---------|---------|---------------------|
| | 1990 | 1993 | 2005 | Index 2005/1993 (%) | 1990 | 1993 | 2005 | Index 2005/1993 (%) |
| Hard coal | 50 | 38 | 27 | 71.1 | 858.7 | 524.4 | 374.5 | 71.4 |
| Brown coal and lignite | 62 | 54 | 36 | 66.7 | 531.3 | 458.4 | 305.8 | 66.7 |
| Crude oil and natural gas | 25 | 27 | 93 | 344.4 | 267.8 | 253.9 | 432.7 | 170.4 |
| Ores | 31 | 18 | 5 | 27.8 | 45.3 | 29.6 | 5.6 | 18.9 |
| Radioactive raw materials | 21 | 16 | 11 | 68.7 | 136.5 | 99.7 | 65.6 | 65.8 |
| Kaolin | 28 | 25 | 27 | 108.0 | 10.1 | 9.6 | 11.1 | 115.6 |
| Building stone | 354 | 351 | 385 | 109.7 | 23.0 | 60.5 | 66.2 | 109.4 |
| Gravel sand, sands | 237 | 165 | 173 | 104.8 | 146.0 | 109.2 | 114.8 | 105.1 |
| Limestones and dolomites | 30 | 63 | 50 | 79.4 | 19.2 | 28.6 | 26.2 | 91.6 |
| Brick clays | 176 | 175 | 109 | 62.3 | 37.0 | 36.7 | 25.1 | 68.4 |
| Other minerals | 134 | 184 | 88 | 47.8 | 86.1 | 77.1 | 52.1 | 67.6 |
| Total | 1,148 | 1,091 | 1,004 | 92.0 | 2,161 | 1,678.1 | 1,479.7 | 88.2 |

Source: Makarius R., ed. (1993, 1995, 2005); Kavina P., ed. (2004); Czech Bureau of Mines database

the mining companies. Nevertheless, the “mining lobby” plays an important role in regional development, especially in areas with underdeveloped economies where the presence of mining companies is approached as mostly positive. Mining companies represent an important source of income for the municipal budget and often contribute to off-budgetary incomes despite the landscape risks and environmental impacts resulting from extraction activities. Municipalities whose territory is affected by extraction receive remunerations for the allotments and compensations from the extracted minerals in accordance with §32a of the Mining Act (No. 44/1988 Coll.). Remunerations are paid to accounts kept by regional branches of the Bureau of Mines and are subsequently distributed to authorised beneficiaries, i.e. to the municipalities and into the state budget. Annual payment per mining area larger than 2 hectares is CZK 10,000 plus additional fee per each extra sq km. The annual payment for mining areas smaller than 2 hectares is CZK 2,000.

According to the Mining Act, annual compensation for the extracted minerals is calculated as a percentage of the total revenues for the extracted mineral at the actual market price (the maximum compensation is 10%). 25% of the amount paid to the Bureau of Mines is transferred to the state budget of the Czech Republic. This money is used for reparation of damages to the environment caused by the extraction of exclusive and non-exclusive deposits. The remaining 75% is transferred to the budget of the municipality. Remuneration is paid in accordance with the kind of extracted mineral. The actual rate depends on the kind of mineral resource and is set by Decree No. 617/1992 Coll. of the Ministry of Economics, with e.g. 5% for oil and natural gas, 0.5% for underground mined coal, 1.5 % for opencast mined coal, 8% for kaolin, 10% for high-quality limestones, 3% for other types of limestone and other cement mineral resources, etc.

EXTRACTION OF MINERAL RESOURCES IN THE CZECH REPUBLIC

Although in modern history the Czech Republic and the previous state formations within its territory did not rank among leading mining countries, the utilisation of domestic raw deposits was high in the past. Over the course of each individual historical period, priorities in terms of extraction of minerals changed, and this was ref-

lected in the varied intensity of extraction with a number of consequences including noticeable changes in the relief. Ore extraction has, for example, a particularly old tradition with the oldest archaeological evidence of gold panning dating back to the 9th century B.C. In the Middle Ages, Bohemia was the centre for European mining of gold and silver. The last boom in mining was after 1948, during the period of socialist industrialisation when ore deposits were extensively extracted, even at the cost of substantial financial losses. Particularly common was that after long-term historical deep mining which damaged the environment to a relatively limited extent, i.e. without substantial anthropogenic transformations of the relief with a maximum attempt at effectiveness, the mining in the 1950s and 1960s broadly affected vast areas with a number of accompanying adverse effects. Vast opencast mining resulted in the destruction and liquidation of numerous underground mines, but especially the emergence of new anthropogenic shapes on the surface. The extraction was often accompanied by vast regulations of waterways and the emergence of new accumulated waste heap formations. After 1989, ore extraction was cut back considerably and later the mining of base metal deposit (+ Au) in Zlaté Hory was terminated. In 1994, ore extraction was definitively brought to an end in the Czech Republic. At present, the areas affected by extraction have been redeveloped and rehabilitated.

A somewhat different trend can be observed in the mining of deposits for energy producing raw materials. Coal has been mined from the beginning of the industrial revolution and the mining of uranium ore began after World War II. The extraction of energy producing raw materials reached its peak in the latter half of the 1980s. After 1989, a state reduction programme was launched, and the previous extensive mining was reduced considerably. Additionally, volume and territorial limits were set for coal mining. The extraction of uranium ore has also been substantially reduced and is limited to the Rožná deposit, where the uranium ore is mined by the traditional deep-mining method. In North Bohemia, however, uranium is still attained through leaching *in situ* as part of the liquidation program at the deposit in Stráž pod Ralskem (table 2). In contrast, the extraction of oil has been dynamically developing of late in South Moravia in the area around Hodonín and Břeclav (fig. 1). There is also new interest in the extraction of oil and natural gas in the Beskydy Mountains in the Trojanovice region where vast deposits of hard

Table 2. Extraction of mineral resources in the Czech Republic (1990, 1993 and 2005)
Tabela 2. Wydobycie surowców mineralnych w Republice Czeskiej (1990, 1993, 2005)

| Raw material | Extraction | | | Index number 2005/1993 (%) |
|--|------------|--------|--------|----------------------------------|
| | 1990 | 1993 | 2005 | |
| Metallic ores out of uranium ore (10 ³ t) | 1,025 | 131 | 0 | 0 |
| Uranium ore (10 ³ t) | 2,400 | 437 | 124 | 28.4 |
| Hard coal (10 ³ t) | 23,385 | 18,296 | 13,252 | 72.4 |
| Brown coal and lignite (10 ³ t) | 77,736 | 63,335 | 44,619 | 70.4 |
| Crude oil (10 ³ t) | 50 | 111 | 301 | 271.2 |
| Natural gas (10 ³ m ³) | 230 | 244 | 221 | 90.6 |
| Kaolin (10 ³ t) | 3,378 | 2,326 | 3,884 | 167.0 |
| Building stone (10 ³ m ³) | 23,396 | 9,677 | 13,684 | 141.4 |
| Gravel sand, sands (10 ³ t) | 20,359 | 12,305 | 15,921 | 129.4 |
| Limestones (10 ³ t) | 12,909 | 10,071 | 9,778 | 97.1 |
| Brick clays (10 ³ m ³) | 3,101 | 1,354 | 1,939 | 143.2 |

Source: Makarius R. ed. (1993, 1995, 2005); Czech Bureau of Mines database

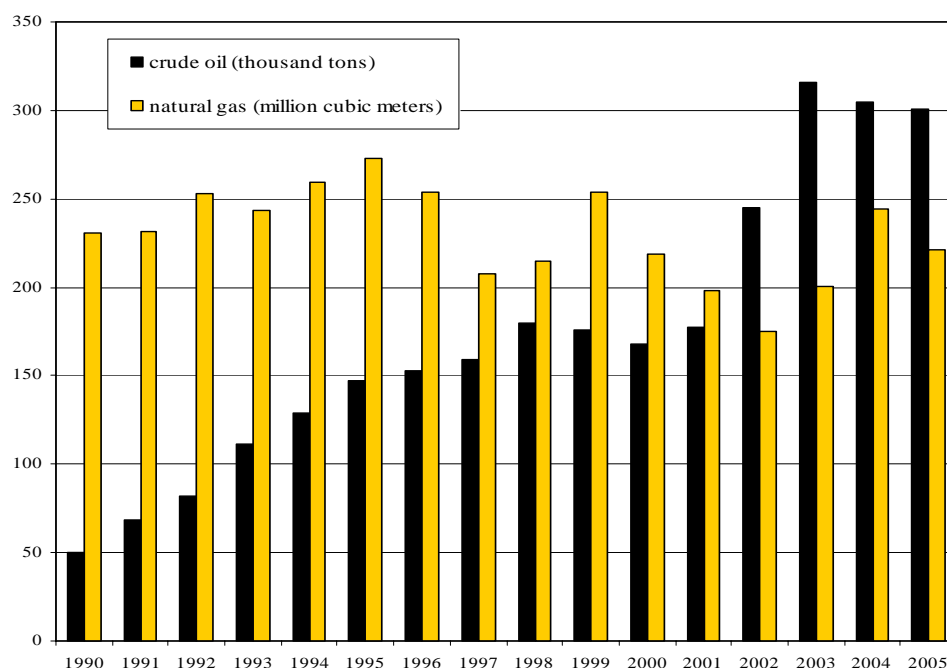


Fig. 1. Extraction of crude oil and natural gas in Czech Republic in 1990–2005

Rys. 1. Wydobycie ropy naftowej i gazu ziemnego w Republice Czeskiej w latach 1990–2005

coal have been found. The Trojanovice allotment was designed for the purposes of extensive hard coal extraction back in 1989, and with its area of 63 sq km is the largest allotment in the Czech Republic. At present, coal mining is concentrated in two areas: Podkrušnohoří (brown coal) and the Ostrava Basin (hard coal).

Coal mining in Podkrušnohoří, cause of the largest destruction to the environment in the Czech Republic in terms of volume, began at the end of the 18th century in locales with outcrops of coal seams and in shallow opencast mines. Since the latter half of the 19th century mining has become more intensive and the North Bohemia coal district has become the most important coal district in Central Europe. Deep mining methods predo-

minated in all basins (Chebská, Sokolovská, and Severočeská) at that time. From the beginning of the 20th century the amount of opencast mining was increasing, resulting in vast devastation to the landscape. While the share of opencast mining on the total volume of mined coal was about 25% at the end of the 1930s, since the 1950s it has gained absolute majority. The first reduction in extraction occurred in the southwest area of Podkrušnohoří in 1833, where mineral water resources protection zones were established for spa purposes. Consequently, the highest volume of extraction was concentrated in the Severočeská hnědouhelná pánev (SHP, North Bohemia Brown-Coal Basin) where 3.5 milliard tons of coal have been extracted so far, of which 2.6 milliard tons

(74.2%) in opencast mines. In the Sokolovská Basin, more than 1.0 milliard tons of coal have been mined (table 3, fig. 2 & 3).

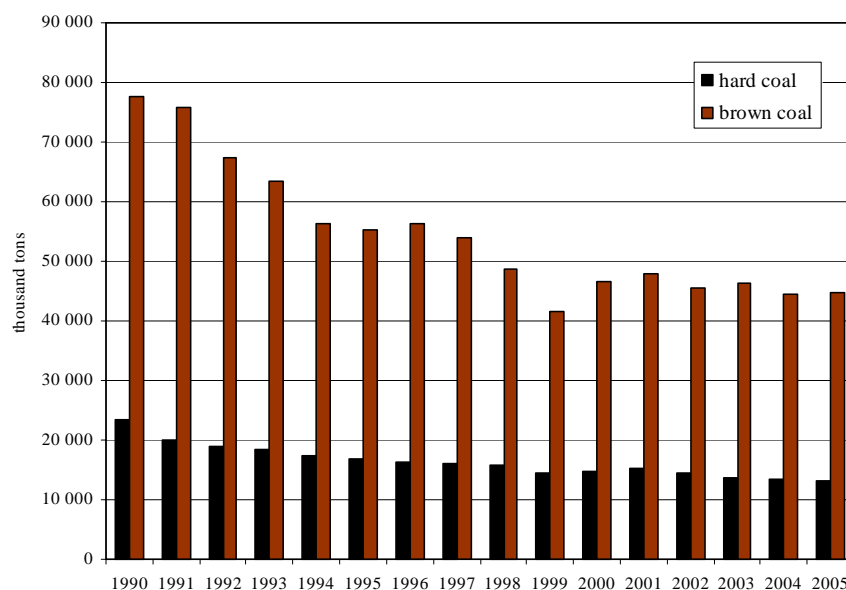
In addition to mineral fuels, industrial minerals represent the most important group of raw materials in the territory of the Czech Republic. In

Table 3. Coal extraction in the Czech Republic in 1990–2005 by mining districts
Tabela 3. Wydobywanie węgla w Republice Czeskiej w latach 1990–2005

| Locales | Extraction (10 ³ t) | | | Number of workers* | | | |
|---------------------------|---------------------------------|---------------|-----------------|--------------------|---------------|-----------------|---------------|
| | 1990 | 2005 | Index 2005/1990 | 1990 | 2005 | Index 2005/1990 | |
| Hard coal | | | | | | | |
| 1 | Ostravsko-karvinský district | 21,042 | 13,227 | 62.8 % | 63 170 | 20 720 | 32.8 % |
| 2 | Rosicko-oslavanský district | 137 | 0 | 0 | 1 660 | 0 | 0 |
| 3 | Žacléřsko-svatoňovický district | 575 | 25 | 4.3 % | 822 | 10 | 1.2 % |
| 4 | Kladensko | 1,322 | 0 | 0 | 4 862 | 0 | 0 |
| 5 | Plzeňsko | 309 | 0 | 0 | 1 152 | 0 | 0 |
| Hard coal – Total | | 23,385 | 13,252 | 56.7 % | 71 666 | 20 730 | 28.9 % |
| Lignite | | | | | | | |
| 6 | Hodonínsko | 1,814 | 467 | 25.7 % | 2,761 | 431 | 15.6 % |
| Brown coal | | | | | | | |
| 7 | Litvínovsko | 8,400 | 469 | 5.6 % | 8,919 | 398 | 4.5 % |
| 8 | Ústecko | 4,126 | 0 | 0 | 842 | 0 | 0 |
| 9 | Mostecko | 26,633 | 15,641 | 58.7 % | 9,717 | 4,576 | 47.1 % |
| 10 | Bílinsko | 7,816 | 8,968 | 114.7 % | 6,044 | 1,931 | 31.9 % |
| 11 | Chomutovsko | 18,911 | 13,188 | 69.7 % | 4,383 | 1,578 | 36.0 % |
| 12 | Sokolovská Basin | 11,850 | 6,353 | 53.6 % | 8,711 | 2,478 | 28.4 % |
| Brown coal – Total | | 77,736 | 44,619 | 57.4 % | 38,616 | 10,961 | 28.4 % |

Source: Makarius R. ed. (1993, 1995, 2005); Czech Bureau of Mines database; Kavina P. ed. (2004)

Note: * number of workers involved in extraction of coal



Source: Makarius, R. ed. (1993, 1995, 2005); Bureau of Mines database; Kavina P. ed. (2004)

Fig. 2. Extraction of hard and brown coals in the Czech Republic in 1990–2005

Rys. 2. Wydobywanie węgla kamiennego i brunatnego w Republice Czeskiej w latach 1990–2005

this group the largest reserves are of limestones, kaolin, clays, bentonite and natural (glass and foundry) sand. Other industrial minerals represent smaller nevertheless important raw material potential of the national economy. Kaolin, quartz sand, limestone, clays, feldspar and dimension stone are also important export commodities. There are very high geological reserves of construction materials – building stone, sand and gravel and brick clays – in the Czech Republic.

GLOBALISATION OF QUARRYING ACTIVITIES

The transformation process of the Czech economy introduced participation of foreign quarrying companies into exploitation of raw materials in the Czech Republic. Among the most significant ranks the participation of transnational companies in quarrying of construction raw materials. This participation is linked to the issue of gro-

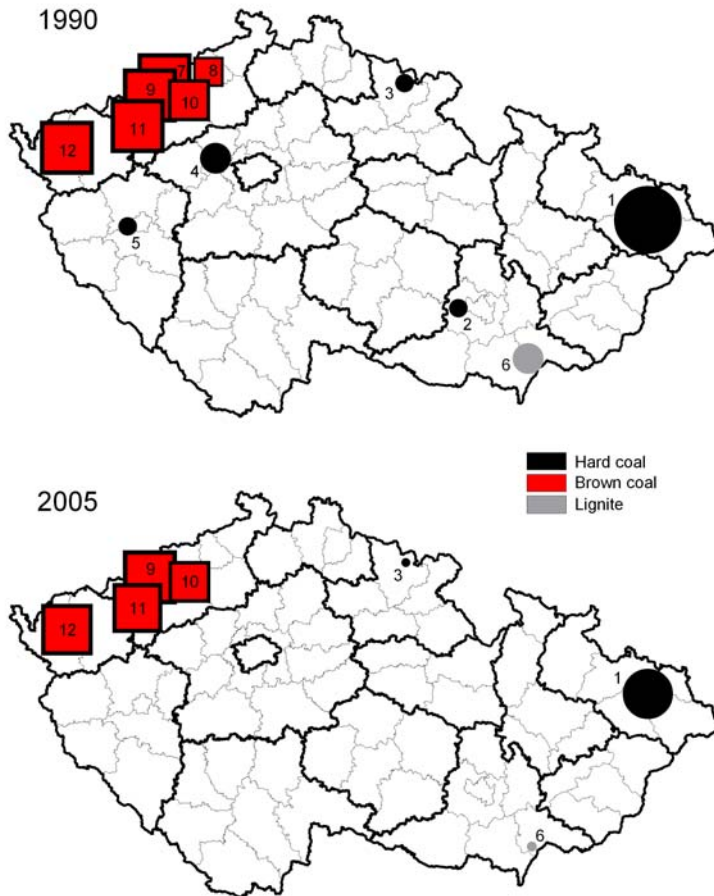


Fig. 3. Extraction of hard coal, brown coal and lignite in the Czech Republic in 1990 and 2005:

Localities:

Hard coal (black circles): 1 – Ostravsko-karvinský mining district; 2 – Rosicko-oslavanský mining district (locality Zbýšov); 3 – Žacléřsko-svatoňovický mining district; 4 – Kladensko; 5 – Plzeňsko (Tlučná, Krimich mine)

Lignite (grey circles): 6 – Hodonínsko
Brown coal (grey squares): 7 – Litvínovsko (Doly Hlubina Litvínov); 8 – Ústecko; 9 – Mostecko (Lom ČSA, Vršany, Jan Šverma); 10 – Bílinsko (Doly Bílina); 11 – Chomutovsko (Doly Nástup Tušimice); 12 – Sokolovská Basin

Rys. 3. Produkcja węgla kamiennego, węgla brunatnego i lignitów w Republice Czeskiej w roku 1990 i 2005:

Lokalizacja:

Węgiel kamienny (czarne koła): 1 – Ostrawsko-Karwiński Okręg Węglowy; 2 – Rosicko-Oslawański Okręg Węglowy (Zbýšov); 3 – Žacléřsko-Svatonický Okręg Węglowy; 4 – Kladno i okolice; 5 – Pilzno i okolice (Tlučná, Krimich)

Lignity (szary okrąg): 6 – okolice Hodonina
Węgiel brunatny (szare kwadraty): 7 – okolice Litwinowa (Hlubina Litvínov); 8 – okolice Usti nad Łabą; 9 – okolice Mostu (ČSA, Vršany, Jan Šverma); 10 – okolice Biliny (Bílina); 11 – okolice Chomutowa (Nástup Tušimice); 12 – Zagłębie Sokolowskie

Table 4. Share of foreign companies in overall quarrying amounts of selected raw materials in the Czech Republic
 Tabela 4. Udział kompanii zagranicznych w ogólnym wydobyciu wybranych surowców w Republice Czeskiej

| Raw material | Share of company in total amount extracted in the Czech Rep. | | | |
|------------------------|--|----------------------|-------------------------|-----------------------|
| | Lasselsberger, a.s. | Holcim (Česko), a.s. | Heidelberg Cement Group | Wienerberger CP, a.s. |
| Kaolin | 79.7 % | 0 | 0 | 0 |
| Gravel sands and sands | 6.0 % | 4.3 % | 9.1 % | 0 |
| Limestones | 6.3 % | 9.8 % | 11.4 % | 0 |
| Brick clays | 0.2 % | 0 | 0 | 43.4 % |
| Clays a bentonites | 46.1 % | 0 | 0 | 0 |

Note: 0 = no share in quarrying of the material

Source: Czech Bureau of Mines database, Makarius, R. ed. (2006), own calculations

wing export volumes of limestones, gravel sands, kaolin, and brick clays.

The largest shares in quarrying of construction raw materials belong to German, Austrian and Swiss companies (table 4). *Lasselsberger a.s.*, a subsidiary of an Austrian transnational company Lasselsberger, dominates in quarrying of kaolin (almost 80% of amount extracted in the Czech Republic). This Czech subsidiary with headquarters located in Plzeň quarries also clays in the Plzeň region, besides kaolin. The company has extended its activities into the region of Chodsko (feldspars, kaolin, clays, gravel sands), into the Třeboň region (feldspars, kaolin, clays, gravel sands), and into the Brno region (feld-

spars and gravel sands). In 2005 Lasselsberger a.s. has become successor of companies Kemat s.r.o. and LB Cemix s.r.o., this way extending its quarrying areas to the Cheb region (clays and gravel sands).

A significant participation of foreign companies is also connected to mining carbonate rocks (limestone, dolomite). Companies producing more than one tenth of total quarrying amounts are: *Lafarge Cement a.s.* (12.2% of all limestones quarried in the Czech Republic) and *Českomoravský cement a.s.* (11.4%), a member of the German concern *HeidelbergCement Group*. Among other important foreign quarrying companies belong *Holcim (Česko) a.s.* (9.8% of all limestones

quarried in the Czech Republic), Cement Hranice a.s. (8.6%), since 1997 with a major share owned by a German concern *Dyckerhoff*, and also *Lasselsberger a.s.*, holding a 75% share in Velkolom Kotouč in Štramberk since 2006. Austrian company *Omya a.s.*, quarries high quality limestones in the Jeseník region: in Vápenná (company headquarters) and Horní Lipová (municipality of Lipová-lázně).

Dominating in brick clay quarrying is the Austrian company *Wienerberger sklářský průmysl, a.s.*, active in the Czech Republic since 1992. It holds 12 industrial plants, including the newly opened brickworks Jezernice near Lipník nad Bečvou (since beginning of 2005).

ENVIRONMENTAL CONSEQUENCES OF EXTRACTION OF SELECTED MINERAL RESOURCES IN THE CZECH REPUBLIC

Extraction of mineral resources on the territory of the Czech Republic operates on the Mining Act (No. 44/1988 Coll.), which newly established the status of “protected deposit territory”, where it is forbidden to establish constructions and equipment not related to the extraction of the deposit (REICHMANN, 2000). For the sake of protection of nature and landscape there are further limitations determined for the extraction of mineral resources, especially those resulting from Act No. 114/1992 Coll. on Protection of Nature and Landscape, as amended by Act No. 218/2004 Coll., which states that on the whole territory of National Parks (NP) it is forbidden to extract minerals, rock and humolites, except for building stone for buildings on the territory of NP, and that on the territory of Protected Landscape Areas (PLA) it is forbidden to “transform the preserved natural environment”. However, explicit restriction of extraction applies to the 1st PLA zones only. Moreover, there are further restrictions in the protective zones of water resources, protected areas of accumulation of underground and surface waters, in the protected area of spas, etc. As of 1992 new intentions to extract raw materials were subject to consideration of their impact on the environment by application of Act No. 244/1992 Coll. In 2002, in accordance with the law of the European Communities, a new legislative tool came into force with Act No. 100/2001 Coll. on Consideration of Environmental Impact (latest amendment in 2004 by Act No. 93/2004 Coll.). In this law, consideration of environmental impact by the EIA (Environmental

Impact Assessment) procedure applies to determined intentions and concepts, the realization of which should have significant impact on the environment. The intentions and concepts are listed in two categories. One comprises intentions subject to consideration at all times (e.g. establishment of a new mining area or modification of an existing one, underground mining of coal exceeding 100,000 tons/year, increase of open-cast mining exceeding 1 million tons/year, or extraction of mineral resources between 10,000 and 1 million tons/year). The other category comprises intentions requiring declaratory proceedings. This is required for example for underground mining exceeding 100,000 tons/year, extraction of other raw materials exceeding 10,000 tons/year, or increase of existing extraction to 1 million tons/year.

The most extensive conflicts of interests are caused in the cases of extraction of limestone and other carbonates. With respect to exceptional nature of karst areas most karst localities are protected by law and extraction on their territory must be permitted by exception given by the Ministry of Environment. In the last few years extraction of limestone in specially protected areas is of opposite trend than in the cases of other raw materials. Despite the fact that the total volume of materials extracted in specially protected areas has decreased within the period from 1990 until present, in case of limestone the volume of its extraction has increased in the last few years after a decrease in the early 1990s. Whereas in 1995 the extraction of limestone in protected landscape areas was 2,327,000 tons, i.e. 21.6% of their total extracted volume in the Czech Republic, by 2003 this figure increased to 3,381,000 tons, which is over a third of the total extraction of limestone in the Czech Republic. Therefore the rate of the growth index for the period 1995–2003 reached 145%. Moreover, there are several other mining areas localized in close vicinity of specially protected areas. Right behind the boundary of PLA *Železné hory* there is extraction in progress with the volume exceeding 1 million tons/year in mining area Prachovice [Holcim (Česko) a.s. Prachovice] as well as in close vicinity of PLA *Moravian Karst* in mining area *Mokrá (HeidelbergCement)*.

Extraction of limestone is a serious stress to protected landscape areas, which can be expressed by the volume of extraction per sq km. Among all PLAs in the Czech Republic, the most extreme stress occurs in PLA *Český kras* (Bohemian Karst) where the load exceeds 26,000 tons

of raw material produced per sq km and in the last few years a slightly increasing trend continues, in spite of the fact that stress exceeding 10,000 tons per sq km is considered as unbearable. High stress due to extraction of limestone occurs also in PLA Moravský kras (Moravian Karst; 2,000 tons of raw material produced per sq km) or in PLA Pálavské vrchy (Pálava Hills), one of the six UNESCO Biosphere Reserves in the Czech Republic (800 tons of raw material produced per sq km). Despite the effort of primarily ecological associations to reduce extraction in specially protected areas, it is very hard to reduce the extraction in most localities. The only outcome is that construction of new cement works was not realized (e.g. Tmaň in Bohemian Karst). A unique project, for the time being, is "Extraction of Limestone : Example of Involvement of the Public into the EIA Process", which was supported by the Ministry of Environment and which brought, for example, preclusion of further expansion of mine Čertovy schody in Bohemian Karst. Apart from that, also new areas for extraction are approved, which is always subject of consideration. Since 2001, the following limestone extraction areas were approved: mining area Chotěšov near Litoměřice (in 2002) and mining area Líšeň II in Brno. Mining area Hvozdečko near Olomouc, with expected extraction of 40,000 tons/year, is currently being approved.

CONCLUSION

Although in modern history the Czech Republic and its previous state formations within its territory did not rank among leading mining countries, the utilisation of domestic raw deposits was high in the past. Over the course of each individual historical period, priorities in terms of extraction of minerals changed, and this was reflected in the varied intensity of extraction with a number of consequences including noticeable changes in the relief. At present there are 1,004 mining spaces with a total area of 1,480 sq km in the Czech Republic. In 2005, 540 deposits were in operation in the Czech Republic, out of which 132 million tons of mineral resources were extracted. At present, the importance of extraction of mineral resources has been shifted from the area of public interest to the interest of private mining companies which intend to make profit from the mineral resources of the territory. In the last few years, structural changes in the Czech economy, especially in industry, have in-

fluenced both the role and importance of extracting and processing of minerals and materials of mineral origin. Index of mineral production share in GDP reflects the changes, as it has decreased from 3.7% in 1993 to 1.3% in 2005. Market economy caused reduction or even termination of non-profitable mining activities, previously supported by the socialist state subventions. Mining of ores was completely abandoned, mining of coal significantly limited, mining of uranium ore strictly reduced.

The strictest rules on the extraction of mineral resources are in areas established by Act on Nature and Landscape Protection No. 114/1992 Coll. In accordance with this law, it is forbidden to extract mineral resources in National Parks (with the exception of extraction of building blocks and sand for construction within the area of the National Park), in the first zone of Protected Landscape Areas and in Nature Reserves.

Although extraction in the second and third zones of the protected landscape areas is not explicitly forbidden by law, it is quite difficult to obtain an extraction permit. Although the overall extraction of mineral resources in the protected areas has decreased after 1989, the amount of extraction in some of them has actually increased. With some mineral resources, e.g. limestone, feldspar or precious stones, the extraction in the protected areas constitutes a substantial share of the total amount of extraction of a particular mineral. The landscape contains giant opencast mines, originating due to large volumes of extracted mineral resources, with noise and dust disturbing the surrounding environment and the natural system of groundwater often disturbed. Among the non-ore raw mineral resources, the extraction of limestone has a special position. The largest opencast mines include Mokrý u Brna, Čertovy schody, Mořina in Český kras, Kotouč near Štramberk, Hranice in Central Moravia and Prachovice in Železné hory. Opencast extraction of limestone often results in disturbances to the hydrogeological environment.

REFERENCES

- Kavina P. (ed.), 2002: Surovinové zdroje České republiky. Ministerstvo životního prostředí, Česká geologická služba-Geofond, Praha: 180 pp.
- Makarius R. (ed.), 1993: Hornická ročenka 1992. Český báňský úřad, vydavatelství Montanex Ostrava: 286 pp.
- Makarius R. (ed.), 1995: Hornická ročenka 1994. Český báňský úřad, vydavatelství Montanex Ostrava: 290 pp.
- Makarius R. (ed.), 2003: Hornická ročenka 2002. Český báňský úřad, vydavatelství Montanex Ostrava: 286 pp.
- Makarius R. (ed.), 2005: Hornická ročenka 2004. Český báňský úřad, vydavatelství Montanex Ostrava: 300 pp.
- Makarius R. (ed.), 2006: Hornická ročenka 2005. Český báňský úřad, vydavatelství Montanex Ostrava: 320 pp.
- Reichmann F. (ed.), 2000: Horninové prostředí ČR – jeho stav a ochrana. Český geologický ústav, Praha: 189 pp.
- Starý, J. Kavina P. (eds.), 2004: Surovinové zdroje České republiky. Ministerstvo životního prostředí, Česká geologická služba-Geofond, Praha: 204 pp.