Ministry of the Environment
of the Czech Republic

MINERAL COMMODITY SUMMARIES OF THE CZECH REPUBLIC 2018

STATISTICAL DATA TO 2017

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Czech Geological Survey

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CONTENTS

EXPLANATORY NOTES

List of abbreviations, symbols and technical units

AOPK ČR	Nature Conservation Agency of the Czech Republic (Agentura ochrany přírody a krajiny České republiky)
AOPK ČR	Nature Conservation Agency of the Czech Republic (Agentura ochrany přírody a krajiny České republiky)
a. s.	initials after a Czech company name indicate that it is a joint stock company (akciová společnost)
bbl	barrel of crude petroleum, 158.99 dm3; 1 tonne of crude petroleum is approximately 7 bbl (6.76-7.75 bbl for crude petroleum extracted in the Czech Republic)
bn	billion, 109
BP	British Petroleum, British multinational oil and petrochemical company
BRICS	acronym for economic group of Brazil, Russia, India, China, South Africa
CFR	Cost and Freight (named port of destination)
CHKO	protected landscape area (Chráněná krajinná oblast)
CHLÚ	protected deposit area (Chráněné ložiskové území)
CHOPAV	Protected area of natural accomodation of water (chráněná oblast přirozené akumulace vod) – see PANAW
CIF	Cost, Insurance and Freight (named port of destination)
CIS	Commonwealth of Independent States, in Russian: Содружество Независимых Государств
CMMI	Council of Mining and Metallurgical Institutions
Coll.	Collection of laws (Sbírka zákonů České republiky) of the Czech Republic
CPPP	constant prices of previous period
CSO	Czech Statistical Office
CZK	Czech crown (česká koruna)
CZSO	Czech Statistical Office
CZ NACE	Czech adoption of the General Industrial Classification of Economic Activities within the European Communities (Nomenclature générale des Activités économiques dans les Communautés Européennes)
ČBÚ	Czech Mining Authority (Český báňský úřad)
ČGÚ	Czech Geological Office (Český geologický úřad)
ČNB	Czech National Bank (Česká národní banka)
ČNR	Czech National Council (Česká národní rada) – former parliament of the Czech (Socialist) Republic
ČR	Czech Republic (Česká republika)
ČSÚ	Czech Statistical Office (Český statistický úřad)
DERA	Deutsche Rohstoffagentur (German Mineral Resources Agency) is a part of

	Bundesanstalt für Geowissenschaften und Rohstoffe (Federal Institute for Geosciences and Natural Resources)
DP	mining lease (dobývací prostor)
EIA	1) Environmental Impact Assessment 2) Energy Information Administration, section of the Department of Energy of the USA providing energy statistics, data, analysis
EU	European Union
EURATOM	Euratom Supply Agency (ESA), European agency for common supply policy on the principle of regular and equitable supply of nuclear fuels for European Community users
EUROSTAT	Statistical Office of the European Communities, organisational branch of the European Commission
FDI	foreign direct investment
FMPE	Federal Ministry of Fuels and Power (Federální ministersvo paliv a energetiky)
FNM	National property Fund (Fond národního majetku)
FOB	Free on Board (port) – seller pays for transportation of the goods to the port of shipment, plus loading costs
GDP	Gross domestic product
GVA	Gross value added (GVA) is a widely used indicator of the total economic performance of each branch. It is an indicator corresponding to the GDP in the whole national economy. It is calculated by subtraction of the intermediate consumption (consumption of the raw materials, energy, materials) from the total value of the production (in terms of accounting, this is the difference between the sales and other services of companies and their consumption of materials, energy and services, this is therefore the sum of their book values added)
IEA	International Energy Agency
IM	Industrial Minerals (journal)
IMF	International Monetary Fund
JORC	Joint Ore Reserves Committee
KKZ	Commission for Classification of Mineral Reserves (Komise pro klasifikaci zásob)
k. s.	initials after a Czech company name indicate that it is a limited partnership company (komanditní společnost)
kt	kilotonne, 1,000 t
Ma	Million of years
MB	Metal Bulletin (journal)
MCS	Mineral Commodity Summaries, mineral yearbook of the US Geological Survey
MF	Ministry of Finance
MH ČR	Ministry of Economy of the Czech Republic (Ministerstvo hospodářství České republiky)
MHPR	Ministry of Economic Policy and Development (Ministerstvo pro hospodářskou politiku a rozvoj)
mill	million, 106
MIT	Ministry of Industry and Trade
MoE	Ministry of the Environment

MŽP ČR Ministry of the Environment of the Czech Republic (Ministerstvo životního prostředí České republiky)
N not available or not reliable data
NP natural park (Národní park)
NPF National Privatization Fund
OBÚ Regional Mining Authority (obvodní báňský úřad)
OPEC Organization of Petroleum Exporting Countries
o.p.s. initials after a Czech organization name indicate that it is a not profit organization (obecně prospěšná společnost)
PANAW Protected area of natural accomodation of water (chráněná oblast přirozené akumulace vod) – see CHOPAV
pcs pieces
PKÚ Palivový kombinát Ústí, s.p.
POPD plan of mine development work of reserved mineral deposits (plán otvírky, přípravy a dobývání výhradních ložisek)
PÚ exploration area (průzkumné území)
ROPO Recognised Overseas Professional Organizations
Sb. Collection of Laws (abbreviated as Coll.) of the Czech Republic
SD Severočeské doly, a.s.
SITC Standard International Trade Classification
s. p. initials after a Czech company name indicate that it is a state public enterprise (státní podnik)
spol. s r. o. initials after a Czech company name indicate that it is a limited liability company (společnost s ručením omezeným), ditto initials s. r. o.
s. r. o. initials after a Czech company name indicate that it is a limited liability company (společnost s ručením omezeným), ditto initials spol. s r.o.
SU Sokolovská uhelná, právní nástupce, a.s.
t metric tonne, 1,000 kg, 1,000,000 g
tce tonne of coal equivalent, the energy unit representing energy 7 million kcal (29,3067 GJ) generated by burning one metric ton of coal; Czech steam coal 1 tce = 1.1 – 1.6 t, coke coal 1.0 – 1.3 t
ths thousand, 103
UNCTAD United Nations Conference on Trade and Development
UNECE United Nations Economic Commission for Europe
UNFC United Nations Framework Classification
UNSTAT United Nations Statistics Division (http://unstats.un.org/unsd/default.htm)
USGS United States Geological Survey – Geological survey of the USA
v. o. s. initials after a Czech company name indicate that it is an unlimited company (general partnership) (veřejná obchodní společnost)
VAT Value Added Tax
WBD Welt Bergbau Daten (World Mining Data), mineral yearbook of Austrian Federal Ministry for Science, Research and Economy
WNA World Nuclear Association
ZCHÚ specially protected area (zvláště chráněné území)

Exchange and inflation rates of currencies in which minerals are priced

Annual inflation rates (%) in the USA (US), the United Kingdom (UK), the Euro Area (EUR) and the Czech Republic (CZ)

	US	UK	EUR	CZ
1991	4.2	7.4	–	56.6
1992	3.0	4.3	–	11.1
1993	3.0	2.5	–	20.8
1994	2.6	2.1	–	10.0
1995	2.8	2.6	–	9.2
1996	2.9	2.4	–	8.8
1997	2.3	1.8	–	8.4
1998	1.5	1.6	–	10.6
1999	2.2	1.3	1.1	2.3
2000	3.4	0.9	2.1	3.8
2001	2.8	1.2	2.4	4.7
2002	1.6	1.3	2.3	1.8
2003	2.3	1.4	2.1	0.1
2004	2.7	1.3	2.1	2.8
2005	3.4	2.0	2.2	1.8
2006	3.2	2.3	2.2	2.5
2007	2.9	2.3	2.2	2.9
2008	3.8	3.6	3.3	6.3
2009	–0.3	2.2	0.3	1.0
2010	1.6	3.3	1.6	1.5
2011	3.1	4.5	2.7	1.9
2012	2.1	2.8	2.5	3.3
2013	1.5	2.6	1.3	1.4
2014	1.6	1.5	0.4	0.3
2015	0.1	0.0	0.0	0.3
2016	1.3	0.7	0.2	0.7
2017	2.1	2.7	1.5	2.4

Notes:

- *source – IMF. World Economic Outlook. October 2018*
- *inflation rates based on average annual changes of consumer price indices*

Average yearly exchange rates of CZK against EUR, USD and GBP

	EUR	USD	GBP
1991	–	29.5	52.0
1992	–	28.3	49.9
1993	–	29.2	43.8
1994	–	28.8	44.0
1995	–	26.5	41.9
1996	–	27.1	42.3
1997	–	31.7	51.9
1998	–	32.3	53.4
1999	36.9	34.6	56.0
2000	35.6	38.6	58.4
2001	34.1	38.0	54.8
2002	30.8	32.7	49.0
2003	31.8	28.2	46.0
2004	31.9	25.7	47.1
2005	29.8	23.9	43.6
2006	28.3	22.6	41.6
2007	27.8	20.3	40.6
2008	24.9	17.0	31.4
2009	26.4	19.1	29.7
2010	25.3	19.1	29.5
2011	24.6	17.7	28.3
2012	25.1	19.6	31.0
2013	26.0	19.6	30.6
2014	27.5	20.7	34.2
2015	27.3	24.6	37.6
2016	27.0	24.4	33.1
2017	27.0	23.4	30.1

Source: Czech National Bank

Mineral reserve and resource classification in the Czech Republic and its evolutional comparison with international classifications

Czech classification

After 1948 the reserve classification of the USSR was progressively adopted in Czechoslovakia, of which the Czech Republic formed part. A Commission for Classification of Mineral Reserves *(Komise pro klasifikaci zásob – KKZ)* was established in 1952, as a state agency to review the categorisation and estimation of reserves of all types of minerals, except radioactive ores.

Initially geological reserves (all reserves in their original state in the deposit without subtracting losses from mining, beneficiation and processing) were classified into subdivisions of groups and categories (slightly simplified).

Groups of geological reserves according to industrial utilisation:

nebilanční potentially economic – currently unminable due to a low grade, small deposit thickness, particularly complicated mining conditions, or due to the unfamiliarity with economic processing methods for the given mineral type, yet which may be considered as exploitable in the future

bilanční economic – minable, suitable for industrial utilisation and for the technical mining conditions for extraction

Categories of geological reserves according to the degree of deposit exploration:

A – explored in detail and delimited by mining works or boreholes, or by a combination of these. Geological setting, distribution of quality mineral types in the deposit and the technological properties of the mineral are known to such a degree that allow for the development of a method for beneficiation and processing of the mineral. Natural and industrial types of minerals are given. Reserves A include those parts of the deposit, where the geological setting, hydrogeological conditions and mining conditions are known to such a degree that a deposit development method can be developed**.**

B – explored and delimited by mining works or boreholes, or by a combination of these in a sparser network than in category A. It further includes reserves of deposits adjoining blocks of category A, verified by exploration works. The manner of geological setting, natural and industrial types of minerals are determined without knowing their detailed distribution in the deposit. The quality and technological characteristics of the minerals are given within a range allowing for a basic choice of a processing method. Hydrogeological conditions and general principles of deposit development are sufficiently clarified.

C_1 – determined by a sparse network of boreholes or mining works, or by a combination of these, as well as reserves which adjoin the reserves of categories A and B, if they are justified from a geological perspective. They also include the reserves of relatively complex deposits with a very irregular distribution of the mineral, even though these deposits were explored in detail. Included here are the deposit reserves partially mined-out with low recovery methods. The setting conditions, quality, industrial types and processing technology of the mineral are defined based on analyses or laboratory tests of samples, or based on analogy with explored deposits of a similar type. The hydrogeological conditions and the principles of deposit development are defined quite in general.

C_2 – are assumed based on geological and geophysical data, confirmed by sampling of the mineral deposit from outcrops, isolated boreholes or mining works. Also, reserves adjoining the reserves of A, B, C_1categories, where geological conditions for this exist.

It is further defined that project development and investment amounts for the construction of mining facilities are permitted on the basis of the economic mineral reserves in categories A+B+C_1, which are therefore reserves eligible for industrial utilisation. That is why, in practice, the economic reserves of categories A, B, C_1, or their total A+B+C_1 were designated by the term industrial reserves. Further improvement of the classification introduced Order of the CSSR Government no.80 in 1988 [7].

In 1963, KKZ established the prognostic reserves *(prognózní zásoby)* category in an amendment of its Principles for the Classification of Solid Minerals (hereinafter Principles) *(Zásad pro klasifikaci zásob pevných nerostných surovin)*. They were defined as unexplored mineral reserves, assumed on the basis of the formation patterns and the distribution of mineral deposits, and investigations, dealing with the geological structure and the history of geological evolution of the evaluated locality. The parameters for the evaluation of prognostic reserves (strike, length, thickness, average grade and the like) are determined according to geological assumptions or they are derived. According to the Principles, prognostic reserves are not listed in the national Register of Reserves *(bilance zásob)*. They serve only as a basis for future planning of geological exploration.

In 1968, KKZ innovated the definition of prognostic reserves. In the amended Principles for reserve classification, it established the division of reserves into proved (by exploration or mining) and assumed, or prognostic. Prognostic geological reserves are unverified reserves, however they are assumed based on geological, geophysical and other scientific knowledge and material. They are predominantly the reserves of larger localities and formations, and, in isolated cases, the reserves of unexplored parts of large structures or deposits.

Due to the establishment of the prognostic reserve category, geological reserves *(geologické zásoby)* can, with regard to contents, be translated into English as total resources. However up to 1989, the term resources did not appear in Czech or Czechoslovak classifications. But up to now, reserves also represent mineral accumulations, which meet the reserves criteria due to being explored, but which do not meet them due to technical and economic reasons (potentially economic reserves *nebilanční zásoby*). They are therefore mineral resources.

In 1981, the Czech Geological Office issued Directive No. 3 [3], where the present prognostic reserves *(prognózní zásoby)* were divided into categories D_1, D_2, D_3. They are defined as follows:

D_1 – relate to verified mineral deposit reserves, with which they form one whole deposit. Determined in delimited areas and quantifiable based on positive detection of an existing mineral and its basic quality characteristics.

D_2 – territorially independent. They are determined in a delimited area based on positive detection of an existing mineral and its basic quality characteristic. Analogies are also used for their determination.

D_3 – determined on the basis of regional investigation. So far, mineral existence has not been proven in such a way, in order to be able to delimit the area of their occurrence and to quantify the prognosis.

In October 1989, the Czech Geological Office issued Decree No. 121/1989 Coll., which redefined the prognostic reserve categories, changed their designation, and for the first time in the Czech Republic established the term resources. The term prognostic resources has been used instead of the term prognostic reserves ever since. The categories P_1, P_2, P_3 were as follows:

P_1 – assumed due to the continuation of an already investigated deposit beyond the reserve outline of category C_2 or due to the discovery of new deposit parts (bodies). The basis for this category are the results of geological mapping, geophysical, geochemical and other work in the area of possibly occurring prognostic resources: geological extrapolation of data results from the investigation, or the verification of part of the deposit. In justified cases this category also includes areas with isolated technical works which do not fulfill the requirements in order to be included in the reserves category C_2. The quantity and quality of the prognostic resources of this category is estimated according to the given deposit type and its part with detected reserves.

P_2 – assumed in basins districts and geological regions, where deposits of the same formation and generation type were detected. It is based on a positive evaluation of deposit indications and anomalies observed during geological mapping and geophysical, geochemical and other work, whose prospect is, if necessary, confirmed by a borehole or surface excavation work. The prognostic resource estimate of assumed deposits and the concept of the shape and dimensions of the bodies, their composition and quality, are derived by analogy with known deposits of the same type.

P_3 – assumed solely on the basis of conclusions concerning the formation possibilities of the deposit types under consideration with regard to favourable stratigraphic, lithological, tectonic and paleogeographic conditions detected while evaluating the locality during geological mapping, and during analysis of geophysical and geochemical data. The quantity and quality of prognostic resources is estimated according to assumed parameters of the deposit development by analogy with more closely explored localities, where deposits of the same genetical type were detected or verified. The prognostic resources of minerals in category P_3 can only be displayed by a surface projection.

The amendment of Mining Act no. 541/1991 Coll. divided the classification of reserves (reserved deposits) according to exploration into the categories of prospected reserves (*vyhledané zásoby)* and explored reserves *(prozkoumané zásoby)*, and, according to exploitability conditions, into economic reserves *(zásoby bilanční)* and potentially economic reserves *(zásoby nebilanční)* .

Economic – reserves suitable for existing technical and economic conditions in exploiting a reserved deposit.

Potentially economic reserves – currently unexploitable due to being unsuitable for existing technical and economic conditions of exploitation, yet assumed to be exploitable in the future in consideration of expected technical and economic development.

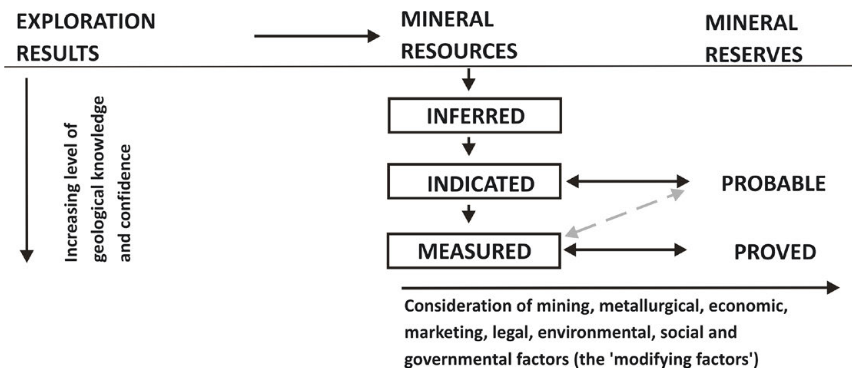
Neither this amendment nor any other regulation defined the content of the terms **prospected** and **explored** reserves. In practice, these categories are identified with the categories of reserve exploration, as they were in effect before the amendement of Mining Act no. 541/1991 Coll., in the following manner: explored reserves = sum of reserve categories A + B + C_1 (also called industrial), prospected reserves = reserves of category C_2.

International classifications

International systems of classifying reserves and resources developed most rapidly in the last quarter of the twentieth century. In 2001, the Pan European Reserves and Resources Reporting Committee (PERC) published Code for Reporting of Mineral Exploration Results, Mineral Resources and Mineral Reserves [1]. This corresponds to the reporting standards of the Australian, Canadian, South African and other organisations grouped in the Combined Reserves International Reporting Standards Committee (now called Committee for Mineral

Reserves International Reporting Standards) – CRIRSCO which is a subcommittee of CMMI (Council of Mining and Metallurgical Industries). It is summarized as follows:

Relations between mineral reserves and resources, their definitions
Chart of the relations [1]



The given definitions are in accordance with the definitions of the UNFC (United Nations Framework Classification) classification of the UN, published by UN-ECE in 1997 [4]. This classification divides (just as, for example, the classification of the USA [5]) its categories according to economic feasibility (quantity and quality of the mineral in situ) in one direction into 3 groups. For the division according to the level of geological knowledge it does not use one direction, one criterion (verification according to technical work carried out), as is common, but two directions, two criteria: 1) According to which of the 4 phases of exploration (from geological to mining) and 2) according to which study (from geological to mining) the given mineral accumulation was prospected or verified. Thus in the area between the axes E (economic), F (feasibility) and G (geological), a total of 36 categories can be established mechanically, out of which about 10 actually exist. The categories are marked with a three-digit code and a priori do not have designations (although recommended designations exist).

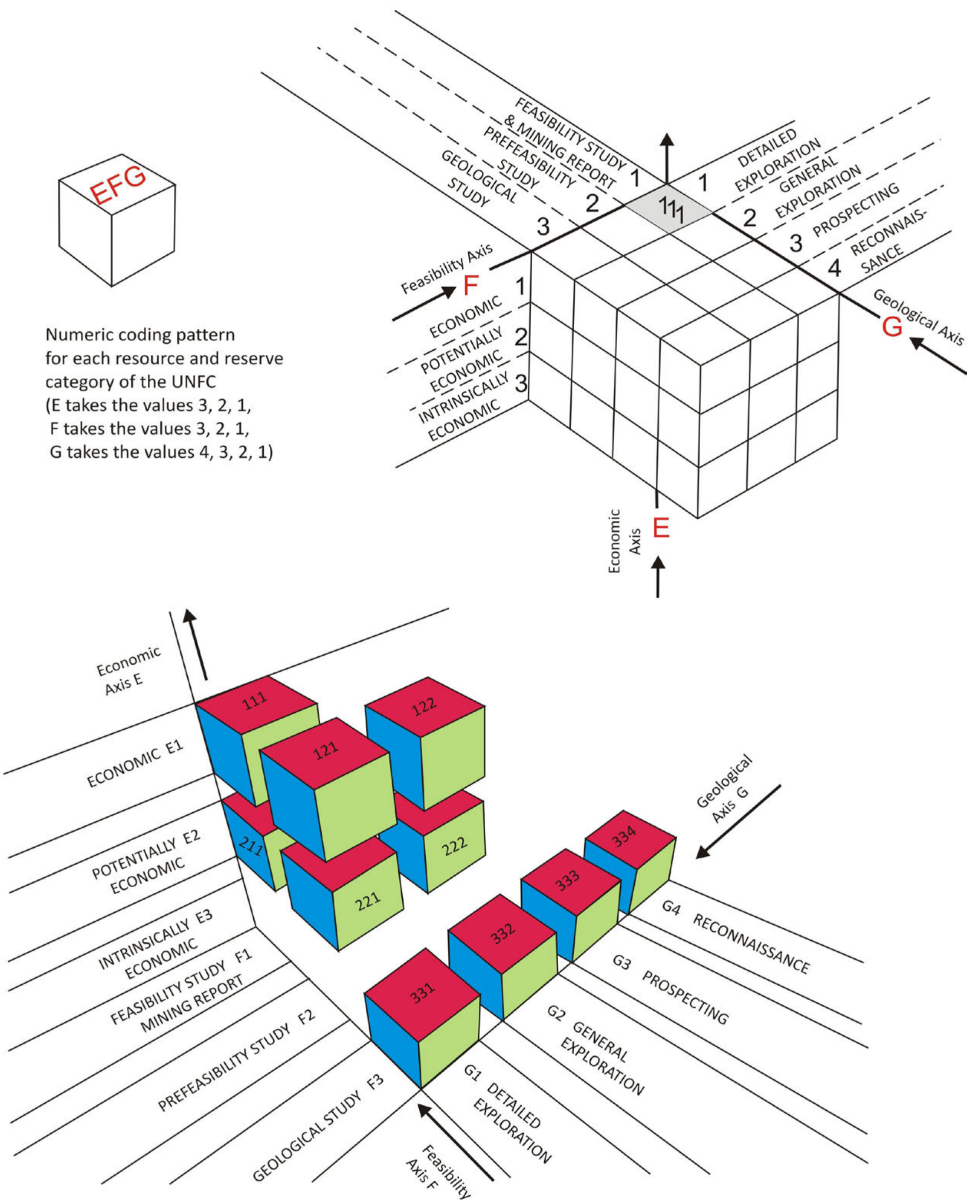
(Notice: In the course of discovery and verification of mineral deposits and their estimations of mineral resources and reserves two fundamental stages connect at each other: prospecting and exploration.

Prospecting is a set of geological activities aiming at discovery of a mineral accumulation (mineral accumulations) which could be a mineral deposit (mineral deposits) and to express in numbers its (their) mineral resources.

Exploration is to decide if a mineral accumulation (prospective mineral deposit) is a mineral deposit or not and if it is, to estimate its mineral reserves.)

An important aspect of the European and similar reporting codes is the concept of the "competent person". He/she is responsible for the calculation of reserves and its categories, is a member of an acknowledged professional society (which sees to the expertise and ethics of its members via sanctions), and has expert and moral qualities. His estimates are accepted as reliable by banks and securities exchanges. Competent persons are members of Recognized Overseas Professional Organizations (ROPO). A list of organisations is compiled by the Australasian Joint Ore Reserves Committee (JORC).

Two ways of presenting UNO spatial mineral resource - reserve classification system (United Nations Framework Classification)[4]

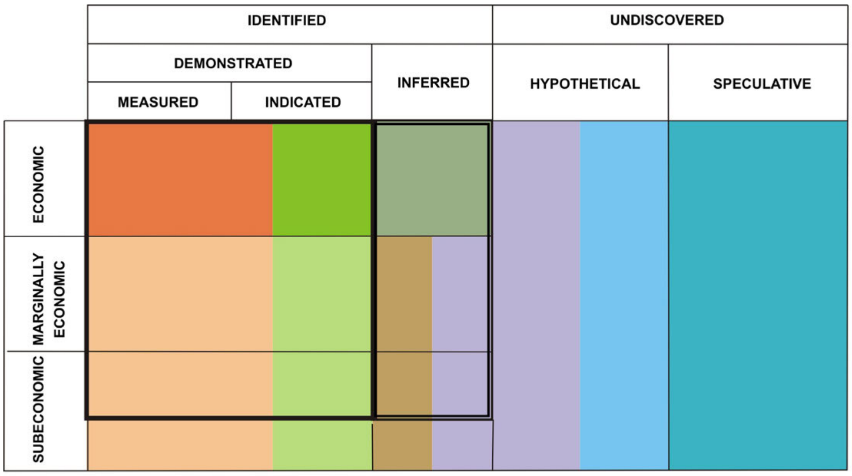


Although some national and international classifications are relatively complicated, the mining industry frequently still makes do with only the categories of proved and probable reserves. If it is seeking funds from banks or share issues (initial public offering) on securities exchanges, it must respect the regulations for reporting its mineral reserves. The securities exchanges have reporting requirements which are particularly strict or even provided by law. In general they require adherence to the reporting codes of the international organizations such as those that cooperate in framing the European Code [1].

Comparison of Czech and international systems of classification

The following scheme and table compare the reserve and resource classifications of the Czech Republic with the international classifications discussed above.

Comparison of the mineral resource classification valid in the USA from 1980 [5] with the reserve and resource classifications valid in the territory of the Czech Republic from 1956



Reserve Base

Inferred Reserve Base

A+B economic reserves, part of economic explored reserves

A+B potentially economic reserves, part of potentially economic explored reserves

C_1 economic reserves, part of economic explored reserves

C_1 potentially economic reserves, part of potentially economic explored reserves

C_2 economic reserves, economic prospected reserves

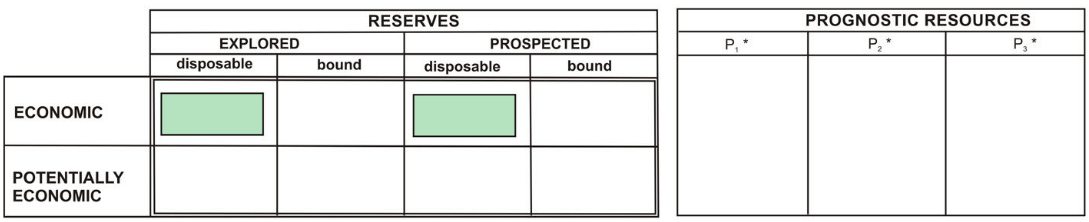
C_2 potentially economic reserves, potentially economic prospected reserves

D_1, P_1

D_2, P_2

D_3, P_3

HISTORY OF RESERVE AND RESOURCE CLASSIFICATION ON THE TERRITORY OF THE CZECH REPUBLIC



* effective from 1989

Geological reserves = all reserves in their original state without considering mining losses and dilution

Exploitable reserves = economic reserves reduced by estimated mining losses

reserves of categories A + B + C (before 1991)	= explored reserves (since 1991)
reserves of category C_2 (before 1991)	= prospected reserves (since 1991)
disposable reserves	= reserves mining of which is not made impossible by protection of surface objects and mining workings
bound reserves	= reserves in protection pillars of surface objects and mining workings
exploitable reserves	= economic geological reserves reduced by amount of prospective mining losses connecting with selected mining technology or with natural conditions
categories A, B, C_1	= so-called industrial categories of reserves (before 1991)
reserve of categories A + B + C_1	= so-called industrial reserves (before 1991), also - in the limited interpretation - economic explored disposable reserves

Is to be noted that reserves in the Czech classification still include potentially economic reserves, i.e. reserves which are currently not recoverable and which are, therefore, potentially economic resources. The term reserves as used, by contrast, in standard international classifications represents only the parts of explored resources which are available for immediate or developed extraction. All other registered parts are resources, not reserves, of a given mineral. Is to be also mentioned that the standard international classifications indicate reserves considering mining recovery and dilution. On the other hand the Czech reserves are mentioned in situ, without influence of recovery and dilution. Therefore Czech economic recoverable (exploitable) reserves are the nearest to the international standards. However, even in this case there is no full accord as this reserves consider recovery of reserves but not their dilution.

Comparison of UNFC with the reserve and resource classifications of the Council of Mining and Metallurgical Industries (CMMI) [4] and of the Czech Republic

Code of the UNFC category	Proposed designation of the UNFC category	CMMI category	Czech categories up to 1981	Czech categories in 1981–1989	Czech categories in 1989–1991	Czech categories after 1991
111	Proved Mineral Reserve	Proved Mineral Reserve	economic reserves – part of exploitable part* A+B	economic reserves – part of exploitable part* A+B	economic reserves – part of exploitable part* A+B	part of exploitable part* of explored economic reserves
121 + 122	Probable Mineral Reserve	Probable Mineral Reserve	economic reserves – part of exploitable part* of A + B + C_1	economic reserves – part of exploitable part* of A + B + C_1	economic reserves – part of exploitable part* of A + B + C_1	part of exploitable part* of explored economic reserves
123		Inferred Mineral Resource	economic reserves – C_2	economic reserves – C_2	economic reserves – C_2	prospected economic reserves
211	Feasibility Mineral Resource	Measured Mineral Resource	potentially economic reserves – A+B	potentially economic reserves – A+B	potentially economic reserves – A+B	part of explored potentially economic reserves
221 + 222	Prefeasibility Mineral Resource	Indicated Mineral Resource	potentially economic reserves – C_1	potentially economic reserves – C_1	potentially economic reserves – C_1	part of explored potentially economic reserves
223		Inferred Mineral Resource	potentially economic reserves – C_2	potentially economic reserves – C_2	potentially economic reserves – C_2	prospected potentially economic reserves
331	Measured Mineral Resource	Measured Mineral Resource	potentially economic reserves – A + B	potentially economic reserves – A + B	potentially economic reserves – A + B	part of explored potentially economic reserves
332	Indicated Mineral Resource	Indicated Mineral Resource	potentially economic reserves – C_1	potentially economic reserves – C_1	potentially economic reserves – C_1	part of explored potentially economic reserves
333	Inferred Mineral Resource	Inferred Mineral Resource	potentially economic reserves – C_2 + part of prognostic reserves	potentially economic reserves + part of D_1	potentially economic reserves + part of P_1	prospected potentially economic reserves + part of P_1
334	Reconnaissance Mineral Resource	not available	part of prognostic reserves	D_2 + D_3+ part of D_1	P_2 + P_3+ part of P_1	P_2 + P_3+ part of P_1

** geological reserves reduced by amount of prospective mining losses*

Conclusions

If they are to be of practical use national and international classifications have to respect the information base given by the reserve estimations of mining enterprises. It may be unsuitable to overly expand the classification requirements or expectations beyond the realistic means of this base. Combining a classification with a study (project), which classifies given resources or reserves, or with a prospecting and exploration phase, in which mineral resources and reserves were estimated, causes problems. For economic (acquiring financial means, taxes, market position) or political reasons, a prospector or a mining company developer may be led, for example, to move their exploration phase higher or lower in comparison with its actual position. In socialist (communist) Czechoslovakia with its completely nationalised industry, commerce and services, results of geological prospecting and exploration were judged not according to the mineral reserves prospected or verified by exploration, but according to the fulfillment of exploration work plans, whether planned investments in exploration were completely spent on "drilling and digging", or not. The wage of the employees of exploration and mining organisations depended on the fullfilment of plans. That is why at all levels, there was also an interest, that prospecting and exploration constantly continue. Consequently, prospecting strictly speaking and general exploration were the most frequent type of prospecting, and verified reserves were possibly never categorised under A. They were commonly only inserted into categories C_1 and C_2. That enabled their permanent verification. On the other hand, many mining organisations mined the reserves of category C_2 which however could have been ranked factually higher; they were over-explored.

References

[1] Code for reporting of mineral exploration results, mineral resources and mineral reserves (The Reporting Code). – http://geolsoc.org.uk/webdav/site/GSL/shared/pdfs/Fellowship/UK_Euro%20Reporting%20 Code.pdf

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[7]**** Nařízení vlády Československé socialistické republiky č.80/1988 Sb., o stanovení kondic, klasifikaci zásob výhradních ložisek a posuzování, schvalování a státní expertize jejich výpočtů.

Translations of Czech article (and legislation) titles:

* *Problems of evaluation and classification of reserves/resources of solid mineral raw materials*

** *Directive no. 3/1981 of the Czech Geological Office for evaluation and registration of geological prognoses and prognostic reserves of minerals*

*** *Mineral exploration and management of reserved deposit mineral reserves (proposal for analysis of the third part of the Mining Act)*

**** *Order of the Czechoslovak Socialistic Republic Government, on setting of standards, classification of reserves of reserved deposits and on assessing, approval and the State expertise of their estimates*

INTRODUCTION

This year, the yearbook *Mineral Commodity Summaries of the Czech Republic* is being published for the twenty-sixth times in its history. It was published and distributed on behalf of the Ministry of Economy until 1996, and on behalf of the Ministry of the Environment from 1997 till present.

After the dissolution of the state-funded organization Czech Geological Survey - Geofond on 31 December 2011, the semi-budgetary organization Czech Geological Survey was charged with compiling the publication *Mineral Commodity Summaries of the Czech Republic*. With isolated interruption in 2011, the Ministry of the Environment commissions the compilation and distribution of the publication, by increasing the budget of the Czech Geological Survey, under which continues to compile the yearbook. This enables the continuation of the unique research (and its publication) regarding the geological evolution of the area of the Czech Republic and the development of the Cech and global economies relate to minerals, economic situation of domestic mining companies, relation of mining to nature protection and regarding the expenses of rectifying negative impacts of mining in the Czech Republic.

The yearbook is published and distributed predominantly in electronic format. Nevertheless before the next year 100th establishment anniversary of the Czechoslovak State Geological Institute in 1919, legal predecessor of the contemporary Czech Geological Survey, the paper edition changes to the new bigger size which provides readers with more comfort.

The publication continues to provide information for those interested in the research, exploration and mining of mineral deposits in the Czech Republic and in the environmental impact of mining in the Czech Republic. It of course continues to cover the most important minerals of the Czech Republic that are or have recently been of industrial importance, but also those minerals, whose reserves or (approved and unapproved) resources have not been mined in the Czech Republic in the past. The listed minerals also include minerals unmined in the present and past, without existing resources and reserves, which are items of Czech foreign trade that can be monitored via tariff items. The publication includes basic data on the status and changes in the mineral reserves of the Czech Republic taken from the Register of Mineral Deposit Reserves of the Czech Republic *(Bilance zásob výhradních ložisek nerostů České republiky)* (hereinafter "the Register"), which is published for a limited number of state administration agencies.

Additional information on domestic prices of minerals, imports and exports, major mining companies, and the location of mineral deposits is intended to assist in understanding the mineral potential of the Czech Republic and to stimulate investment in the minerals industry. This is also aided by the listed prognostic resources, both officially approved by the Commission for Projects and Final Reports of the Ministry of the Environment *(Komise pro projekty a závěrečné zprávy – KPZ)* in categories P_1, P_2, P_3 and unapproved by KPZ (mentioned only in expert reports).

The mineral reserves presented are geological reserves, also called *total reserves*, i.e. original reserves (in situ) within individual deposits, estimated according to the given classification and technical-economic conditions of their exploitability. The initial data come from mineral reserve estimates, which were approved or verified in the past by the Commission for Classification of Mineral Reserves and/or by the Commission for Exploration and Mining of Reserved Minerals of the former MHPR ČR and MH ČR, or by former commissions for management of mineral reserves of individual mining and processing industries. Uranium reserves and reserve estimates were approved by the Commission for Classification of Radioactive Mineral Reserves of the former Federal Ministry of Fuels and Energy. Currently, an approval of a reserve estimation lies within authority of the subject financing the estimation. If the subject is a private company, the company itself approves its reserve estimation. If the subject is the state, the KPZ approves the estimation. In accordance with section 14, article 3) of the Mining Act no. 44/1988 Coll. as amended also the private company submits its reserved mineral reserve estimation to the KPZ via the Ministry of the Environment of the Czech Republic, so that the KPZ may review if the estimation report contents comply with the provisions of the Mining Act.

There are reserved and non-reserved minerals and deposits as defined by the Mining Act no. 44/1988 Coll., as amended. Reserved minerals always form reserved deposits which are owned by the Czech Republic. Non-reserved deposits are owned by landowners. Non-reserved minerals (construction minerals) can form both reserved and non-reserved deposits. Until 1991, (important) deposits of non-reserved minerals of sufficient mineral quantity and quality were proclaimed „suitable for the needs and development of the national economy", hence reserved as defined by the Mining Act at that time. Since 1991, the newly recognised and explored deposits of non-reserved minerals always form non-reserved deposits.

In 1993–2001, the Ministry of the Environment along with the Ministry of Industry and Trade undertook a fundamental economic revaluation of the mineral wealth of the Czech Republic**.** In 2003–2006, the task has continued to a smaller extent. Therefore compared to past years, many considerable changes have occurred in the number of deposits and registered reserves of many minerals (especially metallic ores).

The *Mineral Commodity Summaries of the Czech Republic* includes selected minerals according to whether they are or were mined in the territory of the Czech Republic. Currently mined minerals also include approved prognostic resources, if existing. Currently unmined minerals are divided into those that were mined in the past and those that have never been mined. In both cases, it is distinguished whether their resources and reserves are known or not and, generally, also whether they are metallic ores or industrial minerals. Separate chapters are dedicated to each mineral, or mineral grouping common in its deposit. Each chapter is structured identically. The separate chapters of *currently mined minerals* listed - mineral fuels, industrial and construction minerals, which are of economic importance and of substantial reserves in the territory of the Czech Republic - consist of six parts.

Part 1 - Registered deposits and other resources of the Czech Republic – is based on the inventory of mineral deposits of the Czech Republic and, for the majority of minerals, includes a list of deposits and their location. The names of exploited deposits are given in bold. As for energy minerals and some industrial minerals, only regions and basins rather than single deposits are given. As for dimension stone and construction minerals, which are scattered in hundreds of deposits over the whole territory of the Czech Republic, their groupings are located in the subdivisions of reserved, non-reserved, exploited and unexploited deposits.

Part 2 - Basic statistical data of the Czech Republic as of December 31 – are extracted especially from the Register. There are 3 groups of minerals (ores, energy minerals, and reserved industrial and construction minerals) registered in the Czech Republic. Mine production of non-reserved deposits has been monitored since 1999. Approved prognostic resources are stated, too, if proved they exist.

NOTE:* The *Register* presents the *reserves* data in the categories on exploration (prospected, explored) and economic use (economic, potentially economic), as stipulated by relevant statutes starting with the Mining Act. *Reserves* include *potentially economic reserves,* i.e. reserves which are currently not recoverable and which are, therefore, *potentially economic resources.* Consequently, *total mineral reserves* are in reality *total mineral resources*. The term *reserves* as used, by contrast, in standard international classifications represents only the parts of explored resources which are available for immediate extraction. All other registered parts are resources, not reserves, of a given mineral.** The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter of this yearbook ***"Mineral reserve and resource classification in the Czech Republic and its evolutional comparison with international classifications".

Part 3 - Foreign trade – provides information on import and export, and on average import and export prices of important tariff items of the given raw material (and cites international numeric codes of the tariff items). The foreign trade data are the latest (continuously reviewed) data of the Czech Statistical Office (ČSÚ) – without analyses of their reliability.

Part 4 - Prices of domestic market – provides indicative prices on domestic production, import and export prices. Domestic prices do not include VAT.

Part 5 - Mining companies in the Czech Republic as of December 31, 2017 – provides a list of companies mining the given mineral in the territory of the Czech Republic. The companies are listed according to the production level. Their addresses are available at the Czech Geological Survey.

Part 6 - World production and world market prices - provides data on mining and production of commercial products for the last 5 years, and lists significant world producers, i.e. the top ten countries in world production. Evolution of world prices is mentioned as current quoted or indicative prices in the last five years.

Numerous domestic and foreign data, used in compiling the present yearbook, came from journals, expert literature and the latest editions of various international statistical yearbooks.

MINERAL BASE OF THE CZECH REPUBLIC AND ITS DEVELOPMENT IN 2017

Petr Uldrych et al.
Ministry of the Environment of the Czech Republic

1. Legal framework for mineral resource use

1.1. Reserved and non-reserved minerals and their deposits

The minerals defined in Act No. 44/1988 Coll., on the Protection and Use of Mineral Resources (the Mining Act) as amended, are classified as being reserved and non-reserved. Natural accumulations of reserved minerals form reserved mineral deposits which constitute the mineral wealth of the country and are owned by the Czech Republic. Deposits of non-reserved minerals (especially sand and gravel, crushed stone and brick clay) are a constituent part of the land as stipulated in paragraph 7 of the Mining Act. The possibility to declare significant non-reserved mineral deposits as reserved deposits, was cancelled by the amendment of the Mining Act in 1991. Decisions of administrative agencies in this matter, which had been issued before the amendment went into effect, remain valid based on transitional provisions (paragraph 43 and 43a of the Mining Act). The deposits specified by these decisions are still reserved deposits, i.e. owned by the state, separated from the land itself.

1.2. Planning, approval and carrying out of mineral prospecting and exploration

1.2.1. Reserved minerals

Prospecting and exploration for reserved mineral deposits, by virtue of the ČNR Act No. 62/1988 Coll., on Geological Work (the Geological Act) as amended, may be conducted by an individual or organisation, providing that the work is managed and guaranteed by a qualified and certified person (certified responsible manager for the geological work). An organisation seeking to prospect for and explore these mineral deposits, to verify their reserves, and to process geological documents for their exploitation and protection, must make a request to the Ministry of the Environment to establish an exploration area. The proceedings, subject to administrative rules, are concluded by the establishment or non-establishment of an 'exploration area' (exploration permit). In the former case, the following must be determined: the survey area, the mineral to be prospected and explored for which the exploration area is being established, the conditions for the execution of the work, and the period of validity of the exploration area. The exploration area is not a territorial decision, but provides the entrepreneur or organisation (hereinafter "entrepreneur") with the exclusive privilege to prospect for the mineral in a given exploration area. In the first year, the entrepreneur is obliged by law to pay a tax of CZK 2,000 per km² or km² piece of exploration area, which increases annually by CZK 1,000 per km² and its piece (to CZK 3,000 in the second year, to CZK 4,000 in the third year, etc.). These taxes represent an income for the municipalities, in whose cadastral areas the exploration area is established. If an exploration area lies on cadastral areas of more municipalities the income is divided after ratio of exploration areas on cadastral areas of individual municipalities.

Within the scope of planning and conducting the prospecting for and exploration of reserved mineral deposits, the organisation must consider the conditions and interests protected by special regulations (section 22 of the Act on Geological Work). These primarily refer to the laws for the protection of landscape and nature, agricultural and forest land; to the Water and Mining Acts etc. The Ministry of the Environment can cancel the established exploration area, if the organisation repeatedly or severely violates the obligations set by the Geological Act.

1.2.2. Non-reserved minerals (and their mining)

The above-mentioned enactments apply to prospecting and exploration for non-reserved mineral deposits, only, if they were previously declared as reserved deposits according to the transitional provisions of the Mining Act. In other cases, an organisation can prospect and explore for non-reserved minerals only upon agreement with the landowner. The provision under section 22 of the Act on Geological Work is also valid in these cases. The mining of non-reserved deposits, which constitutes a part of the land, an operation conducted according to the mining methods set by Act No. 61/1988 Coll., on Mining Operations, Explosives and the State Mining Administration, as amended.

1.3. Permit to mine a prospected and explored deposit

If, during prospecting and exploration, a reserved mineral is found to be of quality and quantity indicative of its accumulation (supported by a partial deposit reserve estimate given in the category of prospected reserves), the organisation must report it to the Ministry of the Environment, which issues a certificate for the reserved deposit owned by the state. At the same time, this certificate ensures the deposit against actions rendering its mining difficult or impossible by the establishment of a protected deposit area (CHLÚ) according to section 17 of the Mining Act.

The entrepreneur’s right to mine the reserved deposit is provided by the grant of a mining lease. The submittal of a proposal for the grant of a mining lease must be preceded by an approval from the Ministry of the Environment, which may depend on the fulfilment of limiting conditions accounting for the interests of the state mineral policy, and on covering expenses of geological work already funded by the state. The organisation, on whose behalf the exploration was carried out, has priority in receiving the approval for the grant of the mining lease. If it fails to assert its mining lease, precedence is then given to the organisation which participated financially in the exploration. Somewhat different rules apply to cases concerning crude oil and natural gas based on a transposed EU directive.

The mining lease is only granted to an entrepreneur possessing a Certificate of Mining Operations issued by an authorised Regional Mining Office. This grant procedure takes place in cooperation with relevant administrative agencies, mainly in agreement with environmental, land use planning and building authorities. The entrepreneur‘s proposal for the grant of a mining lease must be furnished with documentation as stipulated by law. The procedure deals with landowner relations and settlement of conflicts of interests, which are protected by special regulations. The environmental impact assessment (EIA) represents a part of the documentation, too. The grant of a mining lease represents a mining as well as land use authorisation.

The entrepreneur, who has been granted a mining lease, may start mining operations only after obtaining a mining permit from the authorised Regional Mining Office. The issue of this permit is subject to an administrative procedure assessing the plans of the opening, the preparation and the mining of the deposit, and the plans for rehabilitation and reclamation after termination of the mining. In justified cases, the Regional Mining Authority may combine the grant of a mining lease and of a mining permit into one administrative procedure.

1.4. Royalties on reserved minerals mined

The entrepreneur is obliged to pay royalties on the mining lease and the extracted reserved minerals. An annual lease payment of CZK 300 is assessed on every hectare opened within the mining lease area, which is marked off on the surface. If there is permitted a mining activity

Royalty tariffs on extracted minerals for individual royalty bases

Mineral, group of minerals	Unit	Tariff for unit in CZK
Crude oil	m^3	558.00
Combustible natural gas	m^3	0.27
Uranium	t	5 834.13
Cesium	kg	16 0782.00
Tin	t	22 726.00
Lithium	t	10 692.00
Manganese	t	2 308.00
Copper	t	7 115.00
Rubidium	kg	114 103.00
Tungsten	t	46 625.00
Golg	kg	40 919.00
Gemstones – moldavites	kg	1 939.59
Gemstones – garnets	kg	1 500.00
Gemstones – mass SiO_2	kg	10.00
Diatomite	t	4.95
Glass and foundry sand	t	8.24
Bentonite	t	3.32
Minerals used to stonework inclusive of fissile slates	m^3	17.55
Gypsum	t	21.84
Graphite	t	30.00
Technically utilisable mineral crystals	t	15.00
Ceramic and refraktory clays and claystones	t	34.74
Kaolin	t	30.00
Quartz, quartzite, dolomite, marl, basalt, phonolite, trachyte if the minerals are suited for technochemical or melting processing.	t	4.36
Feldspar	t	13.73
Wollastonite	t	5.00
High-purity limestone	t	10.55
Other limestones and corrective additives for cement production	t	3.25
Bituminous coal	t	9.90
Brown coal – opencast mining	GJ	1.18
Brown coal – underground mining	t	3.88
Crushed stone	m^3	2.91
Sand and gavel	m^3	3.39
Brick clays and related minerals	m^3	1.40
Other minerals	t	50.37

in the mining lease consisting in the opening, the preparation and the mining of the reserved deposit this annual payment amounts CZK 1,000. The Regional Mining Authority fully transfers this payment to the municipalities, in whose territories the mining lease is located, according to the lease proportions in each municipal territory.

An annual royalties on minerals extracted in mining leases are given by the Government Provision no. 98/2016 Coll. from 16.3.2016, paragraph 33k, article 2 of the Mining Act in the wording of the Act 89/2016 Coll. amending the Mining Act no. 44/1988 Coll. on mineral protection and use.

The royalty is calculated as the product of royalty base, given by amount of mineral mined reported as net mine production in the mining lease, and the royalty tariff defined in Annex to the Government Provision no. 98/2016 Coll. for the mineral in question.

The Regional Mining Authority transfers the yielded royalties partly to the state budget of the Czech Republic to be purposefully used in remediation of environmental damage caused by the mining of reserved and non-reserved deposits, for the provision of discharge of the state geological service connected to protection and registration of mineral wealth and partly to the budget of the relevant municipalities. Portions of the state budget and the budget of the relevant municipalities differ for different minerals and are given by the Mining Act.

1.5. Reserves for mining damages and remediation during the mining of reserved minerals

During the course of mining, the entrepreneur is required to generate sufficient financial reserves for mining damages and for reclamation of areas affected by the deposit exploitation.

2. Selected statistical data on exploration and mining on the territory of the Czech Republic

Statistical data/Year		2013	2014	2015	2016	2017
registered geological works a)	total	3 340	3 585	4 128	5 610	6 225
	economic geological	22	27	26	11	11
protected deposit areas – number		1 098	1 100	1 105	1 112	1 123
mining leases – total number		969	973	974	967	968
number of exploited reserved deposits		502	504	505	507	506
number of exploited non-reserved deposits		203	209	208	221	203
mine production of reserved deposits, mill t b)		107	109	114	110	109
mine production of non-reserved deposits, mill t b)		11	10	12	12	12
organizations managing reserved deposits		321	318	319	322	326
organizations mining reserved deposits		179	181	179	184	180
organizations mining non-reserved deposits		170	152	165	166	147

Note: numbers of data in view are given unless otherwise indicated

a) engineering-geological and hydrogeological works prevail

b) conversions: natural gas 1 mill m^3 = 1 kt, dimension and crushed stones 1,000 m^3 = 2.7 kt, sand and gravel and brick clays and related minerals 1,000 m^3 = 1.8 kt

3. Significance of mining in the Czech economy

Ratio/Year	2013	2014	2015	2016	2017
Annual GDP * growth	–0.5	2.7	5.4	2.5	4.5
Share of mining and quarrying in GDP, % of current prices	0.8	0.9	0.9	0.7	0.7
Share of mining and quarrying GVA in GVA of industrial production**, % of current prices	2.9	3.2	2.9	2.3	2.4

Source: Czech Statistical Office, own calculations
*Notes: * GDP determined by production approach, volume indices, stable period of previous year = 100*
*** Industrial production = mining and quarrying + manufacturing + electricity + gas, steam and air conditioning supply*

4. Trends of reserves of minerals (economic explored disposable reserves)

Totals in mill t (if not otherwise stated)

Statistical data/Year	2013	2014	2015	2016	2017
Metallic ores [a)]	26	27	27	46	92
Energy minerals [b)]	2 847	2 807	2 769	2 850	2 850
of which: uranium (U) (kt)	1	1	1	1	1
crude oil	21	21	21	21	21
natural gas [b)]	6	6	6	6	6
Industrial minerals	2 684	2 673	2 612	2 398	2 541
Construction minerals [c)]	5 153	5 107	5 156	5 140	5 174

Note:
[a)] till 2013 only Au ores (25 642 kt), in 2014-2015 Au ores (25 642 kt) and Li ores (860 kt), in 2016 Au (25 642 kt), Li (860 kt) and Sn-W (19 703 kt) ores
[b)] natural gas – conversion into kt: 1 mill m^3 = 1 kt
[c)] at reserved mineral deposits including dimension stone, conversion into kt – dimension and crushed stones 1,000 m^3 = 2.7 kt, sand and gravel and brick clays and related minerals 1,000 m^3 = 1.8 kt

Generating of the financial reserves is approved by the Regional Mining Authority during the mining permit procedure regarding the opening and extraction of the deposit. Drawing on the reserves is permitted by the Regional Mining Authority upon agreement with the Ministry of the Environment and upon notification by the relevant municipality. In the case of (partially) state-owned enterprises, the Regional Mining Authority decides in agreement with the Ministry of Industry and Trade.

5. Summary of exploration licences valid in 2017 and newly issued in 2017 (listed according to minerals) – prospecting and exploration works financed by companies

Minerals and underground placement sites	Number of valid EA (min. 1)	Number of valid EA (min. 2)	Number of new issues in 2017	Start of validity in 2017
Bituminous coal	1	–	–	–
Crude oil and natural gas	20	–	1	1
Sn–W and Li ores	10	–	1	1
Li ore	–	10	1	1
Cu ore	–	4	–	–
Graphite	–	–	–	–
Gemstones	7	–	2	2
Kaolin	10	–	2	2
Clays	5	–	1	1
Bentonite	7	–	–	–
Feldspar and feldspar substitutes	12	–	–	–
Silica raw materials	2	–	–	–
Corrective additives for cement production	–	–	–	–
Dimension stone	–	–	–	–
Crushed stone	–	–	–	
Sand and gravel	9	–	–	–
Underground placement sites, underground reservoirs	6	–	–	–
Total	**89**	**14**	**8**	**8**

EA - exploration area
Mineral 1 (min. 1) – in case that the raw material is the major one
Mineral 2 (min. 2) – in case that the raw materials is a by-product

6. State-funded geological projects

6.1. Economic geology projects

The Central Geological Authority of the state administration fulfils the duty involving the state register of reserved deposits – state property (section 29 of the Mining Act). Accordingly, it issues the register as one of the main sources for

- land use planning
- the raw material policy
- the energy policy
- the environmental policy
- the structural policy
- the employment policy

The register lists the latest status of the deposits as documented in the reserves estimate. The reserves estimate is prepared with respect to the conditions of exploitability expressing

- the state of the market, prices, business economy,
- the mining and technical conditions of exploitation,
- the conflicts of interests arising from the deposit exploitation (primarily environmental protection and other conflicts)

It is altogether entirely unstable factors reflecting political, economic and social change (in the largest sense).

In the field of economic geology the up-dating of information on mineral deposit potential, state of mineral resources and IT solution of a new Oracle based platform for the Czech Geological Survey mineral database (SurIS) continued. Last stage of correction of inventory and information on current state of selected non-reserved mineral deposits utilization based on document Hor(MPO)1-01 continued and was finished. Data for publication Mineral commodity summaries of the Czech Republic were elaborated and currently digitizing of mineral deposits and exploration areas records (Mineral deposit information system – LIS) continued. Mineral deposit exploration for the establishment of a protected deposit area took place in Slavče cadastral territory at Trhové Sviny in 2017.

Expenditures for state-funded exploration work related to economic geology (rounded values)

1993	CZK 248.7 mill	2006	CZK 1.7 mill
1994	CZK 249.8 mill	2007	CZK 3.0 mill
1995	CZK 242.3 mill	2008	CZK 9.9 mill
1996	CZK 163.0 mill	2009	CZK 10.1 mill
1997	CZK 113.2 mill	2010	CZK 4.2 mill
1998	CZK 114.2 mill	2011	CZK 4.0 mill
1999	CZK 110.8 mill	2012	CZK 1.0 mill
2000	CZK 26.3 mill	2013	CZK 1.5 mill
2001	CZK 21.5 mill	2014	CZK 0.7 mill
2002	CZK 17.0 mill	2015	CZK 0.7 mill
2003	CZK 7.0 mill	2016	CZK 1.7 mill
2004	CZK 26.2 mill	2017	CZK 0.9 mill
2005	CZK 12.0 mill		

6.2. Other geological projects

Mainly geological work of a non-economic geology character was funded by the state. Individual projects were publicly commissioned in order to implement the following partial programmes:

- geological informatics
- geological mapping
- geohazards of the environment
- hydrogeology
- engineering geology
- comprehensive geological studies

The following expenditures were spent on these geological projects since 1998:

1998	CZK 29.6 mill	2008	CZK 41.0 mill
1999	CZK 39.2 mill	2009	CZK 42.2 mill
2000	CZK 48.5 mill	2010	CZK 35.0 mill
2001	CZK 72.8 mill	2011	CZK 22.8 mill
2002	CZK 61.0 mill	2012	CZK 12.6 mill
2003	CZK 67.0 mill	2013	CZK 8.2 mill
2004	CZK 52.1 mill	2014	CZK 7.5 mill
2005	CZK 60.3 mill	2015	CZK 9.2 mill
2006	CZK 55.4 mill	2016	CZK 9.0 mill
2007	CZK 58.1 mill	2017	CZK 8.8 mill

7. Summary of selected legal regulations on mineral prospecting and exploration in force as of June 30, 2018

7.1. Acts

Act No. 44/1988 Coll., on mineral protection and use (the Mining Act) – as amended by the Acts No. 541/1991 Coll., No. 10/1993 Coll., No. 168/1993 Coll., No. 132/2000 Coll., No. 258/2000 Coll., No. 366/2000 Coll., No. 315/2001 Coll., No. 61/2002 Coll., No. 320/2002 Coll., No. 150/2003 Coll., 3/2005 Coll., No. 386/2005 Coll., No. 186/2006 Coll., No. 313/2006 Coll., No. 296/2007 Coll., No. 157/2009 Coll., No. 227/2009, Coll., No. 281/2009 Coll., No. 85/2012 Coll. , No. 350/2012 Coll., No. 498/2012 Coll., 257/2013 Coll., No. 89/2016 Coll., No. 264/2016 Coll., No. 183/2017 Coll. and No. 225/2017 Coll.

Act No. 61/1988 Coll., on mining operations, explosives and the state mining administration as amended by the Acts No. 425/1990 Coll., No. 542/1991 Coll., No. 169/1993 Coll., No. 128/1999 Coll., No. 71/2000 Coll., No. 124/2000 Coll., No. 315/2001 Coll., No. 206/2002 Coll., No. 320/2002 Coll., No. 226/2004 Coll., No. 3/2005 Coll., No. 386/2005 Coll., No.186/2006 Coll., No. 313/2006 Coll., No. 342/2006 Coll., No. 296/2007 Coll., No.376/2007 Coll., No.124/2008 Coll., No.274/2008 Coll., 223/2009 Coll., No. 227/2009 Coll., No. 281/2009 Coll., No. 155/2010 Coll., No 184/2011 Coll. , No. 18/2012 Coll., 64/2014 Coll., No. 250/2014 Coll., No. 206/2015 Sb., No. 204/2015 Sb., No. 320/2015 Coll., No. 91/2016 Coll., No. 243/2016 Coll., No. 451/2016 Coll. and No. 183/2017 Coll., 91/2018 Coll.

Act No. 62/1988 Coll., on geological work, as amended by the Acts No. 543/1991 Coll., No. 366/2000 Coll., No. 320/2002 Coll., No. 18/2004 Coll., No. 3/2005 Coll., No. 444/2005 Coll., No. 186/2006 Coll., No.124/2008 Coll., No. 223/2009 Coll., No. 227/2009 Coll., No. 281/2009 Coll., No. 85/2012 Coll., 64/2014 Coll., 183/2017 Coll. and 225/2017 Coll.

Act No. 157/2009 Coll., on mining waste treatment and amendment of some acts, as ammended by the Act No. 168/2013 Coll., No. 183/2017 Coll. and No. 225/2017 Coll.

Act No. 85/2012 Coll., on carbon dioxide capture into natural rock textures and on amendment of some acts, as amended by the Acts No. 383/2012 Coll. and No. 64/2014 Coll., 193/2016 Coll. and 183/2017 Coll.

Act No. 158/2000 Sb., on prospecting, exploration and exploitation of sea bottom mineral resources and on safety of crude oil and natural gas operations in sea, as amended by the Act No. 296/2007 Coll., No. 124/2008 Coll., No. 227/2009 Coll., No. 281/2009 Coll., No. 201/2015 Coll and No. 183/2017 Coll.

7.2. Other legal regulations

7.2.1. Mineral deposits exploitation

Decree of the ČBÚ No. 104/1988 Coll., **on efficient use of reserved deposits, on permits and notification of mining operations and other activities employing mining methods,** as amended by the Decree No. 242/1993 Coll., No. 434/2000 Coll., and No. 299/2005 Coll.

Decree of the ČBÚ No. 415/1991 Coll., **on construction, the elaboration of documentation and the determination of safety pillars, rods and zones for the protection of underground and surface sites** in the wording of the Decree of the ČBÚ No. 340/1992 Coll., and No. 331/2002 Coll.

Decree of the ČBÚ No. 172/1992 Coll., **on mining leases** in the wording of the Decree No. 351/2000 Coll.

Decree of the ČBÚ No. 175/1992 Coll., **on the conditions of non-reserved mineral deposit exploitation** in the wording of the Decree No. 298/2005 Coll.

Decree of the MŽP ČR No. 363/1992 Coll., **on the survey and registry of old mine workings** in the wording of the Decree of the MŽP No. 368/2004 Coll.

Decree of the MŽP ČR No. 364/1992 Coll., **on protected deposit areas**

Decree of the ČBÚ No. 435/1992 Coll., **on mine surveying documentation during mining and during some operations employing mining methods** in the wording of the Decree of the ČBÚ No. 158/1997 Coll. and the Decree No. 298/2005 Coll. and the Decree No. 382/2012 Coll.

Decree of the MHPR ČR No. 497/1992 Coll., **on the registration of reserves of reserved mineral deposits**

Government Provision no. 98/2016 Coll. on the royalty tariffs (of mined out minerals)

7.2.2. Geological work

Decree of the MŽP No. 282/2001 Coll., **on the registration of geological work**, in the wording of the Decree of the MŽP No. 368/2004 Coll.

Decree of the MŽP No. 368/2004 Coll., **on geological documentation**

Decree of the MŽP No. 369/2004 Coll., **on the planning, execution and evaluation of geological work, on announcing geohazards, and on the procedure for estimating reserves of reserved deposits** as amended by the Decree of the MŽP No.18/2009 Coll.

7.2.3. Regulations on licensing of mining operations and verification of qualification

Decree of the ČBÚ No. 298/2005 Coll., **on the requirements for professional qualification and competence in mining or operations employing mining methods, and on some legal regulation changes,** in the wording of the Decree No. 240/2006 Coll. and the Decree No. 378/2012 Coll.

Decree of the ČBÚ No. 15/1995 Coll., **on the licensing of mining operations and operations employing mining methods as well as on the development of sites and installations, which constitute these operations,** in the wording of the Decree No. 298/2005 Coll. and the Decree No. 380/2012 Coll.

Decree of the MŽP ČR No. 206/2001 Coll., **on the certificate of qualification for planning, executing and evaluating geological work**

ECONOMY AND MINERALS

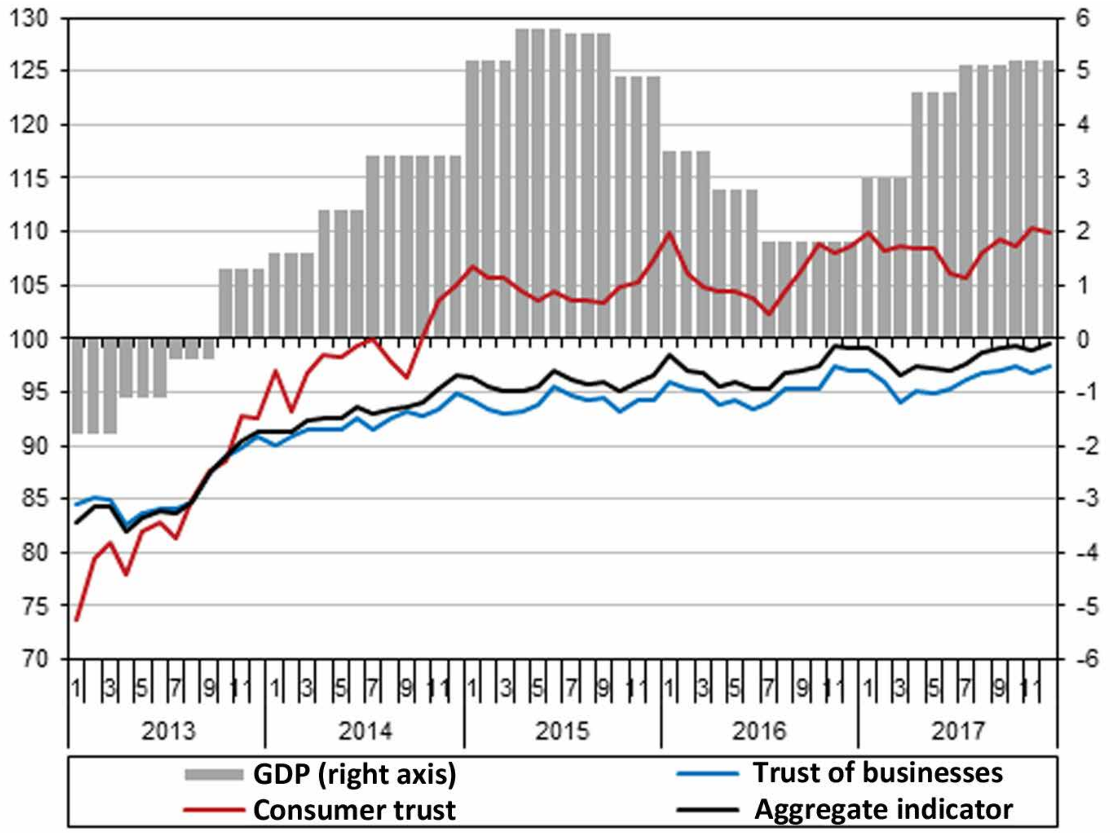
Development of the Czech economy

A shortened reprint from Kamenický J. – Súkupová K. (2018): Vývoj ekonomiky České republiky v roce 2017 (The development of the Czech Republic economy in 2017). – Czech Statistical Office. Prague.

General performance

In 2017, the growth of gross domestic product (GDP) **[1]** posted 4.5%[1]. It is the second highest value since the boom in 2007. A higher economic growth was only achieved in 2015 when the economy was greatly stimulated by absorption resources from the European funds.

In 2017, the expenditure on domestic consumption in 2017 rose by 3.3%, i.e. most prominently since 2003. The YOY growth rate of household consumption accelerated



Source: CSO

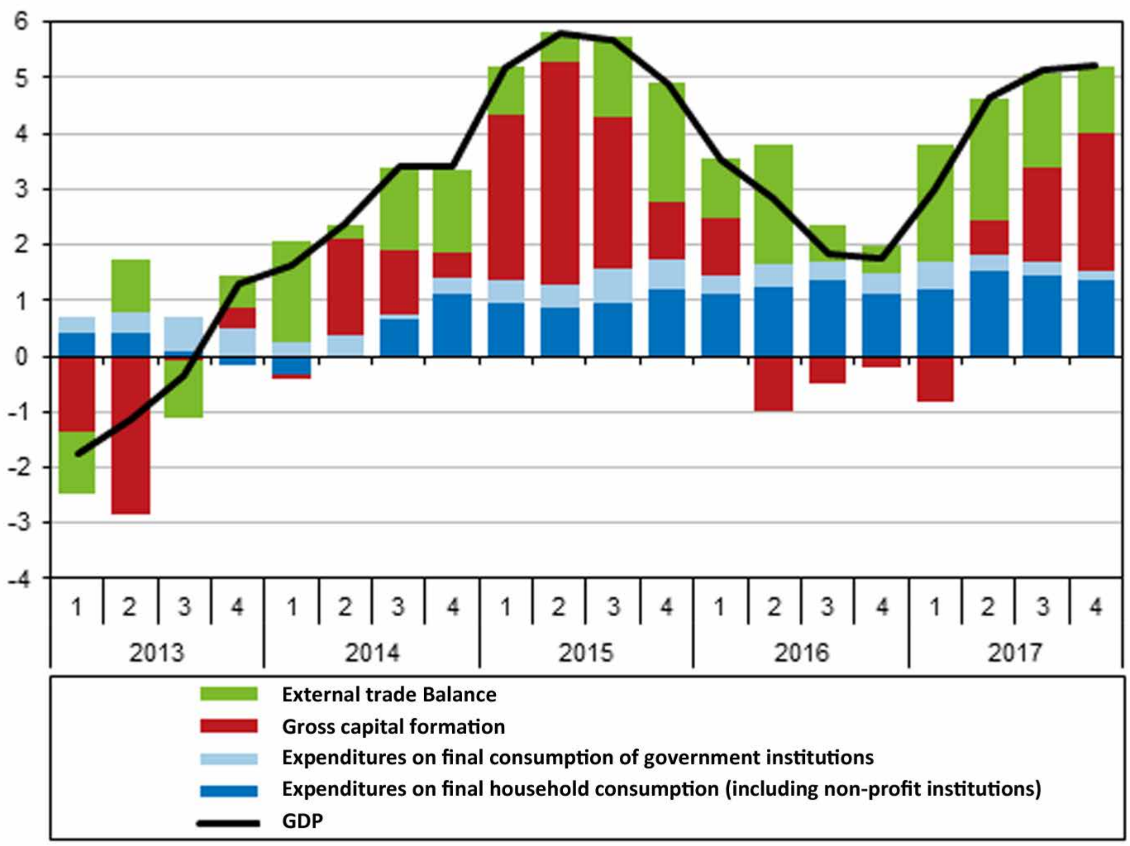
Fig. 1. GDP (volume indices adjusted for seasonal and calendar effects, YOY in %, right axis) and trust indicators [2] (2005 = 100, left axis)

[1] The development of GDP, gross added value and their components is given by volume indices (i.e. adjusted for changes in prices) and adjusted for seasonal and calendar effects. The data were published on 2 March 2018 and the revised data will be published on 3 March 2018.

(4.0%, most prominently since 2007), while the government spending has not risen as much as in the two preceding years (1.6%). In 2017, the total consumption expenditure contributed to an annual GDP growth with 1.7 p.p., of this, the household consumption **[3]** 1.4 p. p.

The overall growth of wages and salaries was driven by the processing industry which employs the most workers. The volume of wage funds grew by 8.6%, with no significant unemployment growth in this sector (0.6%). With regard to the number of employees, trade, transport, accommodation and hospitality where the volume of wages rose by 8.3 % took the second place. At the same time, the employment rate grew by 2.4%. Wages and salaries in industries with the public sector dominance grew by 8.5%. The highest growth regarding the volume of earnings (9.1% at 3.8% employment growth) was achieved by the information and communication activities. With regard to professional, scientific, technical and administrative activities, the employment rate grew at the same pace, with the volume of wages paid (7.9%) posting a slower growth rate. The building industry, finance and insurance sector ((4.5%, the only sector with an employment rate drop by 1.0%) posted the least growth of the wages paid.

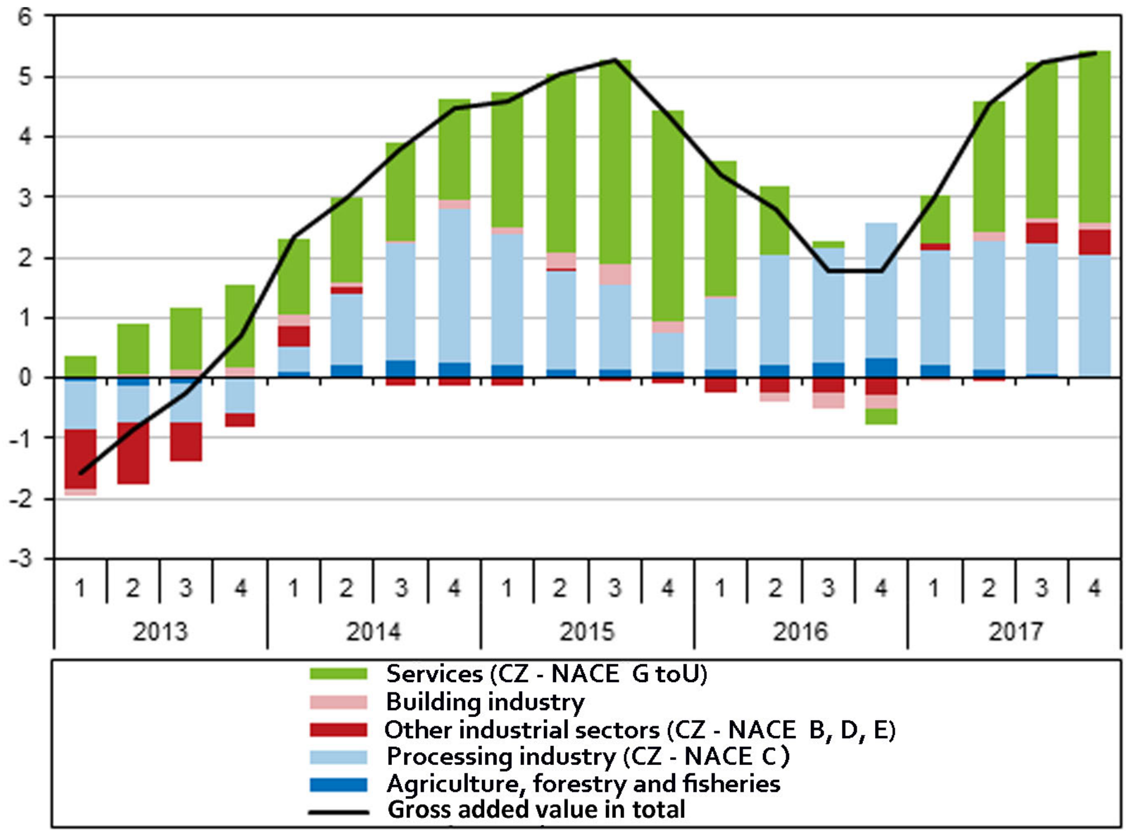
The investment activity was behind the strong growth of GDP in Q3 and Q4. In 2017, the contribution of expenditures to the gross fixed capital formation **[4]** to GDP growth in 2017 stood at 1.2 p.p.



Source: CSO

Fig. 2. Contributions of expenditure components to the real GDP change*
(volume indices, year-on-year growth, contributions in p. p., GDP in %)

* *The contributions to GDP change following the exclusion of end-use imports.*



Source: CSO

Fig. 3. Contributions of sectors to the real gross added value change (volume indices, year-on-year contributions in p. p., GAV in %)

In 2017, external trade reached a positive balance **[5]** of CZK 364.5 billion[2] with a YOY increase by 8.0 billion. The overall increase is a result of a significant increase in the surplus balance of trade in services (CZK 122.3 billion, year-on-year increase of 13.0 billion). Last year, the external trade surplus in goods amounted to CZK 242.3 billion, thus posting a 5.0 billion. In 2017, the terms of trade **[6]** stood at 99.0%. In 2017, the loss from the changes in the terms of trade, expressed as a difference between GDP and real gross national income **[7]** posted CZK 38.5 billion. This was the first negative result since 2012.

When looking at the supply side of GDP **[8],** we may confirm a continued key role of the processing industries in the Czech economy. The gross added value **[9]** in relevant sectors grew by 7.6%. The service sectors were very important. Last year, all sectors contributed positively, so even the building industry (0.1 p. p.) the situation of which has been rather unfavourable since 2016 posted a positive, albeit small, contribution.

Sector performance

Also last year, the Czech economy prospered. In comparison with the rate achieved in 2016, the growth of gross added value[3] was almost double (at 4.5%). Along with 2015, the last year

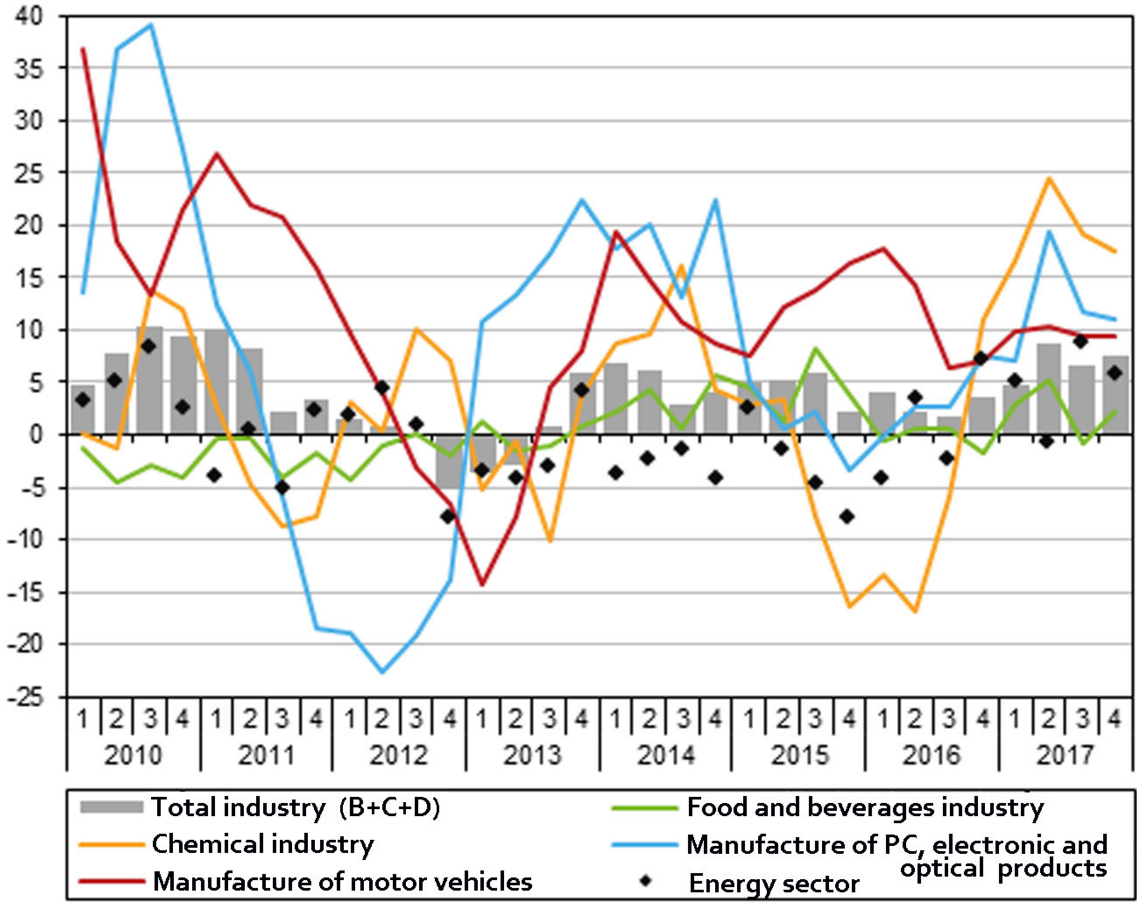
[2] According to the national accounts methodology.

[3] The data regarding GVA are given in constant prices and are adjusted for seasonal and calendar effects.

is one of the most successful over the last decade in this context. As opposed to the previous years of the current boom, all main industry clusters contributed to the YOY GVA growth. Also the improved performance of energy and buildings sectors helped in this regard.

Most particularly, the processing industry continued to have a key role that contributed to the increase in of the overall GVA by almost 50%. The good results of industrial exporters were reflected in the high GVA rate of this sector (+7.6%, the highest in the last six years). The strong GVA growth was achieved in an environment of a moderate employment increase (+0.6%) and the hours worked (+1.0%), which is reflected positively in the productivity development.

Last year, the manufacturers of motor vehicles increased their performance by 9.8% and secured almost a third (together with the closely related sectors[4] almost a half) of growth the total industrial production. Due to a strong domestic demand, also mechanical engineering had a successful year, contributing to the total industry growth with one tenth. In a similar scope, both the second most prominent processing industry – metal working and significantly export-oriented manufacture of computers, electronics and optical products (with the production growth by 12.2% in 2016 by 3.2%) contributed. The contribution of the chemical industry, the production of which,



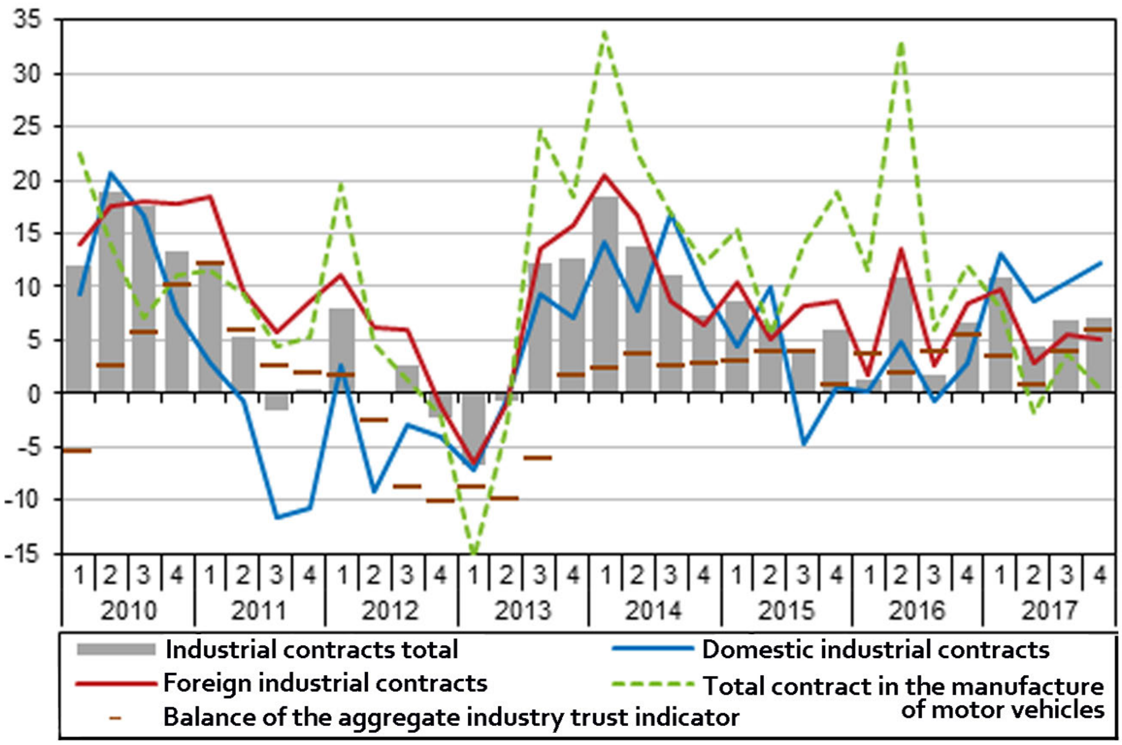
Source: CSO

Fig. 4. Production in industry and selected processing sectors (real, adjusted for calendar effects, YOY in %)

[4] This is mostly the manufacture of electrical equipment (with YOY production growth by 9.1%) and the production of rubber and plastic products (+8.3%).

compared to 2016, grew by almost one fifth[5], the most of the individual industry sectors, was also important. The energy sector showed an extraordinary year, with its production growth accelerating from 0.9% before the last year to 4.8% (the highest rate since 2003)[6].

In some industry sectors, some long-term structural problems persisted. For six consecutive years, mining and quarrying production (continued to fall as a result of a controlled phase out of black coal mining (by 1.7 %[7], in total by more than one quarter). However, after five years, the nominal sales of mining businesses grew (by 8.7 %), as they reflected prices of raw materials. In metallurgy and metal casting, the production showed a moderate decline (as in the preceding two years). As opposed to the boom in 2007, following a short recovery, the production in the leather manufacturing industry posted a moderated decline, and was weaker by almost 30%[8]. Conversely, with regard to the small but steadily growing sector – production of other (mainly rail-based) means of transport – the last year decline (by 9.1%, the most prominent from all industry sectors), was rather a one-off anomaly due to the volatile character of contracts which was also suggested by the positive development of employment.



Source: CSO

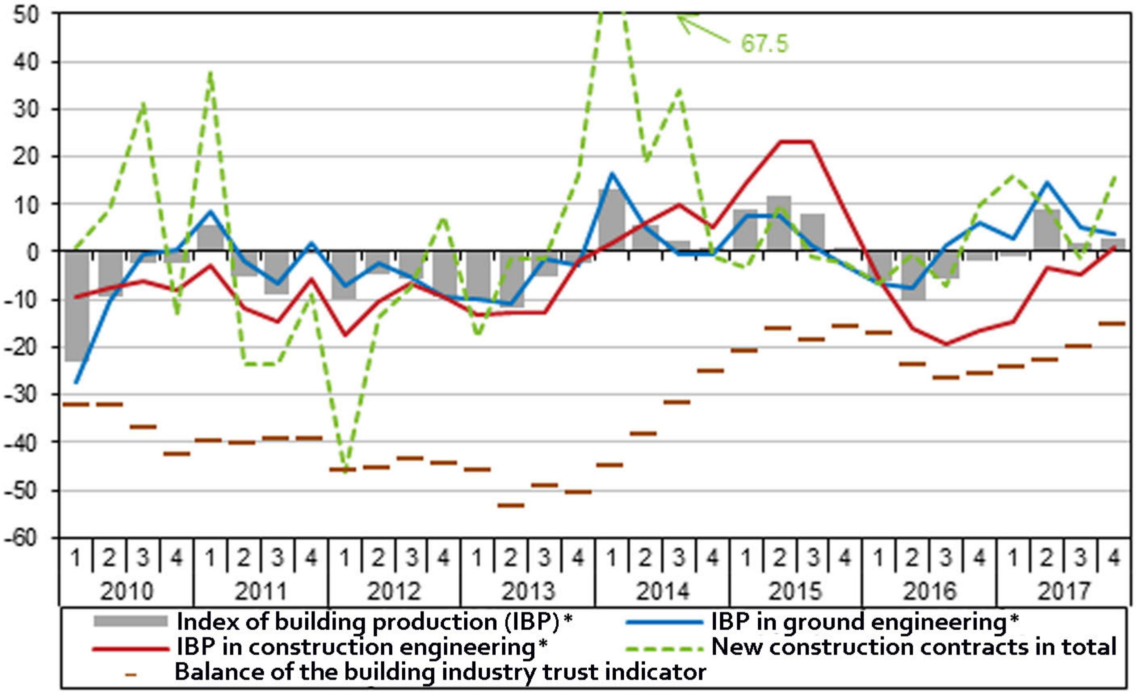
Fig. 5. New contracts in the automotive industry, in the industry in total (in current prices, YOY in %) and the balance of the trust indicator in the inustry

[5] The production in the chemical industry surpassed the level before the accidents (Q2 2015) already at the beginning of 2017.

[6] In particular, the last year's growth of electricity production (+4.5%, to 87 TWh), of this in nuclear power plants by 17.6% was responsible for this.

[7] However, the last year decline was the smallest over the last six years.

[8] The level of production in 2007, was not reached by 10 from 24 processing sectors. Among the major industries, this was mostly the food industry (–5%), metallurgy and metal casting (–12%) and manufacture of other non-metallic mineral products (–13%).



Source: CSO

Fig. 6. Construction production*, the value of new contracts (YOY in %) and the balance of the trust indicator in the building industry

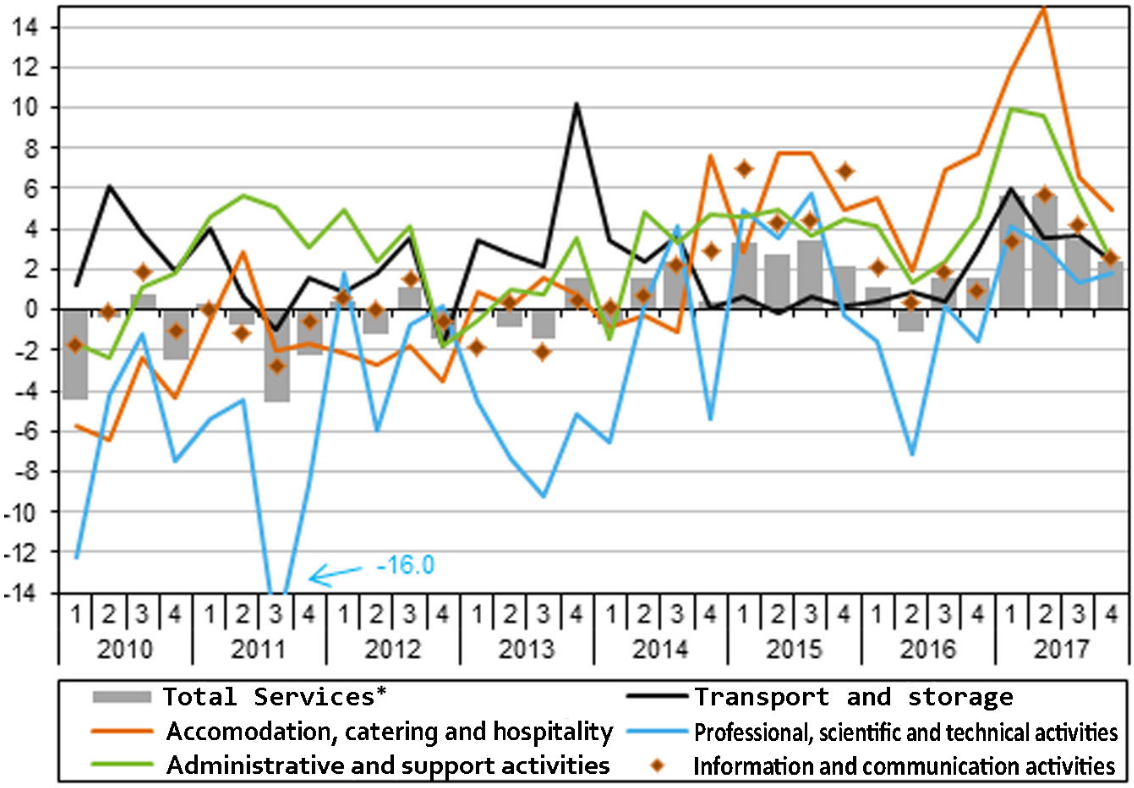
* *Adjusted from the influence of the number of working days*

Last year, similarly as in 2016, the building industry output is limited a low volume of public investment. Last year, the year-on-year growth rate reached 3.6%, as opposed to the result from (year???). The ground engineering was supported by a gradual development of residential construction. The number of started flats has risen for a fourth consecutive year (to last year's 31.5 thousand). The family houses mostly contributed to the growth, with more development in other construction areas – except flats in non-residential buildings and homes for the elderly where the construction development reached a record-low. With regard to residential houses, the number of the flats started was the highest over the last eight years (7,244), but this was not even half the volume of the same period in the record year of 2007. More than a fifth of flats were started in the Central Bohemia region. In Prague, 976 more flats were started than in 2016 (with the second lowest construction development since the mid-1990s), yet the construction development (3,734) was almost by one third weaker than in 2015 and did not reach half of the average of period 2005–2007.

In 2017, the growth of sales in the selected services[9] accelerated to 4.2% (from the last year's 0.8%) and posted the best year-on-year rate over the last ten years. This positive trend was apparent across all sectoral service sections (the most in professional, scientific and technical activities, the least in activities in the area of real estates).

For the most part of 2017, the transport and storage industries contributed to the YOY sales growth in the services, just in Q2, the role of this sector showed a temporary downturn

[9] Without the trade, finance, insurance, science, research and public services. All of the data for services are given in constant prices, YOY data are adjusted for calendar effects, QOQ are adjusted for seasonal effects (including the effects of the number of working days).



Source: CSO

Fig. 7. Sales in services* and their selected sectoral sections (real, adjusted for the effect of the number of working days, YOY in %)

** Without commerce, finance, insurance, science, research and public service*

in favour of information and communication activities and also accommodation, catering and hospitality.

The sentiment of consumers driven by a favourable situation on the labour market during 2018 stood close to a historical high. The sales in retail[10] grew YOY 5.9%, being the highest rate since 2007. In the last 3 years, the Czech Republic is one of the countries with the fastest growth of retail sales in the EU[11]. Last year, the higher rate was posted only by Romania (+11.2%), Slovenia (+8.2%) and Poland (+6.4%), Slovakia (+6.1%), and Cyprus (+5.9%). In the EU, the rate was at 2.5%, Germany 1.9 %, Spain 0.8%, in Italy and Belgium, the showed a moderate decline.

External economic relations

In 2017, the current account balance of payments posted a surplus[12]. Its stood at CZK 54.2 billion and showed a year-on-year drop by 20.1 billion. The positive balance of trade in goods (CZK 240.9 billion) contributed most to the surplus. The trade in services also posted a surplus

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[10] The data do not include the motor segment. The data for retail are adjusted for calendar effects at constant prices.

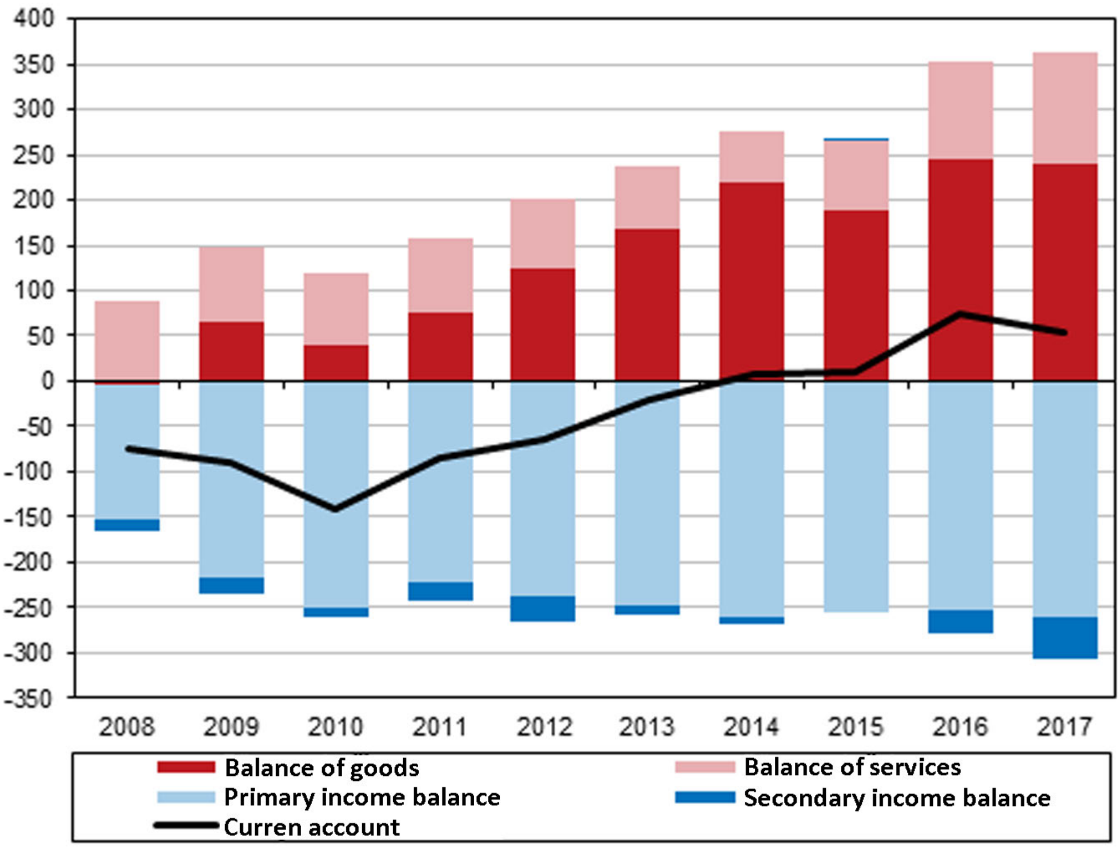
[11] The international comparison based on the data published on 20 March 2018.

[12] The data from the ARAD database of the Czech National Bank.

(122.0 billion), which grew YOY by CZK 14.4 billion. Conversely, the balance of primary and secondary income operated towards the deficit. In 2017, the primary income deficit stood at CZK 260.8 billion, posting a year-on-year increase by 9.1 billion. This was due to a year-on-year increase in the primary income inflows by CZK 17.9 billion. In 2017, the secondary pensions income posted a deficit of 45.0 billion. This is primarily due to a significant drop in the inflows of income from abroad. The capital account surplus stood at CZK 46.5 billion.

The primary income deficit was due to the net drain of income from investments of EUR 321.2 billion. This is by 9.7 billion more than in 2016 (as last year, the foreign investment capital inflow grew by 15.0 billion). At the same time, net drain of income from direct investments reached CZK 345.9 billion, by 20.1 billion more than in 2016. In 2017, the deficit of income from portfolio investments showed a moderate decline to –14.9 billion. The primary income deficit was mostly reduced due to compensations to employees. Their balance reached a surplus of 37.7 billion. The employees in the Czech Republic received CZK 64.0 billion on compensations from abroad (by 6.1 billion more than in 2016).

In 2017, the financial account (FA) posted a surplus of CZK 117.1 billion. Yet, both the asset and liabilities side of the financial account reached twice the level of 2016. FA flows in Q1 when investors responded to the near end of the exchange rate commitment of CNB. For the last year resulting surplus that has been continuously achieved by FA since 2012, the increase of reserve assets of CZK 1,246.,4 billion (of this 1,119.2 billion in Q1 of the year) was responsible. The direct investment net inflows amounted to CZK 135.3 billion (reinvestment of profits contributed by 106.9 billion). Last year, the portfolio investment net inflow stood at



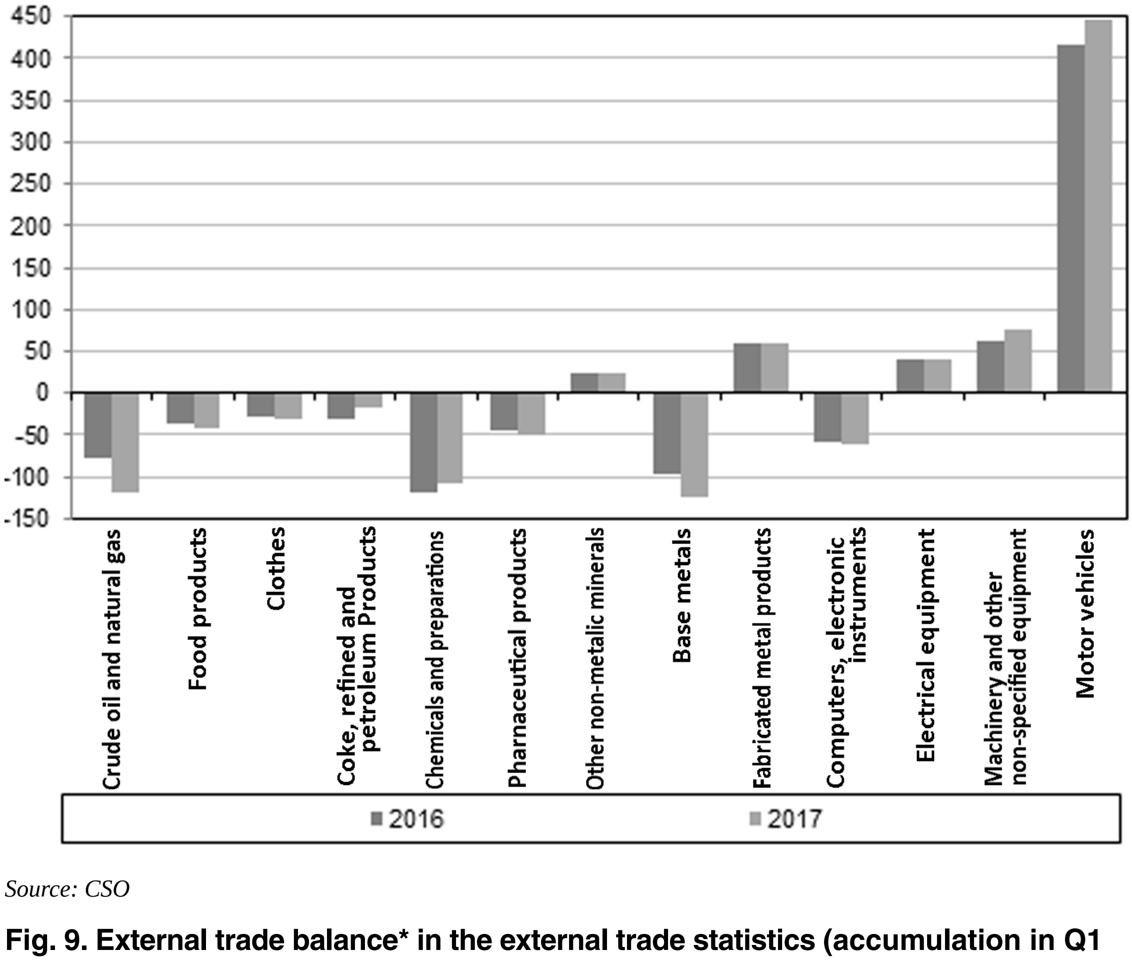
Source: CNB

Fig. 8. Current account balance of payments (accumulation in Q1–Q4 in billion CZK)

CZK 268.3 billion. At the same time, the participation and interests in investment showed a net outflow of CZK 43.5 billion. The investments in debt securities were the source of deficit in the portfolio investment item. For 2017, their net inflow stood at CZK 311.8 billion (by 140.8 billion more than in 2016). The main capital inflow occurred Q1 and Q2 of the year. This is illustrated by development of the share of domestic bonds in the hands of foreign holders[13]. The share above increased dramatically during 2016 (from 23.67 % in January 2016 to 38.66 % in January 2017). As of the end of March, it stood at 47.26% and peaked in September (51.35%). Since then, it has been on steady decline. At the end of December 2017, it stood at 41.64%.

In 2017, the value of exports reached CZK 3,489.1 billion[14]. In comparison with 2016, it thus rose by 189.9 billion (5.8%).

In 2017, the territorial structure of exports did not change dramatically. The European Union remained a dominant destination for the Czech export (83.9% of exports), share of exports to countries outside the EU remained at 16%. Not even higher export dynamics to countries outside the EU (6.2%) led to the change of this structure. In 2017, the largest share of export



Source: CSO

Fig. 9. External trade balance* in the external trade statistics (accumulation in Q1 to Q4, in billion CZK, selected sections of the CPA classification)

** In the national concept*

[13] According to the Ministry of Finance of the Czech Republic. The state bonds by the type of holder.

[14] The external trade statistical data in national concept in nominal terms including only trade in goods. The value of exports is captured in FOB prices, i.e. including the costs related to the transport to the border of the Czech Republic. The imports given below in this chapter is in CIF prices, i.e. including the costs related to the transport to the border of the Czech Republic. The data are valid as of 9 March 2018.

(32.2 %, CZK 1,125.0 billion) was to Germany and the year-on-year exports to this destination rose by 6.1% (CZK 64.5 billion).

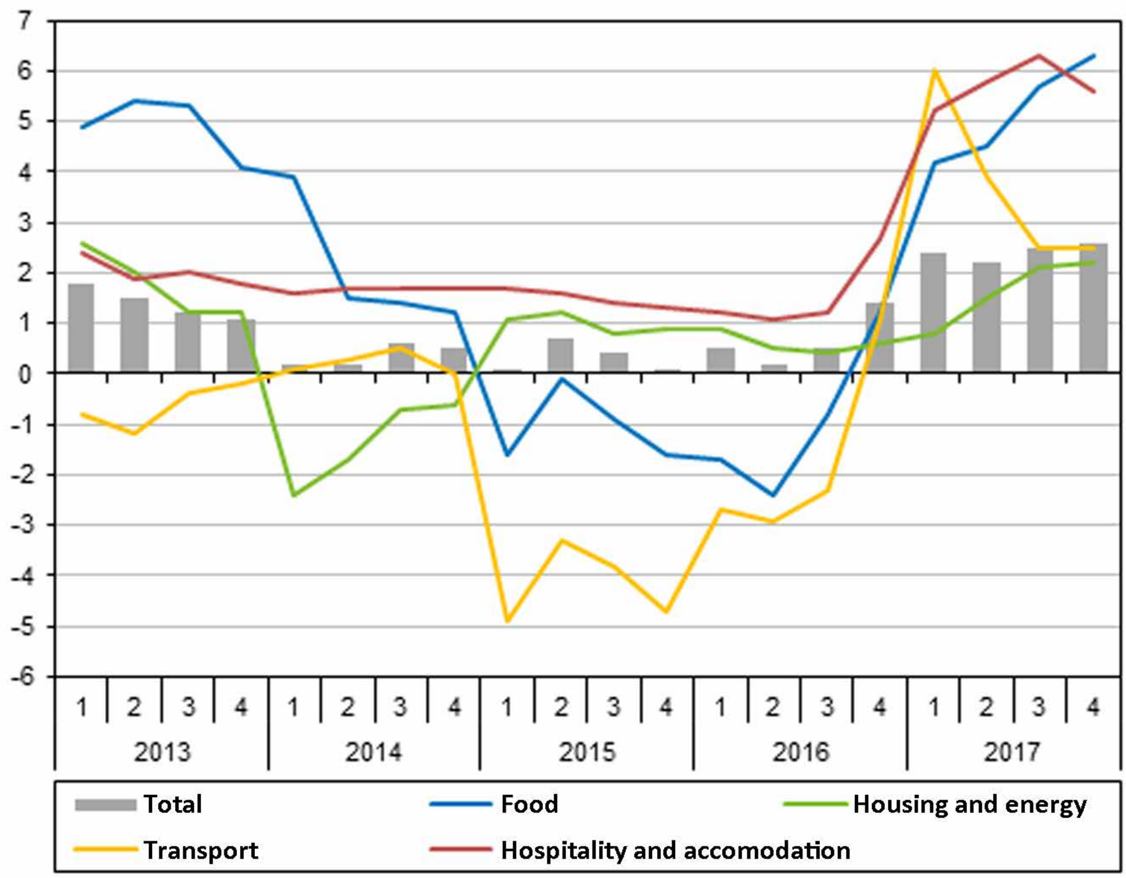
The year of 2017 did not change anything regarding the position of motor vehicles as the key product in the Czech export structure. The total value of motor vehicles exports was only short of CZK 1,000 billion (995.1 billion) and rose by 71.4 billion YOY (7.7%). Last year, the motor vehicles accounted for 28.5% of exports.

In 2017, the value of imports in the Czech Republic also grew, reaching CZK 3,343.8 billion and rising by 208.3 billion (6.6%). Therefore, last year, the import grew faster than export. The increase in the price of certain raw materials (crude oil and natural gas, basic metals) was an important factor. The Czech Republic need to import them more than export, thus the price changes led to a higher increase in import.

In 2017, the external balance of trade in goods posted a surplus of CZK 145.3 billion. Year on year, the positive balance dropped by 18.4 billion. The decline can be attributed to the YOY increase of raw material prices, which increased the value of imports. That was also the reason for an increased deficit of trade with countries outside the EU (by 71.1 billion), while the trade surplus with the EU in 2017 rose by 51.3 billion.

Prices

In 2017, the increase in the overall price level measured by GDP deflator reached 1.3%. Thus, the increase in the overall price level did not entirely reflect the price of the goods consumed



Source: CSO

Fig. 10. Prices in selected sections of the consumer price index (YOY changes in %)

by households (2.5%) and the government sector (3.3%). Also, prices of capital goods posted a moderate increase (1.1%). However, the overall price level increase was mitigated by negative terms of trade (99.0%).

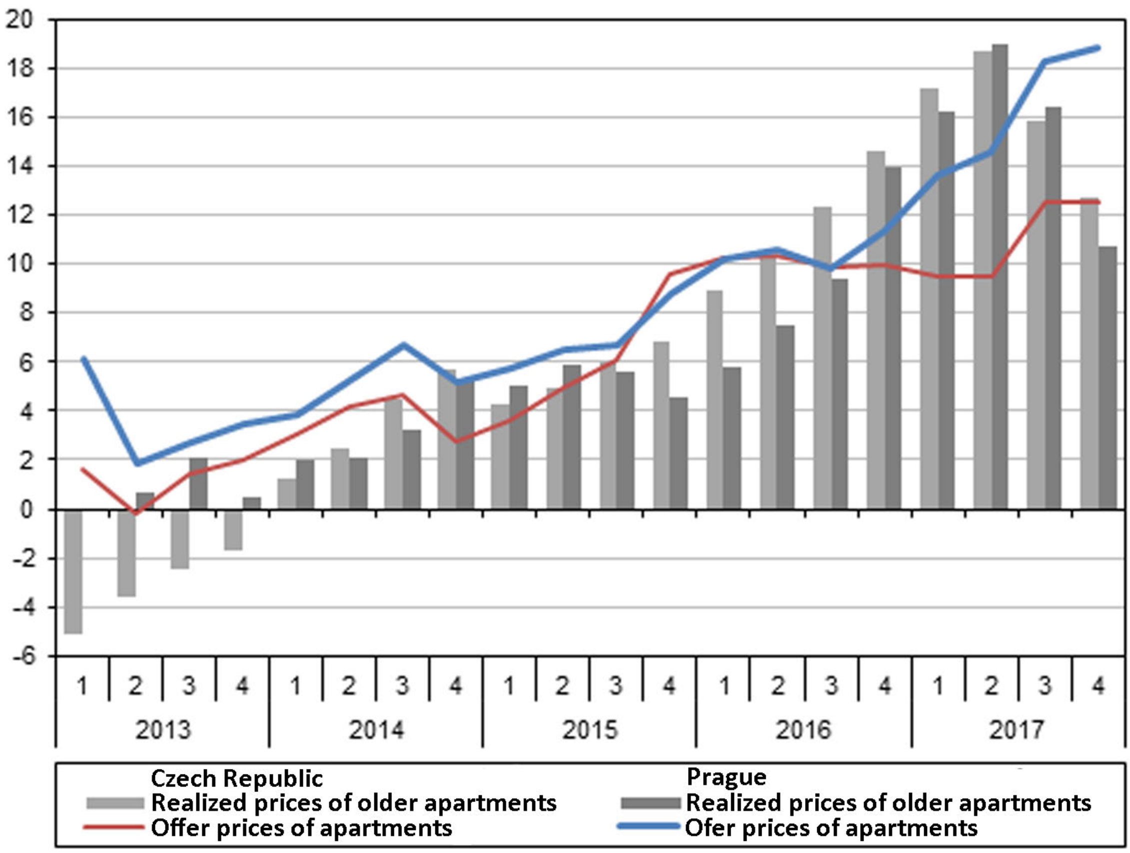
With regard to the development of consumer prices, 2017 was significantly different to the previous three years. Compared to 2016, the consumer price index grew by 2.5%. This being the most prominent growth since 2012 (3.3%).

In 2017, the prices of food and non-alcoholic beverages grew by 5.2%. This being the most prominent growth since 2012.

For 2017, the growth of prices of housing, water, energies and fuels posted 1.7% in total, but kept on accelerating in the course of the year.

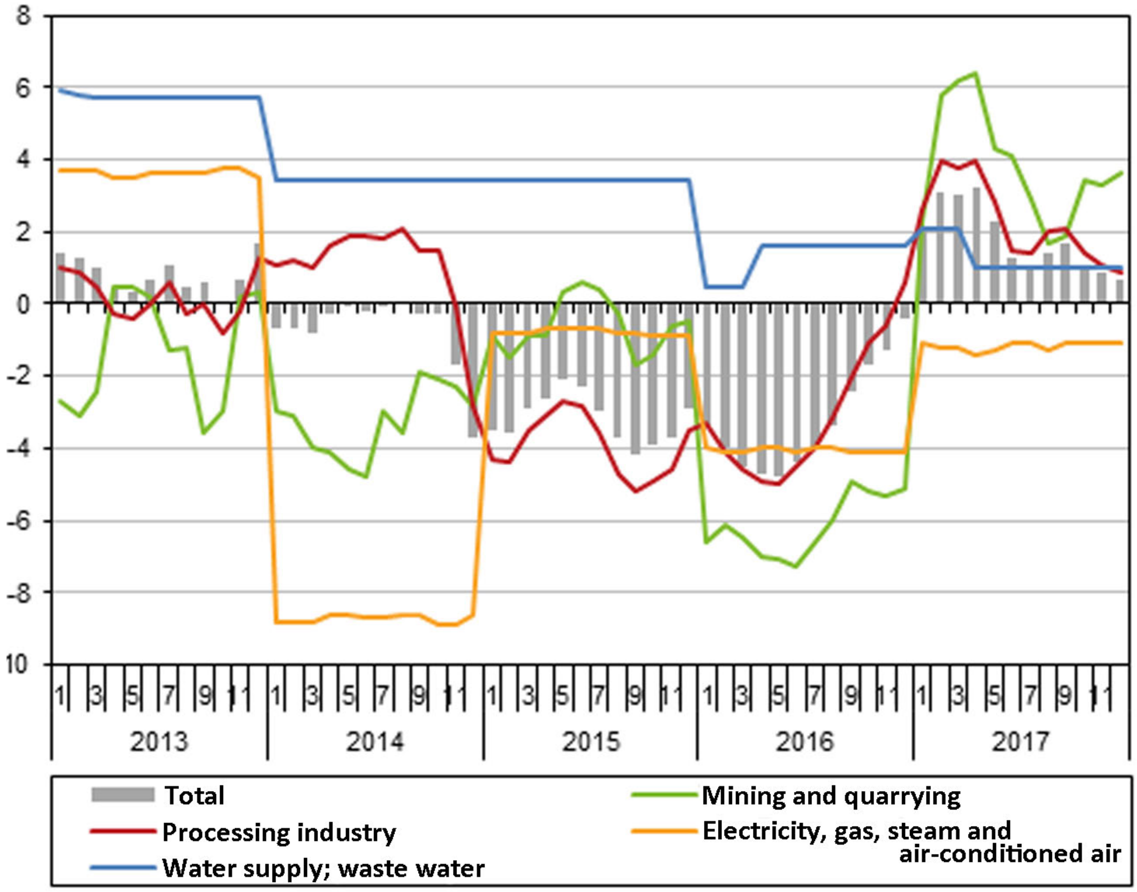
The fourth item that had a significant impact on the growth of the consumer price index throughout the year was hospitality and accommodation. For the entire 2017, the prices increased by 5.7%. A significant increase of salaries in the hospitality and accommodation sectors which is reflected in the final price is responsible for this development.

In 2017, the question of the availability of housing became even more acute. The YOY growth of the index of offer prices of apartments in the Czech Republic stood around 10% already from the end of 2015 and accelerated to 12.5% in Q3 and Q4 2017. At the same time, the offer prices of apartments outside Prague posted only a YOY increase by 4.7% last year. Conversely, the offer prices of apartments in Prague grew at a dazzling pace (at 16.4% on average). The YoY growth of the realized prices of older apartments in the Czech Republic peaked (18.7%) in Q2 2017 and then slowed down. However, it was still higher than 10%.



Source: CSO

Fig. 11. Prices of property (YOY change, in %)



Source: CSO

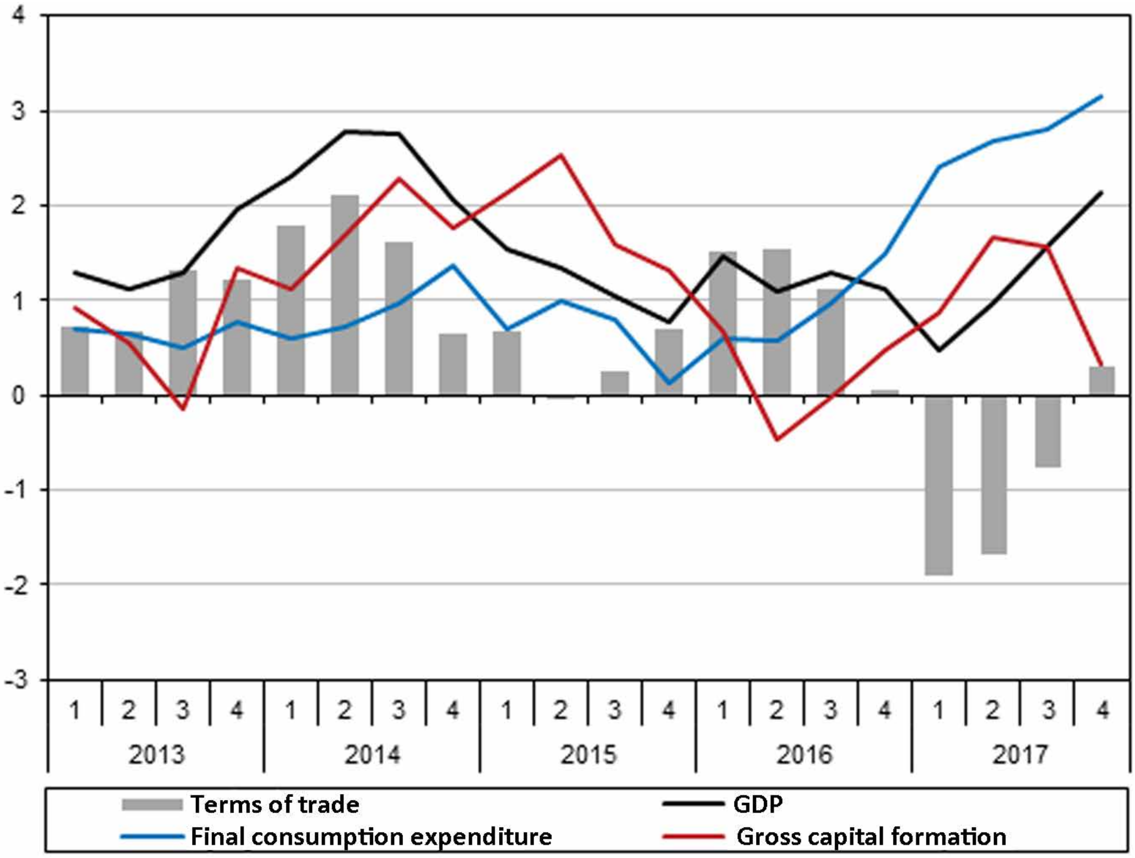
Fig. 12. Prices of the main groups of industrial producers (YOY change in %, according to CPA classification)

Last year, the realized prices of older apartments in Prague grew on average more slowly than in the rest of the Czech Republic. The realized prices of new apartments in Prague reflected a sharp increase in the price of apartments in the new development projects and on average, grew by 13.6%.

In 2017, the prices of industrial manufacturers grew by 1.8%. This is the highest value since 2012 and change compared to the dynamics of 2014–2016 when the prices of industrial manufacturers declined steadily. In 2017, the development of prices of coke and refined petroleum products contributed to the index growth, the increase in the price of food products, beverages and tobacco by 2.6% was also significant. Also, price increases of base metals and metal products in 2017 by 5.3% significantly contributed to the increase. Conversely, prices of the means of transport dropped, for the whole year by 2.2%. Primarily, the prices of means of transport and also the prices of electricity, gas, steam and air conditioning air supply that have been on decline over the last four years operated towards the decline.

In 2017, the prices of agricultural producers grew by 7.3 %. This being the most prominent growth since 2011. At the same time, this is also a major change compared to downturns in 2014–2016.

In 2017, the prices of market services seemed to have broken the stagnation that have practically lasted since 2010. The prices grew by 1.3%, this being the most prominent increase since 2009. At the same time, the growth accelerated in the course of the year – reaching 1.7% in Q4.



Source: CSO

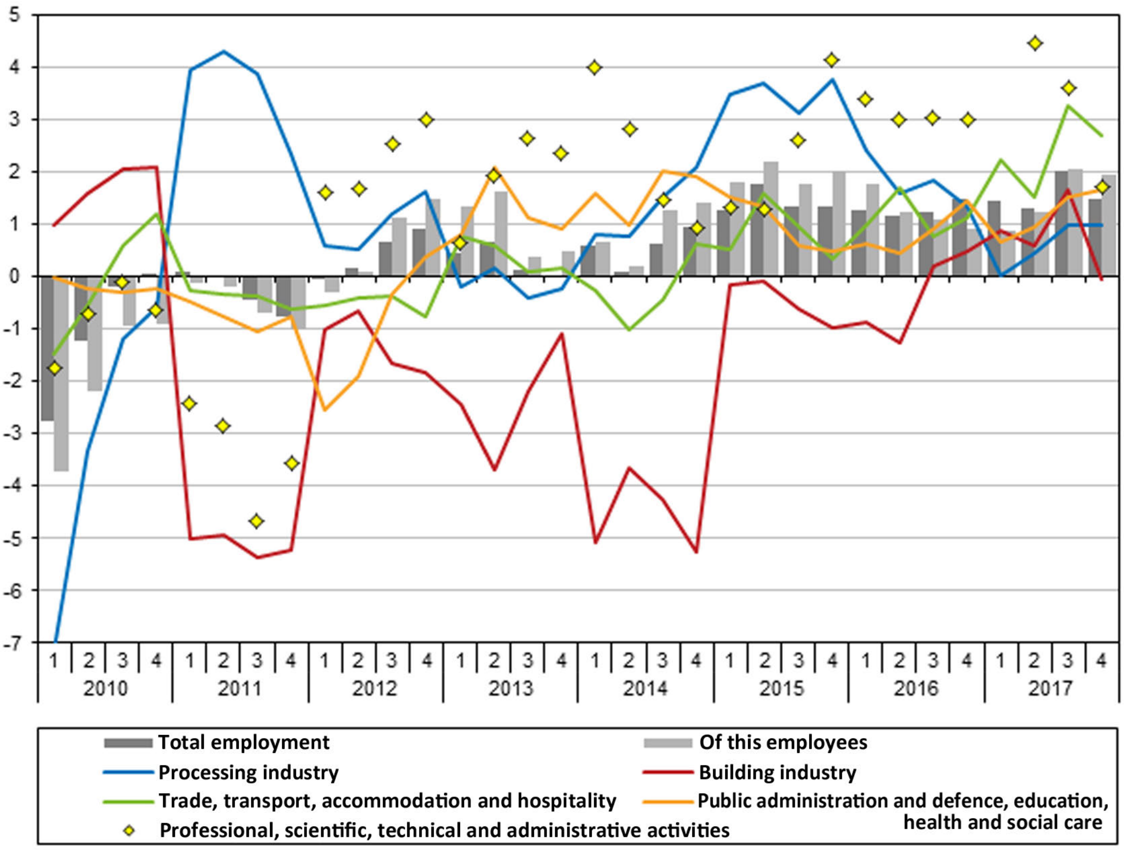
Fig. 13. Deflators (adjusted for seasonal and calendar effects, YOY change, in %)

Toward the end of the year, also the YOY growth of prices of individual services accelerated. Last year, with regard to the most important items, primarily the prices of advertising services and the market surveys grew by 2.7%. The architectonic and engineering services and technical tests and analyses posted a total increase by 1.4%. The overall positive development in 2017 influenced the price increase of the services in the programming and consulting field by 1.3%.

In 2017, export prices posted an overall decline by 0.1%. In 2017, particularly, the prices of exported machinery and means of transport (–2.2%) and industrial consumer goods (–1.0%) plummeted. Conversely, export prices of mineral fuels (16.3%) and other raw materials (10.3%) posted a sharp increase. In 2017, the import prices grew YOY by 0.9%. Similarly, as with the export, the prices of mineral fuels (13,9%) and other raw materials (10.3%) grew, with machinery and means of transport (–2.9%), industrial consumer goods (–2.2%) and animal and vegetable oils (2.6%) working towards the decline.

Labour Market

In 2017, favourable tendencies from previous years continued on the labour market. At the same time, the rising tensions arising from unfulfilled demand of firms for workforce were more prominent than ever. In spite of this, employment grew steadily for the most part of the year. At the end of the last year, most people in history worked In the Czech Republic (5.36 million). The influence of economic cycle associated with the influx of workforce from abroad, but also a shift in the age structure of inhabitants and regular increases of the retirement age were reflected here.

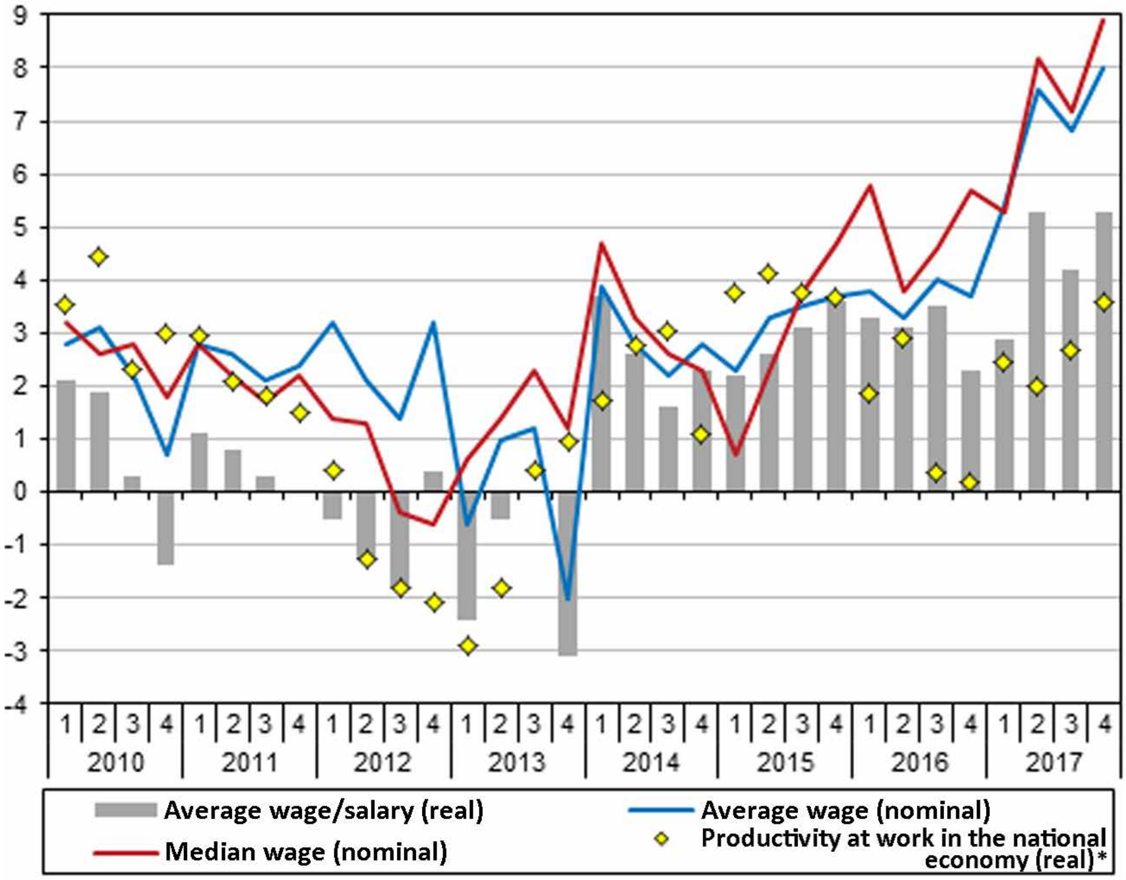


Source: CSO (national accounts)

Fig. 14. Number of workers in selected sectors and total number of employees (according to national accounts, adjusted seasonally, YOY in %)

In 2017, mostly employees contributed to higher employment rate. However, the self-employed person, the growth of whom was happening across the most major industries contributed with one sixth. The number of self-employed has continued to grow for the second consecutive year. From the perspective of industries, the growth of total employment was mostly driven by services in 2017. The role of the processing industry that was intensively hiring employees in 2015 and 2016, gradually diminished. Compared to 2016, 71,000 more people worked in the service sector, 8,000 more people worked in the processing industry. In the context of services, new jobs were mostly created in professional, scientific, technical and administrative work and also information and communication activities industries (in both cases by 3.8%). A moderate increase of employment in sector with the state dominance continued[15] – mainly in the field of defence and education. The six years of reduction of employment in the building industry came to an end, exclusively due to a higher number of the self-employed (benefiting from higher demand for smaller construction work, the development of which has not been negatively influenced by irregularities in the absorption of the European funds). The number of the hours worked in the whole economy of grew by 1.9% last year and for the second consecutive year, it showed higher rates than the total employment. One of the reason also being an increased number of people having a second job, as shown by VŠPS data[16].

[15] It includes the following industries: Public administration and defence, education, health and social care.
[16] In Q3 2017 139,000 people worked like that, 114,000 two years ago.



Source: CSO

Fig. 15. Average monthly gross wages and salaries and wage median (per employee converted to full-time, YOY in %) and productivity at work*

** Share of an seasonally adjusted GDP and employment (concept of national accounts)*

The general unemployment rate **[10]** continuously decreased to historical lows in the context of the development of the independent Czech Republic and its position in the EU. In December 2017, (according to the adjusted seasonal data), there was less unemployed persons (2.4%) aged 15–64 years, a decline of 1.3 p. p. YOY. The rate of unemployment reduction against 2015 and 2016 did not slow down, for which a favourable development in the first half of 2017 was mostly responsible. At the end of the year, 2.0% men and 2.9% women were unemployed (YOY unemployment reduction was comparable for both sexes). By more than a half (by 63,000), the persons that had been unemployed for more than one year contributed in the lower number of the unemployed. In Q4, the frequency of the long-term unemployed in the fourth quarter dropped to a record-breaking 40,000. This is related to an improved position of person with the lowest level of education in the labour market. The unemployment of persons with elementary education at maximum fell from 18.5% to 10.1% (being the sharpest drop in the history of the Czech Republic).

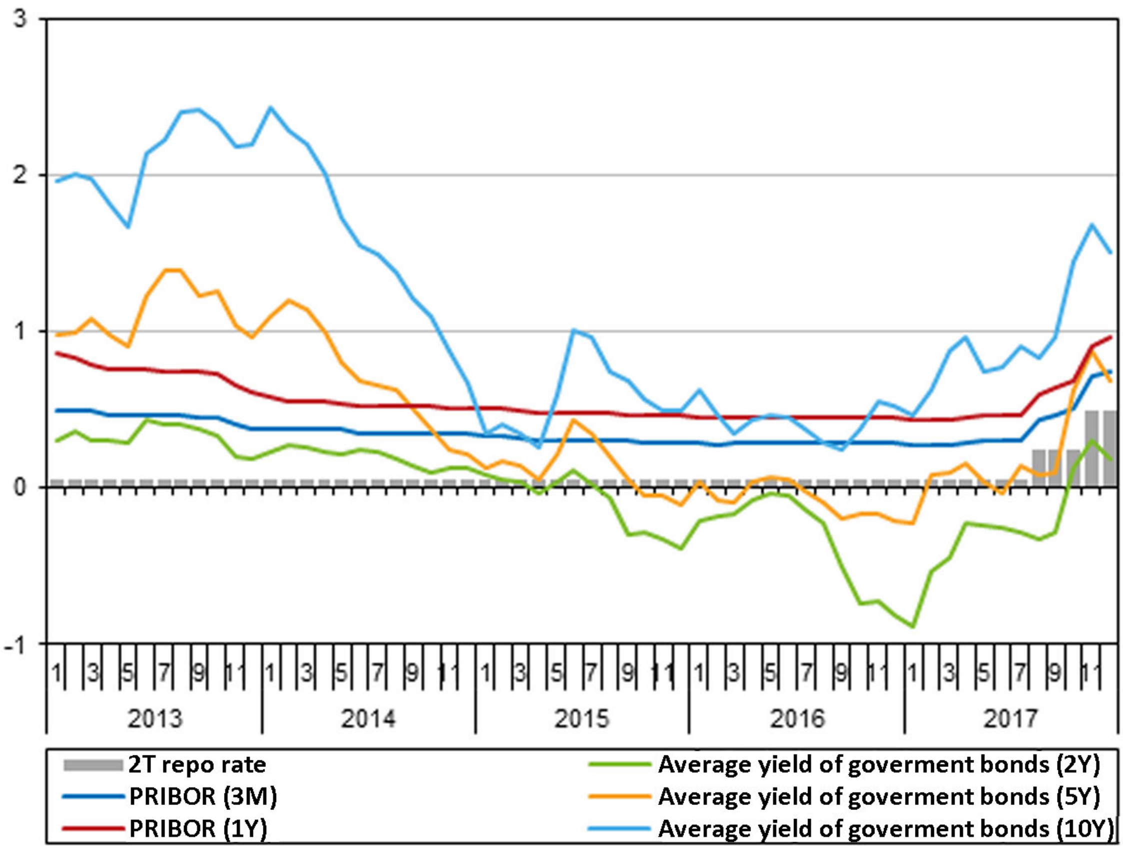
In 2017, the offering of free vacancies at Labour Office (LO) accelerated. The jobs with a requirement for minimum qualification for which the elementary education was sufficient, were responsible for the YOY increase from more than three quarters. This fact combined with an apparent reduction of the situation of the long-term unemployed persons suggests that employers may have significant problems when filling such position with workers from home.

Good economic results of firms, continued positive expectations, but also a more pronounced mismatch between labour supply and demand led to a dynamic wage growth in 2017. An important role was also played by the state – by rising the wage tariffs of own employees as well as by increasing the minimum wage threshold (including a secondary impact on the related guaranteed wages). In Q4 2017, for the first time in history, the average monthly gross wages surpassed the threshold of 30,000 and posted a YOY increase by 8.0% (by 3.7 a year earlier. For the third consecutive year, employees working in accommodation, catering and hospitality benefited the most (last year by 11.9%). Despite the fact that it was a sector with the lowest wage level (CZK 17,500). The growth of the minimum wage also drove earnings in the administrative and support activities (+ 8.0%). In sectors with state dominance, wages in cultural, entertainment and leisure time activities (9.3%) posted the highest growth rate.

Monetary conditions

2017 brought a number of changes in the area of monetary conditions. Following the end of the exchange-rate interventions in April, the Czech crown returned to managed float regime. In the course of the year, the exchange rate of the Czech crown grew stronger against foreign currencies. With the immediate impact being a decline in external trade prices.

To some extent, the end of interventions meant returning to classic monetary policy instruments. For the first time since November 2012, there was a change in monetary policy interest rates in the beginning in August. This was the first growth since 2008. Another upward movement



Source: CNB

Fig. 16. Market interest rate (in %)

occurred in the beginning of November. Following the discussions regarding the stability of the financial system, CNB also applied some instruments of macroprudential policy in 2017. On the one hand, it made the recommendations concerning the provision of mortgages more strict and increased the capital reserve rate for some banks. At the end of 2017, it announced an increase of the countercyclical capital buffer rate effective of 1 July 2018 (from 0.5 % to 1.0%, additional increase to 1.25% from 1 January 2019).

The interest rate on deposit did not reflect movement of the monetary policy or interbank rates in 2017. The consumer loan interests for households continued to decline. In February, their interest dropped below 10.0%, in December the average interest already stood at 8.7%. Conversely, housing loan interest rates gradually grew. The loan interest rates for non-financial enterprises did not change significantly during the year.

The volume of loans provided to households grew for the whole year 2017. As of December 31, the total household debt amounted to CZK 1,595.8 billion. The housing-related debts contributed with 72.2%.

In 2017, the volume of loans and receivables for non-financial enterprises grew by CZK 45.9 billion. As of December 31, the largest share (55,8 %) in the total, had long-term loans, which also posted the most increase with regard to their number (CZK 20.8 billion). However, also the volume of short-term loans showed a sharp increase (by 17.3 billion). Loans in foreign currency (as of December 31, they represented 29.6% from the total loan volume), the volume of which expressed in CZK was affected by the said last year strengthening also played an important role. The total volume of loans in the processing industry throughout the year grew evenly (with the average annual growth rate standing at 4.2%). The long-term strong growth of loan financing in 2017 was followed by the transport and storage (+ CZK 6,3 billion, 15,2%), loan financing of accommodation, catering and hospitality (28.6%) grew significantly. For the whole year, the volume of loans for mining and quarrying declined steadily (for the whole year by CZK 9.6 billion, 46.2%).

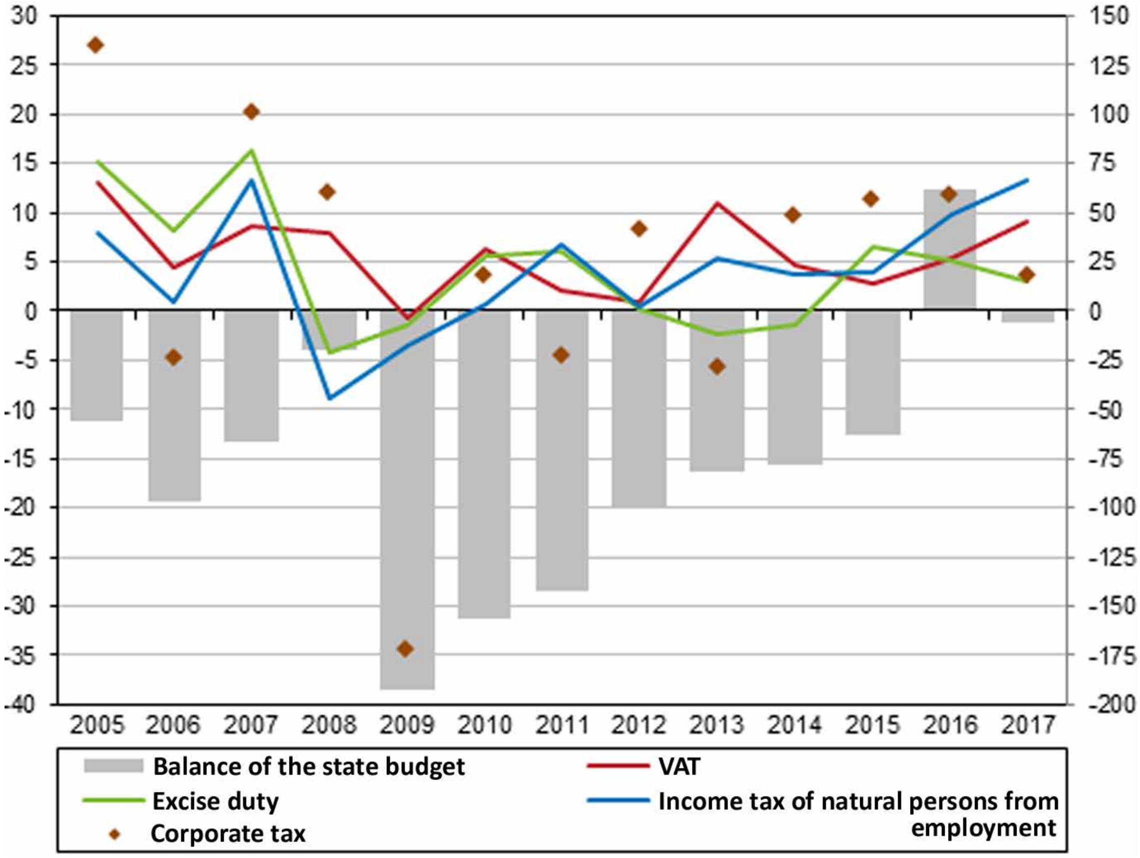
State budget

In 2017, the state budget (SB)[17] posted a moderate deficit (CZK 6.2 billion). Therefore, the positive result of the previous year (+61.8 billion), which was significantly influenced by the remaining payments from the EU budget tied to the completed programming period was not repeated. The SB balance constituting a key component of the deficit or surplus of the management of the government sector stood in relation to the nominal GDP at +0.1% (+1.3% a year earlier).

The total income of SB declined YOY by 0.6%. This was for the first time since 2012, when the domestic economy was seized by recession. For the last year result, a sharp drop in income from the EU budget (year-on-year by CZK 82 billion, to 77 billion), which was at the same time by 21 billion more pronounced than budgetary expectations, was solely responsible. Last year, this was surpassed for all significant tax revenues from the volume perspective. Last year, the nation-wide collection of all tax revenues (including premiums) grew by 6.9% and came close to the value of 2016 (+7.2%, the highest since 2007).

While in 2015 and 2016, the high collection of corporate tax drove the tax revenue of SB (without premiums), last year it was VAT that contributed to the growth by almost a half. The

[17] Unless otherwise stated, all details related to the state budget are based on the data of the Ministry of Finance regarding the state budget current performance.



Source: MF

Fig. 17. Nation-wide collections of tax revenue (YOY in %) and the state budget balance (in billion CZK)

VAT collection has improved year-on-year by 8.3%[18], at the level of all public budgets by 9.1% (by 5.4% a year earlier). Also a movement of certain activities from the grey economy due to recent measures introduced on the tax collection side contributed to this. However, the economic growth reflected in the final consumption expenditure continued to be a key factor of the higher VAT collection – in 2017, they increased, in nominal terms, for households by 6.5% YOY, for government institutions by 5.0% YOY.

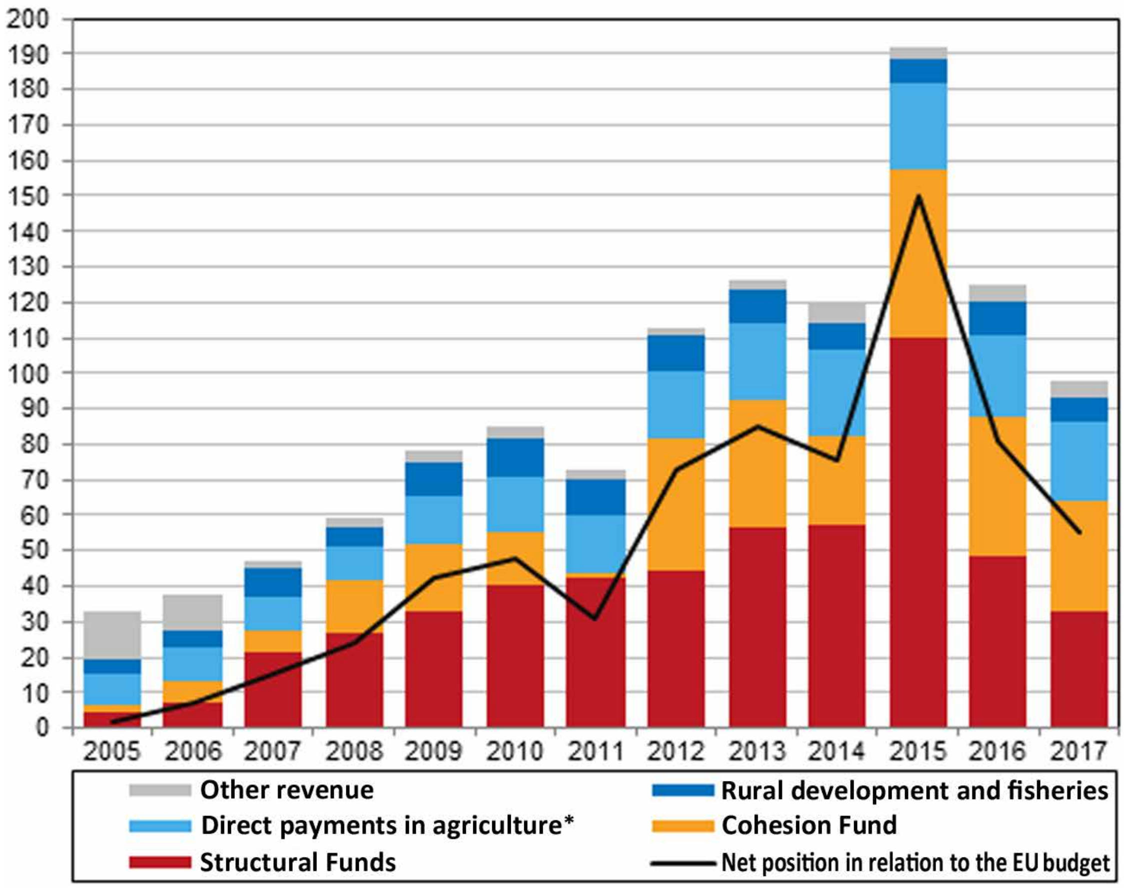
From all excise taxes, SB received by 2.9% YOY in 2017. The collection of the two most important sub-groups – excise duty on mineral oils and taxes on tobacco products improved in a similar vein.

Conversely, the development on the labour market continued to have a positive impact on the collection of the income tax of natural persons from employment (NPIT). Its nation-wide collection grew for a third consecutive year (up to last year's +13,3%) and just surpassed a record-breaking YOY growth from the boom of 2007. The NPIT from capital revenue reached CZK 16 billion last year. This was the only significant tax, from the volume perspective where the state collected less last year. Not only the persisting low interest rates, but also a legislative

[18] Since 1 January 2017, due to budget determination of taxes, the share of SB in the nation-wide VAT revenue dropped from 70.25% to 69.68% in favour of municipalities. Reciprocally (for the benefit of SB), there was an adjustment of the percentage share of the income tax revenue of self-employed natural persons.

amendment relating to the tax exemption for retirement entitlement of armed forces were reflected here.

Last year, the total expenditure of SB rose by 4.9% to almost CZK 1,280 billion. Similarly as in 2016, current expenditure, the pace of which was the highest in the last eight years (+5,5%) contributed exclusively to their growth. Despite low comparative base, capital expenditures dropped again (–3.1%) last year. While in 2016, the absorption of investment was just behind budgetary expectations, last year, this difference was already more than CZK 22 billion. During the year, their absorption showed significant irregularities[19]. The volume of investments realized via common programs of the EU and the Czech Republic (from the 2014–2020 programming period) has reached CZK 36.9 billion, two times the value YOY. Almost half of this amount was financed via the Transport operational program (OP), and one fifth via the Environment OP. All expenditures for the financing of the common programs of the EU and the Czech Republic (incl. current expenditure) amounted to CZK 91.1 billion last year and virtually stagnated compared to 2016. Less than 55% of all capital expenditure allocated by SB were



Source: MF

Fig. 18. Structure of the Czech republic revenue from the EU budget and net position of the Czech Republic to the EU (in billion CZK)

** Also includes market operations and veterinary measures*

[19] Almost half of the annual volume of investments was absorbed in the last quarter. Another quarter then accounted for the third quarter of 2017.

intended exclusively for national projects and therefore had no connection with the EU. The volume of such designated investments (CZK 44 billion) stagnated YOY, however compared to 2015 it was higher almost by 50%. The share of investments in total SB expenditure continued to drop for a second consecutive year, representing a mere 6.4%, the at least value since 1998.

The absorption of the SB investments intended for the European projects is reflected in the development of the Czech Republic position to the EU budget with some delay. Although last year, the Czech Republic received almost CZK 98 billion "net" from the EU, it was the lowest amount over the last six years. This was due to a sharper drop in refunded funds in the area of structural funds. However, their last year amount (CZK 33 billion) slightly exceeded the level from 2007 to 2008, respectively from the beginning of the previous programming period. Conversely, the absorption of the funds designated for direct payments in agriculture and rural development was relatively smooth in the last years. The overall payments of the Czech Republic to the EU budget remain stable. Over the last five years, they oscillated around CZK 43 billion annually.

The non-investment transfers of the public budgets on the territorial level, the growth of which accelerated to 13.4% (from 4.6% in 2016) contributed most to the higher current SB expenditure YOY (by CZK 62.6 billion). This expenditure reflects particularly the growth of earnings of workers in regional education[20]. Also a weight dominant item of social benefits, the increase of which (+16.9 billion) was primarily influenced by the adjustment of pensions contributed by a quarter in the growth of current expenditure. The growth rate of salaries of state employees almost doubled (to 9.2%), mainly due to the increase of wage tariffs. The high dynamics was showed by non-investment transfer to contributory organizations (+13.8%), involving e.g. universities or research organizations. The volume of non-investment transfers to business entities grew by almost one tenth (to CZK 48.3 billion). To some degree, these transfers are related to the supported of renewable energy resources.

Last year, 41.4% of the total state budget spending (year-on-year by 0.7 p. p. less) were paid on social benefits alone. A full 78% of social benefits spending were intended for pensions, for which the state incurred by 3.9% more YOY (in 2016 by 0.9%). The effects of the new regulation allowing to increase pensions beyond the standard adjustment were reflected in the increasing expenditure rate. Conversely, the number of all pension recipients (2.896 million persons) only grew by a minimum (+0.1%). In addition to demographic factors, this was due to a favourable situation on the labour market and the resulting "less demand" for early retirement (a relative YOY increment of persons with permanently reduced old-age pension was the lowest over the last four years). A record-breaking level of employment accompanied by an accelerating wage growth aided a dynamic collection of premiums (+8,2%, the highest since 2007). During 2017, the rate of pension premiums collection continued to increase (in Q1 it stood at 6.6% YOY, at the end of year it came close to 10%). These tendencies resulted in a significant improvement in the pension account balance[21], which was by almost 16 billion YOY favourable and reached CZK +0.1 billion. For the first time following the end of economic boom of the past decade, the pension account was free from the deficit.

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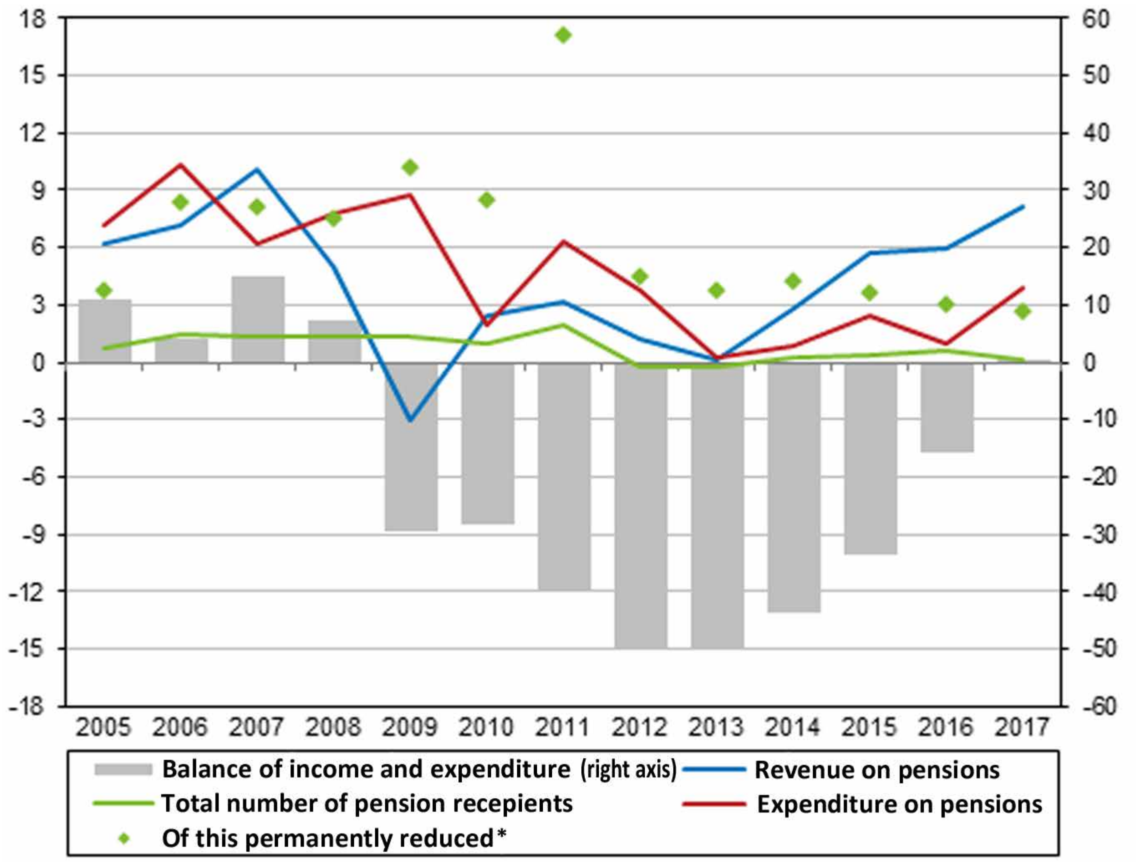
[20] From 1 September 2016, not only the salaries of teaching staff (+8%), but also of the non-teaching staff (+5%) – they will receive a pay from 1 July 2017 (by another 9.4%). From 1 November 2017, the salaries of teaching staff (+15%) were further increased.

[21] It is expressed as the difference between income and expenditure on pensions from SB (from preliminary data).



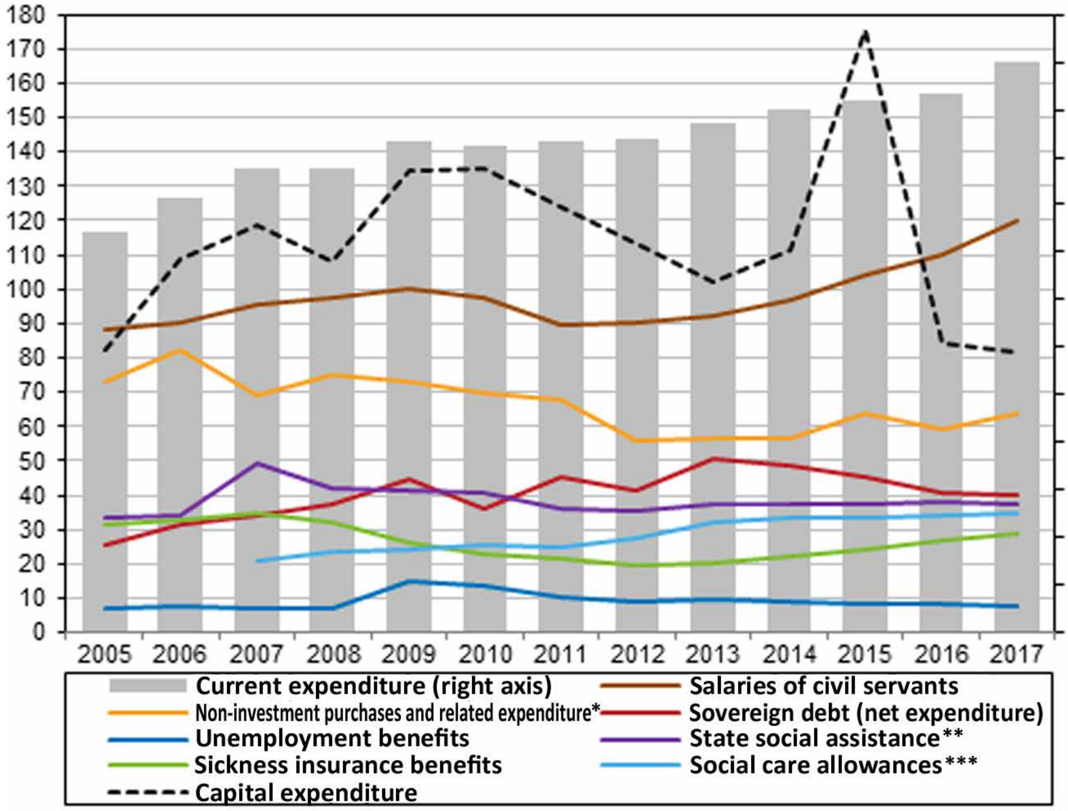
Source: MF, Czech Social Security Administration

Fig. 19. Pension beneficiaries, income and expenditure on pensions from state budget (YOY in %) and the pension account balance (in billion CZK)

** It is an old-age pension granted before the retirement age is reached and reduced for early retirement for the whole time of pension payments*

In 2017, the net costs of the public debt amounted to CZK 39.8 billion. The had declined (albeit at a slower pace) for four consecutive years – in total, they were lower by 21.9%. The lower interest rates on sovereign debt market in the first half of the year and also weaker borrowing state needs (due to improving the balance of SB) were responsible for the decline. In 2017, the national debt fluctuated substantially[22] and at the end of December, it stood at CZK 1,625 billion, being a 0.7% year-on-year increase. While the internal debt ratio rose moderately (+27 billion), the Czech crown value of the external debt continued to decline for a third consecutive year, as the realized its borrowing need exclusively on the domestic market. Thus, the external debt contributed to the total national debt ratio with 15.6% and in Q4, it was the lowest ratio over the last ten years. In Q4 2017, in connection with the brain of speculative capital, not only the volume dropped considerably, but also the share of Czech crown bonds held by non-residents (from 51.4% to 41.6%), and returned to the value from the beginning of the year.

[22] In Q1, the debt rose to CZK 1,789 billionand posted the fastest quarter on quarter growth since 2010 (+11 %). This short-term increase was related to the specific situation on the bond market due to expectations connected with the end of the foreign-exchange interventions. In 2017, government bonds worth CZK 493 billion were sold for a negative return to obtain additional income into the state budget of EUR 1.2 billion. The sovereign debt ratio, with which no interest expenditure are connected, rose from 12.0% to 15.2% in 2017.



Source: MF, Ministry of Labour and Social Affairs

Fig. 20. Selected expenditure of the state budget (in CZK billion)

* *Without interest, guarantees and other financial expenditure on national debt*

** *Including foster care allowances*

*** *Benefits in material need, benefits to persons with disabilities, contribution to care under the Act on Social Services*

According to the CSO data, the consolidated debt of the whole government sector (taking into account management to regional authorities or health insurance companies) amounted to [23] CZK 1,739 billion at the end of Q3 2017. The debt ratio stood at 35.1 % of GDP and fell YOY by 3.1 p. p. to which both reduction of the absolute amount of debt and growth of nominal GDP contributed. In addition to central government institutions, also local government institutions, contributed to the reduction of the debt ratio. In Q1 to Q3 2017 government institution posted a surplus of CZK 84 billion (50 billion a year earlier). The positive balance, as well as its annual increase was posted by all government sub-sectors. The central government institutions contributed the most to the increase of the total surplus.

[23] Preliminary data regarding the debt and deficit of the general government sector for the entire 2017 will be published by CSO on 4 April 2018, Eurostat, on 24 April 2018.

Global economic development

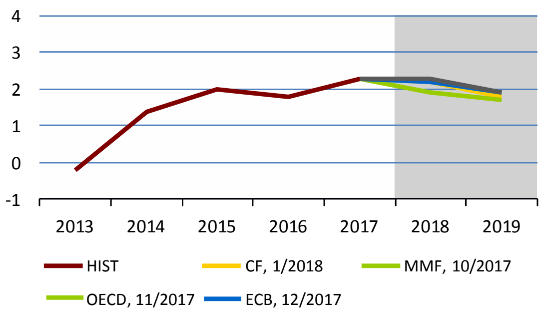
A shortened reprint from Komárek L. – Břízová P. – Adam T. – Novotný F. – Benecká S. – Polášková I. – Babecká O. – Hošek J. (2018): Globální ekonomický výhled – leden 2018 (Global economic outlook – January 2018). – Czech National Bank. Prague.

Euro area

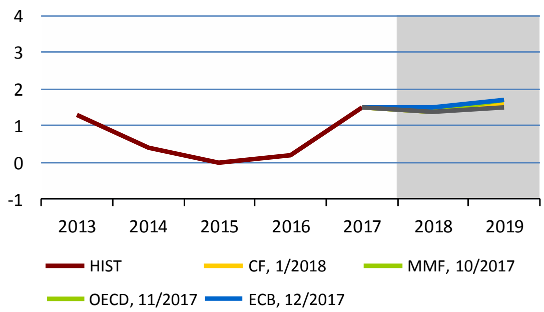
Towards the end of the last year, the Euro area economy continued a robust growth rate posted in the third quarter when GDP grew by 0.6% quarter-on-quarter (by 2.6% year-on-year). The growth in the Euro area is supported by a loose monetary policy, the recovery of the global economy and the positive development of the labour market where the unemployment rate dropped to 8.7% in November. The increasing available household income is reflected in private consumption, which is indicated by both the retail sales growth (by 2.7% YOY in November) and also by the leading indicators **[11]** (see chart below). Also, the production of companies shows an accelerated growth, such as PMI **[2]** in the processing industry, which reached the historically highest value (60.6) in December. We believe that for this and the next year, the monitored outlooks will continue a solid growth rate. This year, the economy should show a similar growth as in the last year (approx. by 2,2%) and a moderate slow-down in the next year.

Nor did the inflation **[12]** posted a significant increase towards the end of the last year, despite the accelerated growth of the economy. In December, according to a quick estimate by Eurostat, its total value fell to 1.4%, while the price increase of the core elements stagnated at 0.9%. There is a substantial uncertainty regarding a possibly stronger accelerated inflation of consumer prices. On the one hand, there is a significant continuous growth recovery and the increase in input prices related to the decline of free capacities in the economy that is indicated

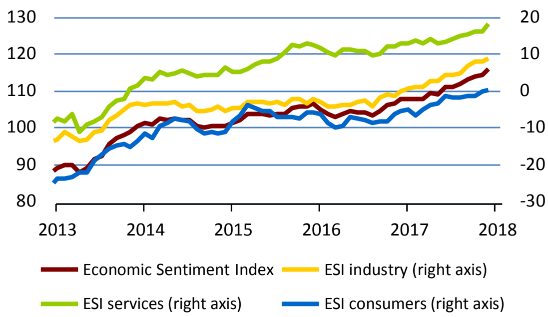
GDP growth, %



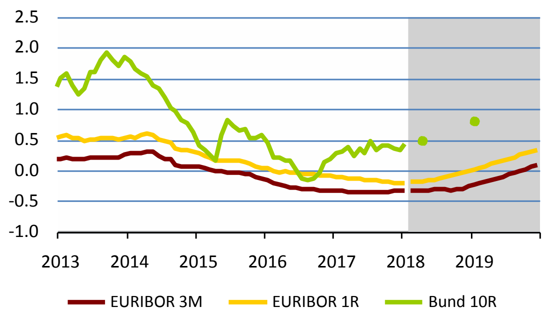
Inflation, %



Leading indicators



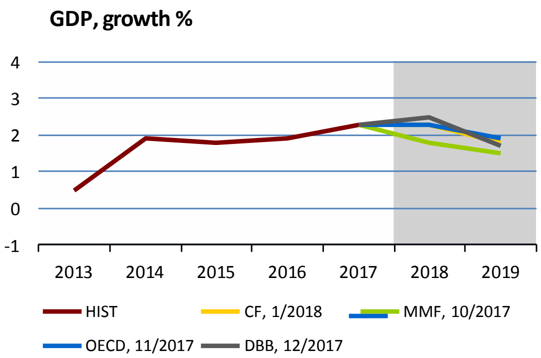
Interest rates, %

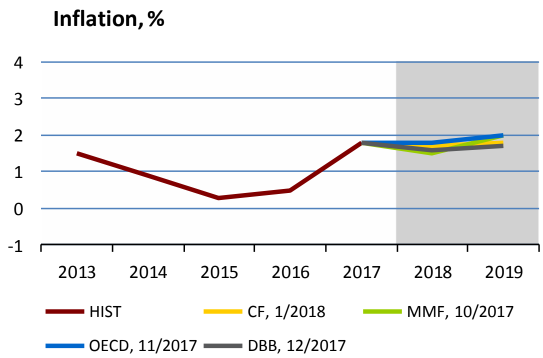


by the PMI surveys. On the other hand, there is however a relatively slow wage growth, the persistence of low inflation and subdued inflation which are reflected in the monitored outlooks. On their basis, the average inflation rate would stand slightly below 1.5% this year and should show a moderate acceleration next year. Due to the subdued inflation outlook, the ECB will continue to purchase assets at least by the end of September at a reduced volume of EUR 30 billion a month. At its December meeting, the ECB reiterated its commitment to keep the base rate at current levels for a longer period of time even after the end of net asset purchases. The financial markets expect first rate increases no sooner than in the second half of 2019.

Germany

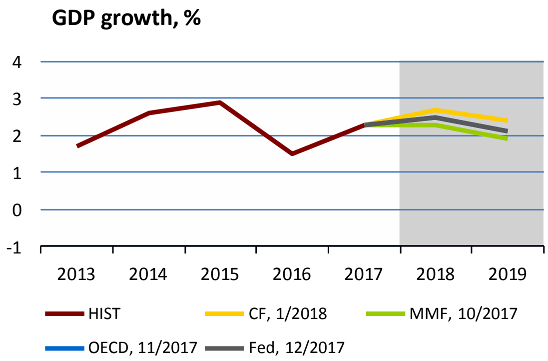
The economic growth outlooks in Germany for the following years have been increased (CF, DBB). This particularly reflected high GDP growth posted in the third quarter of 2017 when the economy accelerated both YOY (to 2.8%), and QOQ (0.8%). The industrial production also showed a positive development and continuation of the set trend suggests an additional growth of the leading PMI indicator in the processing industry in December. Other leading indicators (IFO, ZEW) also saw a positive development, despite continued political uncertainty when government coalition could not be formed after the general election in September. The unemployment rate stood at the historically lowest values in December. The YOY growth of consumer prices in the same month posted a moderate slow-down. Thus, the inflation pressures continue to be low and not even this year the inflation should exceed the 2% threshold.

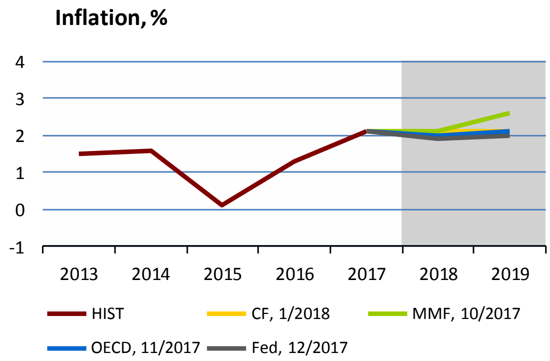


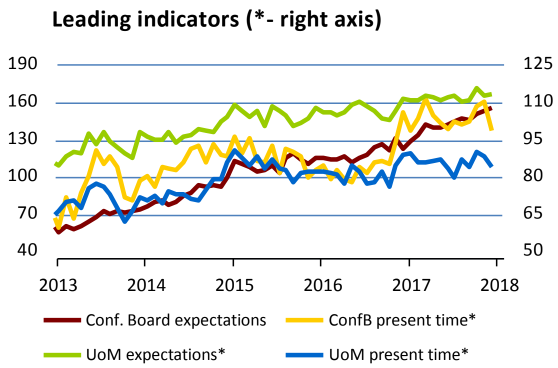


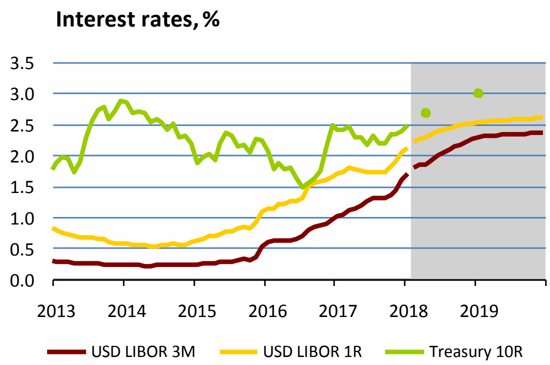
The United States of America

In December, the president Trump managed to push through the most extensive tax reform in the United States in over more than 30 years. With the key element being a tax reduction for corporations from 35 to 21%, and as a result of higher depreciation also the tax burden of small and mid-sized businesses or entrepreneurs should be reduced. The reform will also benefit employees, even though the analyses show that the richest Americans will benefit most (due to both the lower tax rate and two-times increase of the limit for the tax on inheritance). According to the Tax Policy Center, 95% of Americans will experience tax cuts, while the total volume of tax cuts should reach about USD 1.5 billion over ten years. The reform proponents claim that the budgetary loss resulting from the reduced rates will be compensated by the higher total income due to faster economic growth that will be supported by the reform. However, the analysts outside the White House estimate an increase in the US national deficit by up to USD 1 billion.







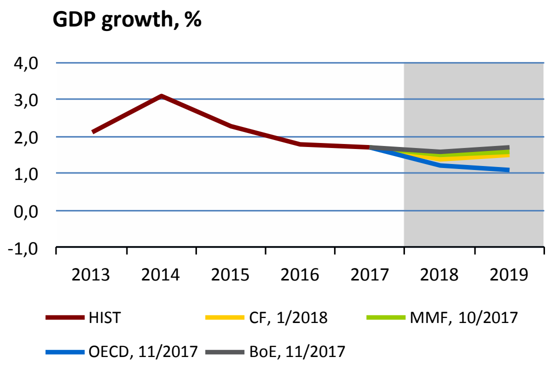


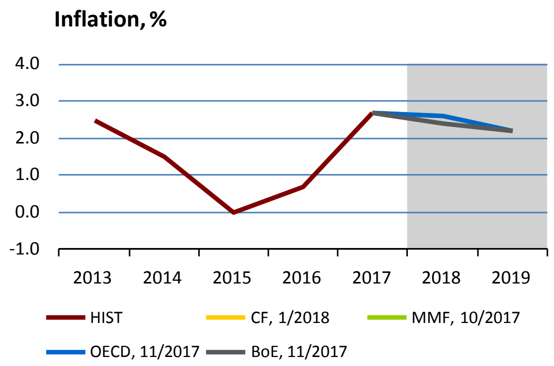
Such new outlooks of the FOMC members reflect a tax reform as it follows from the last meeting minutes. According to them, the reduction of tax burden should support expenses of both the businesses and consumers. At the same time, the members also expressed uncertainty regarding other impacts of the reform (in particular to the labour market and investments). However, most of them have revaluated the outlook regarding the US economy growth upwards. A more optimistic outlook for the economy was then supported by committee decisions to extend the base rate range by 25 BPS to 1.25-1.5%, while further three increases at 25 BPS each can be expected in 2018. (according to the median estimates of the FOMC members). The evaluation of the current economic situation did not show substantial changes, underwent, i.e. the economic activity continues to grow at a solid pace.

This is also confirmed by the labour market data. The unemployment rate remained at 4.1% with year-on-year increase of the average hourly wage by 2.5%. The number of newly created jobs in the non-agricultural sector reached 148,000 in December 148 and according to the investigation by the Conference Board the consumer trust continues to stand at a historical high (122,1). On the other hand, the inflation pressures remain moderate, even though the overall inflation reached 2.2% with the core inflation standing at 1.7% in November. Therefore, the new outlooks by CF or Fed has not brought any changes regarding the inflation forecast, and the economic growth outlook has been revaluated upwards.

United Kingdom

The value of the British inflation rose to 3.1% in November. It was mostly driven by the increase in the prices of transport, leisure activities, hospitality and hotel services, food and accommodation. The core inflation remained at 2.7%. Nevertheless, at its December meeting, the British central bank left the interest rate unchanged following its increase at the previous

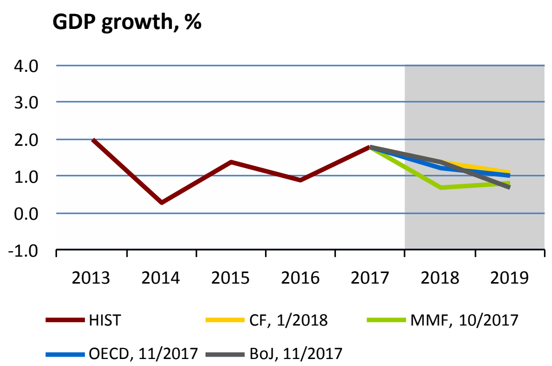


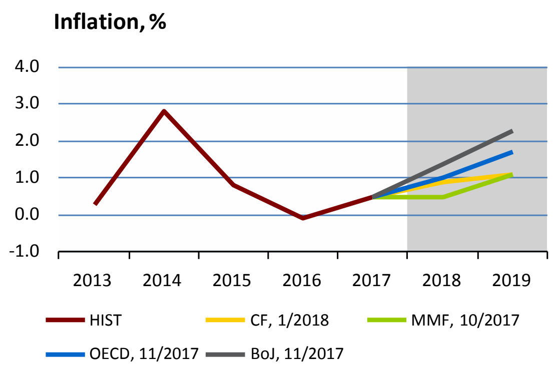


meeting. Should the economic situation so permit, the process of gradual monetary policy tightening will continue in the coming years. The NIESR Institute in London expects that it will be achieved by a frequency of two rate increases by 25 BPS per year. The institute perceives the current economic situation more positively than BoE. According to its estimates, the growth of the British economy in Q4 2017 accelerated to 0.6 % QOQ, while, for now, BoE leans towards a slight deceleration (from 0.4% in Q3). For the following two years, CF predicts that the YOY GDP growth pace will not exceed 1.5% with the inflation slowly returning to 2%.

Japan

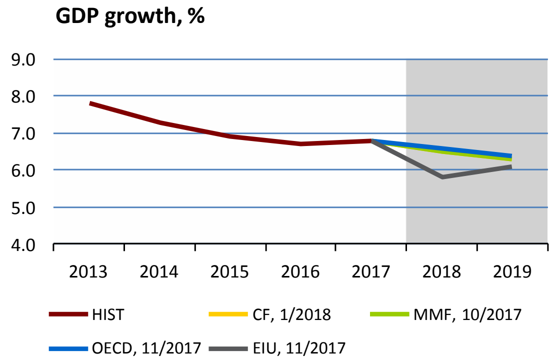
The situation in Japan shows a positive trend. Following a slow-down in October, the dynamics of retail sales posted an increase in November again, as well as wage growth and household expenditures. At the same time, there was further decline in unemployment to 2.7%. Compared to October, the year-on-year industrial production growth slowed down, however its pace remains very solid. In December, PMI in the processing industry grew again, to 52 points. According to purchasing managers, all monitored items have grown. In November, the inflation rose to 0.6%, due to increases in the transport prices and less drop in the prices of food. At its December meeting, BoJ did not change its monetary policy setting. The predictions of the monitored institutions suggest that growth of the Japanese economy should slow down in 2018 and 2019, with continuously rising inflation. BoJ even expects that the inflation should surpass the 2% inflation objective in 2019.

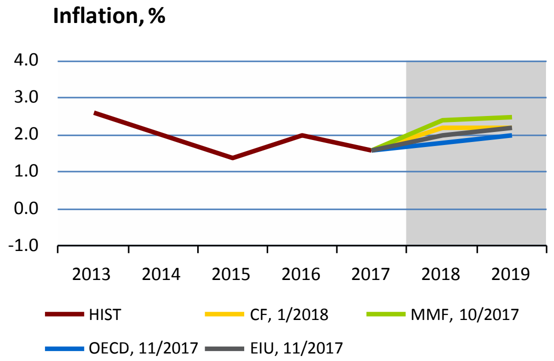




China

According to the statement by the Prime Minister Li Keqiang, the Chinese economy expanded at a rate around 6.9%. CF estimates the value by 0.1 p. b. lower. The official goal for the

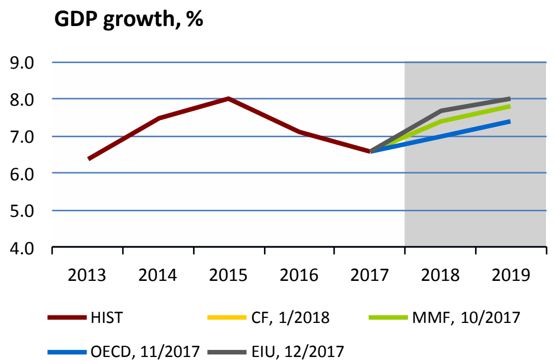


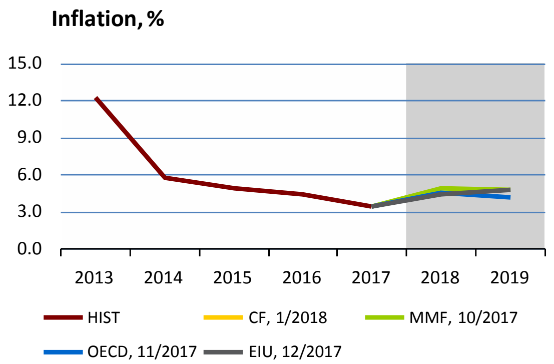


economic growth (6.5%) was overcome particularly due to the development in the building sector and robust demand for Chinese exports abroad. However, according to the current data, the growth rate showed a moderate slow-down towards the end of the year. In addition to the housing market cool down, also business shut-downs will have a significant impact. As one of the measures to improve the air quality in cities is an effort to use the natural gas-powered heating in households and enterprises instead of coal. However, the increased demand and inadequate infrastructure resulted in significantly reduced supplies of natural gas towards the end of the year, which will have a negative impact on the industrial activity. Not even in the coming months, a marked improvement can be expected. A moderate gradual slow-down of the Chinese economy growth is expected this and the next year.

India

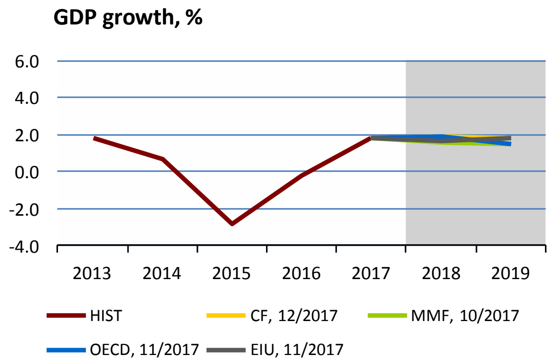
In September and October, the dynamics of industrial production showed a slow-down, with prominent reason being a drop in mining and production in the processing industry. In November, the production rose sharply, mostly due to the development in the processing industry. The turnaround of had previously been suggested by a corresponding sectoral index of the PMI leading indicator that had showed a steady increase since October and reached the highest level in the last 5 years (54.7 points) in December. In addition, according to purchasing managers, the growth of outputs, employment and also new orders contributed to this. Following a slowdown of the Indian economy in the current fiscal year, an acceleration above 7% is expected in the 2018/2019 fiscal year. In November, the inflation rose by 1.3 p. p. to 4.9% and in December, to 5.2 %, mainly due to a more rapid growth of food prices. This was reflected in the revised forecast by CF upwards. Thus, according to the monitored institutions, the inflation should stand above the set inflation objective of 4%, but well within the tolerance range (± 2%) in the next fiscal year.

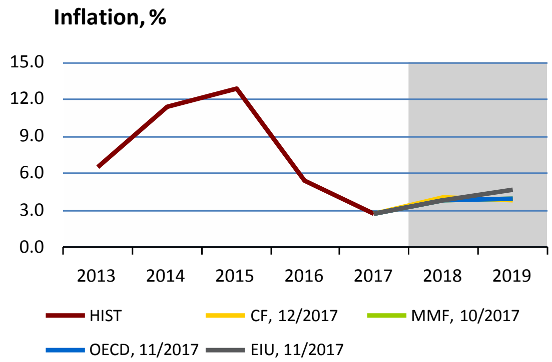




Russia

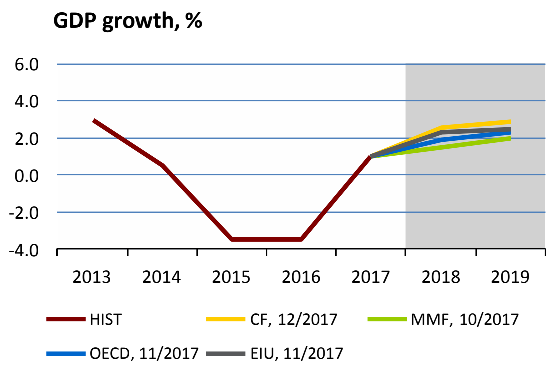
In November, the Russian industrial production unexpectedly fell by 3.6% year on year, this being the worst outcome since October 2009, and the total output per month dropped by 0.2%. The short-term dynamics of other key macro-economic indicators did not show any significant changes. In December, the growth rate of consumer prices remained at the preceding value (2.5% year on year), with the core inflation slowing down to 2.1%. Conversely, the inflation of the prices of producers has accelerated in the fourth consecutive month and reached 8% in November, mostly due to the increase in the prices of producers in the processing industry. The prices of industrial producers posted a 0.9% QOQ growth. At the end of the year, the Russian central bank announced further reduction of the monetary policy rates. Since December 15, the key rate is set at 7.75 % (i.e. there was by a reduction by 0.5 p. p.). Further reductions are expected in the first half of this year. This year, the new CF expects economic growth of just below 2%, with fixed investments growing at 3.4% rate. According to CF, the consumer price inflation should increase to 4.1% as of December.

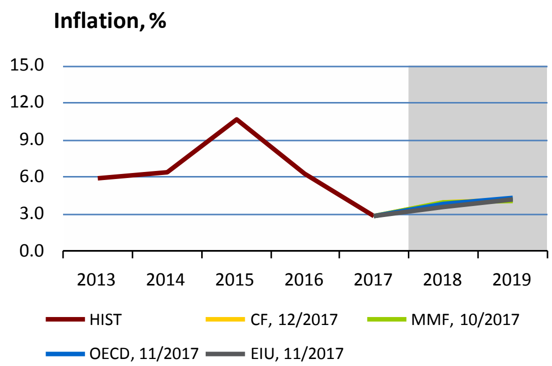




Brazil

In November, the industrial production of the Brazil economy showed a slow-down of its YOY dynamics to 4.7% (from the previous 5.5%). In spite of this being a marked slowdown, its growth rate remains at a historically high. At the beginning of December, PMI also reported a decline in the processing industry (to 52.4), which is confirmed by weaker performance in this sector. In contrast, PMI in the service sector rose (to 47.4). As a result, the aggregate PMI indicator remained unchanged and stayed within the economic contraction range (48.8). Conversely, the trust of industrial businesses has increased. Further decline of the unemployment rate





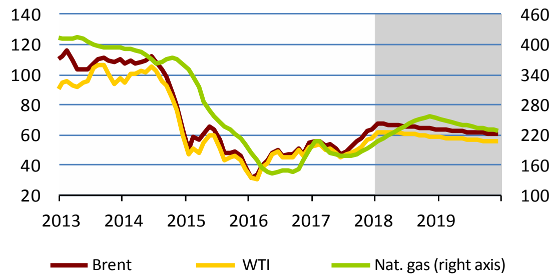
(to 12%) was positive news. In December, the YOY inflation of consumer prices grew closer to the 3% threshold. The higher growth of housing and transport prices were responsible for its moderate acceleration against November. On the contrary, the growth in food prices slowed down. The latest CF revised the outlook for this year by 0.2 p. p. towards a stronger growth (2.6%) and by 0.1 p. p. towards less inflation (4.0% as of December 2018).

Developments on commodity markets

Crude oil and natural gas

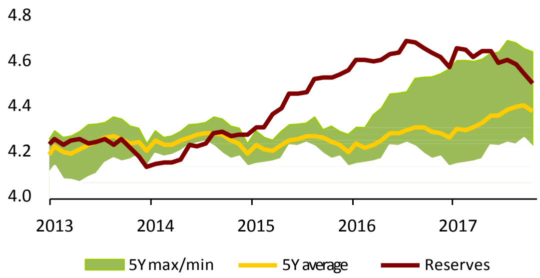
When the OPEC cartel and Russia at the November meeting in Vienna confirmed their commitment to continue the limited production until the end of 2018, the price of oil started to grow again since December. The growth was aided in the second half of the month by losses in Brent oil production due to the shut-down of key pipeline in the North Sea, closure of the pipeline in Libya, the rising political tensions in the Middle East (demonstrations in Iran that have not yet affected the production and oil exports) and last but no least , as a result of the USD rate weakening. The growth of hedge fund long positions also played a role. The WTI price as then supported by the failure of a pipeline from Canada to the USA. Yet, the

Outlook of crude oil (USD/bbl) and natural gas prices (USD/1000 m³)

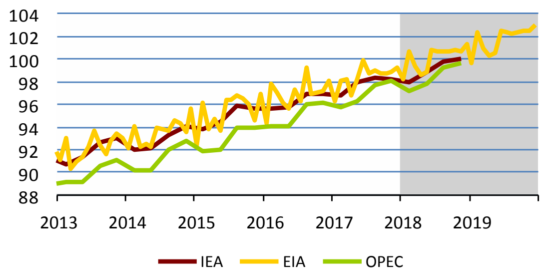


	Brent	WTI	Natural gas
2018	65,74	60,58	236,31
2019	62,04	57,01	238,56

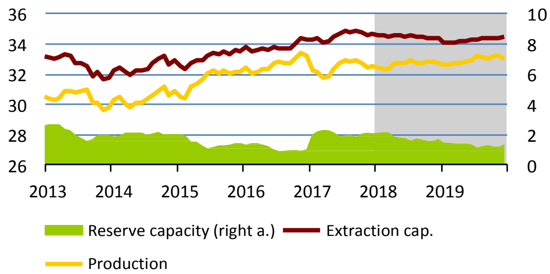
Total reserves of crude oil and its products in OECD (billion barrels)



World consumption of crude oil and its products (million barrels/day)



Production, total and reserve capacities of OPEC countries (million barrels/day)



Source: Bloomberg, IEA, EIA, OPEC, ČNB calculations.

Note: The price of oil at ICE, the price of the Russian gas at the German border - IMF data, HP filter applied. The future oil prices (grey area) are derived from futures contracts, future gas prices are derived from oil prices using a model. Total oil reserves (both commercial and strategic) in OECD countries - IEA estimate. Production and production capacity of the OPEC cartel - an EIA estimate.

Brent-WTI oil spread remains high and it supports the oil export from the USA to Europe and Asia. Only robust production growth in the USA operates against a more accelerated oil price growth. With regard to its continuation, there are still a number of uncertainties, e.g. whether mining companies will respond to the current oil price increase by massive investments into the expansion of production, or whether they will rather accommodate the desire of their shareholders and will increase the payment of the dividend. The question, whether the EIA model, assuming that the technology progress will continue, does not make the forecast of a fast growth of shale oil extraction in the USA the forecast far too optimistic, as suggested by some scholars and practical investors, is discussed. The growing volume of the hedged production of the America producers suggests that the production growth in the USA will continue. According to the survey of Fed in Dallas, 42% of companies would increase investments into the drilling activities at WTI USD 61–65/barrel, other 31% at USD 66/barrel. Compared to the last month, the market curve of futures contracts moved significantly upwards considerably and implies the price of Brent oil in 2018 standing at USD 65.7/barrel on average and its fall in 2019 to USD 62.0/barrel.

Other commodities

Following a moderate decline in December, the general price index of non-energy commodities returned to a growth trend and recorded a three-year maximum in January. Two sub-indices contributed to this in January. However, the sub-index of food commodities prices continues to stay close to the lowest values since 2010. The outlook is a rising one though, which largely contributes to rising outlook of the total index. Conversely, in January, the sub-index of industrial metal prices posted a strong growth following some fluctuation in December, and reached the highest value since February 2013. However, its outlook more or less stagnates.

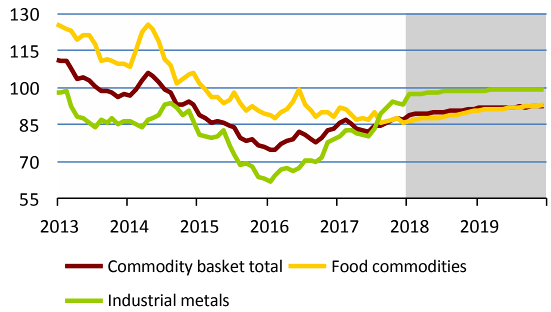
The prices of industrial metals are no longer supported by weakening dollar and favourable outlook of the processing industry, as suggested by further growth of the global JPMorgan PMI. The latter completed the year of 2017 at 54.5, being the highest in almost seven years. The Euro area contributed the most to the growth of the aggregate index PMI reached a historical high, but it was also supported by the majority of other developed countries. Also sub-indices in China, India and Russia showed some growth. The index structure is also positive, as new orders recorded the most prominent improvement. The increase in industrial metal prices in December was strong across the entire index and also the price of iron ore continues to post growth in the last two months. The price of coal, the outlook of which is declining due to the uncertainty regarding the future demand in China, which is trying to redirect the growth of its economy more into services and private consumption continued to grow.

At present, the prices of the crops predominantly stagnate due to high reserves and a favourable harvest outlook, although in the event of corn and wheat in particular, a transition towards growth is expected. With regard to industrial crops, cotton, specifically, has shown a price increase.

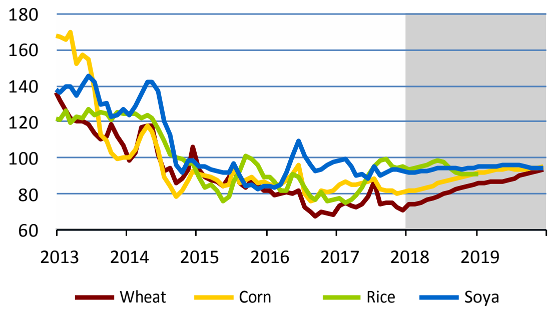
Unconventional monetary policy of ECB

The economists agree that inflation in the long run goes hand in hand with the development of the amount of money in the economy. In some circles, the quantitative easing (QE) of central banks thus raised concerns regarding its inflationary effects, particularly in the context of the

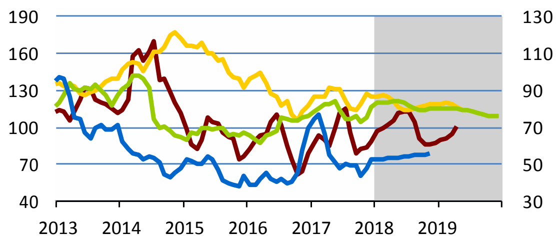
Price indexes of non-energy commodities



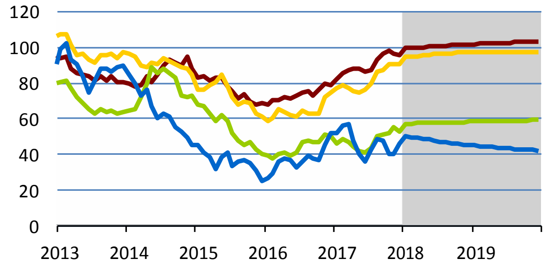
Food commodities



Meat, non-food agricultural commodities (*-right axis)



Base metals and iron ore



Source: Bloomberg, Czech National Bank calculations.
Note: The structure of of the price indexes of non-energy commodities corresponds to the composition of The Economist commodity indexes. Prices of the particular commmodities are expreased in indexes 2010 = 100.

misleading reference to this instrument as "money printing". However, as illustrated in this article, almost 3 three after its start, the growth of money reserves in the Euro area does not reach the pre-crisis values, as ECB, as well as other central banks, influences the amount of money reserves only indirectly due to predominantly endogenous character of money. The indirect channels include a portfolio restructuring (rebalancing) channel portfolio that results in a more loose financial conditions in most of the economy sectors. However, the new credit formation is determined, in addition to many other factors, by the credit price that cannot be influenced by the monetary policy, not event by its unconventional instruments. Therefore, the popular thesis that the quantitative easing is "money printing" that would ultimately lead to high inflation is not confirmed.

The exact effects of quantitative easing of ECB on the real economy and inflation in the Euro area cannot be determined due the interaction between many transmission channels and also because a number of economic events occurring in the period of quantitative easing are simultaneously at play. For example, the exchange of EUR against USD has weakened significantly already before the announcement of QE. In the period of asset purchases, also oil prices dropped significantly, reducing the overall inflation on one hand, and influencing positively the available income of households and firms in the Euro area on the other hand. The recent political uncertainty and Brexit have also macroeconomic implications making the analysis of QE effects more complicated.

Sources

ECB Economic Bulletin (2015/7). The transmission of the ECB's recent non-standard monetary policy measures.
ECB Economic Bulletin (2017/4). Which sectors sold the government securities purchased by the Eurosystem?
ECB Economic Bulletin (2017/6). Base money, broad money and the APP.

List of abbreviations

bbl	barrel
b. p.	Basis point (hundredth of a percentage point)
BoE	Bank of England
BoJ	Bank of Japan
ConfB	Conference Board Consumer Confidence Index
CF	Consensus Forecasts
ČNB	Czech National Bank
DBB	Deutsche Bundesbank
ECB	European Central Bank
EIU	Economist Intelligence Unit
ESI	Economic Sentiment Index of the European Commission
EU	European Union
EUR	euro
EURIBOR	Euro InterBank Offered Rate
Fed	Federal Reserve System (US central bank)
GDP	Gross domestic product
LIBOR	London InterBank Offered Rate
MMF	International Monetary Fund
OECD	Organisation for Economic Co-operation and Development
p.p.	percentage point
PMI	Purchasing Managers Index
UoM	University of Michigan Consumer Sentiment Index
WTI	West Texas Intermediate

Glossary of selected economic terms in foregoing chapters Development of the Czech economy and Global economic development

[1] Gross domestic product (GDP) is one of the basic and widely used macroeconomic indicators characterizing economic activity and growth. It can be defined either as the sum of the gross value added of various sectors and branches of the national economy (the value of goods and services produced after subtracting intermediate consumption, i.e. the value of goods and services consumed during their production) or as the value of domestic final demand (final consumption and gross capital formation) plus exports minus imports.

[2] Confidence Index

Composite confidence indicator (economic sentiment indicator)is aweighted average of seasonally adjusted **confidence indicators in industry, construction, trade, selected services, and consumer confidence.**

Composite business confidence indicator is a weighted average of seasonally adjusted confidence indicators in industry, construction, trade, and selected services.

Consumer confidence indicator is composed of four indicators calculated by GfK Prague (expected financial situation of consumers, expected total economic situation, expected total unemployment (with inverted sign) and savings expected in the next 12 months).

Business cycle surveys are based on opinions of entrepreneurs operating in specific areas of interest (e.g. industry, construction, trade, selected services). By the use of partial questions, they reveal prospects for the future (on manufacturing or business activity, demand, prices, loans, etc.). Consumer surveys indicate intentions of consumers, especially the propensity to make purchases or savings and plans for purchase of selected consumer durables. The common feature of these surveys is that the answers do not provide direct quantifications, but outline future in generic terms - e.g. better, same, worse. Evaluations of results are carried out via variant summaries of responses. A clear expression of tendencies is the business cycle balance, which is the difference between expected improvements and deteriorations expressed as a percentage. The higher the positive balance of answers, the more optimistic is considered the answer obtained. CSO calculates separate indicators of confidence among business and consumers and also the composite confidence indicator (economic sentiment indicator) which summarizes business and consumer confidence in a certain way.

There is a lot of such confidence indicators in the world, e.g. Purchasing Managers Index (**PMI),** Economic Sentiment Index (**ESI**), University of Michigan Consumer Sentiment (**UoM**).

[3] Private consumption is given by household final consumption expenditures and determines the standard of living of the population. It contains household consumption of goods and services for final use, which is covered by the disposable income of the population. The general rule is the faster the GDP growth, the faster the rise in private consumption.

[4] Gross fixed capital formation is a basic component of investment and includes acquisitions of fixed assets (esp. machinery, equipment, buildings and structures) during a certain period. Total investments include gross fixed capital formation, changes in reserves, and net acquisition of valuables.

[5] Foreign trade balance – so called net exports – it is given by the difference between values of exports and imports of goods and services, it influences growth of GDP and macroeconomic balance of a country.

[6] Terms of trade are a ratio of export prices to import prices. These prices are determined by the selective indexes of nominal prices of export and import (approx. 2,350 selected export representatives and 2,300 representatives for imports surveyed monthly within approx. 590 selected reporting units for exports and the same number for imports, which significantly contribute to the volume of realization of individual important foreign trade groups) and also serves to convert trade from current to constant prices. During export, the prices of the post free border of the Czech Republic are monitored, during the import the prices invoiced by a foreign supplier. The value of TT> 100 represents a situation where the economy can import the identical volume of goods at a lower export volume, respectively import more at the identical export volume and vice versa for TT <100.

[7] Real gross domestic income is defined as gross domestic product after taking into account the effects of the terms of trade.

[8] Supply side of the economy relates to the basic factors of economic activity (labour, capital and total factor productivity) and to the main branches of activity (agriculture, industry, construction, services).

[9] Gross value added (GVA) is a widely used indicator of the total economic performance of each branch. It is an indicator corresponding to the GDP in the entire national economy. It is calculated by subtracting so called intermediate consumption (value of raw materials, energy, materials consumption) from the total value of production.

[10] Unemployment rate is the ratio of the unemployed to the total labour force. We distinguish between the general unemployment rate determined by surveys of the CSO and the proportion of unemployed persons calculated by the Ministry of Labour and Social Affairs – this is called the "Registered unemployment rate".

[11] Leading economic indicators are various measurable economic factors that change before the economy starts to follow a particular pattern or trend. So they fonction as indicators of changes in the climate of economy but they are not always accurate.

[12] **Inflation** is generally understood as a recurring growth of most prices in the economy. It is a weakening of the real value (i.e. purchasing power) of a given currency against the goods and services bought by consumers – if there is a consumer price inflation in an economy, then consumers need increasingly more local currency units to buy the same basket of goods. In practice, inflation of consumer prices is measured by consumer price index (CPI).

Foreign direct investment in mining in the Czech economy

Foreign direct investment (FDI) is an investment of money or money assessable assets and rights made by a company or individual in one country in business interests (e.g. agreement on profit distribution, excercise of effective influence on a company business, minimum stake 10% in a company equity, in a company voting rights) in another country in order to gain share in the business.

FDI = equity (investment of foreign investor into a company equity also equity of branches, daughter and associate companies)
+ reinvested profit (= retained profit of past periods + post-tax profit – dividends)
+ other capital (given and taken credits and debt securities among direct investors and their branches, daughters and associate companies)

Compiled on the basis of the texts:
Foreign Direct Investment – FDI.-(I)INVESTOPEDIA, www.investopedia.com/terms/fdi.asp
Bolotov I. (2015): Diskuse na téma přímé zahraniční investice a a) jejich obecné dopady na Českou ekonomiku b) jejich dopady na strukturu zapojení České republiky do mezinárodního obchodu. 2M0301 „Mezinárodní obchod“, cvičení č.9. – Katedra mezinárodního obchodu, Fakulta mezinárodních vztahů, VŠE, Praha.

Following tables are based on CNB data and own calculations:

Foreign direct investment in the Czech Republic – state on the date December 31 of the given year (ths CZK unless provided otherwise)

		FDI total	In mining and processing of bituminous and brown coal	In extraction of crude oil and natural gas	In other mining	In supporting activity in mining total	Total in mining activities	Mining activities in total as % of FDI in total
2013	Equity	1 338 371 170	16 337 020	1 799 477	2 728 094	48 834	20 913 425	1.56
	Reinvested profit	1 120 866 569	–3 440 124	6 338 148	4 008 953	1 047 482	7 954 459	0.71
	Other capital	209 503 325	15 549 418	29 206	361 020	–12 533	15 927 111	7.60
	Total	2 668 741 063	28 446 314	8 166 831	7 098 067	1 083 783	44 794 995	1.68
2014	Equity	1 332 907 239	16 885 103	1 714 031	2 770 896	49 814	21 419 844	1.61
	Reinvested profit	1 189 925 711	–8 386 509	5 040 400	4 135 449	1 536 044	2 325 384	0.20
	Other capital	251 767 896	8 972 383	57 253	167 370	1 549	9 198 555	3.65
	Total	2 774 600 846	17 470 977	6 811 684	7 073 715	1 587 407	32 943 783	1.19
2015	Equity	1 482 024 589	18 676 664	1 942 377	2 757 988	49 746	23 426 775	1.58
	Reinvested profit	1 235 655 323	–12 787 644	3 252 489	4 595 441	1 760 714	–3 179 000	–0.26
	Other capital	177 488 955	1 506 119	33 497	76 023	2 128	1 617 767	0.91
	Total	2 895 168 867	7 395 139	5 228 363	7 429 452	1 812 588	21 865 542	0.76
2016	Equity	1 569 048 217	11 071 231	1 636 785	3 173 462	81 980	15 963 458	1.02
	Reinvested profit	1 310 028 377	–10 037 497	3 706 865	4 246 086	1 460 430	–624 116	–0.05
	Other capital	245 154 046	1 711 341	–1 594	450 777	–80 547	2 079 977	0.85
	Total	3 124 230 640	2 745 075	5 342 056	7 870 325	1 461 863	17 419 319	0.56
2017	Equity	1 605 946 068	11 071 231	2 007 362	3 143 462	82 116	16 304 171	1.02
	Reinvested profit	1 454 302 616	–10 610 654	4 249 423	4 503 768	1 451 975	–405 488	–0.03
	Other capital	237 251 001	1 711 125	–25 547	450 777	–80 547	2 055 808	0.87
	Total	3 297 499 685	2 171 702	6 231 238	8 098 007	1 453 544	17 954 491	0.54

Foreign direct investment of the Czech Republic origin abroad – state on the date December 31 of the given year (ths CZK)

		FDI total	In mining and processing of bituminous and brown coal	In extraction of crude oil and natural gas	In other mining	In supporting activity in mining total	Total in mining activities	Mining activities in total as % of FDI in total
2013	Equity	217 200 000	0	0	0	0	0	0
	Reinvested profit	169 900 000	0	0	0	0	0	0
	Other capital	29 000 000	0	0	0	0	0	0
	Total	411 600 000	0	0	0	0	0	0
2014	Equity	242 533 271	0	0	63 501	0	63 501	0.03
	Reinvested profit	167 857 207	0	0	26 584	0	26 584	0.02
	Other capital	5 927 862	0	0	14 732	0	14 732	0.25
	Total	416 388 340	0	0	104 817	0	104 817	0.03
2015	Equity	259 638 257	0	0	122 982	0	122 982	0.05
	Reinvested profit	180 391 178	0	0	107319	0	107319	0.06
	Other capital	21 482 669	0	0	–47 579	0	–47 579	–0.22
	Total	416 512 104	0	0	182 542	0	182 542	0.04
2016	Equity	313 266 806	0	0	182 961	0	182 961	0.06
	Reinvested profit	202 345 248	0	0	14 732	0	14 732	0.01
	Other capital	–17 541 072	0	0	–553	0	–553	0.003
	Total	498 070 982	0	0	197 140	0	197 140	0.04
2017	Equity	303 939 373	0	0	81 859	0	81 859	0.03
	Reinvested profit	239 695 854	0	0	–66 116	0	–66 116	–0.03
	Other capital	–7 613 578	0	0	0	0	0	0.00
	Total	536 021 649	0	0	15 743	0	15 743	0.003

Mineral facts: Incompetent competent persons

The assessment of its economic benefit based on the calculation of its reserves, or resources of the raw material according to the one of the most internationally recognized reporting assessment systems is at the very end of the deposit exploration. The so-called competent person is responsible for the accuracy of such assessment (Please see a separate chapter *Classification of reserves and resources in the Czech Republic and its development compared to other international classifications* in this yearbook).

The become a competent person, a surveying expert has to have an appropriate qualification and must be entered on the relevant list of one of the internationally acclaimed geologist's professional organizations, that will, in a way, guarantee his/her professional and moral qualities.

The reporting systems regarding the results exploration of accumulations (deposits) of raw materials are used, apart from the banking sector and its credit-related decision making, mostly for the information to investors into survey and mining, particularly through investments in the shares of mining companies at stock exchanges. Either, by purchasing the so-called Initial Public Offerings (IPO), not yet traded on stock the exchange or by purchasing already traded shares.

A stock exchange is, perhaps, in every capital city of the EU. In some countries, there are several such exchanges. The Federation of European Securities Exchanges does not associate all of them. Yet, it consists of 37 stock exchanges affiliated via capital into 19 entities operating in 30 countries (including Switzerland and Armenia). The most prominent include NASDAQ OMC Group Inc. (this colossus from the USA has stock exchanges in Stockholm, Copenhagen, Helsinki, Iceland, Riga, Tallinn, Vilnius, and Armenia) and EURONEXT Group formed by a merger of the legendary NYSE, a New York stock exchange, and EuroNext based in Paris (stock exchanges in Amsterdam, Brussels, Lisbon, and Paris). The London Stock Exchange (LSE) itself has also a global reach.

An independent authority, ESMA (European Securities and Markets Authority) for the protection of investors, flawless market operation and financial stability, established by the European Council and the European Parliament managed together with other banking, insurance and pension supervisory authorities by the European Systemic Risk Board (ESRB) operates in the EU. ESMA is authorised to make recommendations to capital market, not to issue orders.

In its recommendations [**1**]**,** mining companies are classified (e.g. together with companies involved in scientific research or newly established companies – start-ups) as professional issuers (of securities). In addition to the requirements regarding stock exchange prospectuses (notification for investors) of these companies, recommended contents of reports by competent persons are given and acceptable internationally recognized notification standards regarding offering of business investment in the extraction of mineral resources are mentioned, namely: JORC, SAMREC, CIM Guidelines were (Society for Mining and Metallurgy and exploration, PERC, Certification Code for exploration prospects, Mineral Resources and Ore Reserves Instituto de Ingenieros de Minas de Chile, NAEN, Petroleum Resources Management System (Society of Petroleum Engineers and World Petroleum Council and American Association of Petroleum Geologists and Society of Petroleum Evaluation Engineers), COGE Handbook

(Canadian Oil and Gas Evaluation Handbook), NI 51-101, Norwegian Petroleum Directorate classification system for resources and leisure travellers, VALMIN, SAMVAL, CIMVAL (VALMIN in Australia, SAMVAL in South Africa, CIMVAL in Canada are systems for the determination of the cost of mineral assets - deposits of raw materials). However, all of them are non-binding recommendations. The national stock exchange supervisory authorities may take them into account, bur do not have to.

Therefore, ESMA does not certainly prefer the European PERC system. A list of permitted ESMA notification systems includes all internationally recognized systems. The fact that the list does not include the Canadian NI 43-101 rather makes an impression that ESMA, or the EU, leaves the issue of reliability of the reported values on the person submitting the notification.

Nonetheless, some international hands-on experience show that such an approach may be detrimental to the trust of investors, and stock market trade as a result.

As early as in 2009, the Australian stock exchange (ASX) informed the public of its investigation of 800 registered mining companies, how their reports regarding the survey results, resources and reserves of raw materials comply with the notification principles of the JORC system for the period from October 2008 to March 2009 **[2]**.

Of the total 5.200 notifications, 312 did not pass the test. In 176 cases, the reason was insufficient or missing information regarding the competent persons. The remaining notifications showed mistake in particular with regard to information on reserves (80) and resources (11) and wrongly stated purpose of the survey (41).

These irregularities were dealt with by Stock exchange market supervision (ASXMS) as follows:

- It required to substitute the defective report with a new corrected one,
- It required the submission of an explanatory report or amendment,
- It issued an educative warning to the offending company,
- The offending company with serious irregularities in the report received a “please explain” letter and published it on the market.

ASXMS (ASX Market Supervision) also organised training seminars. It proposed no recourse of the competent persons.

From 1 May to 31 August 2015, the Prospectors and Developers Association of Canada (PDAC) had 34 studies - preliminary economic forecasts, preliminary economic feasibility and economic feasibility studies analysed - whether they are compliant with the requirements of the NI 43-101 system regarding the notification of the results of surveys of accumulations of raw materials [**3]**. 33% of them failed due to „incompetent“ competent persons. The information regarding projects were both incomplete in the reports and lacked a description of risks and budgets of costs were insufficient on regular basis. In addition, it was pointed out that during the analysis, the accuracy of geological and technological preconditions was not checked, therefore any deficiencies in this regard were not detected by the analysis. The incompetence is said to be a non-random one but rather an intentional tendency to inform the investor public using distorted information. A necessity to change the NI 43-101 system is presumed, but no penalties to the competent persons is proposed.

These facts show that the concept of a competent persons in reporting systems alone does not protect the stakeholders from mistakes and fraud in the reports regarding the results of surveys of accumulations of mineral resources. At least, the entities depending on the accuracy of the reported data regarding the sources and reserves of raw materials (stock exchanges, banks, perhaps even states with their resource and inventory stocktaking) should watch the reliability of notifications more closely and propose measures to remedy any identified deficiencies.

Literature

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[2] Review of JORC Code disclosure compliance for the six months to 31 March 2009. – ASX Media release, 14 May 2009. (www.asx.com.au/documents/asx-compliance/mr_140509_jorc_code_review.pdf)
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The economic situation of domestic mining companies

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Table 1: Mining total

Indicator	Unit	2013	2014	2015	2016	2017
Number of enterprises		241	242	251	240	232
Number of employees		57 146	55 895	63 427	54 959	53 482
Sales	mill CZK	153 688	147 489	185 334	156 164	182 210
Value added	mill CZK	57 054	57 473	74 260	38 105	65 691
Sales per employee	ths CZK/ employee	2 689	2 639	2 922	2 833	3 407
Labour productivity based value added	CZK/ employee	998 385	1 028 222	1 170 808	691 821	1 228 267
Hourly labour productivity	CZK/ working hour	595	609	697	416	733
Average salary	CZK/ employee	29 736	29 847	30 462	30 815	32 126
(Value added – salaries) per employee	CZK/ employee	968 649	998 374	1 140 346	661 006	1 196 141

Indexes	17/13	14/13	15/14	16/15	17/16
Number of enterprises	-4%	0%	4%	–5%	–3%
Number of employees	-6%	–2%	13%	–13%	–3%
Sales	19%	–4%	26%	–16%	17%
Value added	15%	1%	29%	–49%	72%
Sales per employee	27%	–2%	11%	–3%	20%
Labour productivity based value added	23%	3%	14%	–41%	78%
Hourly labour productivity	23%	2%	15%	–40%	76%
Average salary	8%	0%	2%	1%	4%
(Value added – salaries) per employee	23%	3%	14%	–42%	81%

Source: own calculations according to Ministry of Industry and Trade and CSO

An analysis of the economic situation of enterprises using raw materials depends on the availability of data. Enterprise data is the basis. Many businesses extract from more raw materials and are therefore included in the analysis multiple times. The second problem is that these businesses are not only extracting the specific raw materials, but are also engaged in downstream production. For instance, they extract brick clay and produce bricks. At the enterprise level, economic data cannot be separated for individual raw materials and for the downstream production.

For large- and medium-size enterprises, there are a lot of economic data. The problem is economic data for small- and micro-sized enterprises. For this reason, the selection of indicators has been adapted. Enterprises extracting raw materials can be characterised by absolute indicators, namely by their number, recalculated number of employees (e.g. when someone works half-time, he/she is only one half), sales and added value. And, also through selected relative indicators, such as sales per employee, value added labour productivity, hourly labour productivity, average wage and difference of the added value and wage per employee (see Tab. 1).

As we proceed from statistical data in which individual business data are subject to confidentiality, the raw materials for less than three enterprises need to be summarised in one table.

The economic data for all mining companies (Mining Total) is for a period of five years, i.e. from 2013 to 2017, supplemented by chain indexes and last-period index to the initial value. Comparable indices for individual minerals are compared with values for Mining total that equals 100%.

The total data for Mining Total for the above reasons differs from the CZ-NACE B industry classification, Mining and Quarrying. These differences can be demonstrated in the sales (see Tab. 2). Total sales for individual raw materials are divided by enterprises belonging to CZ-NACE B Mining and Quarrying and other industries. For instance, all enterprises mining black coal, brown coal and lignite belong to the CZ-NACE B section. However, most of the mining of kaolin is the majority of sales from other industries, i.e. mining is included in the production of porcelain. In the case of Mining Total, the share of other industries is not so high, i.e. 39,468/182,210 = 22%. In other words, 78% of sales is from the CZ-NACE B section.

From the point of view of the recurrence of the enterprises, it is obvious that Mining Total sales are in the amount of CZK 142,742 million. Enterprises included in the CZ-NACE B section Mining and Quarrying once show the sales of CZK 92,741 million. Thirty-five percent of Total Sales of enterprises belonging to the CZ-NACE B section are companies that recur in this section, amounting to CZK 50,001.

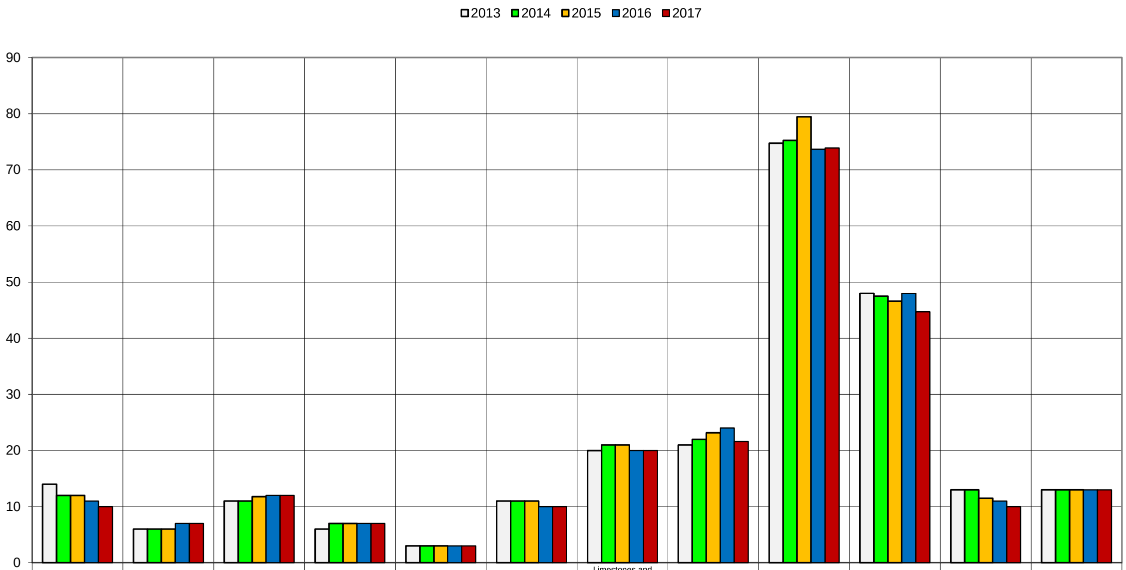
The official value of sales for the section CZ-NACE B Mining and Quarrying amounts to CZK 95,871 million, which means that CZK 95,871–92,741 million= CZK 3,130 million was not included in the selection of Mining Total. Roughly over three percent of sales of the CZ-NACE B section were not included in the Mining Total.

Even though the following figures and tables are self-explanatory, a brief commentary is included.

Table 2: Sales in 2017 (mill CZK)

Mineral raw material	Total	CZ-NACE B	Other CZ-NACE
Bituminous coal, Brown coal and lignite	41 026	41 026	0
Kaolin	7 822	3 695	4 126
Clays and betonite	6 580	5 427	1 153
Feldspar	7 861	3 281	4 580
Glass sand	2 935	2 484	451
Foundry sand	5 798	3 930	1 868
Limestones and corretive sialic additives for cement production and dolomite	9 793	3 780	6 012
Dimension stone	2 163	1 992	171
Crushed stone	29 981	29 064	917
Sand and gravel	14 072	12 141	1 931
Brick clays and related minerals	7 995	2 235	5 760
Other minerals	46 187	33 687	12 500
Mining total	182 210	142 742	39 468
Firm classified one time into data processing		92 741	
CZ-NACE B		95 871	
Firm classified more times into data processing		50 001	

Source: own calculations according to Ministry of Industry and Trade and CSO



	Bituminous coal, Brown coal and lignite	Kaolin	Clays and betonite	Feldspar	Glass sand	Foundry sand	Limestones and corretive sialic additives for cement production and dolomite	Dimension stone	Crushed stone	Sand and gravel	Brick clays and related minerals	Other minerals
2013	14	6	11	6	3	11	20	21	75	48	13	13
2014	12	6	11	7	3	11	21	22	75	48	13	13
2015	12	6	12	7	3	11	21	23	79	47	12	13
2016	11	7	12	7	3	10	20	24	74	48	11	13
2017	10	7	12	7	3	10	20	22	74	45	10	13

Source: own calculations according to Ministry of Industry and Trade and CSO

Figure 1. Number of enterprises

The number of organisations (see Tab. 1) declined by 4% in 2017/2013, rising by 2015 and then started to decline.

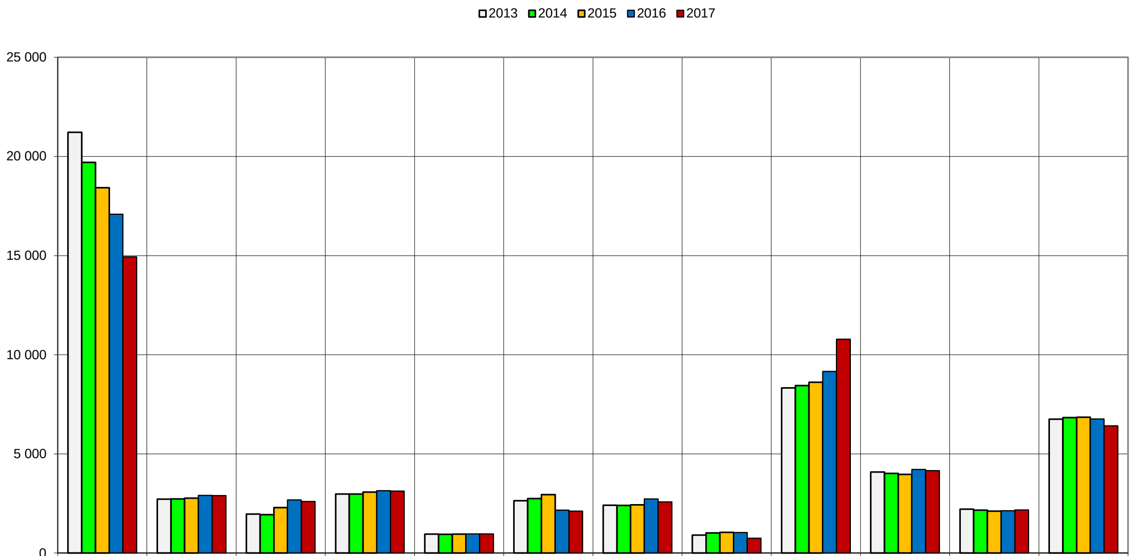
Comparing Mining Total (232 organisations) and CZ-NACE B section, Mining and Quarrying, (393 organisations) in 2017 shows that in our selection there are 161 organisations less. However, there are 91 organisations from other industries, i.e. there are 141 organisations from the CZ-NACE B. There are 280 very small organisations in the CZ-NACE B section, which we cannot align to individual raw materials. Good data is shown for 113 organisations. The difference 141 - 113 = 28 organisations corresponds to the repetition of organizations in individual raw materials.

As expected, the highest number of enterprises have crushed stone and sand and gravel as raw materials (see Fig. 1). In reality this number will probably be significantly higher, because these mineral industries have many small companies, which we have not recorded. On the contrary, for bituminous and brown coal we recorded all companies because there are big companies only in these commodities. The smallest number of companies is recorded for glass sand.

Recalculated number of employees (it is an average recalculated registered balance) for Mining Total (see Tab. 1) would fall by 6% in the period 2013–2017. The number of workers in the period from 2013 to 2017 was dependent on the number of included organisations, while it was the highest in 2015.

In the CZ-NACE B section Mining and Quarrying, number of employees is 24,886 in 2017. The difference between 53,482 in Mining Total compared to CZ-NACE B section is due to the repetition of the enterprises belonging to Section B and the inclusion of enterprises from other industries.

Data for individual raw materials are shown in Fig. 2. Bituminous coal, brown coal, lignite and crushed stone account for the highest number of employees. The least number of employees



	Bituminous coal, Brown coal and lignite	Kaolin	Clays and betonite	Feldspar	Glass sand	Foundry sand	Limestones and corretive sialic additives for cement production and dolomite	Dimension stone	Crushed stone	Sand and gravel	Brick clays and related minerals	Other minerals
2013	21 223	2 715	1 967	2 971	953	2 640	2 405	900	8 323	4 087	2 215	6 746
2014	19 707	2 722	1 939	2 978	943	2 748	2 399	1 015	8 441	4 017	2 158	6 827
2015	18 421	2 763	2 292	3 069	952	2 946	2 426	1 047	8 614	3 968	2 115	6 846
2016	17 089	2 903	2 678	3 145	958	2 166	2 723	1 032	9 154	4 217	2 130	6 764
2017	14 936	2 892	2 600	3 126	962	2 111	2 583	749	10 784	4 155	2 173	6 411

Source: own calculations according to Ministry of Industry and Trade and CSO

Figure 2. Number of employees

was registered in dimension stone and glass sand industries. Developments of numbers of employees in various raw-material related sectors. In coal industry, however, the number of employees has been steadily decreasing.

	Bituminous coal, Brown coal and lignite	Kaolin	Clays and betonite	Feldspar	Glass sand	Foundry sand	Limestones and corretive sialic additives for cement production and dolomite	Dimension stone	Crushed stone	Sand and gravel	Brick clays and related minerals	Other minerals	Mining total
2013	1 516	452	179	495	318	240	120	43	111	85	170	519	237
2014	1 642	454	176	425	314	250	114	46	112	85	166	525	231
2015	1 535	460	195	438	317	268	116	45	108	85	184	527	252
2016	1 554	415	223	449	319	217	136	43	124	88	194	520	229
2017	1 494	413	217	447	321	211	129	35	146	93	217	493	230

Source: own calculations according to Ministry of Industry and Trade and CSO

Figure 3: Average number of employees per enterprise

In order to provide more detailed information on the number of employees, the authors added Figure 3 which shows the average number of employees per company in individual mining sectors. The largest enterprises operate in extraction of black and brown coal and lignite. Companies producing dimension stone, gravel and crushed stone belonged to the smallest ones.

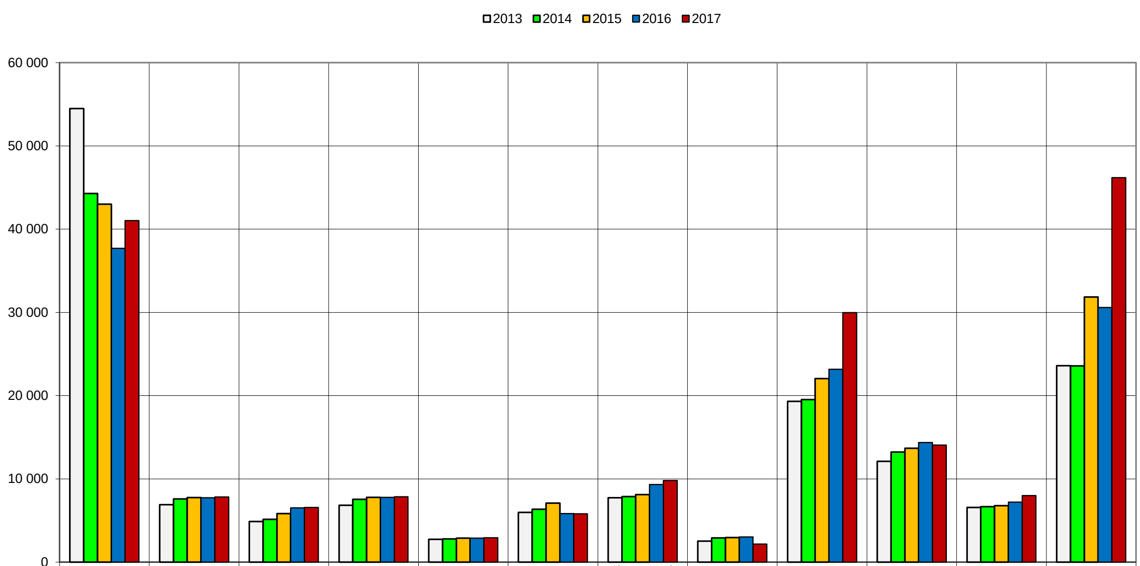
In CZ-NACE B Mining and Quarrying, the value of this indicator is 63 in 2017, but for enterprises (113 organisations) with available data from CZ-NACE B, the figure is 252. In the selection of enterprises for Mining Total, the achieved value is 230. The Mining Total includes slightly smaller enterprises in terms of the number of employees.

Sales (sales of own goods and sales of own production and services characterise the total performance of enterprises mining raw materials. If there are no sales, there are no money flows to cover expenses as well.

Sales of mining companies (see Tab. 1) have in the period from 2012 to 2016 a reverse W shape. In 2014, the sales declined slightly and increased in 2015, but probably due to the inclusion of new enterprises in the processing. In 2016, with a decline in the number of enterprises, their number showed a fall. In 2017, even with a stable number of enterprises, the sales increased considerably by 17%.

The category of other raw materials showed best results in the period from 2013 to 2017, almost at a double rate. Building stone showed good results as well. Black coal, brown coal and lignite reached the highest sales between 2013 and 2016. In 2017, other raw materials reached the highest sales (see Fig. 4).

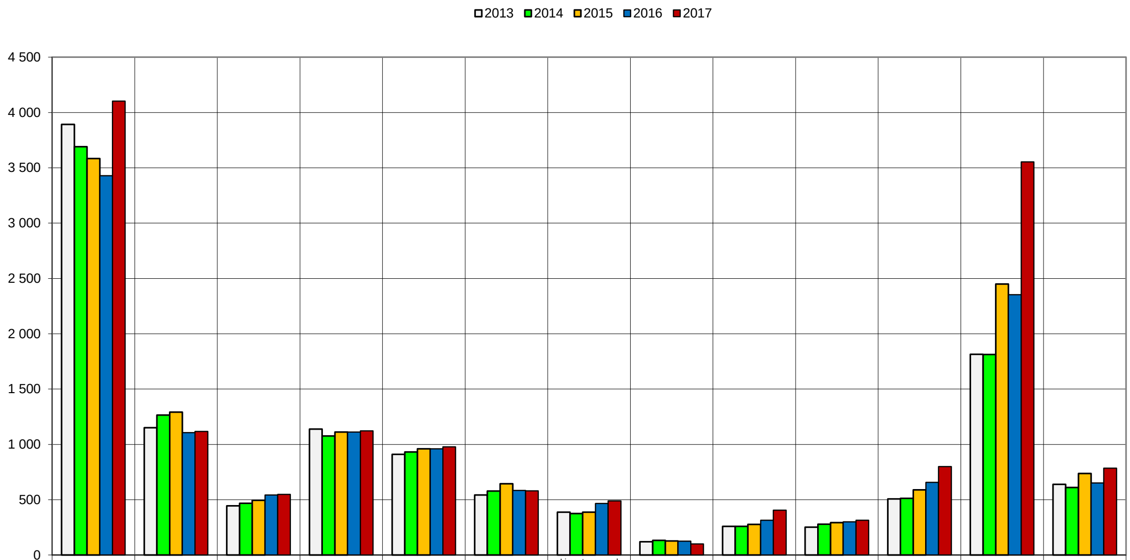
Similarly, to the number of employees, average values per company are also provided for sales (Fig. 5). Clearly the largest companies in terms of sales are those involved in the production of coal...



	Bituminous coal, Brown coal and lignite	Kaolin	Clays and betonite	Feldspar	Glass sand	Foundry sand	Limestones and corretive sialic additives for cement production and dolomite	Dimension stone	Crushed stone	Sand and gravel	Brick clays and related minerals	Other minerals
2013	54 486	6 907	4 890	6 834	2 730	5 971	7 740	2 519	19 328	12 117	6 579	23 587
2014	44 296	7 592	5 147	7 536	2 793	6 357	7 875	2 903	19 541	13 220	6 660	23 568
2015	43 014	7 750	5 824	7 783	2 881	7 084	8 118	2 959	22 058	13 675	6 771	31 853
2016	37 711	7 740	6 520	7 786	2 879	5 837	9 325	3 017	23 170	14 364	7 219	30 595
2017	41 026	7 822	6 580	7 861	2 935	5 798	9 793	2 163	29 981	14 072	7 995	46 187

Source: own calculations according to Ministry of Industry and Trade and CSO

Figure 4. Sales (mill CZK)



	Bituminous coal, Brown coal and lignite	Kaolin	Clays and betonite	Feldspar	Glass sand	Foundry sand	Limestones and corretive sialic additives for cement production and dolomite	Dimension stone	Crushed stone	Sand and gravel	Brick clays and related minerals	Other minerals	Mining total
2013	3 892	1 151	445	1 139	910	543	387	120	259	252	506	1 814	638
2014	3 691	1 265	468	1 077	931	578	375	132	260	278	512	1 813	610
2015	3 584	1 292	495	1 112	960	644	387	128	278	294	589	2 450	737
2016	3 428	1 106	543	1 112	960	584	466	126	314	299	656	2 353	652
2017	4 103	1 117	548	1 123	978	580	490	100	406	315	799	3 553	785

Source: own calculations according to Ministry of Industry and Trade and CSO

Figure 5: Average sales per enterprise (mill CZK)

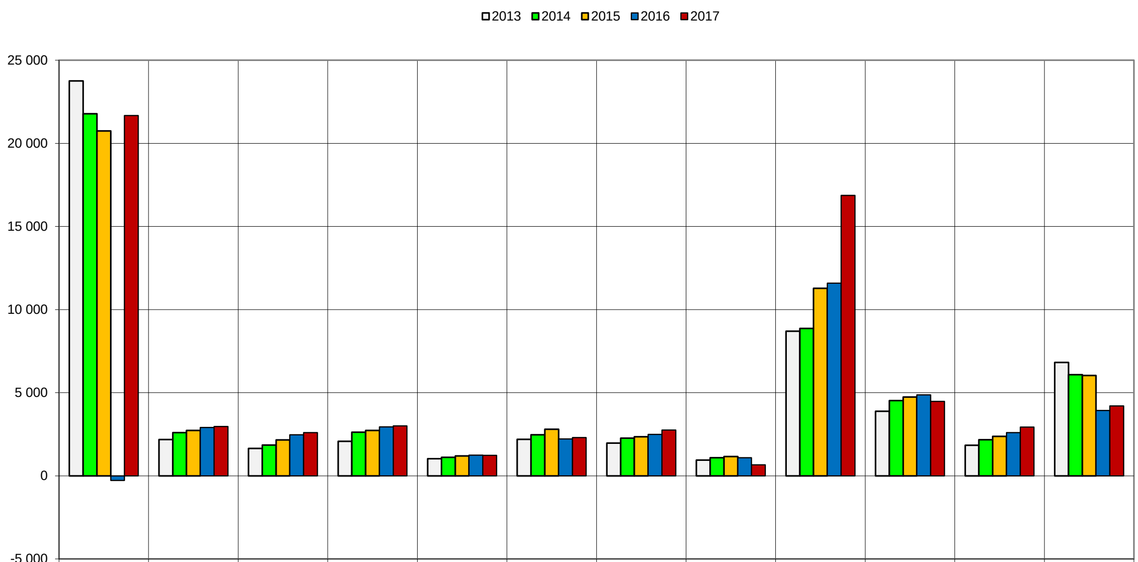
In the period 2012 to 2016, coal recorded the biggest drop in average sales per company. The highest increases were recorded in the companies belonging to the Other minerals group. Other raw materials achieved the second place, which in 2017 significantly increased the value of sales per enterprise

In 2017, the sales per enterprise in the CZ-NACE B section, Mining and Quarrying, were CZK 244 million. However, for large enterprises in this section, the size was CZK 6,244 million, and for medium-sized enterprises the size was CZK 404 million. The average size of enterprises from other sectors included in processing is CZK 434 million. The Mining Total includes all large and medium-sized enterprises and part of small enterprises from the CZ-NACE B section and part of enterprises from other industries, which results in the fact that the average size of sales per enterprise for Mining Total is CZK 786 million.

Value added is not in new financial statements, but it can be calculated (= sales - change in inventory of finished products and incomplete production – capitalisation (production for own consumption) – intermediate consumption (consumption of raw materials, energy and services + purchased goods)). Compared to the calculation from the financial statements valid until 2015, the sign is reversed in the calculation because of the reallocation of these items from revenues to costs.

Value added has a relation to the Gross Domestic Product (GDP) or Gross Value Added (GVA), which is the basis for the calculation of GDP. The advantage of value added compared to sales is that it does not change as a result of company break-ups and mergers.

Between 2013 and 2017, the development of value added for Mining Total was quite interesting (see Tab. 1). In 2014, with a significant drop in value, the added value stagnated. Companies were able to reduce the intermediate consumption by the same amount when reducing sales, which is a very positive result. In 2015, with the increase in the number of organisations involved in the processing, there was an increase in value added. In 2016, there



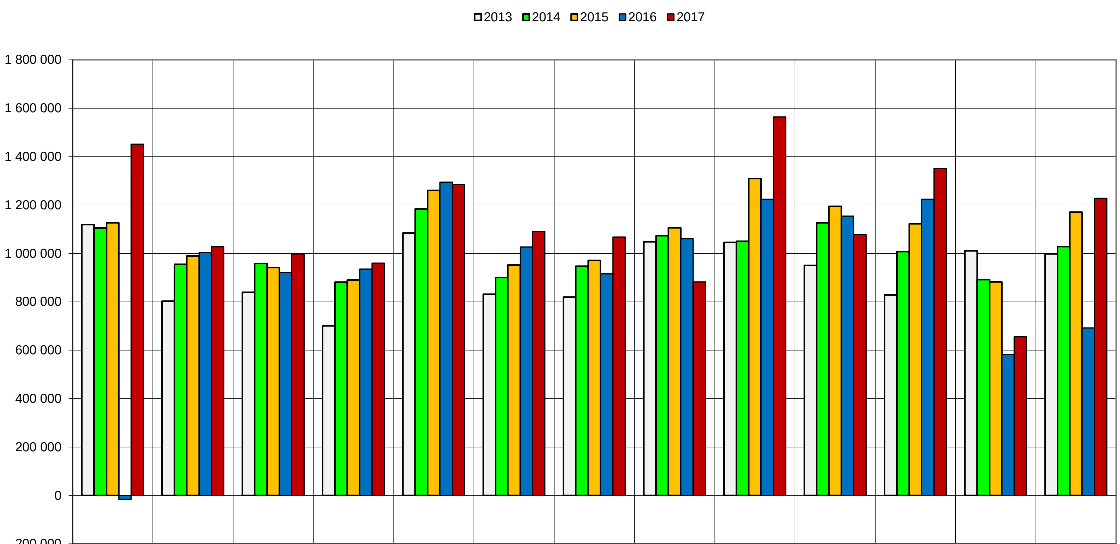
	Bituminous coal, Brown coal and lignite	Kaolin	Clays and betonite	Feldspar	Glass sand	Foundry sand	Limestones and corretive sialic additives for cement production and dolomite	Dimension stone	Crushed stone	Sand and gravel	Brick clays and related minerals	Other minerals
2013	23 752	2 179	1 652	2 082	1 034	2 195	1 972	944	8 704	3 885	1 835	6 821
2014	21 780	2 599	1 857	2 626	1 116	2 475	2 273	1 090	8 864	4 525	2 175	6 090
2015	20 748	2 734	2 158	2 731	1 200	2 804	2 356	1 158	11 285	4 740	2 374	6 042
2016	-271	2 914	2 468	2 942	1 241	2 223	2 494	1 094	11 590	4 868	2 606	3 937
2017	21 680	2 972	2 595	3 000	1 237	2 302	2 758	661	16 868	4 480	2 936	4 202

Source: own calculations according to Ministry of Industry and Trade and CSO

Figure 6: Value added (mill CZK)

was a decline in organisations, but a sharp decline in value added was another significant impact. In 2017, value added was rising.

Looking at individual raw materials, it is clear that black coal, brown coal and lignite caused a sharp decline in 2016. Increase in 2017, again coal and building stone.



	Bituminous coal, Brown coal and lignite	Kaolin	Clays and betonite	Feldspar	Glass sand	Foundry sand	Limestones and corretive sialic additives for cement production and dolomite	Dimension stone	Crushed stone	Sand and gravel	Brick clays and related minerals	Other minerals	Mining total
2013	1 119 146	802 815	839 617	700 555	1 084 252	831 377	820 009	1 048 139	1 045 686	950 618	828 739	1 011 101	998 385
2014	1 105 194	954 939	958 072	881 904	1 183 454	900 554	947 555	1 073 352	1 050 153	1 126 505	1 007 901	892 056	1 028 222
2015	1 126 364	989 720	941 891	889 927	1 260 241	951 804	971 358	1 106 195	1 310 021	1 194 416	1 122 326	882 607	1 170 808
2016	-15 861	1 003 672	921 569	935 303	1 294 543	1 026 268	915 739	1 060 640	1 223 770	1 154 427	1 223 691	582 006	691 821
2017	1 451 559	1 027 356	998 178	959 812	1 284 942	1 090 700	1 067 524	881 987	1 564 140	1 078 279	1 351 363	655 460	1 228 267

Source: own calculations according to Ministry of Industry and Trade and CSO

Figure 7: Labour productivity based on value added (CZK/employee)

The share of value added in the Mining Total of individual raw materials corresponds approximately to their contribution to the production of gross added value.

The set of relative indicators must begin with the most important one – labour productivity. Labour productivity, calculated as the value added by one employee, shows how much is left to an enterprise for wages and insurance, depreciation, financial and other costs and profit for the enterprise owner.

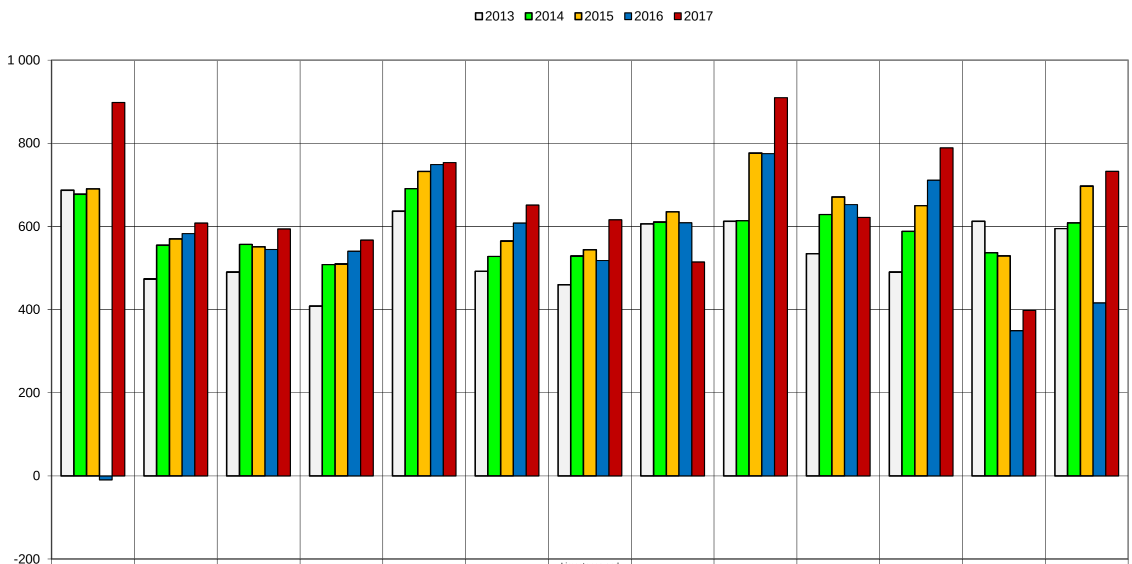
Labour productivity from value added is a relative indicator that allows for quality comparisons regardless of the absolute size of the value added.

Developments in labour productivity were broadly uniform throughout the period 2013–2017, up to the problematic year 2016 in black coal, brown coal and lignite. Coal is a crucial raw material for labour productivity (see Tab. 1).

In 2017, labour productivity for the CZ-NACE B section, Mining and Quarrying, was CZK 1,194,025 per employee. For large enterprises in the section, a total of CZK 1,207,158 per employee. The Total Mining reported a labour productivity value of CZK 1,228,267 per employee. Enterprises from other industries that follow the production of raw materials have logically a lower productivity than CZ-NACE B (virtually nothing is produced from purchased materials and semi-finished products in the CZ-NACE B section). The value of Total Mining was given by repeating in the processing of enterprises with significantly higher labour productivity.

Among the raw materials (Fig. 7), there are large differences in labour productivity both over time and in absolute values. In 2017, the absolute best work productivity was in building stone and coal, but in 2016 coal showed the worst value. From the point of view of the dynamics, brick raw materials showed the best development in the respective period.

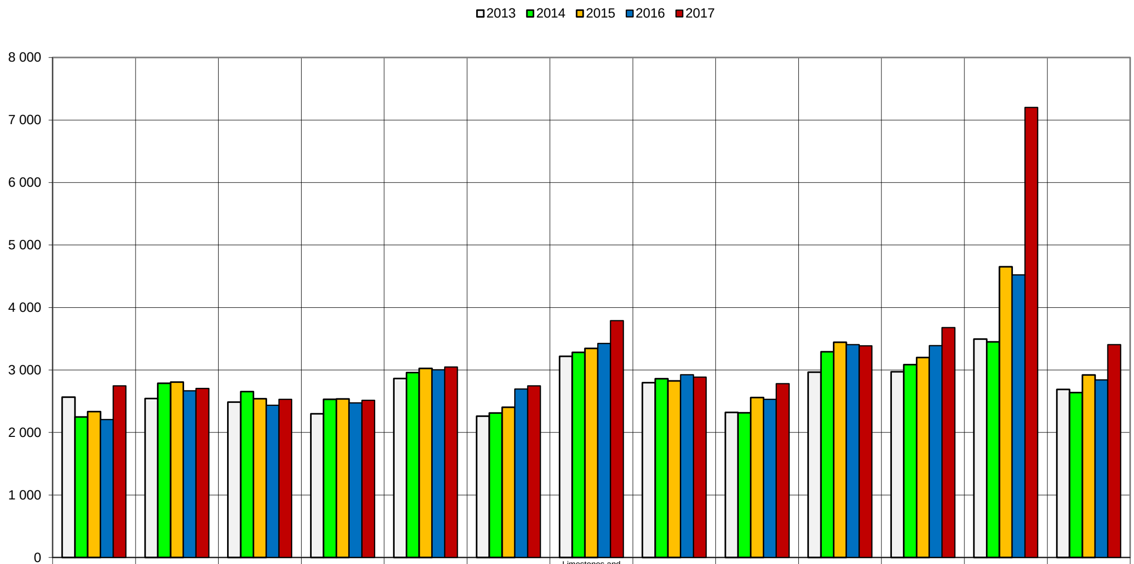
Hourly labour productivity from value added, i.e. value added per hour worked, (Fig. 8) shows similar characteristics as productivity per worker (Fig. 7). On the other hand, it is



	Bituminous coal, Brown coal and lignite	Kaolin	Clays and betonite	Feldspar	Glass sand	Foundry sand	Limestones and corretive sialic additives for cement production and dolomite	Dimension stone	Crushed stone	Sand and gravel	Brick clays and related minerals	Other minerals	Mining total
2013	687	474	490	409	637	492	460	607	612	534	490	613	595
2014	677	555	557	508	691	528	529	610	614	629	588	537	609
2015	691	570	551	510	732	565	544	636	776	671	650	529	697
2016	-10	583	545	541	749	608	518	609	775	652	711	349	416
2017	898	608	594	567	754	652	616	515	910	622	789	398	733

Source: own calculations according to Ministry of Industry and Trade and CSO

Figure 8: Hourly labour productivity (CZK/working hour)



	Bituminous coal, Brown coal and lignite	Kaolin	Clays and betonite	Feldspar	Glass sand	Foundry sand	Limestones and corretive sialic additives for cement production and dolomite	Dimension stone	Crushed stone	Sand and gravel	Brick clays and related minerals	Other minerals	Mining total
2013	2 567	2 544	2 486	2 300	2 863	2 262	3 218	2 798	2 322	2 965	2 971	3 496	2 689
2014	2 248	2 789	2 655	2 531	2 961	2 313	3 282	2 860	2 315	3 291	3 086	3 452	2 639
2015	2 335	2 805	2 542	2 536	3 027	2 405	3 347	2 827	2 561	3 446	3 201	4 653	2 922
2016	2 207	2 666	2 435	2 475	3 004	2 695	3 424	2 924	2 531	3 406	3 390	4 523	2 841
2017	2 747	2 704	2 531	2 515	3 049	2 747	3 791	2 887	2 780	3 387	3 680	7 204	3 407

Source: own calculations according to Ministry of Industry and Trade and CSO

Figure 9: Sales per employee (CZK thousand/employee)

a more precise expression of productivity, because it shows the book value added per working hour.

For CZ-NACE Section B, Mining and Quarrying, the value of hourly labour productivity of CZK 725 per employee in 2017 and, for Mining Total, it was CZK 733 per employee, which is very similar.

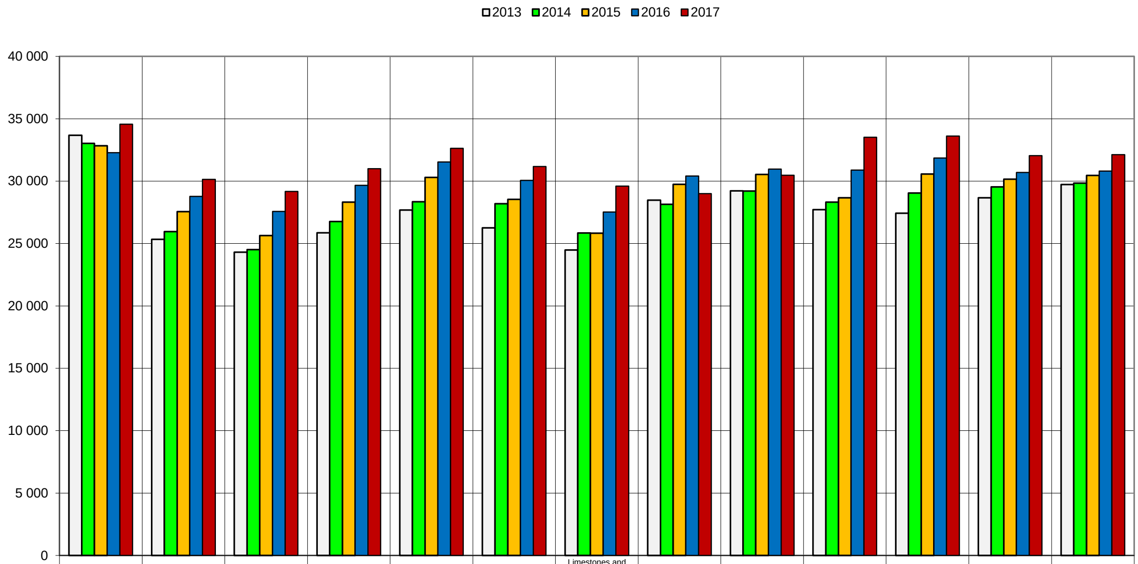
Sales per employee showed an interesting development. There was a very slight decrease (–2%) in 2014 compared to 2013. In 2015, there was a significant growth of 11% and again a very modest 3% decrease in 2016. 2017 saw a significant increase in sales per employee by 20% (see Tab. 1).

In 2017, the sales per employee in the CZ-NACE B section, Mining and Quarrying, were CZK 3,852 thousand. and CZK 3,407 thousand for Mining Total. Mining Total does not reach the total for the CZ-NACE B section. This is due to the classification of the CZ-NACE 23 Manufacture of other non-metallic mineral products (e.g. bricks, cement, etc.) into processing, which reaches the sales per employees of CZK 2,873 thousand.

In the past three years, other raw materials have shown the highest sales per employee. In 2017, it is of very high value. Limestone, brick raw materials and dolomite occupy the second place (Fig. 9).

The average wage for Total Mining in the years 2013 to 2017 grew, with the highest growth in 2017 (see Fig. 1). Most of the raw materials had a similar trend except for decorative stones, building stone and coal. The highest average wages are in coal mining, which is understandable due to deep coal mining (see Fig. 10).

Compared to the CZ-NACE B section, Mining and Quarrying (average salary in 2017, CZK 33,442) the Mining Total shows the average salary of CZK 32,126, which is 96% of the section figure.



	Bituminous coal, Brown coal and lignite	Kaolin	Clays and betonite	Feldspar	Glass sand	Foundry sand	Limestones and corretive sialic additives for cement production and dolomite	Dimension stone	Crushed stone	Sand and gravel	Brick clays and related minerals	Other minerals	Mining total
2013	33 684	25 344	24 307	25 865	27 692	26 265	24 477	28 476	29 232	27 717	27 431	28 664	29 736
2014	33 026	25 958	24 522	26 762	28 350	28 202	25 843	28 149	29 216	28 322	29 043	29 543	29 847
2015	32 836	27 557	25 641	28 318	30 301	28 536	25 827	29 752	30 549	28 667	30 577	30 167	30 462
2016	32 294	28 777	27 576	29 665	31 546	30 068	27 521	30 419	30 973	30 885	31 852	30 700	30 815
2017	34 571	30 146	29 180	31 000	32 634	31 181	29 613	29 001	30 475	33 516	33 616	32 052	32 126

Source: own calculations according to Ministry of Industry and Trade and CSO

Figure 10. Average salary (CZK/employee)

The difference in value added labour productivity and average monthly wage *12 (see Fig. 11) is (in our selection of indicators) a critical indicator for evaluation of performance of enterprises. The higher the value, the better, i.e. it leaves more money for covering other

	Bituminous coal, Brown coal and lignite	Kaolin	Clays and betonite	Feldspar	Glass sand	Foundry sand	Limestones and corretive sialic additives for cement production and dolomite	Dimension stone	Crushed stone	Sand and gravel	Brick clays and related minerals	Other minerals	Mining total
2013	1 085 461	777 471	815 310	674 689	1 056 560	805 112	795 532	1 019 663	1 016 454	922 901	801 308	982 437	968 649
2014	1 072 169	928 981	933 550	855 142	1 155 104	872 352	921 712	1 045 202	1 020 937	1 098 183	978 858	862 514	998 374
2015	1 093 529	962 163	916 251	861 609	1 229 940	923 267	945 532	1 076 443	1 279 472	1 165 749	1 091 749	852 441	1 140 346
2016	-48 155	974 895	893 993	905 639	1 262 997	996 200	888 218	1 030 221	1 192 797	1 123 542	1 191 839	551 306	661 006
2017	1 416 988	997 209	968 998	928 813	1 252 308	1 059 519	1 037 911	852 986	1 533 666	1 044 763	1 317 746	623 408	1 196 141

Source: own calculations according to Ministry of Industry and Trade and CSO

Figure 11: (Value added – salaries) per employee (CZK/employee)

costs (depreciation, social taxes, financial costs etc.) and for the profit creation. For company owners, this is the most important index from this selection of indices. The more an employee produces, the more remains at an owner´s disposal to cover costs and for formation of profits. In view of the fact that average salaries are not too variable, the result is due to differences in the book value added labour productivity.

Table 1 shows that the value of the indicator grew between 2013 and 2015. It plunged in 2016 and peaked in 2017. Compared to the value of the CZ-NACE B section, Mining and Quarrying (CZK 1,189,315 per employee), the selection of Mining Total shows a similar value, i.e.CZK 1,196,141 per employee.

Figure 11 shows the different level and dynamics of the indicator. In 2017, building stone was the highest, followed by coal, glass sands, and brick raw materials. A catastrophic value for coal is in 2016.

A review of individual minerals follows.

As there is only one company included in bituminous coal production, we cannot provide data solely for bituminous coal. All the enterprises included in this raw material belonged to the CZ-NACE B section Mining and Quarrying of Raw Materials.

Table 3: Bituminous coal, brown coal, and lignite

Indicator	Unit	2013	2014	2015	2016	2017
Number of enterprises		14	12	12	11	10
Number of employees		21 223	19 707	18 421	17 089	14 936
Sales	mill CZK	54 486	44 296	43 014	37 711	41 026
Value added	mill CZK	23 752	21 780	20 748	–271	21 680
Sales per employee	ths CZK/ employee	2 567	2 248	2 335	2 207	2 747
Mining total = 100%	*%*	*95%*	*85%*	*80%*	*78%*	*81%*
Labour productivity based value added	CZK/ employee	1 119 146	1 105 194	1 126 364	–15 861	1 451 559
Mining total = 100%	*%*	*112%*	*107%*	*96%*	*–2%*	*118%*
Hourly labour productivity	CZK/ working hour	687	677	691	–10	898
Mining total = 100%	*%*	*116%*	*111%*	*99%*	*–2%*	*123%*
Average salary	CZK/ employee	33 684	33 026	32 836	32 294	34 571
Mining total = 100%	*%*	*113%*	*111%*	*108%*	*105%*	*108%*
(Value added – salaries) per employee	CZK/ employee	1 085 461	1 072 169	1 093 529	–48 155	1 416 988
Mining total = 100%	*%*	*112%*	*107%*	*96%*	*–7%*	*118%*

Indexes	17/13	14/13	15/14	16/15	17/16
Number of enterprises	–29%	–14%	0%	–8%	–9%
Number of employees	–30%	–7%	–7%	–7%	–13%
Sales	–25%	–19%	–3%	–12%	9%
Value added	–9%	–8%	–5%	–101%	–8098%
Sales per employee	7%	–12%	4%	–5%	24%
Labour productivity based value added	30%	–1%	2%	–101%	–9252%
Hourly labour productivity	31%	–1%	2%	–101%	–9280%
Average salary	3%	–2%	–1%	–2%	7%
(Value added – salaries) per employee	31%	–1%	2%	–104%	–3043%

Source: own calculations according to Ministry of Industry and Trade and CSO

It is the most important raw material in 2017 in terms of employment (27.93% Mining Total), value added (33.00% Mining Total) and the second most important in sales (22.53% Mining Total). In terms of the number of organisations, it belongs to small raw materials. However, in the past years, it was the most important raw material, where the share of employees was 37.14%, sales 43.93% and added value 41.63% in 2013. Since 2013, the importance of coal has steadily decreased. In 2017, it is the second raw material in efficiency, labour productivity and the first in the average salary.

Between 2013 and 2017, the number of employees was falling steadily, the sales had been falling until 2016, added value fell, and it even showed a negative value in 2016. In 2017, both sales and added value reached a good figure, mainly due to a large increase in coal prices (see Tab. 3). Between 2013 and 2017, it was the raw material with the worst dynamics regarding the number of employees and sales and the third worst regarding the value added.

In the relative indicators, the year 2016 is catastrophic and the year 2017 is the best. The raw material has the above average level, compared to the Mining Total, mainly at the indicators of labour productivity, average salary and (value added – salaries) per employee. On the other hand, the sales per employee indicator was below the average of the Mining Total indicator.

Table 4: Kaolin

Indicator	Unit	2013	2014	2015	2016	2017
Number of enterprises		6	6	6	7	7
Number of employees		2 715	2 722	2 763	2 903	2 892
Sales	mill CZK	6 907	7 592	7 750	7 740	7 822
Value added	mill CZK	2 179	2 599	2 734	2 914	2 972
Sales per employee	ths CZK/ employee	2 544	2 789	2 805	2 666	2 704
Mining total = 100%	*%*	*95%*	*106%*	*96%*	*94%*	*79%*
Labour productivity based value added	CZK/ employee	802 815	954 939	989 720	1 003 672	1 027 356
Mining total = 100%	*%*	*80%*	*93%*	*85%*	*145%*	*84%*
Hourly labour productivity	CZK/ working hour	474	555	570	583	608
Mining total = 100%	*%*	*80%*	*91%*	*82%*	*140%*	*83%*
Average salary	CZK/ employee	25 344	25 958	27 557	28 777	30 146
Mining total = 100%	*%*	*85%*	*87%*	*90%*	*93%*	*94%*
(Value added – salaries) per employee	CZK/ employee	777 471	928 981	962 163	974 895	997 209
Mining total = 100%	*%*	*80%*	*93%*	*84%*	*147%*	*83%*

Indexes	17/13	14/13	15/14	16/15	17/16
Number of enterprises	17%	0%	0%	17%	0%
Number of employees	7%	0%	1%	5%	0%
Sales	13%	10%	2%	0%	1%
Value added	36%	19%	5%	7%	2%
Sales per employee	6%	10%	1%	–5%	1%
Labour productivity based value added	28%	19%	4%	1%	2%
Hourly labour productivity	28%	17%	3%	2%	4%
Average salary	19%	2%	6%	4%	5%
(Value added – salaries) per employee	28%	19%	4%	1%	2%

Source: own calculations according to Ministry of Industry and Trade and CSO

The share of kaolin enterprises that are not included in the section CZ-NACE B Mining and Quarrying of Raw Materials is more than 50% in this raw material, measured by sales. Most of them are CZ-NACE 23 enterprises, in particular ceramic production.

In terms of importance, it is rather a smaller raw material, where, in 2017, its share in sales was 4.29%, in employee 5.41% and in value added 4.52%. Their values in 2017 compared to 2013 were the development of the values of absolute indicators over the time: sales increased by 13%, value added increased by 36% and the number of employees increased by 7%. This is a good development of the raw material (see Tab. 4).

In the relative indicators, the raw material showed a favourable development in labour productivity, average salary and effectiveness measured by the indicator (value added – salaries) per employee. Sales per employee were as follows: growth by 2015, then decline and growth again. In relation to the Mining Total, with the exception of the extreme year of 2016, due to the development of the added value of coal, the values of relative indicators were mostly below the level of the total.

With bentonite, the number of organisations was on the border of possibilities for publishing

Table 5: Clays and bentonite

Indicator	Unit	2013	2014	2015	2016	2017
Number of enterprises		11	11	12	12	12
Number of employees		1 967	1 939	2 292	2 678	2 600
Sales	mill CZK	4 890	5 147	5 824	6 520	6 580
Value added	mill CZK	1 652	1 857	2 158	2 468	2 595
Sales per employee	ths CZK/ employee	2 486	2 655	2 542	2 435	2 531
Mining total = 100%	*%*	*92%*	*101%*	*87%*	*86%*	*74%*
Labour productivity based value added	CZK/ employee	839 617	958 072	941 891	921 569	998 178
Mining total = 100%	*%*	*84%*	*93%*	*80%*	*133%*	*81%*
Hourly labour productivity	CZK/ working hour	490	557	551	545	594
Mining total = 100%	*%*	*82%*	*91%*	*79%*	*131%*	*81%*
Average salary	CZK/ employee	24 307	24 522	25 641	27 576	29 180
Mining total = 100%	*%*	*82%*	*82%*	*84%*	*89%*	*91%*
(Value added – salaries) per employee	CZK/ employee	815 310	933 550	916 251	893 993	968 998
Mining total = 100%	*%*	*84%*	*94%*	*80%*	*135%*	*81%*

Indexes	17/13	14/13	15/14	16/15	17/16
Number of enterprises	9%	0%	7%	2%	0%
Number of employees	32%	–1%	18%	17%	–3%
Sales	35%	5%	13%	12%	1%
Value added	57%	12%	16%	14%	5%
Sales per employee	2%	7%	–4%	–4%	4%
Labour productivity based value added	19%	14%	–2%	–2%	8%
Hourly labour productivity	21%	14%	–1%	–1%	9%
Average salary	20%	1%	5%	8%	6%
(Value added – salaries) per employee	19%	15%	–2%	–2%	8%

Source: own calculations according to Ministry of Industry and Trade and CSO

data. Therefore, the raw material of clay + bentonite were jointed. Sales in this raw material were attributable at 82% to the section CZ-NACE B Mining and Quarrying.

Development over the time was excellent in absolute indicators, when index 2017/2013 was 1.35 at sales, 1.57 at value added, and 1.32 at the number of employees. These outstanding growths were reflected in the value of the raw material in the Mining Total, when the share in sales increased from 3.14% in 2013 to 3.61% in 2017. The share in value added and the number of employees (see Tab. 5) developed in a similar way. During the period from 2013 to 2017, the development of the number of employees was the best of all raw materials. The development of added value was the third best.

The average salary grew throughout the entire period from 2013 to 2017, but was still below the level of total mining, although the level improved. Other relative indicators showed growth in 2014, followed by a fall from 2015 to 2016 and then followed by a successful year of 2017. The level of all relative indicators was below the Mining Total, with the exception of the extreme year of 2016 due to the development of the added value of coal.

Enterprises in terms of sales in felspar are attributable at 58% to industry 23 Manufacture

Table 6: Feldspar

Indicator	Unit	2013	2014	2015	2016	2017
Number of enterprises		6	7	7	7	7
Number of employees		2 971	2 978	3 069	3 145	3 126
Sales	mill CZK	6 834	7 536	7 783	7 786	7 861
Value added	mill CZK	2 082	2 626	2 731	2 942	3 000
Sales per employee	ths CZK/ employee	2 300	2 531	2 536	2 475	2 515
Mining total = 100%	*%*	*86%*	*96%*	*87%*	*87%*	*74%*
Labour productivity based value added	CZK/ employee	700 555	881 904	889 927	935 303	959 812
Mining total = 100%	*%*	*70%*	*86%*	*76%*	*135%*	*78%*
Hourly labour productivity	CZK/ working hour	409	508	510	541	567
Mining total = 100%	*%*	*69%*	*84%*	*73%*	*130%*	*77%*
Average salary	CZK/ employee	25 865	26 762	28 318	29 665	31 000
Mining total = 100%	*%*	*87%*	*90%*	*93%*	*96%*	*96%*
(Value added – salaries) per employee	CZK/ employee	674 689	855 142	861 609	905 639	928 813
Mining total = 100%	*%*	*70%*	*86%*	*76%*	*137%*	*78%*

Indexes	17/13	14/13	15/14	16/15	17/16
Number of enterprises	17%	17%	0%	0%	0%
Number of employees	5%	0%	3%	2%	–1%
Sales	15%	10%	3%	0%	1%
Value added	44%	26%	4%	8%	2%
Sales per employee	9%	10%	0%	–2%	2%
Labour productivity based value added	37%	26%	1%	5%	3%
Hourly labour productivity	39%	24%	0%	6%	5%
Average salary	20%	3%	6%	5%	5%
(Value added – salaries) per employee	38%	27%	1%	5%	3%

Source: own calculations according to Ministry of Industry and Trade and CSO

of Other Non-Metallic Mineral Products and 42 Civil Engineering. The results are more about manufacturing enterprises than about mining alone.

In terms of absolute indicators, it is a small to medium-sized raw material. The development over the time was excellent for absolute indicators (see Tab. 6), where sales grew by 15% between 2013 and 2017, added value by 44% and the number of employees by 5%. The share in total (the Mining Total) also developed extremely favourably, namely with value added from 3.65% in 2013 to 4.57% in 2017. Also, the share of employees increased from 5.20% to 5.84%. On the contrary, the proportion of sales fell from 4.45% to 4.31%.

All relative indicators (sales per employee, labour productivity, average salary and efficiency (measured by the indicator (value added – salaries) per employee) increased throughout the period from 2013 to 2017, which is an excellent result. However, their level with respect to the Mining Total was below 100%, except for the year of 2016. Between 2013 and 2017, the raw materials ranked third in the growth of labour productivity and efficiency.

85% of sales of glass sand are attributable to the section CZ-NACE B Mining and Quarrying. It is the raw material extracted by the lowest number of organisations and the raw material which shows the second lowest sales, added value and the number of employees.

Table 7: Glass sand

Indicator	**Unit**	**2013**	**2014**	**2015**	**2016**	**2017**
Number of enterprises		3	3	3	3	3
Number of employees		953	943	952	958	962
Sales	mill CZK	2 730	2 793	2 881	2 879	2 935
Value added	mill CZK	1 034	1 116	1 200	1 241	1 237
Sales per employee	ths CZK/ employee	2 863	2 961	3 027	3 004	3 049
Mining total = 100%	*%*	*106%*	*112%*	*104%*	*106%*	*89%*
Labour productivity based value added	CZK/ employee	1 084 252	1 183 454	1 260 241	1 294 543	1 284 942
Mining total = 100%	*%*	*109%*	*115%*	*108%*	*187%*	*105%*
Hourly labour productivity	CZK/ working hour	637	691	732	749	754
Mining total = 100%	*%*	*107%*	*114%*	*105%*	*180%*	*103%*
Average salary	CZK/ employee	27 692	28 350	30 301	31 546	32 634
Mining total = 100%	*%*	*93%*	*95%*	*99%*	*102%*	*102%*
(Value added – salaries) per employee	CZK/ employee	1 056 560	1 155 104	1 229 940	1 262 997	1 252 308
Mining total = 100%	*%*	*109%*	*116%*	*108%*	*191%*	*105%*

Indexes	17/13	14/13	15/14	16/15	17/16
Number of enterprises	0%	0%	0%	0%	0%
Number of employees	1%	–1%	1%	1%	0%
Sales	7%	2%	3%	0%	2%
Value added	20%	8%	7%	3%	0%
Sales per employee	6%	3%	2%	–1%	2%
Labour productivity based value added	19%	9%	6%	3%	–1%
Hourly labour productivity	18%	9%	6%	2%	1%
Average salary	18%	2%	7%	4%	3%
(Value added – salaries) per employee	19%	9%	6%	3%	–1%

Source: own calculations according to Ministry of Industry and Trade and CSO

The development of the values of absolute indicators between 2013 and 2017 was favourable when sales grew by 7%, added value by 20% and the number of employees virtually stagnated (see Tab. 7).

The development of relative indicators (sales per employee, labour productivity, average salary and efficiency (measured by the indicator (value added – salaries) per employee) is good, with an increase of between 18% and 19% in 2017/2013. The good trend slightly deteriorated in 2017. The level of values of relative indicators with respect to the Mining Total is usually good, which is above the total mining.

One-third of the sales of the raw material foundry sand originated in the enterprises outside the section CZ-NACE Section B Mining and Quarrying. In terms of the importance in the Mining Total, it is a less important raw material.

The development of absolute indicators (excluding the number of organisations) observed a growth in values up to 2015, followed by a subsequent decline. The sales that the raw material gained from 2013 to 2015 were lost between 2016 and 2017. In the period from 2016 to 2017, it lost about a third of what it gained from 2013 to 2015. The number of employees recorded a deep decline between 2016 and 2017 (see Tab. 8). The development in the period from 2016

Table 8: Foundry sand

Indicator	**Unit**	**2013**	**2014**	**2015**	**2016**	**2017**
Number of enterprises		11	11	11	10	10
Number of employees		2 640	2 748	2 946	2 166	2 111
Sales	mill CZK	5 971	6 357	7 084	5 837	5 798
Value added	mill CZK	2 195	2 475	2 804	2 223	2 302
Sales per employee	ths CZK/ employee	2 262	2 313	2 405	2 695	2 747
Mining total = 100%	*%*	*84%*	*88%*	*82%*	*95%*	*81%*
Labour productivity based value added	CZK/ employee	831 377	900 554	951 804	1 026 268	1 090 700
Mining total = 100%	*%*	*83%*	*88%*	*81%*	*148%*	*89%*
Hourly labour productivity	CZK/ working hour	492	528	565	608	652
Mining total = 100%	*%*	*83%*	*87%*	*81%*	*146%*	*89%*
Average salary	CZK/ employee	26 265	28 202	28 536	30 068	31 181
Mining total = 100%	*%*	*88%*	*94%*	*94%*	*98%*	*97%*
(Value added – salaries) per employee	CZK/ employee	805 112	872 352	923 267	996 200	1 059 519
Mining total = 100%	*%*	*83%*	*87%*	*81%*	*151%*	*89%*

Indexes	17/13	14/13	15/14	16/15	17/16
Number of enterprises	–9%	0%	0%	–9%	0%
Number of employees	–20%	4%	7%	–26%	–3%
Sales	–3%	6%	11%	–18%	–1%
Value added	5%	13%	13%	–21%	4%
Sales per employee	21%	2%	4%	12%	2%
Labour productivity based value added	31%	8%	6%	8%	6%
Hourly labour productivity	32%	7%	7%	8%	7%
Average salary	19%	7%	1%	5%	4%
(Value added – salaries) per employee	32%	8%	6%	8%	6%

Source: own calculations according to Ministry of Industry and Trade and CSO

to 2017 meant a decrease in the importance of the raw material in the Mining Total, namely year 2017 compared to year 2013, with sales from 3.88% to 3.18%, value added from 3.85% to 3.50% and the number of employees from 4.62% to 3.95%.

Relative indicators (with the exception of the extreme year 2016 in productivity) are below the level of the Mining Total. However, they have a good dynamic when sales per employee increased by 21%, labour productivity by 31%, average salary by 19% and efficiency, the so-called (value added – salaries) per employee, by 32%. The dynamics of relative indicators is very good, when the growth of sales per employee was the third best of all raw materials.

Table 9: Limestone and corrective additives for cement production and dolomite

Indicator	Unit	2013	2014	2015	2016	2017
Number of enterprises		20	21	21	20	20
Number of employees		2 405	2 399	2 426	2 723	2 583
Sales	mill CZK	7 740	7 875	8 118	9 325	9 793
Value added	mill CZK	1 972	2 273	2 356	2 494	2 758
Sales per employee	ths CZK/ employee	3 218	3 282	3 347	3 424	3 791
Mining total = 100%	*%*	*120%*	*124%*	*115%*	*121%*	*111%*
Labour productivity based value added	CZK/ employee	820 009	947 555	971 358	915 739	1 067 524
Mining total = 100%	*%*	*82%*	*92%*	*83%*	*132%*	*87%*
Hourly labour productivity	CZK/ working hour	460	529	544	518	616
Mining total = 100%	*%*	*77%*	*87%*	*78%*	*124%*	*84%*
Average salary	CZK/ employee	24 477	25 843	25 827	27 521	29 613
Mining total = 100%	*%*	*82%*	*87%*	*85%*	*89%*	*92%*
(Value added – salaries) per employee	CZK/ employee	795 532	921 712	945 532	888 218	1 037 911
Mining total = 100%	*%*	*82%*	*92%*	*83%*	*134%*	*87%*
Indexes	17/13		14/13	15/14	16/15	17/16
Number of enterprises	0%		5%	0%	–5%	0%
Number of employees	7%		0%	1%	12%	–5%
Sales	27%		2%	3%	15%	5%
Value added	40%		15%	4%	6%	11%
Sales per employee	18%		2%	2%	2%	11%
Labour productivity based value added	30%		16%	3%	–6%	17%
Hourly labour productivity	34%		15%	3%	–5%	19%
Average salary	21%		6%	0%	7%	8%
(Value added – salaries) per employee	30%		16%	3%	–6%	17%

Source: own calculations according to Ministry of Industry and Trade and CSO

The raw material group of limestone, cement raw materials and dolomite is small to medium. A total of 61% of sales are gained in downstream productions (cement, etc.). In 2017, sales per employee reached the second-best value in the Mining Total. In 2017, the raw material ranked second in sales per employee.

Sales and added values increase over the entire period. The number of employees grew by 2016. Sales for the entire period grew by 27% and value added by 40%. Raw material has a very good dynamics (see Tab. 9).

Relative indicators, namely sales per employee and labour productivity show the importance of downstream productions. Sales per employee are above the average of the Mining Total, labour productivity, efficiency, i.e. labour productivity – average salaries is below average. Virtually all indicators grew during the monitored period.

Table 10: Dimension stone

Indicator	Unit	2013	2014	2015	2016	2017
Number of enterprises		21	22	23	24	22
Number of employees		900	1 015	1 047	1 032	749
Sales	mill CZK	2 519	2 903	2 959	3 017	2 163
Value added	mill CZK	944	1 090	1 158	1 094	661
Sales per employee	ths CZK/ employee	2 798	2 860	2 827	2 924	2 887
Mining total = 100%	*%*	*104%*	*108%*	*97%*	*103%*	*85%*
Labour productivity based value added	CZK/ employee	1 048 139	1 073 352	1 106 195	1 060 640	881 987
Mining total = 100%	*%*	*105%*	*104%*	*94%*	*153%*	*72%*
Hourly labour productivity	CZK/ working hour	607	610	636	609	515
Mining total = 100%	*%*	*102%*	*100%*	*91%*	*146%*	*70%*
Average salary	CZK/ employee	28 476	28 149	29 752	30 419	29 001
Mining total = 100%	*%*	*96%*	*94%*	*98%*	*99%*	*90%*
(Value added – salaries) per employee	CZK/ employee	1 019 663	1 045 202	1 076 443	1 030 221	852 986
Mining total = 100%	*%*	*105%*	*105%*	*94%*	*156%*	*71%*

Indexes	17/13	14/13	15/14	16/15	17/16
Number of enterprises	3%	5%	5%	4%	–10%
Number of employees	–17%	13%	3%	–1%	–27%
Sales	–14%	15%	2%	2%	–28%
Value added	–30%	15%	6%	–6%	–40%
Sales per employee	3%	2%	–1%	3%	–1%
Labour productivity based value added	–16%	2%	3%	–4%	–17%
Hourly labour productivity	–15%	1%	4%	–4%	–15%
Average salary	2%	–1%	6%	2%	–5%
(Value added – salaries) per employee	–16%	3%	3%	–4%	–17%

Source: own calculations according to Ministry of Industry and Trade and CSO

Most sales of dimension stone in 2017 are attributable to the section CZ-NACE B Mining and Quarrying – 92%. This is a less important raw material, but in terms of the number of organisations, it is the third most important raw material.

Absolute indicators rose by 2015 and 2016, and then declined sharply. This is partly due to the failure to find data in 2017 of a major enterprise. However, it still be a drop-in value in 2017, though not so significant. This is one of the few raw materials which observed a decline in absolute indicators over the period from 2013 to 2017 (see Tab. 10). Regarding the dynamics of the indicator values over the period from 2013 to 2017, it was the second worst raw material in sales and value added. Regarding the number of employees, the dynamics was the third worst.

The development in relative indicators also showed a decline in 2017. Overall, over the whole period, only sales per employee (3%) and average salary (2%) increased. Labour productivity declined by 16% as well as efficiency.

Table 11: Crushed stone

Indicator	Unit	2013	2014	2015	2016	2017
Number of enterprises		75	75	79	74	74
Number of employees		8 323	8 441	8 614	9 154	10 784
Sales	mill CZK	19 328	19 541	22 058	23 170	29 981
Value added	mill CZK	8 704	8 864	11 285	11 590	16 868
Sales per employee	ths CZK/ employee	2 322	2 315	2 561	2 502	2 780
Mining total = 100%	*%*	*86%*	*88%*	*88%*	*88%*	*82%*
Labour productivity based value added	CZK/ employee	1 045 686	1 050 153	1 310 021	1 223 770	1 564 140
Mining total = 100%	*%*	*105%*	*102%*	*112%*	*177%*	*127%*
Hourly labour productivity	CZK/ working hour	612	614	776	775	910
Mining total = 100%	*%*	*103%*	*101%*	*111%*	*186%*	*124%*
Average salary	CZK/ employee	29 232	29 216	30 549	30 973	30 475
Mining total = 100%	*%*	*98%*	*98%*	*100%*	*101%*	*95%*
(Value added – salaries) per employee	CZK/ employee	1 016 454	1 020 937	1 279 472	1 192 797	1 533 666
Mining total = 100%	*%*	*105%*	*102%*	*112%*	*180%*	*128%*

Indexes	17/13	14/13	15/14	16/15	17/16
Number of enterprises	–1%	1%	6%	–7%	0%
Number of employees	30%	1%	2%	6%	18%
Sales	55%	1%	13%	5%	29%
Value added	94%	2%	27%	3%	46%
Sales per employee	20%	0%	11%	–2%	11%
Labour productivity based value added	50%	0%	25%	–7%	28%
Hourly labour productivity	49%	0%	27%	0%	17%
Average salary	4%	0%	5%	1%	–2%
(Value added – salaries) per employee	51%	0%	25%	–7%	29%

Source: own calculations according to Ministry of Industry and Trade and CSO

Sales of raw materials crushed stone in 2017 were made up of 97% of enterprises belonging to the section CZ-NACE B Mining and Quarrying. It is the largest raw material in terms of the number of organisations (see Tab. 11). Also, regarding the other absolute indicators in 2017, the importance of the raw material was high and it was the third most important raw material in terms of sales and the second most important raw material in terms of value added and the number of employees. The dynamics of absolute indicators were excellent, with the growth in sales by 55% between 2013 and 2017, added value by huge 94% and the number of employees by 30%. Regarding this raw material, there is a lot of very small enterprises which we do not have data about. When including them, the importance of this raw material would further increase. All of these indicators steadily increased over the respective period. Between 2013 and 2017, the raw material had the second-best growth in terms of the number of employees and sales. The increase in value added was the best.

The development in relative indicators was also excellent when sales per employee increased by 20%, labour productivity by 50%, as well as efficiency, i.e. the difference in labour productivity and average salary. In 2017, the raw material reached the highest labour productivity and efficiency of the Mining Total. Labour productivity and efficiency are above the average of total mining. This also corresponds to the dynamics of indicators growth in the period from 2013 to 2017, when both efficiency and labour productivity growth were second best.

Table 12: Sand and gravel

Indicator	**Unit**	**2013**	**2014**	**2015**	**2016**	**2017**
Number of enterprises		48	48	47	48	45
Number of employees		4 087	4 017	3 968	4 217	4 155
Sales	mill CZK	12 117	13 220	13 675	14 364	14 072
Value added	mill CZK	3 885	4 525	4 740	4 868	4 480
Sales per employee	ths CZK/ employee	2 965	3 291	3 446	3 406	3 387
Mining total = 100%	*%*	*110%*	*125%*	*118%*	*120%*	*99%*
Labour productivity based value added	CZK/ employee	950 618	1 126 505	1 194 416	1 154 427	1 078 279
Mining total = 100%	*%*	*95%*	*110%*	*102%*	*167%*	*88%*
Hourly labour productivity	CZK/ working hour	534	629	671	652	622
Mining total = 100%	*%*	*90%*	*103%*	*96%*	*157%*	*85%*
Average salary	CZK/ employee	27 717	28 322	28 667	30 885	33 516
Mining total = 100%	*%*	*93%*	*95%*	*94%*	*100%*	*104%*
(Value added – salaries) per employee	CZK/ employee	922 901	1 098 183	1 165 749	1 123 542	1 044 763
Mining total = 100%	*%*	*95%*	*110%*	*102%*	*170%*	*87%*

Indexes	17/13	14/13	15/14	16/15	17/16
Number of enterprises	–7%	–1%	–2%	3%	–7%
Number of employees	2%	–2%	–1%	6%	–1%
Sales	16%	9%	3%	5%	–2%
Value added	15%	16%	5%	3%	–8%
Sales per employee	14%	11%	5%	–1%	–1%
Labour productivity based value added	13%	19%	6%	–3%	–7%
Hourly labour productivity	16%	18%	7%	–3%	–5%
Average salary	21%	2%	1%	8%	9%
(Value added – salaries) per employee	13%	19%	6%	–4%	–7%

Source: own calculations according to Ministry of Industry and Trade and CSO

86% of sales of sand and gravel are generated by enterprises from CZ-NACE B section, Mining and Quarrying. It is an important raw material in terms of the number of organisations (2nd place), added value (3rd place), sales (4th place) and number of employees (4th place).

The development of absolute indicators was not dramatic in the period from 2013 to 2017, i.e. sales increased by 16%, the added value by 15% and the number of employees by 2%.

Most of the relative indicators over the period from 2013 to 2017 were above the Total Mining average. It was the second-best raw material in terms of the average salary in 2017.

Table 13: Brick clays and related minerals

Indicator	Unit	2013	2014	2015	2016	2017
Number of enterprises		13	13	12	11	10
Number of employees		2 215	2 158	2 115	2 130	2 173
Sales	mill CZK	6 579	6 660	6 771	7 219	7 995
Value added	mill CZK	1 835	2 175	2 374	2 606	2 936
Sales per employee	ths CZK/ employee	2 971	3 086	3 201	3 390	3 680
Mining total = 100%	*%*	*110%*	*117%*	*110%*	*120%*	*108%*
Labour productivity based value added	CZK/ employee	828 739	1 007 901	1 122 326	1 223 691	1 351 363
Mining total = 100%	*%*	*83%*	*98%*	*96%*	*177%*	*110%*
Hourly labour productivity	CZK/ working hour	490	588	650	711	789
Mining total = 100%	*%*	*82%*	*97%*	*93%*	*171%*	*108%*
Average salary	CZK/ employee	27 431	29 043	30 577	31 852	33 616
Mining total = 100%	*%*	*92%*	*97%*	*100%*	*103%*	*105%*
(Value added – salaries) per employee	CZK/ employee	801 308	978 858	1 091 749	1 191 839	1 317 746
Mining total = 100%	*%*	*83%*	*98%*	*96%*	*180%*	*110%*

Indexes	17/13	14/13	15/14	16/15	17/16
Number of enterprises	–23%	0%	–12%	–4%	–9%
Number of employees	–2%	–3%	–2%	1%	2%
Sales	22%	1%	2%	7%	11%
Value added	60%	19%	9%	10%	13%
Sales per employee	24%	4%	4%	6%	9%
Labour productivity based value added	63%	22%	11%	9%	10%
Hourly labour productivity	61%	20%	11%	9%	11%
Average salary	23%	6%	5%	4%	6%
(Value added – salaries) per employee	64%	22%	12%	9%	11%

Source: own calculations according to Ministry of Industry and Trade and CSO

In the raw material brick clays and related minerals, 72% of the sales come from enterprises from the manufacturing industry, mainly from CZ-NACE 23, especially brick production. The share of non-mining enterprises is the largest among all raw materials. It is a less important raw material. But in effectiveness, it was the third most effective raw material in 2017, and third in labour productivity, average salary and sales per employee.

Sales and value added increased during the period under review by 22% and 60%, respectively (see Tab. 13). The increase in value added between 2013 and 2017 was the second best of all raw materials.

The development of relative indicators was very favourable, when they mostly reach levels above Total Mining, with labour productivity and efficiency growing by 63% and 64%, respectively. A more moderate growth was recorded in the average salary and sales, by 23% and 24%, respectively. This development suggests the highest increase in labour productivity, average salary and efficiency from all raw materials. Sales growth per employee was the second best.

The Other Raw Materials package (Tab. 14) includes raw materials with a small number of organisations, which cannot be reported separately. These include mining uranium, oil,

Table 14: Other minerals (uranium + crude oil + graphite + gemstones + silica minerals + gypsum)

Indicator	**Unit**	**2013**	**2014**	**2015**	**2016**	**2017**
Number of enterprises		13	13	13	13	13
Number of employees		6 746	6 827	6 846	6 764	6 411
Sales	mill CZK	23 587	23 568	31 853	30 595	46 187
Value added	mill CZK	6 821	6 090	6 042	3 937	4 202
Sales per employee	ths CZK/ employee	3 496	3 452	4 653	4 523	7 204
Mining total = 100%	*%*	*130%*	*131%*	*159%*	*160%*	*211%*
Labour productivity based value added	CZK/ employee	1 011 101	892 056	882 607	582 006	655 460
Mining total = 100%	*%*	*101%*	*87%*	*75%*	*84%*	*53%*
Hourly labour productivity	CZK/ working hour	613	537	529	349	398
Mining total = 100%	*%*	*103%*	*88%*	*76%*	*84%*	*54%*
Average salary	CZK/ employee	28 664	29 543	30 167	30 700	32 052
Mining total = 100%	*%*	*96%*	*99%*	*99%*	*100%*	*100%*
(Value added – salaries) per employee	CZK/ employee	982 437	862 514	852 441	551 306	623 408
Mining total = 100%	*%*	*101%*	*86%*	*75%*	*83%*	*52%*

Indexes	17/13	14/13	15/14	16/15	17/16
Number of enterprises	0%	0%	0%	0%	0%
Number of employees	–5%	1%	0%	–1%	–5%
Sales	96%	0%	35%	–4%	51%
Value added	–38%	–11%	–1%	–35%	7%
Sales per employee	106%	–1%	35%	–3%	59%
Labour productivity based value added	–35%	–12%	–1%	–34%	13%
Hourly labour productivity	–35%	–12%	–1%	–34%	14%
Average salary	12%	3%	2%	2%	4%
(Value added – salaries) per employee	–37%	–12%	–1%	–35%	13%

Source: own calculations according to Ministry of Industry and Trade and CSO

natural gas, graphite, precious stones, diatomite, quartz raw materials and gypsum. 73% of the organisations belong to the CZ-NACE B section, Mining and Quarrying.

To comment on such a diverse group is problematic. It contains very efficient mineral industries (crude oil, natural gas), but also very problematic ones (uranium) due to near-zero or intermittent mining.

In 2017, it was the most important raw material in terms of sales, the third most important in the number of employees and the fourth most important raw material in terms of added value. The opposed development between 2013 and 2017 is interesting. The increase in sales was the best of all raw materials and the increase in value added was the worst.

Regarding the relative indicators, the year 2017 is the most significant, when they observed a significant growth. The level of sales per employee is excellent compared to the Mining Total, when it is the highest. The average salary is at a good level. On the contrary, labour productivity and efficiency are insufficient.

Outline of domestic mine production

		2013	2014	2015	2016	2017
Energy minerals						
Uranium	t U	232	165	134	128	59
	Concentrate production, t U (1)	206	146	122	137	56
Bituminous coal	kt	8 610	8 341	7 640	6 074	4 870
Brown coal	kt (2)	40 585	38 348	38 251	38 646	39 310
Crude oil	kt	152	148	126	116	107
Natural gas	mill m^3	207	198	200	169	171
Industrial minerals						
Pyrope bearing rock	kt	16	18	17	8	34
Moldavite (tectite) bearing rock	ths m^3	41	45	67	71	54
	kt (1 m^3 = 1.8 kt)	74	81	120	128	97
Kaolin	Raw, kt (3)	3 108	3 281	3 454	3 540	3 669
	Beneficiated, kt	609	617	648	648	676
Clays	kt	465	518	569	538	537
Bentonite (4)	kt	226	301	369	374	254
Diatomite	kt	49	34	15	26	34
Feldspar	kt	411	422	433	454	368
Feldspar substitutes	kt	15	17	21	31	34
Silica minerals	kt	15	16	14	18	17
Glass sand	kt	862	734	812	801	755
Foundry sand	kt	412	603	535	521	556
Limestones and corrective additives for cement production	kt	9 605	10 342	10 568	11 412	10 787
Dolomite	kt	392	449	451	440	450
Gypsum	kt	11	11	11	10	7
Construction minerals						
Dimension stone	Mine production in reserved deposits, ths m^3 (5)	140	145	187	156	111
	Mine production in reserved deposits, kt (1 m^3 = 2.7 kt) (5)	378	392	505	421	300
	Mine production in non-reserved deposits, ths m^3 (6)	31	58	55	48	33
	Mine production in non-reserved deposits, kt (1 m^3 = 2.7 kt) (6)	84	157	149	130	89
Crushed stone	Mine production in reserved deposits, ths m^3 (5)	11 420	12 341	13 740	12 385	12 776
	Mine production in reserved deposits, kt (1 m^3 = 2.7 kt) (5)	30 384	33 321	37 98	33 440	34 495
	Mine production in non-reserved deposits, ths m^3 (6)	970	982	1 171	1 408	1 251
	Mine production in non-reserved deposits, kt (1 m^3 = 2.7 kt) (6)	2 620	2 651	3 162	3 802	3 378
Sand and gravel	Mine production in reserved deposits, ths m^3 (5)	5 346	5 753	6 063	6 143	6 198
	Mine production in reserved deposits, kt (1 m^3 = 1.8 kt) (5)	9 623	10 355	10 913	11 057	11 156
	Mine production in non-reserved deposits, ths m^3 (6)	4 300	4 063	4 796	4 045	4 829
	Mine production in non-reserved deposits, kt (1 m^3 = 1.8 kt) (6)	7 740	7 313	8 633	7 281	8 692
Brick clays and related minerals	Mine production in reserved deposits, ths m^3 (5)	743	677	736	877	678
	Mine production in reserved deposits, kt (1 m^3 = 1.8 kt) (5)	1 337	1 219	1 325	1 579	1 220
	Mine production in non-reserved deposits, ths m^3 (6)	140	161	165	225	251
	Mine production in non-reserved deposits, kt (1 m^3 = 1.8 kt) (6)	252	290	297	405	452
Metallic ores (not mined)						

(1) corresponds to sales production (without beneficiation losses)

(2) Czech Statistical Office presents so-called sales mining production which is production of marketable brown coal and reaches on average about 95 % of given mine production

(3)raw kaolin, total production of all technological grades

(4) including mining of montmorillonite clays overburden of kaolins since 2004

(5) decrease of mineral reserves by mining production

(6) estimate

Domestic share in the world mine production

			2013	2014	2015	2016	2017
Energy minerals							
Uranium (U)		world: WNA	0.38%	0.39%	0.29%	0.22%	0.10%
Bituminous coal		world: IEA, BP	0.16%	0.12%	0.12%	0.11%	0.07%
Brown coal + Lignite		world: IEA, BP	4.83%	4.83%	4.73%	4.75%	4.73%
Crude oil		world: BP	0.004%	0.004%	0.003%	0.003%	0.002%
Natural gas		world: BP	0.006%	0.005%	0.006%	0.006%	0.005%
Industrial minerals							
Gemstones	Pyrope bearing rock		N	N	N	N	N
	Moldavite (tecti-te) bearing rock		N	N	N	N	N
Kaolin		world: MCS	8.40%	8.00%	9.65%	9.58%	9.92%
Clays			N	N	N	N	N
Bentonite		world: MCS	2.19%	2.47%	2.31%	2.31%	1.34%
Diatomite		world: MCS	2.28%	1.44%	0.66%	0.97%	1.13%
Feldspar		world: MCS	1.79%	1.96%	2.04%	1.97%	1.60%
Feldspar substitutes			N	N	N	N	N
Glass + Foundry sand		world: MCS	0.90%	0.81%	0.74%	0.74%	0.62%
Limestones		world: MCS *	0.20%	0.21%	0.23%	0.22%	0.22%
Dolomite			N	N	N	N	N
Gypsum		world: MCS	0.01%	0.004%	0.004%	0.004%	0.003%
Construction minerals							
			N	N	N	N	N
Metallic ores (not mined)							

** calculation based on lime and cement production. 2 t of limestone = 1 t of lime or 2 t of cement*

ENVIRONMENT AND MINERALS

Mining and nature protection

1,505 reserved and 875 non-reserved mineral deposits were registered in the Czech Republic as of December 31, 2017. The number of exploited deposits was markedly lower – 506 reserved and 203 non-reserved. Only 43 reserved and 7 non-reserved deposits were mined in the specially nature protected areas, which represents 8.5 % and 3.5 % of the total number, respectively.

Act No 114/1992 Sb. on nature and landscape protection in its present wording regulates activities in specially protected areas (ZCHÚ) of the Czech Republic (national parks – NP (Národní park), protected landscape areas – CHKO (Chráněná krajinná oblast), national nature reserves, nature reserves, national nature monuments and nature monuments). According to this Act, all mineral mining (section 16) in national parks (with exception of crushed stone and sand mining for construction in the territory of the national park), in the first zone of protected landscape areas (section 26) and in national nature reserves (section 29) is prohibited. Although the mining of mineral resources is not prohibited by law in other areas (2nd to 4th zones of the CHKO, nature reserves, national nature monuments and nature monuments), it is very difficult to obtain authorization. Legal regulations which mention prohibition

Specially protected areas (ZCHÚ) in the Czech Republic

Number/Year	2013	2014	2015	2016	2017
Total number	2 421	2 601	2 639	2 665	2 630
National parks (NP)	4	4	4	4	4
Protected landscape areas (CHKO)	25	25	25	26	26
Others	2 392	2 572	2 610	2 635	2 600

Source: AOPK ČR (2017)

National parks in the Czech Republic

National park	Year of the NP declaration	National park area (km^2)	Proportion on the territory of the Czech Republic 78 864 km^2 (%)
Krkonoše Mountains National Park	1963	363	0.46 %
Podyjí National Park	1991	63	0.07 %
Šumava National Park	1991	686	0.87 %
National Park Bohemian Switzerland	2000	79	0.10 %

Pramen: AOPK ČR (2016)

Structure of ZCHÚ in 2017

Category of specially protected areas	Number	Area (km²)	Proportion on the territory of the Czech Republic 78 864 km² (%)
LARGE-EXTENT ZCHÚ:			
National parks (NP) – mining explicitly prohibited	4	1 191	1.51
Protected landscape areas (CHKO)	26	11 375	14.42
– (in them the 1st zones of CHKO where mining is explicitly prohibited)	26	920	1.17
ZCHÚ with mining explicitly prohibited by the Act No. 114/1992 Sb.	29 *	2 066 *	2.62 *
SMALL-EXTENT ZCHÚ:			
National nature monuments (NPP)	124	66	0.08
National nature reserve (NPR)	109	295.3	0.37
Nature monuments (PP)	1 557	319	0.41
Nature reserves (PR)	810	429	0.54
NPP, NPR, PP, PR	2 600	1 110	1.41
– (from them NPP, NPR, PP, PR on the area of NP, CHKO)	753	472	0.59
LARGE-EXTENT AND SMALL-EXTENT ZCHÚ – total	2 630	13 675	17.34

** data from 2013, currently without updating*
Source: AOPK ČR (2018)

Mining of reserved and non-reserved mineral deposits in CHKO, kt

Mineral	Reserved deposits					Non-reserved deposits				
	2013	2014	2015	2016	2017	2013	2014	2015	2016	2017
Gemstones*	16	18	17	8	34	–	–	–	–	–
Crude oil	0	0	0	0	0	–	–	–	–	–
Natural gas**	0	1	1	2	2	–	–	–	–	–
Quartz sand	0	225	176	598	255	–	–	–	–	–
Feldspar	279	265	293	312	315	–	–	–	–	–
Limestone	3 278	3 344	3 169	3 512	3 284	–	–	–	–	–
Dimension stone**	41	32	35	71	77	2	1	1	1	1
Crushed stone**, ***	3 041	2 764	3 308	3 510	2 945	173	223	53	642	19
Sand and gravel**	980	1 072	1 189	1 505	1 595	28	34	47	29	5
Brick clay**	0	0	0	0	0	0	0	0	0	0
Total	**7 636**	**7 721**	**8 188**	**9 510**	**8 506**	**203**	**258**	**101**	**673**	**25**
Index, 1990 = 100	48	48	51	59	66	–	–	–	–	–
Index, 2000 = 100	–	–	–	–	–	66	84	33	218	12

** pyrope bearing rocks, ** conversion to kt: natural gas (1,000,000 m³ = 1 kt), dimension and crushed stone (1,000 m³ = 2.7 kt), sand and gravel and brick clays (1,000 m³ = 1.8 kt), *** increase in mine production of non-reserved crushed stone deposits in 2011 is caused by increase in production of non-reserved part of Měrunice deposit at the expense of its reserved one, **** The increase in the extraction of the quartz sand non-reserved deposits in 2016 is due to an increase in the mining share of Srní Okřešice locality*

Mining of reserved and non-reserved mineral deposits in individual CHKO, kt

Name of CHKO	2013	2014	2015	2016	2017
Beskydy Mts.	30	38	10	53	35
Bílé Karpaty Mts.	170	208	181	206	222
Blaník	0	0	0	0	0
Blanský les	663	484	711	602	725
Brdy **	**	**	**	0	11
Broumov region	149	117	96	122	144
České středohoří Mts.	1 439	1 341	1 505	2 145	1657
Český kras (Bohemian Karst)	3 375	3 473	3 328	3 617	3 344
Český les Mts.	0	0	0	0	0
Český ráj	0	0	0	0	0
Jeseníky Mts.	94	70	102	156	97
Jizerské hory Mts.	0	0	0	3	22
Kokořín region – Máchův kraj *	0	225	176	604	253
Křivoklát region	234	226	254	327	298
Labské pískovce (Elbe sandstones)	0	0	0	0	0
Litovelské Pomoraví region	0	0	0	0	0
Lužické hory Mts.	8	5	7	6	0
Moravský kras (Moravian Karst)	31	0	0	0	17
Orlické hory Mts.	0	0	0	0	0
Pálava region	0	0	0	0	0
Poodří region	0	0	0	169	136
Slavkovský les region	160	140	155	16	218
Šumava Mts.	63	82	61	81	86
Třeboň region	1 130	1 263	1 327	1 540	1555
Žďárské vrchy Mts.	131	131	112	191	174
Železné hory Mts.	162	176	170	153	144
Total mine production (rounded)	**7 839**	**7 979**	**8 195**	**10 143**	**9 138**

** in 2014 the CHKO Kokořínsko was extended about 140 km^2, now is called Kokořínsko-Máchův kraj*
*** CHKO Brdy was established on 1. 1. 2016j*

of the "permanent damage of the soil surface" are the main reason – and they practically exclude mineral mining. A further reason is the civil activity in the field of environmental protection.

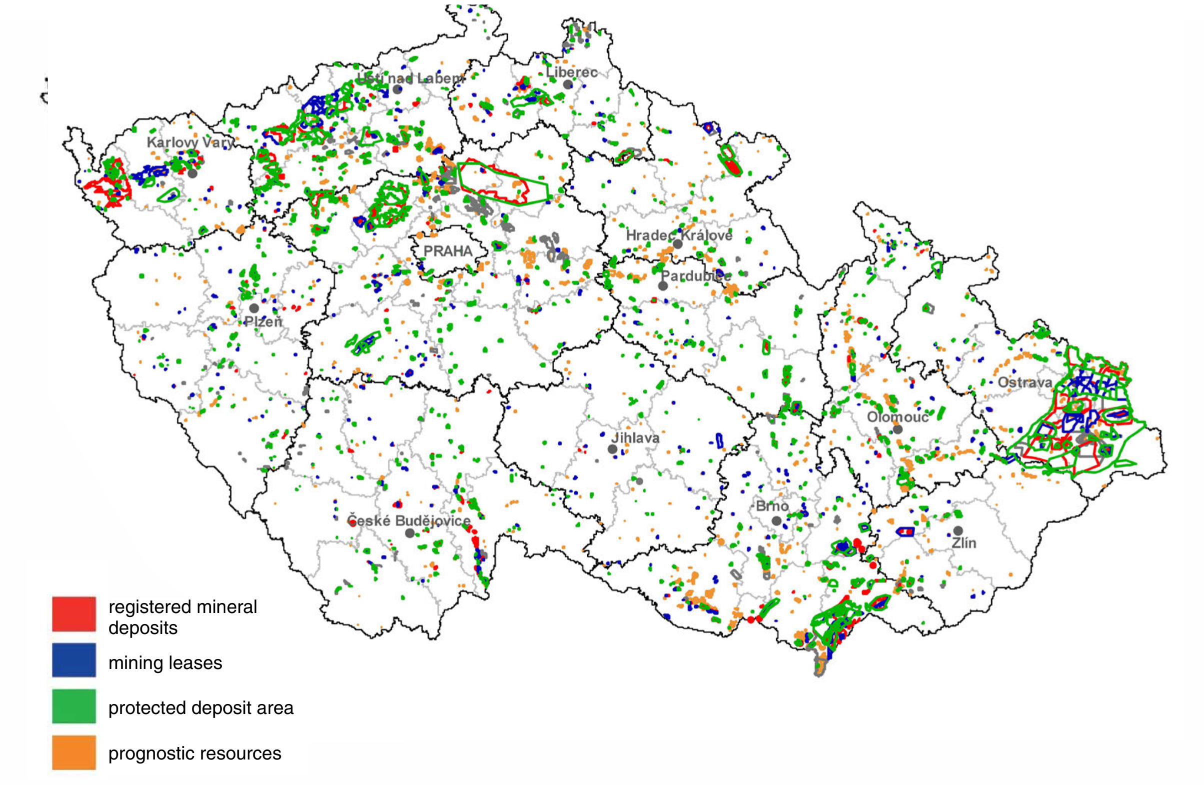
Mineral deposits are mined, and were in the past mined, in the CHKO in majority of cases where the mining claims were already determined before these CHKO were established. Mining in the CHKO declined after 1989 till 2002, after it rather grows till 2008 and after declines and stagnates respectively namely of registered deposits, which follows from the data in the table "Mining of reserved and non-reserved mineral deposits in CHKO" below and also from the fact that reserved deposits were mined in 19 from 25 CHKO in 2007 and 2008 (see the table "Mining of reserved and non-reserved mineral deposits in individual

Impact of mining of reserved deposits in CHKO, t/km² in a year
(areas of CHKO as of December 31)

Name of CHKO	area km² in 2017	2013	2014	2015	2016	2017
Beskydy Mts.	1 205	26	33	9	45	29
Bílé Karpaty Mts.	746	238	291	253	288	298
Blaník	40	0	0	0	0	0
Blanský les	219	3 122	2 283	3 354	2 840	3 311
Brdy *	345	*	*	*	0	32
Broumov region	432	363	285	234	290	334
České středohoří Mts.	1 070	1 345	1 253	1 407	1 537	1 549
Český kras (Bohemian Karst)	132	25 485	26 227	25 512	27 311	25 333
Český les Mts.	466	0	0	0	0	0
Český ráj	182	0	0	0	0	0
Jeseníky Mts.	743	127	95	138	211	131
Jizerské hory Mts.	374	0	0	0	9	59
Kokořín region – Máchův kraj *	410	0	0	176	1 459	617
Křivoklát region	625	365	359	403	514	477
Labské pískovce (Elbe sandstones)	243	0	0	0	0	0
Litovelské Pomoraví	93	0	0	0	0	0
Lužické hory Mts.	270	0	0	0	22	0
Moravský kras (Moravian Karst)	91	337	0	0	0	185
Orlické hory Mts.	233	0	0	0	0	0
Pálava region	85	0	0	0	0	0
Poodří region	82	0	0	0	2 061	1 659
Slavkovský les	610	250	219	242	263	357
Šumava Mts. (CHKO + NP)	1 680	37	49	95	48	51
Třeboň region	687	1 614	1 804	1 895	2 114	2 263
Žďárské vrchy Mts.	708	182	183	157	266	246
Železné hory Mts.	285	426	463	447	403	505
TOTAL (total mining/total area)	**12 056**	**661**	**663**	**699**	**838**	**758**

Note: an impact exceeding 10,000 t/km² in a year is regarded as critical
** CHKO Brdy was established on 1.1.2016*
*** in 2014 the CHKO Kokořín region was extended about 140 km², now is called Kokořín region-Mácha's country (Máchův kraj)*

CHKO") compared to 17 from 25 CHKO in 2006. Deposits were mined only in 16 CHKO in 2009 and 2010, in 14 CHKO in 2011 till 2014 and in 15 CHKO in 2015 when CHKO Kokořínsko was extended about 140 km² and now is colled Kokořínsko-Máchův kraj. In 2016, the number of protected landscape areas in the Czech Republic increased to 26 (CHKO Brdy was established on 1.1.2016) and this number is the same also in 2017, in 18 of them were mined raw materials.



Mining activities charge of the Czech Republic territory

As far as the impact of mining on the area is concerned, the CHKO Český kras (Bohemian Karst – limestone mining) is especially unfavourably affected. The impact on some other CHKO, especially CHKO Třeboň region, Poodří, České středohoří Mts., Blanský les is still rather high (see Tab. "Impact of mining of reserved deposits in CHKO"). The reduction in mining by 32% occurred in 2017 in the České středohoří protected landscape area. The mining activities in the area of Moravský kras (Moravian Karst) were terminated in 2014. In 2017 two deposits are being mined here again - the limestone deposit Ochoz u Brna and the deposit of foundry sands Rudice-Seč. From 2015 when CHKO Kokořínsko was extended about 140 km^2 (now is colled Kokořínsko-Máchův kraj) is reported quartz sand deposit Srní – Okřešice in this CHKO. In 2016 the Brdy protected landscape area was established but mining there was not take place. In 2017, however, a building stone in the total amount of 11 kt was already mined on two localities (Záběhlá-Červený lom and Chaloupky-hlína).

It is possible to get a clearer picture of mining activities in the Czech Republic from following map.

As well as the Act No. 114/1992 Sb. on nature and landscape protection, Act No. 100/2001 Sb. on environmental impact assessment and the Decree of the MŽP No. 175/2006 Sb. (formerly No. 395/1992 Sb.), by which some provisions of the Act No. 114/1992 Sb. are applied, have a fundamental influence on permission for exploration and mining.

The Mining Act No. 44/1988 Sb. obliges the mining companies by its section 31 to reclaim the areas with mining impacts and to create financial means for this reclamation. These are considered as mining costs from the viewpoint of the profi tax. Table "Development of reclamations after mining" shows that the areas with mining impact decreased and those reclaimed increased in 2012–2016.

Methods of reclamation used in 2017 are shown in the table “Reclamation after mining of reserved minerals in 2017”.

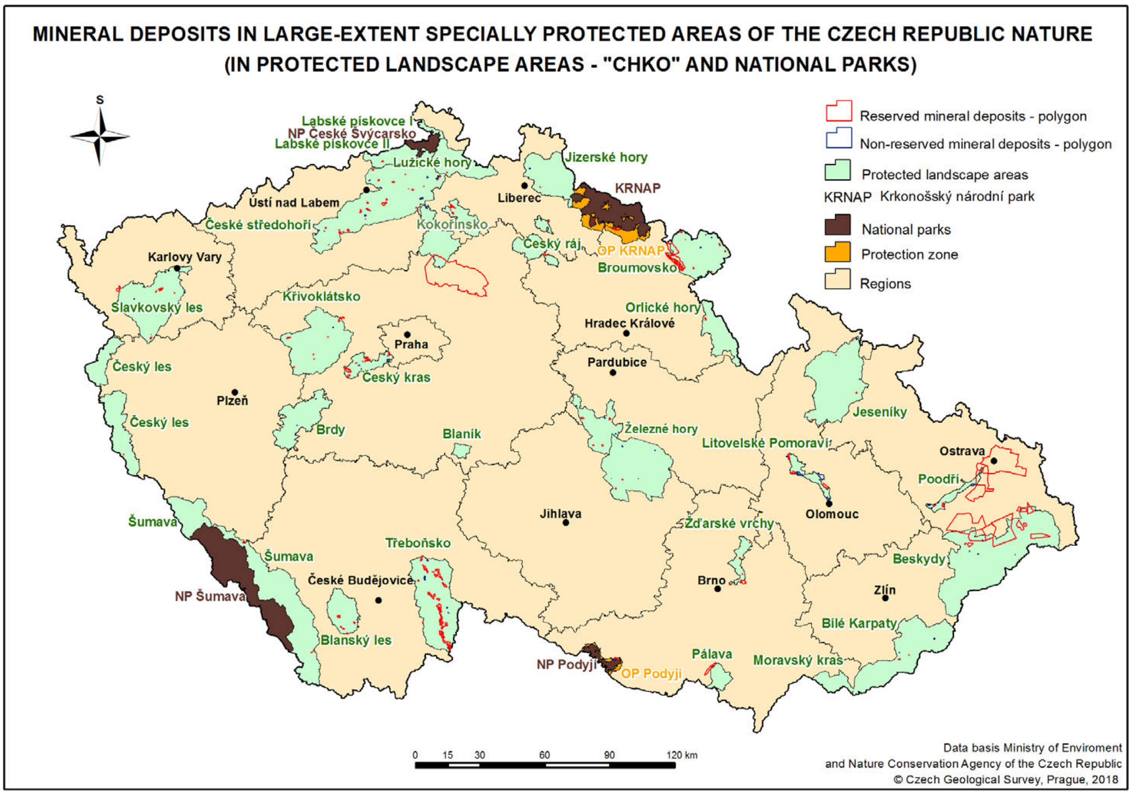
Development of reclamations after mining

km^2		2013	2014	2015	2016	2017
Reserved deposits	Area with manifestation of mining, not yet reclaimed	529	481	536	523	459
	Reclamations in process	93	89	79	71	70
	Reclamations finished since the start of mining	230	235	258	254	245
	Reclamations finished in the given year	5	2	12	3 15	5
Non-reserved deposits	Area with manifestation of mining, not yet reclaimed	12	13	14	15	16
	Reclamations in process	3	3	4	4	4
	Reclamations finished since the start of mining	3	2	3	3	4
	Reclamations finished in the given year	0,2	0,1	0,3	0,4	0,8

Reclamation after mining of reserved minerals in 2017

Region	Reclamations in process								Reclamations finished							
	agricultural		forest		water		other		agricultural		forest		water		other	
	in DP	out DP	in DP	out DP	in DP	out DP	in DP	out DP	in DP	out DP	in DP	out DP	in DP	out DP	in DP	out DP
South Bohemia	17	4	27	3	37	0	48	0	57	41	72	30	304	2	40	1
South Moravia	158	6	56	8	2	0	28	0	501	34	177	20	9	0	28	8
Karlovy Vary	63	86	185	766	6	5	23	17	368	1 135	1 332	2 147	564	26	138	34
Hradec Králové	31	0	24	5	4	0	18	0	61	6	137	4	61	0	21	4
Liberec	23	0	112	25	0	0	11	0	92	51	252	15	4	0	82	7
Moravia and Silesia	16	1	327	47	38	0	204	12	880	77	867	70	393	5	381	13
Olomouc	22	2	60	65	109	0	2	0	25	131	17	10	48	0	9	6
Pardubice	8	0	5	7	3	0	4	0	40	0	10	9	65	0	10	2
Plzeň	30	4	56	3	1	0	0	0	11	16	45	48	0	0	22	12
Prague	1	0	0	0	0	0	9	1	2	5	0	0	0	0	5	2
Central Bohemia	159	0	154	4	37	0	52	4	409	108	108	9	284	1	127	33
Ústí nad Labem	501	178	1 189	398	37	13	851	132	1 934	2 345	2 351	2 919	530	218	935	1 530
Vysočina	0	0	1	0	1	0	2	2	0	0	29	5	0	0	3	13
Zlín	3	0	2	0	80	0	3	0	92	54	46	0	255	5	3	3
Czech Republic intotal	1 035	281	2 198	1 331	355	18	1 255	168	4 472	4 003	5 443	5 286	2 517	257	1 804	1 668

[ranked according to regions and way of reclamation; DP = mining lease (in = within, out = outside), areas in hectares (1 km^2 = 100 ha)]



Mining influences the environment, changes the character of the landscape, and alters ecological conditions for flora and fauna. In some areas mining activities can last several human generations. This way the impact of mining persists and a more permanent new arrangement of natural conditions and relationships in its area is not quickly evident. The new arrangement can be equal to or even better than the original one, of course on a different level. Examples include artificial lakes formed e.g. in south Bohemia by sand and gravel mining, constructions and sport grounds in former quarries or specially protected nature areas proclaimed paradoxically in the territory of former quarries, and also 35 hectares of new vineyards planted as agricultural reclamation of a closed brown coal mine in the north of Bohemia in the Most wine region. They represent by their area almost 6.5 % of the total 550 hectares of productive vineyards of the Czech wine region.

In Bavaria, Germany, they studied the plant biodiversity in local quarries (S.Gilcher – U. Tränkle (2005): Steinbrüche und Gruben Bayerns und ihre Bedeutung für den Arten- und Biotopschutz.-Bayerischen Industrieverband Steine und Erden e.V., München.). Of the 2 533 known plant species (of which 701 are endangered) in Bavaria in quarries whose combined area amounts to 0.006 % of Bavaria´s total area, they counted 1039 species (41 % of the total count), of which 87 species were endangered (12.4 % of all endangered plant species).

In Baden-Württemberg, Germany, (Schelkingen quarries – raw material for cement) an original research project was developed *(Brodkom E.-Benett P.-Jans D. (editors)(2001): Good environmental practice in the European extractive industry. A reference guide. – Environnement, hors-série no 1, p. 35. Société de l'industrie minérale.Paris.)*. "This consisted of using cut grass to encourage vegetation growth by spreading it over the floor of a closed-down quarry. In order to protect germination, the grass counteracts high soil temperatures. The moisture of the soil is retained much longer, and the air humidity under the grass is higher. ... Corresponding tests on the following substrates were carried out at the quarry: raw soil substrate (unchanged quarry site), mixed substrate (screen residue and excavated material), excavated material. ... With regard to effectiveness, it can be stated that 50 to 60 % of the species established on the areas from which the cut grass was taken were introduced and naturalised in an single mowing process. The costs incurred by such the process range between a minimum of 0.43–0.61 EUR/m^2 (without site preparation) and a maximum of 1.36–1.87 EUR/m^2 (including distribution of substrate and further measures). In contrast to that, the costs occuring for recultivation for agricultural or forestry purposes, amount to between 1.02–3.07 EUR/m^2."

In 2009, participants in the workshop Obnova území narušených těžbou nerostných surovin ("Restoration of Mining-Impacted Land") organized by the citizens association Calla- Association for Preservation of the Environment and by the Department of Botany of the Faculty of Science at the University of South Bohemia set down principles of eco-friendly restoration of mining-impacted land (J. Řehounek (2010): Přírodovědci formulovali zásady ekologické obnovy po těžbě. /Naturalists formulate principles of post-mining ecological restoration.-Minerální suroviny/Surowce mineralne (magazine), 1:32–33. Mining Union of the Czech Republic, Brno:

1. Prior to commencing mining, a qualified biological assessment not only of the mining area, but also of its surroundings is essential. It would be beneficial if the actual mining were to be managed, if possible, in such a way so as to preserve (possibly maintain and expand) as many (semi) natural habitats in the immediate vicinity of the mine site or dumping ground. A roughly 100-metre zone in an area that can be accessed by most of the species is key for the subsequent colonization of the mining-impacted land during spontaneous succession.
2. Environmental impact assessments, biological assessments and reclamation plans, which concern the restoration of mining-impacted land and dumping grounds, should be prepared by experts, who are not only familiar with the current state of knowledge in the field of ecological restoration, but also with realistic possibilities and limits of mining technology. These problems should henceforth be included in the examinations for persons authorized to prepare environmental impact assessments pursuant to Act No. 100/2001 Coll. (EIA), and for persons certified in preparing biological assessments pursuant to § 67 of Act No. 114/1992 Coll. and in preparing assessments evaluating impacts on bird areas and on Special Areas of Conservation (SAC) pursuant to § 45i of said Act. Ongoing training in ecological restoration should be mandatory for these persons.
3. A basic restoration plan (e.g. in the form of a remediation and reclamation summary) should already be known when a mining lease (in the case of reserved deposits) is granted, or when a planning permit that designates the area for mining (in the case of non-reserved deposits) is granted, and should take into account the potential possibilities of the area. Room must be left to make any possible changes according to current conditions during the mine planning phase (plan of mine development work /POPD/ including detailed rehabilitation and reclamation plans, mining permits, etc.) and during the actual mining and completion phases.
4. It is essential to conduct another continuous assessment of the locality (a scheduled monitoring programme) already during the course of mining and after its termination, which may discover the presence of rare and endangered species and communities, as well as important geological and geomorphological phenomena. The restoration plan will have to be modified with respect to this assessment, which should be provided by the mining company via or under supervision of a qualified person.

5. Prior to, during and after mining, it is necessary to monitor invasive species at the mine site and in its surroundings. If their presence may possibly jeopardize the intended restoration method, then they must be removed by sanitation methods.
6. The great majority of mining-impacted land can restore itself spontaneously – via spontaneous succession, which may in some cases also be guided (directed, blocked or reversed). As a rule, at least 20 % of a large mine site´s total area should be left to spontaneous succession in the most bilogically valuable areas. Smaller mining sites and dumping grounds can usually be integrated into the landscape without problem, thus ecological succession may be implemented in their entire area.
7. If endangered and specially protected species and communities are highly dependent on the mine site environment, then their population and biotypes will have to be managed appropriately. This should be covered by mandatory funds generated by the mining company for reclamation, after its completion by public funds designated for landscape programmes.
8. The most valuable mine sites and dumping grounds should be declared specially protected areas (most often classified specifically as a nature monument) and managed accordingly, or declared temporary protected areas if only temporary protection is needed. Less valuable mine sites and dumping grounds left to eco-friendly restoration should almost always at least be registered as important landscape elements. Special attention should be paid to mine sites that may be incorporated into the territorial system of ecological stability.
9. Restoration of a mine site or dumping ground should primarily increase the observable landscape diversity. It is necessary to break up straight lines and surfaces (peripheries, shore lines, etc.) with uneven areas, at the very latest after termination of (or preferably during the course of) mining. Shallow shore areas are necessary at flooded mine sites.
10. Unsuitable pieces of equipment and waste should removed after mining is terminated, if the aim is to integrate a mine site or dumping ground into the environment.
11. The nutrient-rich top soil sections must be permanently removed from those parts of the mine site that are designated for eco-friendly restoration in the least amount of time. This already needs to be taken into account during the reclamation planning phase. As overburden is returned, so are excess nutrients, which mostly support the evolution of a few less abundant, agressive species, including invasive ones. Once mining commences it is therefore necessary to verify, in collaboration with protection of agricultural land resources authorities (hereinafter OZPF), if the overburden is being carefully and completely removed from areas designated for eco-friendly restoration. Otherwise it is necessary to modify the implementation of the reclamation plan, again however in collaboration with OZPF and mining authorities.
12. From an environmental protection perspective, phased mining and restoration works best at larger mine sites, specifically when spread out over a longer period so that abandoned areas of the mining area are gradually left to restoration. This procedure helps create more varied and higher-quality communities with regard to age and extent in restored areas.
13. It is beneficial to place permanent study areas designated for scientific research, testing of eco-friendly interventions and monitoring in all types of mining areas. These areas should be respected by the mining companies.

Conclusion of the workshop: Eco-friendly restoration of mining-impacted land is certainly not the only option of how to deal with the integration of these areas into the landscape. Our laws should however allow for this restoration method, which is common in many countries, to become an equivalent alternative to the thus far predominant forest and agricultural reclamations.

In 2011, a final report on project VaV SP/2d1/141/07 "Rekultivace a management nepřírodních biotopů v České republice" ("Reclamation and Management of Non-Natural Biotypes in the Czech Republic") was published for the entire duration of the project in 2007 – 2011 carried out by the Institute for Environmental Policy, Public Benefit Corporation, by the Institute of Geology of the Academy of Sciences of the Czech Republic, Public Research Institution, and by the Czech University of Life Sciences Prague. Its fi and recommendations state among other things:

"Areas impacted by mining and by some other human activities such as quarries, sand pits, mining sites of kaolin and brick clays, waste piles/dumps and large waste depots, are by far not really devastated, dead "lunar landscapes". On the contrary, it is being demonstrated that, in terms of the protection of diverse biotypes, they are a very important refuge, where mushrooms and wild plants and animals are finding optimum living conditions, which they entirely lack in urbanized and industrial areas, and on land used intensively by agriculture...

It is absolutely vital that the relevant state administration authorities respond appropriately to the new scientific findings. In the next legislative session, they should in collaboration with experts prepare and put into practice appropriate changes to laws and executive regulations, which regulate mining and other related human activities, primarily remediation and reclamation. The following legal regulations must be amended:

- Act No. 44/1988 Coll., on mineral protection and use (the Mining Act) – subsequently amended;
- Regulation of the ČBÚ No. 172/1992 Coll., on mining leases in the wording of the Regulation No. 351/2000 Coll.;
- Regulation of the ČBÚ No. 104/1988 Coll., on efficient use of reserved deposits, on permits and notifi ation of mining operations and other activities employing mining methods – subsequently amended;
- Act No. 61/1988 Coll., on mining operations, explosives and the state mining – subsequently amended;
- Act No. 334/1992 Coll., on protection of agricultural land resources – subsequently amended
- Regulation of the MŽP ČR No. 13/1994 Coll., governing some details of agricultural land resources protection – subsequently amended;
- Regulation of the ČBÚ No. 13/1994 Coll., on efficient use of reserved deposits, on permits and notifi ation of mining operations and other activities employing mining methods – subsequently amended;
- Act No. 289/1995 Coll., on forests, modifying and amending certain acts (the Forest Act);
- Regulation of the Ministry of Agriculture of the Czech Republic No. 77/1996 Coll., on necessary elements of applications for dispossession or curtailment of rights, and on details of protection of lands devoted to forest function performance – subsequently amended;
- Act No. 114/1992 Coll., on nature and landscape protection – subsequently amended.

These unavoidable changes should eliminate evident discrepancies and deficiences in the legislation concerning the areas in question and harmonize legal regulations, so that ecological and economic highly effective nature-friendly methods of restoration based on natural or directed ecological succession may be used to a greater extent...”

The conclusions and recommendations expressed in the final report of the project „Reclamation and Management of Non-Natural Habitats in the Czech Republic“ were overwhelmingly fulfilled from the legislative point of view and most of the laws and decrees were recently amended. We state the status of amendments to this legislation in 2017:

- Act No. 44/1988 Coll., on mineral protection and use (the Mining Act) – novelization is the Act No. 89/2016 Coll., with effect from 1. 1. 2017;
- Regulation of the ČBÚ No. 351/2000 Coll., on mining leases in the wording – without change
- Regulation of the ČBÚ No. 104/1988 Coll., on efficient use of reserved deposits, on permits and notifi ation of mining operations and other activities employing mining methods – novelization is the Regulation of the ČBÚ No. 299/2005 Coll., with effect from 1. 8. 2005;
- Act No. 61/1988 Coll., on mining operations, explosives and the state mining – novelization is the Act No. 451/2016 Coll., with effect from 13. 1. 2017;
- Act No. 334/1992 Coll., on protection of agricultural land resources – novelization is the Act No. 184/2016 Coll., with effect from 28. 6. 2016;
- Regulation of the MŽP ČR No. 13/1994 Coll., governing some details of agricultural land resources protection – novelization is the Regulation of the MŽP No. 153/2016 Coll., with effect from 1. 6. 2016;
- Act No. 289/1995 Coll., on forests, modifying and amending certain acts (the Forest Act) –
- novelization is the Act No. 62/2017 Coll., with effect from 1. 5. 2017;
- Regulation of the Ministry of Agriculture of the Czech Republic No. 77/1996 Coll., on necessary elements of applications for dispossession or curtailment of rights, and on details of protection of lands devoted to forest function performance – without change
- Act No. 114/1992 Coll., on nature and landscape protection – novelization is the Act No. 123/2017 Coll., with effect from 1. 6. 2017.

Publication

Řehounek J., Řehounková K., Prach K. (editoři[eds]) (2010): Ekologická obnova území narušených těžbou nerostných surovin a průmyslovými deponiemi. – Calla, České Budějovice. [Ecological reclamation of regions disturbed by minerals mining and industrial stockpiles.] keep to the conclusions of the workshop.

Share of specially Protected Areas of the Czech Republic nature (zvláště chráněná území přírody České republiky (ZCHÚs)) established in localities with former mining ("after mining") in all the ZCHÚs
(compiled after data of the Nature Conservation Agency of the Czech Republic – AOPK ČR in 2018)

Region	Number of ZCHÚs (without CHKOs)	Area of ZCHÚs (without CHKOs) (ha)	Number of ZCHÚs "after mining"	Area of ZCHÚs (without CHKOs) "after mining" (ha)	Share of ZCHÚ areas "after mining" in the all ZCHÚs area	Share of ZCHÚ number "after mining" in the all ZCHÚs number	Share of ZCHÚ areas "after mining" in the all ZCHÚs area in the Czech Republic	Share of ZCHÚ number "after mining" in the all ZCHÚs number in the Czech Republic
	data 2017	data 2017	* data 2013	* data 2013	* data 2013	* data 2013	* data 2013	* data 2013
Central Bohemia	300	15 624	41	817.99	6.79 %	16.14 %	0.80 %	1.69 %
Prague	94	2 327	36	714.04	30.46 %	39.56 %	0.70 %	1.48 %
Karlovy Vary	79	4 967	6	33.03	0.81 %	8.70 %	0.03 %	0.25 %
Olomouc	165	7 538	20	195.88	2.67 %	13.16 %	0.20 %	0.82 %
South Moravia	342	11 469	23	343.00	3.98 %	7.64 %	0.34 %	0.95 %
Pardubice	108	5 970	5	116.84	2.22 %	4.95 %	0.12 %	0.21 %
Plzeň	191	6 677	17	148.09	1.35 %	8.76 %	0.15 %	0.70 %
Zlín	215	2 585	6	23.72	1.11 %	3.39 %	0.02 %	0.25 %
Moravia and Silesia	163	8 404	17	264.81	3.21 %	10.49 %	0.26 %	0.70 %
Liberec	126	5 829	6	244.38	4.38 %	4.84 %	0.24 %	0.25 %
Vysočina	197	5 449	4	29.25	0.51 %	2.13 %	0.30 %	0.16 %
Ústí nad Labem	175	9 338	12	327.79	5.11 %	7.50 %	0.32 %	0.25 %
Hradec Králové	138	8 319	6	17.10	0.24 %	4.58 %	0.02 %	0.25 %
South Bohemia	332	16 501	18	247.24	1.62 %	5.50 %	0.24 %	0.75 %
Czech Republic total	**2 600**	**110 997**	**217**	**3 523.16**	**3.48 %**	**8.93 %**	**3.48 %**	**8.93 %**

** data from 2013. onwards are not available*

Eliminating negative consequences of mining in the Czech Republic – major methods and financial resources

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Introduction

The process of restructuring coal and ore mining, and of eliminating negative environmental consequences of mining in the landscape and erasing these consequences in affected areas of the Czech Republic, is executed in several ways and with various financial resources. It specifically involves:

1. Use of funds from a financial reserve generated by mining companies for remediation, reclamation, and mining damages
2. Use of funds from annual royalties paid by mining companies on mining leases and on extracted reserved minerals pursuant to the Mining Act
3. Phase-out programme of mining activities and erasing consequences of coal, ore and uranium mining funded by the national sources via the Ministry of Industry and Trade
4. Use of proceeds from privatisation of state assets in eliminating old ecological burdens caused by mining, existing prior to privatisation of mining companies
5. A programme which deals with ecological damage caused prior to privatisation of brown coal mining companies in the Ústí nad Labem Region and Karlovy Vary Region, with ecological revitalisation upon termination of mining operations in the Moravian-Silesian Region, with eliminating ecological burdens caused by the exploration for and extraction of crude oil and natural gas in designated areas of the South Moravian Region, and with reducing the impacts caused by the termination of coal mining in the Kladno Region based on Government resolutions in 2002. Funds are provided by proceeds from privatisation of national assets.

1. Use of funds from a financial reserve generated by mining companies for remediation, reclamation, and mining damages

Financial reserve for remediation and reclamation

The most important source for funding the elimination of the consequences of mining operations in the Czech Republic is the financial reserve for remediation and reclamation, generated by mining companies during the exploitation of reserved mineral deposits.

The amendment to Mining Act No. 541/1991 Coll., under Article 31 Section 6, imposes on the mining company to generate a financial reserve in order to meet the obligation established under Article 31 Section 5 of the Mining Act, thus guaranteeing the remediation and reclamation of all plots of land affected by mining (hereinafter referred to as “reserves”). The reserves are part of the company´s expenses. Pursuant to article 32 section 2 of the Mining Act, the determination of anticipated expenses for remediation and reclamation is part of the plan for opening, preparation and exploitation of reserved deposits (hereinafter referred to as “POPD”), and the POPD must also contain a proposal regarding the amount of, and the method for, generating the required financial reserve. However, the anticipated amount of financial costs for remediation and reclamation must for be already included the first time, pursuant to the provision under Article 2, Section 4, Par. k) Point 4 of Decree No. 172/1992 Coll., as amended, in the application for the grant of a mining lease. An interim provision of Act No. 541/1991 Coll. established that the required reserve amount should be provided in 10 years (i.e. by 20 December 2001) in the case of existing mines. In the subsequent amendment of the Mining Act by Act No. 168/1993 Coll., the time period for generating the reserve was changed to last for the duration of the economic life of the mine, quarry or their sections. However, that did not apply to companies with an announced or approved phase-out programme (ores, coal).

According to the provision under article 37a section 2 of the Mining Act, creation of reserves is subject to approval by Regional Mining Authorities (RMA). Upon the request of a company, these also permit the drawing on funds from the generated reserve upon agreement with the Ministry of the Environment and upon approval of the relevant municipality. In the case of public enterprises, the RMA makes a decision regarding the drawing on the reserve upon agreement with the Ministry of Industry and Trade.

The issues mentioned are further regulated by FMF (Federal Ministry of Finance) Measure No. ref. V/20 100/1992 Coll. (published in the Collection of Laws, part 106/1992), on the chart of accounts and on accounting procedures, which lays down the rules regarding the generating and use of financial reserves by companies with permitted mining operations. At the end of each accounting period, companies execute closings of books and carry out document inventories, which verify the balancing of books (Act No. 593/1992 Coll. and No. 563/1991 Coll.).

Legal regulation of reserves for rehabilitation, reclamation as well as mining damage was updated after the effect of Act No. 223/2006 Coll. (amendment of the Reserves Act) and No. 313/2006 Coll. (amendment of the Mining Act) came into effect.

Financial reserve for mining damages

Pursuant to article 37a section 1 of the Mining Act, a mining company is obliged to generate a financial reserve to ensure settlement of mining damages. The reserve amount generated and charged to expenses must correspond to the needs for settling mining damages in the course of time depending on their creation, or prior to their creation.

Generating of reserves is subject to approval by the relevant Regional Mining Authority, which also approves the drawing on these reserves upon agreement with the Ministry of the Environment. Prior to making a decision on the drawing on these reserves, the Regional Mining Authority requests a statement from the relevant municipality. In the case of public enterprises, the RMA decides in agreement with the Ministry of Industry and Trade.

A company´s request to draw on the financial reserve for mining damages must be furnished with a list of mining damages, an expense estimate for their elimination and a time table of resource expenses for the elimination of mining damages.

2. Use of funds from annual royalties paid by mining companies on mining leases and on extracted reserved minerals pursuant to the Mining Act

Reimbursements on mining leases

Since 1 January 2017, the payments and rates of reimbursements from mining leases are regulated by Act No. 89/2016 Coll., which amends Act No. 44/1988 Coll., on the Protection and Use of Mineral Resources, as amended (the Mining Act). The holders of mining areas have the obligation

Generated and drawn reserves for remediation and reclamation (in CZK thousand)

Year	Bituminous coal		Brown coal		Crude oil and natural gas		Ores		Industrial minerals		Radioactive minerals		Total	
	generated	drawn	generated	drawn	generated	drawn	generated	drawn	generated	drawn	generated	drawn	generated	drawn
1993	118,500	0	1,341,769	65,615	12,722	0	0	0	97,438	8,236	0	0	1,570,429	73,851
1994	123,750	18,600	573,242	259,929	6,836	0	0	0	255,155	30,335	0	0	958,983	308,864
1995	85,895	136,064	3,845,935	265,856	22,414	370	0	0	276,724	24,230	0	0	4,230,968	426,520
1996	143,500	97,993	1,436,957	831,817	25,811	113	0	0	270,432	31,829	0	0	1,876,700	961,752
1997	108,000	42,108	1,302,735	1,087,993	62,618	5,569	0	0	484,420	53,262	0	0	1,957,773	1,188,932
1998	51,594	48,033	1,226,036	994,133	22,112	9,541	0	0	466,649	59,913	0	0	1,766,391	1,111,620
1999	132,143	56,236	1,199,633	704,199	26,181	7,473	0	0	318,852	141,530	0	0	1,676,809	909,438
2000	42,747	52,029	1,119,474	683,179	23,487	600	0	0	307,433	140,225	0	0	1,493,141	876,033
2001	876,194	77,458	1,267,431	678,515	23,184	2,750	390	0	215,379	53,893	0	0	2,382,578	812,616
2002	887,250	129,600	1,007,561	653,557	100	250	0	0	157,721	50,604	0	0	2,052,632	834,011
2003	1,800	498	5,199,919	4,844,371	11,782	1,050	0	0	179,763	57,848	0	0	5,393,264	4,903,767
2004	65,002	54,162	1,031,828	720,168	4,770	0	0	0	160,102	73,177	0	0	1,261,702	847,507
2005	66,504	54,204	964,222	547,883	17,524	9,409	0	0	228,713	113,743	0	0	1,276,963	725,239
2006	74,178	113,691	845,008	663,055	17,893	3,300	0	0	144,665	92,489	0	0	1,081,744	872,535
2007	32,696	88,462	718,820	240,060	25,417	17,259	0	0	127,413	82,329	0	0	904,346	428,110
2008	17,660	66,941	626,649	330,397	24,828	16,372	0	0	233,615	99,610	0	0	1,008,637	513,320
2009	21,780	69,711	650,696	394,528	15,454	1,324	0	0	177,681	77,290	0	0	955,897	542,853
2010	22,800	147,848	298,205	133,171	16,302	461	0	0	96,207	94,517	0	0	433,515	375,997
2011	22,500	170,958	625,011	491,068	22,336	986	0	0	82,252	87,681	0	0	752,099	750,693
2012	22,500	141,432	632,601	364,264	9,871	1,693	0	0	96,263	91,721	0	0	761,235	599,110
2013	15,000	240,951	648,019	325,791	13,530	2,044	0	0	86,121	57,478	0	0	762,670	626,254
2014	15,000	204,020	612,459	470,297	11,566	1,341	0	0	84,084	40,704	0	0	723,109	716,362
2015	15,000	108,188	577,398	518,197	12,131	809	0	0	98,192	70,309	0	0	702,721	697,503
2016	13,000	163,255	602,096	381,520	12,676	1,562	0	0	83,754	62,752	0	0	711,526	609,089
2017	90,000	131,195	612,635	465,305	11,879	550	0	0	76,948	49,832	0	0	791,462	637,882

Source: Czech Mining Authority

to pay an annual payment from the mining area to the account of the relevant district mining office. The rate of the reimbursement from the mining lease is CZK 300 per hectare or CZK 1,000 per hectare if the mining activity in the mining lease is allowed, consisting in the preparation, opening and extraction of the reserved deposit. A calendar year is the payment period.

The ultimate recipient of the mining lease royalties are the municipalities in whose territory the mining lease is located. These resources are used, in large measure, as compensation for negative impacts of mining on the municipalities in question.

As shown in the following table, approx. CZK 460.1 million was paid out to municipalities since the inception of royalties payments on mining leases in 1993 till 2017.

Reimbursements from mining lease areas paid out to municipalities pursuant to Article 32a) Sec. 1 of the Mining Act (in CZK thousand) CZK

Generated and drawn reserves for mining damages (in CZK thousand)

Year	Bituminous coal		Brown coal		Crude oil and natural gas		Ores		Industrial minerals		Radioactive minerals		Total	
	gene-rated	drawn	gene-rated	drawn	gene-rated	drawn	gene-rated	drawn	gene-rated	drawn	gene-rated	drawn	gene-rated	drawn
1993	400,721	4,093	150,548	42,957	0	0	0	0	28,462	0	0	0	579,731	47,050
1994	105,650	38,813	50,000	32,223	0	0	0	0	9,328	28,852	0	0	164,978	99,888
1995	204,785	86,001	209,207	37,748	0	0	0	0	10,673	9,394	0	0	424,665	133,143
1996	151,643	74,952	259,779	84,258	0	0	0	0	13,100	3,407	0	0	424,522	162,617
1997	77,900	142,512	318,981	127,715	0	0	0	0	5,733	683	0	0	402,614	270,910
1998	185,723	174,640	252,920	112,852	0	0	0	0	16,043	3,638	0	0	457,686	291,130
1999	111,588	174,640	212,722	40,448	0	0	0	0	10,803	6,844	0	0	335,113	221,932
2000	110,088	107,852	240,655	188,685	0	0	0	0	11,414	1,020	0	0	362,157	297,557
2001	145,750	188,073	105,513	217,306	192	0	100	0	35,877	6,628	0	0	287,432	412,007
2002	102,750	168,531	102,700	510,200	0	0	0	0	2,327	2,338	0	0	207,777	681,069
2003	0	0	816,197	999,271	90	0	0	0	12,576	2,263	0	0	828,863	1,001,534
2004	187,700	139,714	164,700	315,321	0	0	0	0	3,007	4,560	0	0	355,407	459,595
2005	191,700	143,974	97,433	279,955	0	0	0	0	6,597	4,273	0	0	295,730	428,202
2006	285,780	251,941	522,908	1,334	150	0	0	0	4,517	6,846	0	0	813,355	260,121
2007	260,850	190,982	193,147	932,392	30	0	0	0	4,298	3,831	0	0	458,325	1,127,205
2008	304,700	308,593	64,601	155,924	0	0	0	0	3,739	2,788	0	0	373,040	467,305
2009	317,625	282,928	30,200	25,800	0	0	0	0	3,447	1,216	0	0	351,272	309,944
2010	283,008	173,686	25,034	15,730	100	0	0	0	2,644	1,514	0	0	310,786	190,930
2011	468,508	196,012	25,663	25,248	100	0	0	0	2,695	2,595	0	0	496,966	223,855
2012	811,202	741,987	30,000	5,818	100	0	0	0	6,157	3,325	0	0	847,459	751,130
2013	145,000	131963	30,000	0	0	0	0	0	3,378	2,724	0	0	178,378	134,686
2014	75,000	183,517	57,391	60,201	50	0	0	0	15,495	3,330	0	0	145,833	245,339
2015	75,000	148,989	35,000	67,096	50	0	0	0	5,076	13,212	0	0	115,126	229,297
2016	30,000	106,673	15,161	36,307	50	0	0	0	3,437	3,250	0	0	48,648	146,230
2017	120,000	109,000	1,666	99,798	247	0	0	0	1,244	2,613	0	0	123,157	211,763

Source: Czech Mining Authority

Royalties on extracted reserved minerals

Since 1 January 2017, the payments and royalty tariffs from extracted minerals are regulated by Act No. 89/2016 Coll., which amends Act No. 44/1988 Coll., on Mineral protection and use, as amended and by Government Provision No. 98/2016 Coll., on the royalty tariffs.

The royalty tariffs from extracted minerals for individual sub-bases of reimbursement stipulated in the Government Regulation amounts at most to 10% of the market price per unit of quantity for each species of extracted minerals. A calendar year is the payment period.

The royalty tariffs may be increased on the basis of market prices development, in the time limits of at least five years.

Part of the yield of the royalty from the extracted minerals in the amount of

a) a partial royalty of quarried brown coal –

Reimbursements from mining lease areas paid out to municipalities pursuant to Article 32a) Sec. 1 of the Mining Act (in CZK thousand)

Year	Number of municipalities	Total
1993	1,327	25,929
1994	1,194	22,752
1995	1,168	24,114
1996	1,225	24,032
1997	1,191	23,446
1998	1,269	22,885
1999	1,208	23,629
2000	1,178	23,780
2001	1,171	23,728
2002	1,168	22,899
2003	1,158	21,740
2004	1,161	21,511
2005	1,138	21,077
2006	1,127	16,178
2007	1,118	15,512
2008	1,305	15,127
2009	1,239	14,925
2010	938	14,032
2011	885	13,888
2012	939	13,809
2013	918	13,800
2014	918	13,800
2015	919	13,800
2016	917	13,688
2017	935	96,304
Total		**556,385**

Source: Czech Mining Authority

1. 33% is allocated to the budget of the municipality in whose territory brown coal quarrying was carried out, and
2. 67% is allocated to the state budget,

b) partial royaltys from extracted brown coal or black coal –
1. 75% is allocated to the budget of the municipality in whose territory the mining of black coal or brown coal was carried out, and
2. 25% is allocated to the state budget

c) partial royaltys from radioactive minerals –
1. 75% is allocated to the budget of the municipality in whose territory the mining of radioactive minerals was carried out, and
2. 25 % is allocated to the state budget,

d) partial royaltys from oil or from flammable natural gas –

Distribution of royalties on extracted reserved minerals pursuant to Article 32a) Sec. 4 of the Mining Act (in CZK thousand)

<table>
<tr><th>Year</th><th colspan="2">50% SB (State budget)</th><th></th><th>50% Municipalities</th><th>Total</th></tr>
<tr><td>1993</td><td colspan="2">230,400</td><td></td><td>230,526</td><td>460,926</td></tr>
<tr><td>1994</td><td colspan="2">245,762</td><td></td><td>245,276</td><td>491,038</td></tr>
<tr><td>1995</td><td colspan="2">221,909</td><td></td><td>221,566</td><td>443,475</td></tr>
<tr><td>1996</td><td colspan="2">229,703</td><td></td><td>229,703</td><td>459,406</td></tr>
<tr><td>1997</td><td colspan="2">228,874</td><td></td><td>228,874</td><td>457,748</td></tr>
<tr><td>1998</td><td colspan="2">220,885</td><td></td><td>220,886</td><td>441,771</td></tr>
<tr><td>1999</td><td colspan="2">219,938</td><td></td><td>219,938</td><td>439,876</td></tr>
<tr><td>2000</td><td colspan="2">227,778</td><td></td><td>227,859</td><td>455,637</td></tr>
<tr><td>Total</td><td colspan="2">1,825,249</td><td></td><td>1,824,628</td><td>3,649,877</td></tr>
<tr><th></th><th colspan="2">12.5 % MIT</th><th>12.5 % MoE</th><th>75 % Municipalities</th><th></th></tr>
<tr><td>2001</td><td colspan="2">153,166</td><td>12,500</td><td>302,221</td><td>467,887</td></tr>
<tr><td>2002</td><td colspan="2">55,000</td><td>59,500</td><td>356,724</td><td>471,224</td></tr>
<tr><td>2003</td><td colspan="2">61,713</td><td>61,800</td><td>371,827</td><td>495,340</td></tr>
<tr><td>2004</td><td colspan="2">70,000</td><td>69,500</td><td>393,695</td><td>533,195</td></tr>
<tr><td>2005</td><td colspan="2">76,398</td><td>76,700</td><td>449,135</td><td>602,233</td></tr>
<tr><td>2006</td><td colspan="2">76,305</td><td>76,400</td><td>455,947</td><td>608,652</td></tr>
<tr><td>2007</td><td colspan="2">82,716</td><td>82,300</td><td>494,737</td><td>659,753</td></tr>
<tr><td>2008</td><td colspan="2">84,367</td><td>84,250</td><td>505,782</td><td>674,399</td></tr>
<tr><td>2009</td><td colspan="2">80,720</td><td>80,720</td><td>484,556</td><td>645,996</td></tr>
<tr><td>2010</td><td colspan="2">73,023</td><td>73,023</td><td>435,103</td><td>581,149</td></tr>
<tr><td>2011</td><td colspan="2">80,714</td><td>80,714</td><td>484,284</td><td>645,712</td></tr>
<tr><td>2012</td><td colspan="2">78,711</td><td>78,711</td><td>472,266</td><td>629,688</td></tr>
<tr><td>2013</td><td colspan="2">74,554</td><td>74,554</td><td>447,323</td><td>596,430</td></tr>
<tr><td>2014</td><td colspan="2">73,146</td><td>73,146</td><td>438,875</td><td>585,167</td></tr>
<tr><td>2015</td><td colspan="2">64,699</td><td>64,699</td><td>388,193</td><td>517,591</td></tr>
<tr><td>2016</td><td colspan="2">54,290</td><td>54,290</td><td>325,740</td><td>434,319</td></tr>
<tr><td></td><td colspan="3">State budget</td><td rowspan="2">Municipalities</td><td rowspan="2"></td></tr>
<tr><td></td><td>Czech Mining Authority 60 %</td><td>28 % MIT</td><td>12 % MoE</td></tr>
<tr><td>2017</td><td>325,725</td><td>152,003</td><td>65,148</td><td>385,613</td><td>928,489</td></tr>
<tr><td>Total 1993–2017</td><td colspan="4"></td><td>12,669,745</td></tr>
</table>

Source: Czech Mining Authority

1. 75% is allocated to the budget of the municipality in whose territory the extraction of oil or natural gas was carried out
2. 25% is allocated to the state budget or

e) other partial royaltys –

1. 38% is allocated to the budget of the municipality in whose territory mining of other minerals was carried out, and
2. 62% is allocated to the state budget.

3. Phase-out programme of mining activities and erasing consequences of coal, ore and uranium mining funded by the national sources

The restructuring of industry in the Czech Republic, specifically of metallurgy and engineering, initiated after 1989, had an immediate impact on the mining sector. Uneconomic ore, coal and uranium mining, and a lower raw material demand were the decisive reasons for the restructuring and subsequent privatisation of mining companies. Part of the restructuring of the mining industry was the announcement of a phase-out of mining activities in uneconomic underground mines and quarries.

The essential method of funding the restructuring of the mining sector is provided by subsidies from the state budget, in accordance with relevant Government resolutions, for the phase-out and to erase the consequences of mining operations.

In the initial phase, the phase-out in individual branches of mining occurred independently, mainly because mining companies reported to various departments.

The phase-out of uranium mining was already decided upon in 1989, as based on documents processed by the Federal Ministry of Fuel and Energy, which was approved by ČSSR (Czechoslovak Socialist Republic) Cabinet Resolution No. 94/1989 on the concept of lowering the unprofitability of uranium mining in the ČSSR in 1990, in the 9th and 10th five-year plans by phasing it out. This Cabinet resolution from 1990 was subsequently amended by the Government of the ČSFR (Czechoslovak Federal Republic) with new Government Resolution No. 894/1990 regarding the modification of the phase-out concept for uranium mining in the ČSFR.

In 1990, ore mining was integrated into the Federal Ministry of Metallurgy, Engineering and Electric Engineering which, for the purpose of dealing with ore mining and the announcement of a phase-out programme for the ore mining industry as of 1 July 1990, processed documents for Government proceedings and Government Resolution No. 440/1990 was adopted.

The phase-out of coal mining was announced at the end of 1992 based on Government Resolution No. 691/1992 concerning the programme for restructuring the coal industry, and documents for Government proceedings were processed by the Ministry of Industry and Trade.

Even though the phase-out of ore mining was not completed, a merger of Rudné doly Příbram state enterprise with DIAMO state enterprise occurred as of 1 January 2001, thereby ending the industry-by-industry monitoring of the phase-out, i.e. ore and uranium mining.

Another modification of the reporting method concerning the drawing on state budget funds occurred in 2003, when, in addition to the proposed state participation in the completion of the restructuring of coal mining, Government Resolution No. 395/2003 authorised the transfer of the Barbora locality from OKD, a. s. company to DIAMO state enterprise, and the localities of Ležáky, Kohinoor and of Kladenské doly to Palivový kombinát Ústí state enterprise.

Use of national sources subsidies for the phase-out of mining and to erase consequences of mining and mandatory social health expenses (in CZK million)

Year	Mining in total			Coal mining			Ore mining			Uranium mining		
	TPO	MSHE	total	TPO	MSHE	total	TPO	MSHE	total	TPO	MSHE	total
1992	1,100.3	0	1,100.3	555.7	0	555.7	248.0	0	248.0	296.6	0	296.6
1993	2,555.1	1,436.3	3,991.4	1,816.1	949.7	2,765.8	43.2	189.0	232.2	695.8	297.6	993.4
1994	3,940.1	1,528.0	5,468.1	2,333.4	1,011.7	3,345.1	35.1	179.6	214.7	1,571.5	336.7	1,908.2
1995	3,861.1	1,678.1	5,539.2	1,956.8	1,329.9	3,286.7	198.8	36.4	235.2	1,759.3	346.4	2,105.7
1996	3,755.5	1,823.2	5,578.7	2,168.3	1,422.7	3.591.0	126.7	33.0	159.7	1,486.9	367.0	1,853.9
1997	2,305.9	1,811.1	4,117.0	1,364.6	1,362.8	2,727.4	100.1	34.9	135.0	836.6	413.4	1,250.0
1998	2,571.7	1,862.9	4,434.6	1,690.2	1,403.7	3,093.9	94.8	30.2	125.0	979.7	422.9	1,402.6
1999	2,073.5	1,955.8	4,029.3	1,206.1	1,475.9	2,682.0	79.2	37.6	116.8	787.9	442.2	1,230.1
2000	2,064.2	1,986.1	4,050.3	1,193.8	1,475.2	2,669.0	158.0	30.2	188.2	712.3	474.9	1,187.2
2001	2,296.2	1,955.6	4,251.8	1,118.4	1,451.0	2,569.4	part of the uranium mining			1,174.6	500.4	1,675.0
2002	1,729.9	1,913.8	3,643.7	574.9	1,359.2	1,934.1				1,154.8	553.3	1,708.1
2003	2,148.5	1,751.1	3,899.6	654.4	1,294.2	1,948.6				1,494.1	455.5	1,949.6
2004	2,576.1	1,713.2	4,289.3	With the merger of s. p. Rudné doly Příbram with s. p. DIAMO and the takeover of phased out areas of OKD, a. s., monitoring on an industry-by-industry basis was terminated.								
2005	2,110.3	1,669.1	3,779.4									
2006	2,069.8	1609.3	3,679.1									
2007	1,917.9	1,574.1	3,492.0									
2008	1,971.9	1,465.7	3,437.6									
2009	2,027.4	1,383.5	3,410.9									
2010	2,281.0	1,257.6	3,538.6									
2011	2,557.1	1,149.6	3,706.7									
2012	2,717.8	979.4	3,697.2									
2013	2,428.0	855.9	3,283.9									
2014	2,768.8	744.5	3,513.3									
2015	2,672.0	641.6	3,313.6									
2016	2,515.1	551.9	3,067.0									
2017	3,121.6	5,432.2	3,664.8									
Total	**64,136.8**	**35,840.6**	**99,977.4**	**16,632.7**	**14,536.0**	**31,168.7**	**1,083.9**	**570.9**	**1,654.8**	**12,950.1**	**4,610.3**	**17,560.4**

Source: MIT
TPO – technical work related to phase-out and erasing consequences of mining operations
MSHE – mandatory social health expenses

Since the initiation of the phase-out of mining in 1992, a total of cca CZK 96,312.6 billion was released from the state budget for the phase-out of mining and to erase the consequences of mining. As shown in the table above, cca CZK 61,015.2 billion were spent on technical work related to the phase-out of mining and on erasing the consequences of mining operations, and cca CZK 35,297.4 billion on social health benefits for miners.

4. Exploitation of proceeds from the sale of privatised property and profit from state participation in companies to remove old ecological burdens incurred prior to the privatisation of mining companies

Based on a decision by the Czech Republic Government, the former National Property Fund of the Czech Republic (as of 1 January 2006 the Ministry of Finance, based on Act No. 178/2005 Coll. and Act No. 179/2005 Coll.) pledged, by virtue of "ecological contracts" entered into with particular individual assignees of assets from privatisation, to eliminate old ecological burdens created prior to privatisation by the use of its privatisation proceeds.

The procedures and process principles for implementing measures leading to remediation of old ecological burdens created prior to privatisation are established in accordance with Government Resolution No. 51 dated 10 January 2001.

The process adheres primarily to the following Acts and Resolutions of the Czech Republic Government:

a) Act No. 92/1991 Coll., on the terms and conditions regarding the transfer of state assets to other persons, as amended;
b) Act. No. 178/2005 Coll., on the National Property Fund of the Czech Republic liquidation and on on the responsibility of Ministry of Finance during privatisation Czech Republic assets (Act on the National Property Fund liquidation), as amended;
c) Act No. 179/2005 Coll., which amends some laws in connection with adopting the Act on the National Property Fund liquidation, as amended;
d) Government Resolution No. 51 from 10 January 2001, which contains the appendix entitled

Overview of entities with which "ecological contracts" were entered into, including guaranteed financial volumes and their actual drawn amount (in CZK) – as of 30/06/2018

Name of mining company	Amount of guarantee	Drawn from guarantee	Amount available for drawing
DIAMO, státní podnik	4,200,000,000	2,887,730,509.14	1 312 269 490,86
DIAMO, státní podnik	3,797,000,000	3,787,286,690.79	On 1 December 2014 environmental contract successfully executed
DIAMO, státní podnik	32,000,000,000	8,871,624,835.62	23,128,375,164.38
OKK Koksovny, a.s.	27,800,000,000	2,692,638,828.43	25,107,361,171.57
Sokolovská uhelná, právní nástupce, a.s.	214,000,000	144,936,723.71	69,063,276.29
Severočeské doly, a.s.	172,265,000	6,174,847.10	166,090,152.90

Principles for Settlement of Ecological Obligations Arising during Privatisation (hereinafter Principles), as amended;

e) Government Resolution No. 565/2006 on Principles during completion of privatisation pursuant Act No. 92/1991 Coll., on the terms and conditions regarding the transfer of state assets to other persons and Act No. 178/2005 Coll., on the National Property Fund of the Czech Republic liquidation and on on the responsibility of Ministry of Finance during privatisation Czech Republic assets, as amended;

f) Act No. 134/2016 Coll., on Awarding Public Contracts, as amended.

The processing of the programme is always provided by the Ministry of Finance. The Ministry of the Environment provides a guaranteed expertise in the process, it issues binding opinions to the individual procedural steps of implementation in accordance with „MF and MoE Directive No. 4/2017 on preparation and implementation of contracts addressing environmental obligations in privatisation“. Mutual collaboration of both authorities in the implementation process is regulated by the "Rules for Mutual Collaboration of the Ministry of the Environment and the Ministry of Finance in the Awarding of 'Ecological Contracts' to Eliminate Old Ecological Damage".

Elimination of old ecological damage created prior to privatisation proceeds for the most part according to priorities established by the MoE (Ministry of the Environment).

5. A programme dealing with ecological damage caused prior to privatisation of brown coal mining companies in the Ústí nad Labem Region and the Karlovy Vary Region, with ecological revitalisation upon termination of mining in the Moravian-Silesian Region, with eliminating ecological burdens caused by the exploration for and extraction of crude oil and natural gas in designated areas of the South Moravian Region, and with reducing impacts caused by the termination of coal mining in the Kladno Region based on Government resolutions in 2002 and 2008. The source of funding includes the proceeds from the sale of privatised assets and the profit from state participation in companies.

After the privatisation of mining companies, the financial settlement of related ecological damage was not resolved in an appropriate manner, within the scope of privatisation projects. However, within the scope of privatisation, companies took over not only mining localities but also extensive areas from the state, which were designated for revitalisation and for which a required financial reserve was not generated in the past.

Mining companies are only obliged to generate a financial reserve for remediation and reclamation of areas affected by mining since 1994, and that on the basis of Amendment (No. 168/1993 Coll.) of the Mining Act.

In 2002, the Czech Republic Government being aware of this fact began to intervene financially in the ecological and partially economic revitalisation of regions with active or terminated mining operations. The aim was to remedy the environmental damage caused by mining operations prior to implemented legal regulation.

For this purpose it earmarked CZK 15 billion from the proceeds from sale of assets designated for privatisation and from the profits of public enterprises to deal with ecological damage created prior to privatisation of brown coal mining companies in the Ústí nad Labem

Region and Karlovy Vary Region, CZK 20 billion to deal with ecological damage caused by mineral mining, primarily underground mining of bituminous coal in the Moravia and Silesia Region, CZK 1 billion to eliminate ecological burdens caused by the exploration for and extraction of crude oil and natural gas in the South Moravian Region, and CZK 1.177 billion to deal with reducing the impacts caused by the termination of coal mining in the Kladno Region.

In 2010, the Government approved the use of CZK 1 billion of the funds released for the revitalisation of the Moravian-Silesian Region for the financing of environmental actions by the state enterprise, DIAMO. In 2017, the Government approved the amount of CZK 250 million from the same funds for the implementation of measures to prevent the spread of pollution from the old ecological burdens caused by the previous metallurgical activity on the premises of Poldi Kladno Steelworks in mine waters. Thus the programme of revitalisation of the Moravian-Silesian Region and the liquidation of oil-gas wells in the South Moravian Region is not allocated with CZK 21 billion, but only CZK 19.750 billion.

The funds from the proceeds from privatisation are released in accordance with Government decisions to cover the expenses of eliminating environmental damage caused by present operations of mining companies, to cover the expenses of and support investment and non-investment activities connected with the remediation of environmental damage caused by mineral mining and to revitalise affected areas, and for financial support of development projects in areas designated for industrial use approved by the Government.

Dealing with ecological damage created prior to privatisation of brown coal mining companies in the Ústí nad Labem Region and the Karlovy Vary Region

For more than 150 years, the character of the landscape was affected significantly by intensive opencast and underground mining of brown coal in the Krušné Hory Mts. piedmont area of Northwest Bohemia. Underground mining primarily affected the territory with the deepest seams (up to 450 m below the surface) in the central, Most-Bílina area of the basin as well as the Teplice area of the North Bohemian Basin. Opencast mining occurred primarily in areas of coal seam outcrops southwest of Chomutov, west and east of the City of Most, north of the City of Bílina, northwest of the City of Teplice, southwest and north of the City of Ústí nad Labem.

In 2002, the then National Property Fund of the Czech Republic was bound by resolutions of the Czech Republic Government to eliminate ecological damage caused by the activities of coal mining companies in the Ústí nad Labem Region and the Karlovy Vary Region, and to revitalise affected areas. The process was initiated that same year.

In accordance with a relevant resolution of the Czech Republic Government, the process dealing with ecological damage arisen prior to privatisation of brown coal mining companies in the Ústí nad Labem Region and the Karlovy Vary Region includes both of the Krušné hory Mts. Basin situated in the territory of the Districts of Sokolov, Chomutov, Most, Teplice and of Ústí nad Labem, i.e. the Sokolov Basin and the North Bohemian Basin or the mining premises of Sokolovská uhelná, a.s., Severočeské doly, a.s., Mostecká uhelná společnost, a.s. (currently mining companies Severní energetická, a.s. and Vršanská uhelná, a.s.), Kohinoor, a.s., and Palivový kombinát Ústí, s.p.

The programme mentioned specifies a group of projects aimed primarily at creating and renewing:

– forest stands,
– agricultural land,
– bodies of water,

– landscape vegetation,
– biocorridors and biocentres,
– areas for recreation,
– areas designated for ecology and natural science,
– building sites.

As of 31/12/2017, the funds actually spent on **221** finished projects amounted to **CZK 9.908 billion** and **CZK 2.354 billion** on **31** projects under implementation. The remaining amount required to secure additional money for the projects in progress amounts to **CZK 0.755 billion**.

List of companies included in the programme plan:
Sokolovská uhelná, právní nástupce, a.s. (SU)
Severočeské doly a.s. (SD)
Mostecká uhelná společnost, a.s. (MUS) currently mining companies Severní energetická, a.s. and Vršanská uhelná, a.s.
Palivový kombinát Ústí, s.p. (PKÚ) with the registered office in Hrbovice

List of regions (projects of cities and municipalities) included in the programme plan:
Karlovy Vary Region – KK
Ústí nad Labem Region – ÚK

Finished and ongoing projects (in MCZK)

Coal Companies	Finished projects		Ongoing projects		
	Number of projects	Project costs	Number of projects	Project prices	Amount drawn as of 12/31/2016
SU	20	2,251.7	6	939.2	873,4
SD	29	2,109.6	2	74.6	0
MUS	46	663.9	16	1,394.4	1,209.6
PKÚ	44	3 043.2	0	0	0
Total 1	139	8 068.4	24	2,408.2	2,083
Municipalities	Finished projects		Ongoing projects		
	Number of projects	Project costs	Number of projects	Project prices	Amount drawn as of 31 Dec 2016
KK	38	1,073.7	2	182.6	77.8
ÚK	44	765.8	5	517.5	192.9
Total 2	82	1,839.5	7	700.1	270.7
Total 1–2	221	9,908	31	3,108.3	2,354

Revitalisation of the Moravian-Silesian and South Moravian Region

Currently, the revitalisation of the Moravian-Silesian Region is aimed primarily at eliminating the consequences of ecological burden caused by bituminous coal mining and, in the South Bohemian Region, at eliminating ecological burdens caused by the exploration for and extraction of crude oil and natural gas.

As of 31/12/2017, the funds actually spent on **147** finished projects amount to about **CZK 8.969 billion** and on **38** on-going projects the funds amount to about **CZK 2.167 billion** as of the specified date.

Categories of priority projects, approved by the Government, which deal with eliminating environmental damage caused by mineral mining in the Moravian-Silesian and South Moravian Region

1. Reclamation work
2. Reducing thermal activity
3. Comprehensive site development
4. Comprehensive reduction of uncontrolled methane emissions
5. Eliminating old ecological burdens in OKD, a.s.
6. Land development upon termination of mining
7. Eliminating ecological burdens caused by the exploration for and extraction of crude oil and natural gas

Finished projects (in CZK) – as of 12/31/2015

Project title	Project costs
1. Reclamation work	
7/02 Reclamation of the Rudná area, Construction No. 5, (along the street Polanecká)	5,213,707
7/03 Reclamation of reservoirs and lands below the Stachanov reservoirs	40,634,358
7/03 Reclamation of reservoirs and lands below the Stachanov reservoirs – additional construction works	8,824,451
7/04 Reclamation of the Žofie waste dump	1,950,601
7/05 Drainage of waterlogged land near Ščučí	7,345,430
7/06 Drainage of lands south of Kuboň Pond – site A and B	2,377,507
7/10 Remediation of the Václav waste dump – external review AR	36,000
7/10 Remediation of the Václav waste dump	18,816,781
7/10 Remediation of Salma	7,105,772
7/14 Reclamation of the Oskar waste dump	6,091,629
7/15 Development along the Orlovská Stream	6,275,508
7/16 Development along the Sušanky Stream	6,796,317
7/16 Development along the Sušanky Stream – phase II.	2,026,032
7/16 Development along the Sušanky Stream – updated estimate of project documentation	17,850
7/17 Remediation of the Urx slide area	6,934,739
Final assessment of the “Reclamation of reservoirs and lands below the Stachanov reservoirs” project – additional construction work	42,000
7/20 Drainage of waterlogged land near Paskov	6,974,421
7/21 Erosion-control measures	821,087
Total 1	**128,284,191**
2. Reducing thermal activity	
8/01 Survey and monitoring of thermal activity in the Heřmanice waste dump	4,962,696
8/02 Survey and monitoring of thermal activity in the Hedvika waste dump	6,506,627
8/04 Survey and monitoring of thermal activity in the Heřmanice waste dump – site II	4,224,505
8/05 Survey and monitoring of thermal activity in the Ema waste dump	1,487,696

8/10 Comprehensive rehabilitation of the contaminated area in Trojice – stage I: review of risk analyses of the contaminated area	2,337,570
Examiner´s report: Comprehensive rehabilitation of the contaminated area in Trojice – stage I: review of risk analyses of the contaminated area	46,800
8/08 Long term monitoring of thermal activity in the Hedvika waste dump	3,270,345
Total 2	**22,836,239**
3. Comprehensive site development	
9/01 Height measurement in areas with phased out mining operations managed by DIAMO (ODRA) – execution	5,626,650
9/02 Monitoring (incl. measurements) and evaluation of the territory of Slezskoostravský and Bartovický zlom	533,520
Height measurement in areas with phased out mining operations	1,094,800
Examiner´s report: Height measurement in areas with phased out mining operations	44,140
Extinguishing of local fire on the Ludvík waste dump in the cadastral area of Radvanice – project	513,600
Total 3	**7,812,710**
4. Comprehensive reduction of uncontrolled methane emissions	
Comprehensive analysis of the methane problem in connection with old mine workings – study	7,602,000
Examiner´s report on the conceptual solution of the methane problem	35,000
Measures for removal of accidental methane emissions in Orlová	62,873,211
Reducing verified methane emissions in the City of Orlová – Project Orlová 2 – additional construction work	6,933,219
35/1 Security provision of liquidated shaft Jan Maria and remediation of mine area	32,103,924
35/2 Elimination of uncontrolled natural gas emissions from deep exploration boreholes in the area of Trojanovice – survey	19,980,000
35/A Preparing individual methodical procedures of basic activities	1,856,400
Survey of mine gas emissions in areas with phased out coal mining and related health and environmental risks	2,344,300
Reducing verified methane emissions in the City of Orlová – Project Orlová 2	34,503,154
Expert assessment 35/AKT updated project no. 35 – Comprehensive analyses of the methane problem in connection with old mine workings	178,500
35/L1 "Economics of filling underground spaces"	2,261,000
35/L2 Geophysical and borehole survey	1,707,650
35/L3 "Scientific-research support for important safety improvements regarding uncontrolled mine gas emissions from old workings, as a result of dealing with residual coal gas capacity and gas bearing capacity of phased out and abandoned mine sections"	2,261,000
Reducing verified methane emissions in the City of Orlová from 1 February to 31 May 2010 – provision of essential safety measures	2,397,600
Reducing verified methane emissions in the City of Orlová from 1 June to 30 September 2010 – provision of essential safety measures	2,397,600
Reduction of verified methane emissions in Orlová from 1 October 2010 to 31 January 2011 – provision of essential safety measures	2,397,600
Reducing verified methane emissions in the City of Orlová from 1 February 2011 to 31 May 2011 – provision of essential safety measures	2,397,600
Reducing verified methane emissions in the City of Orlová from 1 June 2011 to 30 September 2011 – provision of essential safety measures	2,397,600
Methane emissions in locations of plugged shallow boreholes in the cadastral area of Trojanovice – project	780,000
35/5 Elimination of uncontrolled natural gas emissions from deep exploration boreholes in the area of Trojanovice – boreholes NP 546 and NP 805	48,295,233
35/6 Elimination of uncontrolled natural gas emissions from deep exploration boreholes in the area of Václavovice, Soběšovice, – Dolní Domaslavice, Fryčovice – Příbor východ – exploration	46,607,352
35/D3 monitoring and maintenance of SDD throughout project implementation, control metascreening	21,645,499

35/B OKR area categorisation map	2,264,500
35/D3 Monitoring and maintenance of SDD with continuous data transfers (4 SDD) – project	2,192,121
35/J Reconstruction of the existing Electronic Monitoring System – project	37,815,164
Re-liquidation of SDD Michálkovická jáma	9,389,164
35/7 Liquidation of the oil and natural gas deep exploratory borehole Lm 1 Dolní Lomná	15,471,008
35/4 35/4 – Humanisation of sealed or liquidated old mine works and degassing boreholes in the urban area of Ostrava	192,675,399
Total 4	**563,762,798**
5. Eliminating old ecological burdens in OKD, a. s.	
Processing the “Remediation and reclamation of the Kašpárkovice lands” project	809,200
Processing the “Remediation of the Solca tailing ponds” project	1,224,510
Processing the “Development of lands including Karvinský Creek in the area of Špluchov – phase 3” project	1,860,565
Remediation and reclamation of the Křemenec area	113,929,281
Expert assessment of the legitimacy of OKD, a.s. request for approval of Method Changes No. 3 – Křemenec	39,668
Reclamation of waste dump D – reclamation of waste dump D1 and D2	57,387,914
Dolina I land decontamination and reclamation	21,295,875
Louky land reclamation – structure no. 8	60,525,001
Land development within the scope of revitalising the František locality	379,154,077
František locality – additional construction work	63,260,118
Remediation of Solec hill, structure 2 – additional construction work	4,389,633
Remediation of Darkov area, stage I, site C2	386,637,496
Remediation of the former surface mine Paskov	14,020,975
Reclamation of the Lazy waste dump	98,637,394
Remediation of Zdeněk Nejedlý park – phase 1, reclamation of the area southward Karvinský Creek	41,661,196
Remediation at former OKD Doprava, area A – construction work	4,041,581
Remediation of Solec hill, structure 2	10,191,540
Modification of the Stonávka river in kms 0.00 – 2.90, phase A – additional construction work	30,957,408
Reclamation of the D1 waste dump – slope modification	11,432,245
Forensic verification of correctness of the state/OKD ratio (proportion) in financing of submitted sub-projects	0
Total 5	**1,203,179,751**
6. Land development upon termination of mining	
Demolition KOBLOV	6,914,610
Demolition HRUŠOV	6,845,432
Project documentation regarding land development within the scope of eliminating environmental damage upon termination of mining – executed in areas no. 1 and 3 of project no. 45	1,543,500
45/01 František premises, phase 1	13,917,808
45/02 František premises, phase 2 – demolition	1,229,793
Ostravice Dam – Hrabová km 12.05, st. no. 237	63,580,471
Remediation of the damaged Ostravice dam body – additional construction work	12,184,996
45/07 Přívoz premises, demolition	10,835,872
45/08 Pokrok premises, demolition	25,498,110
Slide area stabilisation and drainage modification in the area of Bučinský les in the cadastral area of Radvanice and Bartovice – project	1,591,030
Slide area stabilisation and drainage modification in the area of Bučinský les in the cadastral area of Radvanice and Bartovice – supplemental engineering-geological survey	235,620
45/09 Farma VKK 1 Rychvald premises	19,276,732

VKK Rychvald premises – additional construction work	3,321,357
45/11 Comprehensive development of the water channel and canal network on the premises of the Petr Bezruč mine – project documentation	1,920,000
45/12 Land development upon the termination of mining by DIAMO, s. p., o. z. ODRA – Hlubina premises	7,057,921
45/14 Land development upon the termination of mining by DIAMO, s. p., o. z. ODRA – Barbora premises, 2nd stage	2,268,698
Huminisation of the town centre of Orlová Lutyně – study	2,257,430
Construction of the recreation area "Stříbrné jezero" – project	3,468,000
Reclamation of lands of the former František – Horní Suchá mine – additional construction work	17,729,490
Preparation of a biological assessment according to Act No. 114/1992 Coll., as amended, as part of the land development upon termination of sand and gravel mining – Hlučín	237,600
Realization of Mír Gardens in Svinov – project documentation	201,600
45/15 Petr Bezruč mine premises, phase 2	3,519,308
Reclamation of former mining land in the cadastral area of Malá táhle for leisure and tourism purposes – project documentation	2,208,000
Documentation according to article 6, Act No. 100/2001, on environmental impact assessment, noise and dispersion study to the project Huminisation of the town centre of Orlová	228,000
Huminisation of the town centre of Orlová – Lutyně – project documentation	3,600,000
Reclamation of the waterbody in the historic Božena Němcová Park, affected by mining, for leisure activities of residents of the City of Karviná – project documentation	2,352,000
Revitalization of former mining land in the area of the cemetery in Ostrava – Nová Ves	3,591,601
Reclamation of the former sand quarry and forest land in the cadastral area of Sedlnice for leisure activities – project documentation	2,338,350
Revitalisation of former mining land in the cadastral area of Horní Benešov – project documentation	2,358,440
Remediation, reclamation, and revitalization of former gravel-sand-mining areas near Hlučín – project documentation	31,669,450
Reclamation of the centre of the city district Svinov near Bílovecká primary school – project	270,810
Revitalisation of the former mining land in the cadastral area of Bruntál – locality „Za mlékárnou" – EIA documentation	496,100
Remediation and reconstruction of the sewerage system due to residual effects of coal mining in Petřvald	356,308,426
Rehabilitation and reconstruction of the sewerage system due to residual effects of coal mining in Petřvald – additional construction work	13,661,058
Reconstruction of the bridge in Albrechtice – project	1,438,830
Land development upon termination of mining – multifunctional premises of the former Dukla Mine	250,685,969
Revitalization and rehabilitation of areas affected by mining activities in Horní město – village centre revitalization after termination of mining – securing of old stopes	22,741,061
Revitalization and rehabilitation of areas affected by mining activities in Horní město – village centre revitalization after termination of mining – securing of old stopes	1,977,021
Preparation of project documentation and engineering services for the Remediation, reclamation and revitalization of areas near Hlučín upon termination of sand and gravel mining – additional services	3,567,212
Remediation of environmental damage caused by undermining – liquidation of slit tanks – project documentation	1,415,700
Repair of the road along the water conduit to Žermanice dam	2,699,264
Remediation of Slezská Ostrava Castle in connection with damage control of former mining activity and land preparation for leisure activities – DSP	5,838,272
45/20 Potable water conveyance to and from the Alexander premises – project documentation	368,200
Remediation of Mír gardens in Svinov	2,416,799
Revitalization of former mining land in the cadastral area of Bruntál – Locality "Uhlířský vrch" – Stage I – project documentation	145,200

Ostravice river, check dam in the river kilometrage 0.0–3.0 construction No. 5659 – project	2,328,040
Land stabilisation and drainage modification in the area of the Šporovnice locality in the cadastral area of Radvanice – project	1,779,600
45/19 Comprehensive development of the supply of drinking water and its sewage removal on the premises of Koblov – project documentation	2,110,700
Revitalisation of the territory negatively influenced by the construction of water reservoirs for mines and iron works – Revitalisation of the Žermanice dam territory – right bank protection – phase I and II – implementation	70,387,257
Revitalisation and social rehabilitation of lands affected by the mining activity in Horní Město – Skály near Rýmařov – project documentation	1,172,490
Revitalisation and social rehabilitation of lands affected by the mining activity in Horní Město – Rešov Cycle Track – Rešovské vodopády (Rešov waterfalls) – project documentation	965,580
Reclamation of former mining land and rehabilitation of damage arisen by the mining activity in the area of the Hranečník terminal	70,808,037
Remediation of the slope at the Volný Pond in Radvanice	5,626,624
Revitalisation of the territory negatively influenced by the construction of water reservoirs for mines and iron works – Revitalisation of the Žermanice dam – right bank protection – phase I and II – additional construction work	6,819,611
Reclamation of unpaved areas	5,759,645
Reconstruction of a sports complex in Karviná – Ráj – removal of negative impacts of mining activities	60,345,372
Reconstruction of a sports complex in Karviná – Ráj – removal of negative impacts of mining activities – additional construction work	1,496,165
45/24 Liquidation of the major mine works “Obránců míru” and “Úklonné jámy” – additional construction work	896,930
Revitalisation of the centre of the Svinov Municipal District at primary school Bílovická 1 in order to eliminate the negative effects of mining activities from the past – implementation	1,222,655
Reconstruction of the bridge in Albrechtice – implementation	9,725,460
Revitalisation of the area negatively affected by the construction of water reservoirs for the supply of mines and steelworks – Protection of the Těrlická Dam against sewage and reconstruction and extension of water management infrastructure in Třanovice – 1st construction – water supply	7,248,858
Total 6	**1,166,952,127**
Total 1–6	**3,191,111,786**
7. Eliminating ecological burdens caused by the exploration for and extraction of crude oil and natural gas	
Remediation of old environmental burdens – insufficiently liquidated probes after the extraction of oil and gas – Remediation of the emergency-state probe HR 43	238,144,159
Remediation of old environmental burdens – insufficiently liquidated probes after the extraction of oil and gas – Remediation of the emergency-state probe HR 44 – additional construction work	6,580,424
Remediation of old environmental burdens – insufficiently liquidated probes after the extraction of oil and gas in sector I in the Morava Quaternary Protected Area of Natural Accumulation of Water (PANAW)	750,927,090
Remediation of old environmental burdens – insufficiently liquidated probes after the extraction of oil and gas in sector II in the Morava Quaternary PANAW	639,187,165
Remediation of old environmental burdens – insufficiently liquidated probes after the extraction of oil and gas in sector III in the Morava Quaternary PANAW	461,068,789
Remediation of old ecological burdens – insufficiently liquidated wells after the extraction of oil and gas in sector V in the Morava Quaternary PANAV	365,577,345
Remediation of old environmental burdens – insufficiently liquidated probes after the extraction of oil and gas in sector IV in the Morava Quaternary PANAW	563,317,393
Remediation of old environmental burdens – insufficiently liquidated probes after the extraction of oil and gas in sector VI in the Morava Quaternary PANAW	2,754,045,015
Total 7	**5,778,847,380**
Total 1–7	**8,969,959,166**

Ongoing projects (in CZK)

Project title	Project price	Project costs thus far
1. Reclamation work		
7/09 Reclamation of NP 1 lands	117,400,280	38,443,430
7/18 Capacity increase of Sčučí floodway – project documentation	2,371,600	1,365,300
7/23 Remediation of Lipina premises, land A	5,963,654	4,996,530
Total 1	**125,735,534**	**45,368,299**
2. Reducing thermal activity	**0**	**0**
3. Comprehensive site development	**0**	**0**
4. Comprehensive reduction of uncontrolled methane emissions		
Controlled methane drainage from underground areas in the City of Orlová (Project Orlová 3)	111,299,603	64,965,088
35/2 Elimination of uncontrolled natural gas emissions from deep exploration boreholes in the area of Trojanovice	105,914,779	47,999,142
Updated project no. 35 – Comprehensive analyses of the methane problem in connection with old mine workings in the Moravian-Silesian Region	1,282,560,880	988,458,095
Total 4	**1,499,775,262**	**1,157,193,729**
5. Eliminating old ecological burdens in OKD, a. s.		
Decontamination and reclamation of sludge tanks – phase III., IV. and V.	261,721,195	243 827,790
Decontamination and reclamation of the Lazy mine sludge tanks, phase I. and II.	33,773,258	29,242,963
Regulation of the Stonávka River, km 0.00-2.90 phase A	177,037,484	165,579,361
Total 5	**473,811,345**	**441,020,058**
6. Land development upon termination of mining		
Reclamation of lands of the former František – Horní Suchá mine	95,200,679	93,765,102
Revitalization of municipality Doubrava centrum – square – project	120,000	110,000
Reclamation of the former area of the Volný Pond and forest land in the cadastral area of Radvanice for leisure time activities	4,912,661	4,399,019
Development of former mining land – Reconstruction of road no.III/472 (Doubrava-Dědina) damaged by mining activities – project documentation	2,403,790	1,636,690
Reclamation of former mining land in the cadastral area of Horní Benešov – Cycle Routes – project	2,157,330	1,525,550
Reclamation of former mining land in the cadastral area of Horní Benešov – Road Restoration – project	1,136,406	535,260
Revitalization of former mining land in the cadastral area of Bruntál – locality “Za mlékárnou” – project documentation	2,416,975	943,500
Revitalization of former mining land in the cadastral area of Bruntál – locality “Laguny” – project documentation	2,349,700	1,078,000
Revitalization (remediation) of Slezská Ostrava Castle in connection with damage control of former mining activity and land preparation for leisure activities	34,626,442	28,874,722
Revitalization (remediation) of the Ostravice river in connection with damage control of former mining activity	174,795,342	170,121,072
Lučina, revitalization of waterway after mining activity, river kilometrage 0.000–3.262, construction no. 5657 – project documentation	2,323,200	882,450
Remediation of mine damages at Bohumínská Stružka, Rychvaldy weir – Czech Railways track, kms 4.595–10.530, construction no. 5660 – project documentation	2,318,360	0
Damage control of former mining activity and subsidence of ground – flood control Žabník in Ostrava – Koblová	58,657,519	58,537,837
Revitalization and resocialization of lands affected by mining activity in Horní Město – Preparation of industrial zone – project documentation	1,076,900	477,300

Revitalization and resocialization of lands affected by mining activity in Horní Město – Cycle track Dobřečov – Ferdinandov – project documentation	851,840	653,790
Reclamation of former mining land in the cadastral area of Horní Benešov – Technical infrastructure in the Šibeník locality	11,961,423	11,961,423
45/23 Liquidation of mine work "Nová jáma, ZH-jih" – implementation	9,808,875	9,143,982
45/24 Liquidation of the main mine workings "Obránců míru" and "Úklonné jámy" – realisation	43,415,284	41,782,215
45/25 Liquidation of the main mine working "Nová jáma Josef" – realisation	61,707,447	60,054,503
Revitalisation of territory affected by construction of water reservoirs for mine and iron works – Revitalisation of the Těrlice dam territory – cycle track, phase I – project documentation	1,452,000	1,200,000
Liquidation of the main mine work No. 735 – descending gallery Zálužné 2 and sealing of the main mine work No. 733 – Jáma Zálužné in the cadastral area of Nové Těchanovice – project documentation	332,750	296,450
Humanisation of the town centre of Orlová Lutyně – implementation	109,518,338	0
Revitalisation of former mining land in the cadastral area of Horní Benešov	8,519,024	2,906,125
Revitalisation of the area negatively affected by the construction of water reservoirs for the supply of mines and steelworks – Protection of the Těrlická Dam against sewage and reconstruction and extension of water management infrastructure in Třanovice – 1st construction – water supply	8,468,543	0
Reconstruction and extension of sewer B into Radvanice (Ostrava canalization)	36,862,460	0
Reparation of canalization in Heritesova street (Ostrava canalization)	985,916	0
Reparation of canalization in Mitušova street (Ostrava canalization)	2,340,000	0
Odra – remediation of mining impacts – Ostraca Zábřeh, Dubí construction work no. 5039	28,351,341	0
Elimination of environmental damage caused by undermining – liquidation of slit tanks – realization	7,996,194	0
Total 6	**751,080,771**	**523,678,410**
7. Eliminating ecological burdens caused by the exploration for and extraction of crude oil and natural gas		
Total 1 – 7	**2,850,402,912**	**2,167,260,496**

Reducing impacts caused by the termination of coal mining in the Kladno Region

In the middle of 2002, the Czech Republic Government decided to phase out underground mining of bituminous coal in the Kladno Region due to the economic ineffectiveness of mining. This hasty closure of mines in this region brought about, similarly as in the preceding coal districts, the need to deal with eliminating environmental damage caused by past mining operations in a special way.

In consideration of the situation which developed in the Kladno Region, the Czech Republic Government noted the need to reduce the impacts caused by the termination of coal mining in the Kladno Region, by issuing Resolution **No. 552** on 4 June 2003, dealing with the reduction of impacts caused by the termination of coal mining in the Kladno Region. It agreed with the idea of gradually releasing, according to the means of the National Property Fund of the Czech Republic, an amount of up to **CZK 1.177 billion** from FNM resources starting in 2004 in order to deal with ecological impacts caused by coal mining in the past and with land reclamation. Considering the shortage of funds in order to carry out the "Reclamation of the Tuchlovice Mine Waste Dump" contract, the Czech Republic Government modified the above-mentioned resolution with Resolution **No. 1467** on 20 December 2006, and **agreed** with the idea of gradually releasing, according to the means of the MF, funds in the amount of up to **CZK 1.427 billion** starting in 2004 from a special account managed by the MF pursuant to article 4 of Act No. 178/2005 Coll., on the termination of the National Property Fund, in order to deal with ecological burdens caused in the past and with land reclamation. From that time the sum was increased to **CZK 1.727 billion** pursuant Government Resolution **No. 688** dated 9 June 2008.

The Government of the Czech Republic, by its resolution of 19 April 2017 No. 296, agreed to implement measures to prevent the spread of pollution from the old ecological burdens due to the previous metallurgical activity in the premises of the former steelworks Poldi Kladno into the mine waters, with the approval and inspection processes being implemented within the framework of the programme for mitigating the effects of coal mining in the Kladno Region, which was approved by the Government by Government Resolution No. 552 of 4 June 2003. At the same time, the Government approved the increase of the allocated amount by CZK 250 million from the funds allocated to the revitalisation programme of the Moravian-Silesian Region.

The funds will be used to implement technical solutions to prevent the spread of the old ecological burdens pollution caused by the previous metallurgical activities at the Poldi Kladno premises in mine waters and the possible construction of a mine water treatment plant.

The following projects are considered essential:
- eliminating the dangerous conditions at the V Němcích Schöeller mine waste dump,
- reclamation of the Tuchlovice mine waste dump.

As of 31/12/2017, the funds actually spent on **7** finished projects amounted to **CZK 1.713 billion.**

Finished projects (in CZK)

Project title	Project costs
V Němcích Schoeller mine waste dump – eliminating dangerous conditions	234,429,193
Eliminating the dangerous conditions at the V Němcích Schoeller mine waste dump – stage 2, western section	106,862,466
Eliminating the dangerous conditions at the V Němcích Schoeller mine waste dump – additional construction work	46,608,677
Reclamation of Tuchlovice dump – Supplement no. 1 of the Project Erosion-control measures	20,274,715
Reclamation of the Tuchlovice mine waste dump	1,024,249,827
Reclamation of the Schoeller mine waste dump in Libušín	271,192,891
Reclamation of the Schoeller mine waste dump in Libušín – additional construction work	9,625,428
Total	**1,712,987,466**

GEOLOGY AND MINERALS

Geological evolution of the area of the Czech Republic

Arnošt Dudek

The Czech Republic is located in the very centre of Europe at the limit between the Hercynian Meso-Europe and the Neo-Europe (Fig. 1). There is hardly any country with such a variegated geological structure in such a small area and with such a complex geological evolution. Practically all known rocks and the majority of geological formations and known types of ores and industrial minerals occur on the state territory. Even though most ore deposits are interesting mainly from a scientific and mineral collectors' point of view, a number were of European importance during the Middle Ages and the beginning of modern time. The interesting and complex history of this area attracted attention of researchers already in early times and it strongly influenced the evolution of the mining and geological sciences. It was on this territory where one of the oldest mining laws, the Jihlava Mining Law (1260), and slightly later the mining law of the King Wenceslas II "Ius regale montanorum" (1300), which became basis of many mining laws in other states of the world especially in South America, came into being. The origin of the world-known works of Georgius Agricola, especially his book "Bermannus sive de re metallica dialogus" (1530), is also linked to the territory of the Bohemian Massif.

Three main structural complexes form the geological structure of Czech territory. The oldest one, consolidated already during the Precambrian orogenies, is **Brunia (Brunovistulicum)**, taking basically the area of Moravia. This segment of the Earth's crust probably represents an extremity of the East European platform, even though some researchers consider it as a part of the African plate. The influence of the younger – Paleozoic and Alpine – orogenies was only minor and it served as a foreland of the nappe structures which were thrust over it. The **Hercynian-consolidated Bohemian Massif**, overlapping to the area of the neighbouring Austria, Germany and Poland in the south, west and north, forms the major part of the state territory. Bohemian Massif belongs to the Paleo-Europe. The Hercynian orogeny in the end of the Carboniferous put the finishing touches on it, even though it also contains older building elements. It already behaved as a consolidated block after the Hercynian orogeny, only sometimes flooded by epi-continental sea and affected only by fault tectonics. As a crustal block rising from young sedimentary formations, it broke up only during the younger mountain-building processes, morphologically only in the end of the Neogene and in the Quaternary. Geological continuation of the Hercynides towards the west is indicated by other crustal blocks which were created later – Schwarzwald, Vosges Mountains, the French Massif Central and Iberian Meseta, in the northern branch then the Armorican Massif and massifs in southern England and Ireland. The eastern margin of the Bohemian Massif was thrust over the Cadomian unit of the Brunovistulicum during the Hercynian orogeny. The boundary between the hercynian Mesoeurope and alpine Neoeurope crosses the eastern part of the Czech Republic. The Alpides are represented there by the **West Carpathians**. They are

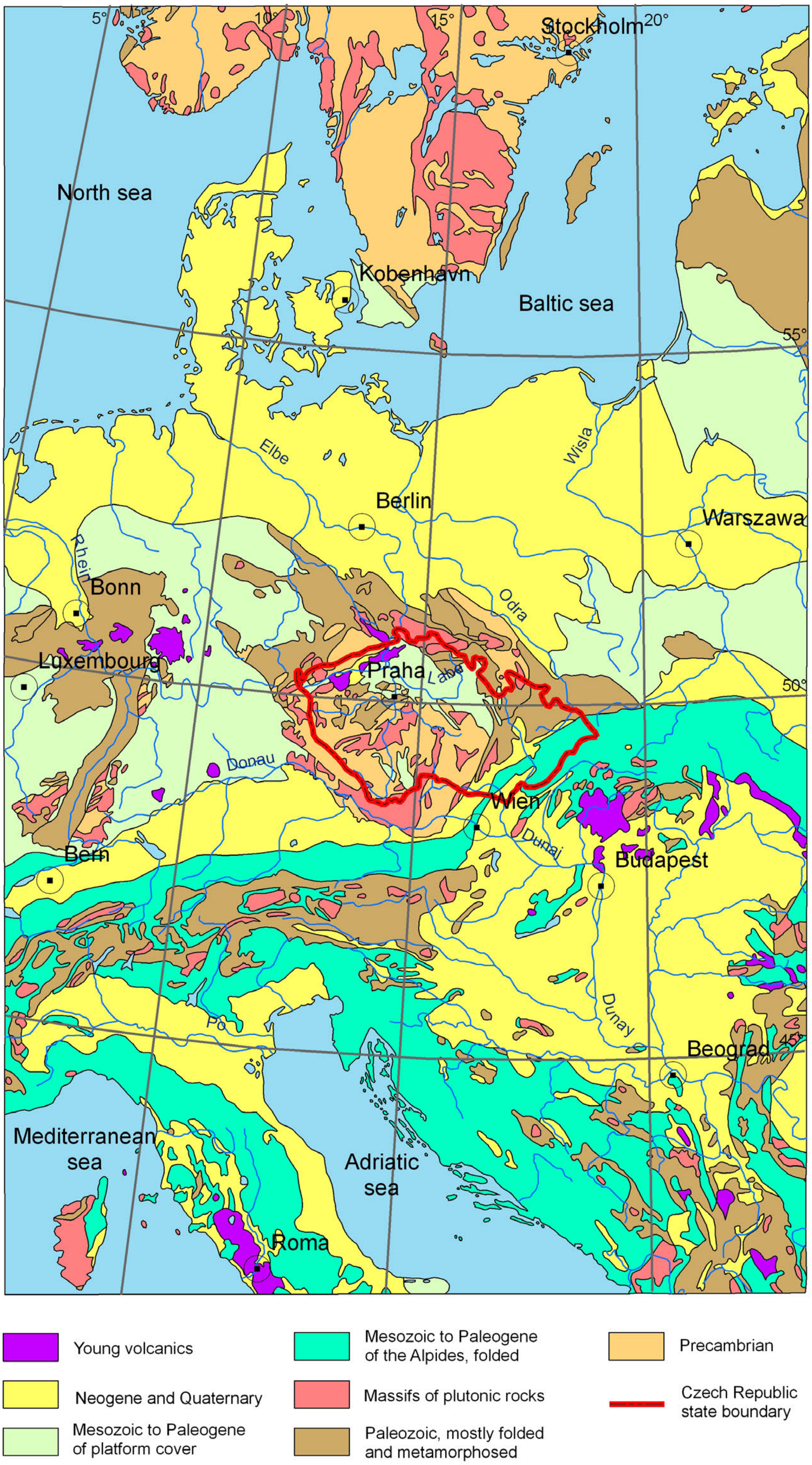


Fig. 1: Geological position of the Czech Republic in Europe

built by an inner unit – Central West Carpathians, Outer Flysh Carpathians and the Carpathian Foredeep. The ***Central West Carpathians*** are formed by pre-Mesozoic volcanosedimentary complexes, mostly metamorphosed and penetrated by late-Hercynian granitoid plutons, and their sedimentary cover (Trias to Lower Cretaceous). At the beginning of Upper Cretaceous the Central Carpathians were intensively folded and in places also metamorphosed. A tectonic zone of first order – the ***Klippen Belt,*** built mostly by Mesozoic sedimentary rocks separates the Central Carpathians from the external Flysh Carpathians. The ***Outer Flysh Carpathians*** are formed (besides rare uppermost Jurassic sediments and local Cretaceous volcanics) predominantly by sedimentary complexes of Cretaceous and Paleogene age. These complexes were as horizontal nappes thrust over the Brunovistulian basement and its sedimentary cover over a distance of tens of kilometres partly even over the Neogene Carpathian Foredeep.

As in the study of the history of mankind, there is little information on the oldest periods of the evolution of the Earth we live on, and our findings are accompanied by a large number of uncertainties. This of course applies also for the Czech territory, even though it belongs to the areas where systematic geological research was in progress since the beginning of the 19th century.

Complexes of the **Brunia (Brunovistulicum)** crop out on the surface only in the western Moravia, but they reach far to the east below the overthrust nappes of the Outer Flysh Carpathians. They are formed by metamorphic rocks – mainly monotonous biotite paragneisses – which were altered during the Proterozoic orogenies, and intruded by huge massifs of abyssal magmatic rocks of about 550 Ma age at the boundary between the Proterozoic and Paleozoic. The Brno and Dyje Massifs represent the exposures of these rocks. Granitoid plutons covering large areas as well as smaller basic massifs of gabbros and norites compacted this unit and prevented its later reworking by younger mountain-building processes, which formed the Bohemian Massif. Western parts of the Brunovistulicum are built by variegated volcano-sedimentary complexes (involving limestones, graphitic rocks, quartzites, amphibolites and orthogneisses). These parts were strongly affected by the Hercynian tectonometamorphic processes. They crop out from beneath of the overthrust Hercynian complexes of the Moldanubicum and Lugicum in tectonic windows of the Dyje and Svratka Domes of the **Moravicum** and Desná Dome of the **Silesicum**. Their appurtenance to the Brunia (Brunovistulicum) has not been commonly accepted yet and these units are by some authors ranked to the Lower Paleozoic and to the Hercynian Bohemian Massif. Platform sediments – the Cambrian conglomerates and sandstones in limited areas, marine Silurian shales sporadically and extensive and important sediments of the Devonian, Mississippian (Lower Carboniferous) and continental sediments of the coal-bearing Pennsylvanian (Upper Carboniferous) – are deposited on the Cadomian basement. The younger platform cover is represented by sediments of the Jurassic, Cretaceous, Paleogene and the Neogene of the Carpathian Foredeep. This consolidated basement was overthrust by nappes of the Outer Flysh Carpathians from the east (Fig. 2).

The lower level (basement) of the **Bohemian Massif** – the epi-Variscan platform – is built by metamorphic rocks intruded by numerous and very large granitoids massifs, and by only weakly metamorphosed or unmetamorphosed but Hercynian-folded Lower Paleozoic. Regionally it is divided (Fig. 3) into the core, formed by the highly metamorphosed **Moldanubicum** and mostly only weakly metamorphosed **Bohemicum (Teplá-Barrandian domain)**. This core is rimmed by the **Saxothuringicum** (Krušné hory Mts.) on the NW, **Lugicum** (Krkonoše Mts., Orlické hory Mts., Králický Sněžník) on the north and **Moravo-Silesicum** (Jeseníky Mts., eastern part of the Českomoravská vrchovina Highlands) on the east (see Fig. 3). These marginal complexes are metamorphosed mostly less intensively than the central Moldanubicum.

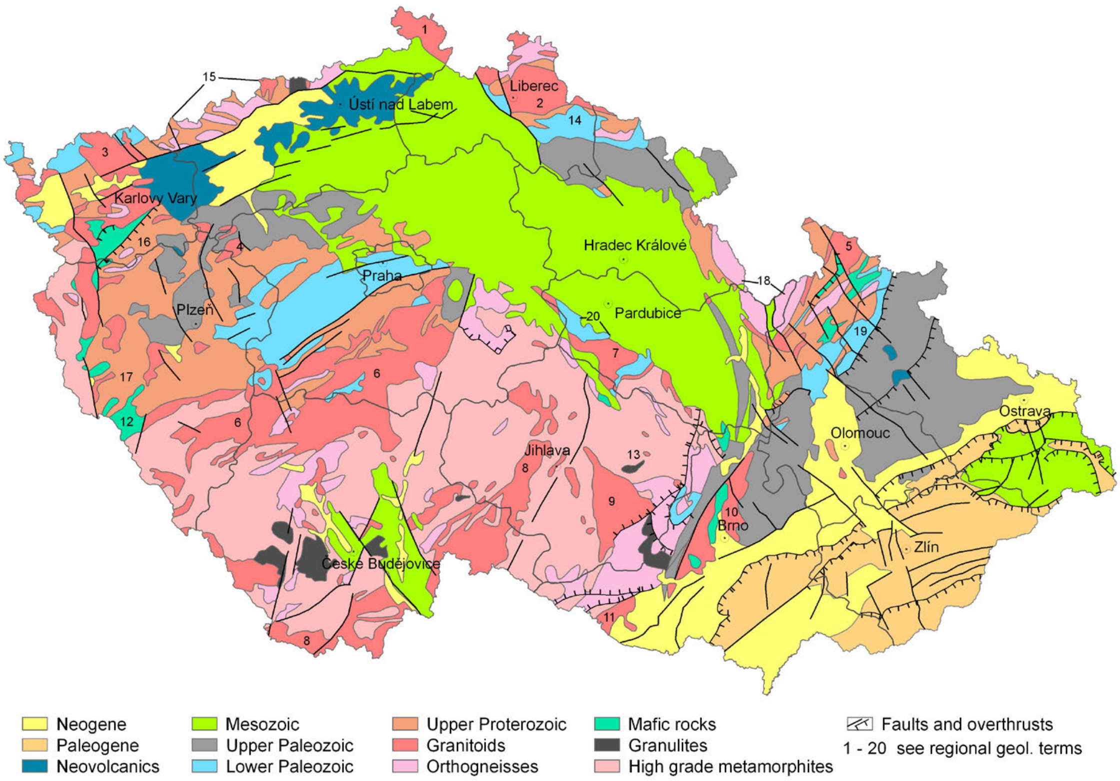


Fig. 2: Geology of the Czech Republic

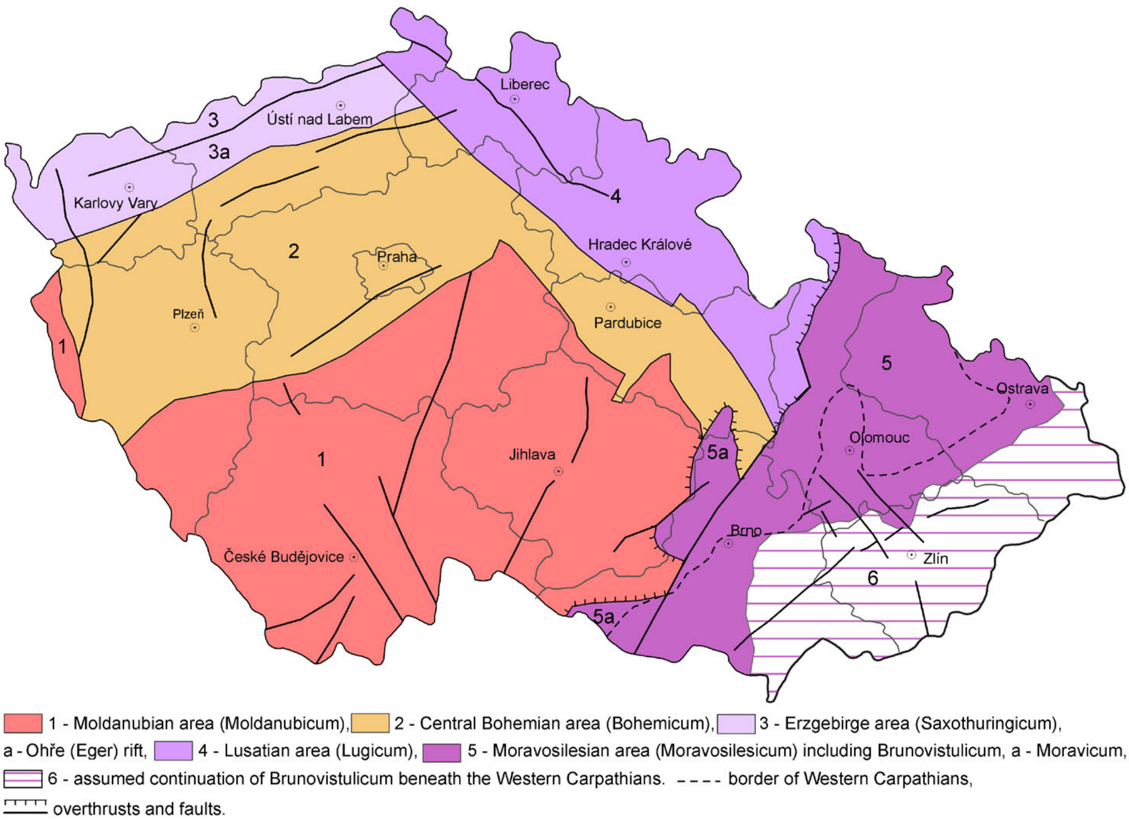


Fig. 3: Regional basement division of the Bohemian Massif on the territory of the Czech Republic

The ***Moldanubicum*** is formed by rocks metamorphosed mainly in the amphibolite facies – sillimanite and cordierite gneisses and migmatites with intercalations of orthogneisses, marbles, quartzites, graphitic rocks and amphibolites. Bodies of high-temperature and high-pressure metamorphic rocks – granulites and garnet peridotites with eclogites – are numerous, too. Their occurrences mark the course of old tectonic zones, along which these rocks were exhumed from depth. They are exposed mainly in southern Bohemia (Blanský les, Prachatice, Křišťanov and Lišov granulite massifs) and western Moravia (Bory and Náměšť granulite massifs). The age of the protolith of Moldanubian complexes is probably Upper Proterozoic; their metamorphism under the amphibolite, granulite and eclogite facies conditions is linked to the Hercynian orogeny. Pre-Paleozoic, Cadomian metamorphism of regional extent, mostly overprinted by the Hercynian processes, is nevertheless documented. Minor bodies of old orthogneisses exhumed along deep-reaching faults in the southern Bohemia, the radiometric age of which is even 2.1 Ga, represent a single exception. They document the existence of the Lower Proterozoic in the deeper crustal structure of the Bohemian Massif. Some Moldanubian rocks, especially gneisses, granulites and amphibolites, represent common resources of building stone.

The metamorphic rock complexes of the central Bohemian ***Bohemicum (Teplá-Barrandian domain)*** as well as the marginal complexes of the Saxothuringicum, Lugicum and Moravo-Silesicum developed by regional metamorphism of mainly Upper Proterozoic protoliths (1,000–545 Ma). During this period, the area of today's Bohemian Massif was covered by a deep sea, in which sandy and clayey rocks were deposited. Surrounding continents, probably rather distant in the mainland formed by very old rocks, represented the source area of the deposited material. Some clastic minerals from metamorphic rocks of the southern Bohemia (up to 2.7 Ga old, in the neighbouring Bavaria even 3.8 Ga) were at least in part derived from the Archaic of the African shield. They were of course deposited much later. The sedimentation was accompanied by submarine volcanism of tholeiitic basalts, which formed linear structures tens of kilometres long, maybe in some cases standing out above the sea level (*island arcs*) as well as much less extensive acid volcanism. The volcanic activity was accompanied by deposition of black shales with abundant pyrite and of siliceous sediments – lydites. Finely banded structures resembling organogenic stromatolites, which would belong to the oldest organic remnants on the Czech territory, were found rarely in the latter. A set of these sediments and volcanic rocks was intensively folded and mostly also metamorphosed in the end of the Proterozoic. Very weakly metamorphosed Proterozoic rocks are nowadays exposed only in central Bohemia between Prague and Plzeň (in the so-called *Barrandian*). The intensity of their alteration increases towards the marginal mountains. A continuous succession of thin metamorphic zones of Barrovian type up to gneisses with kyanite and sillimanite developed especially towards the W and SW. Proterozoic rocks are altered into gneisses and amphibolites also in the Krušné hory Mts., Krkonoše Mts., Orlické hory Mts. and Hrubý Jeseník Mts. These complexes were intruded by numerous massifs of granites (especially Stod, Čistá-Jesenice and Lužice massifs) and gabbros (Kdyně and Poběžovice massifs) in the end of the tectonometamorphic processes especially in the western and northern Bohemia. The Pre-Paleozoic ***Cadomian orogeny*** represents one of the most important magmatogennic and tectonometamorphic processes in the evolution of the Bohemian Massif.

The Earth's crust in Czech territory was not completely solid after the Cadomian orogeny and it gradually broke into a number of smaller blocks, which moved away from each other and were partly flooded by sea again during the ***Lower Paleozoic*** [Cambrian, Ordovician, Silurian, Devonian to Mississippian (Lower Carboniferous)]. Unaltered sediments were preserved especially in central Bohemia, in the area between Prague and Plzeň (Pilsen), named Barrandian, to a lesser extent also in other parts of the Bohemian Massif. In its marginal parts (excluding Brunovistulicum), Paleozoic complexes experienced strong metamorphism and therefore their identification and dating is commonly very difficult. In the Barrandian, sedimentation started already in the ***Lower Cambrian***, represented by a formation of conglomerates and sandstones up to several hundred to thousand meters thick. Sporadic occurrences of shales of fresh-water or brackish origin, in which the oldest fossils of arthropods in Bohemia were found, are known here. Sea penetrated to central Bohemia in the Middle Cambrian and deposited sandstones and especially shales, which are world-known for their occurrences of trilobite fauna. The evolution of the Cambrian was terminated by extensive rhyolites and andesite terrestrial volcanism.

The ***Ordovician*** started by the sea again transgressing in central Bohemia and by the formation of the so-called ***Prague Basin***, the evolution of which continued until the Middle Devonian. The Ordovician rocks are represented mainly by clastic sediments, mostly various types of shales with thick quartzite intercalations), the deposition of which was accompanied by intensive basaltic volcanism. Deposits of sedimentary iron ores (e.g. Nučice, Ejpovice etc.) which were of a high importance in the 19th and beginning of the 20th century originated in relation to the volcanic activity. The Bohemian Massif was located close to the southern polar circle in the Ordovician and sedimentation of rocks as well as volcanic activity proceeded in the sub-polar climate. This crustal segment moved rather rapidly to the north, into warmer waters of the tropic of Capricorn in the end of the Ordovician.

The change of the climate and by this also conditions of development of organisms and sedimentation during the ***Silurian*** resulted in formation of fine-grained black shales with abundant graptolite fauna, accompanied also by intensive volcanic activity and intrusions of numerous diabase sills. Mass development of organisms with carbonate shells occurred in its upper parts with regard to the increasing temperature and massive limestone formations were formed.

Continuous carbonate sedimentation in the Prague Basin lasted until the ***Devonian***, whereas in the surrounding parts of Europe as well as more distant areas the rock deposition was interrupted by the ***Caledonian orogeny***. Gradual unaffected evolution of both the sediments and organisms and their long-lasting detailed study by several generations of Czech paleontologists was a prerequisite for the determination of the first, globally valid ***stratotype*** between two systems (Silurian and Devonian) in Klonk u Suchomast SW of Prague. The limestone sedimentation in the Prague Basin terminated in the Middle Devonian and sandstones with terrestrial flora ended the Devonian sedimentation in this area.

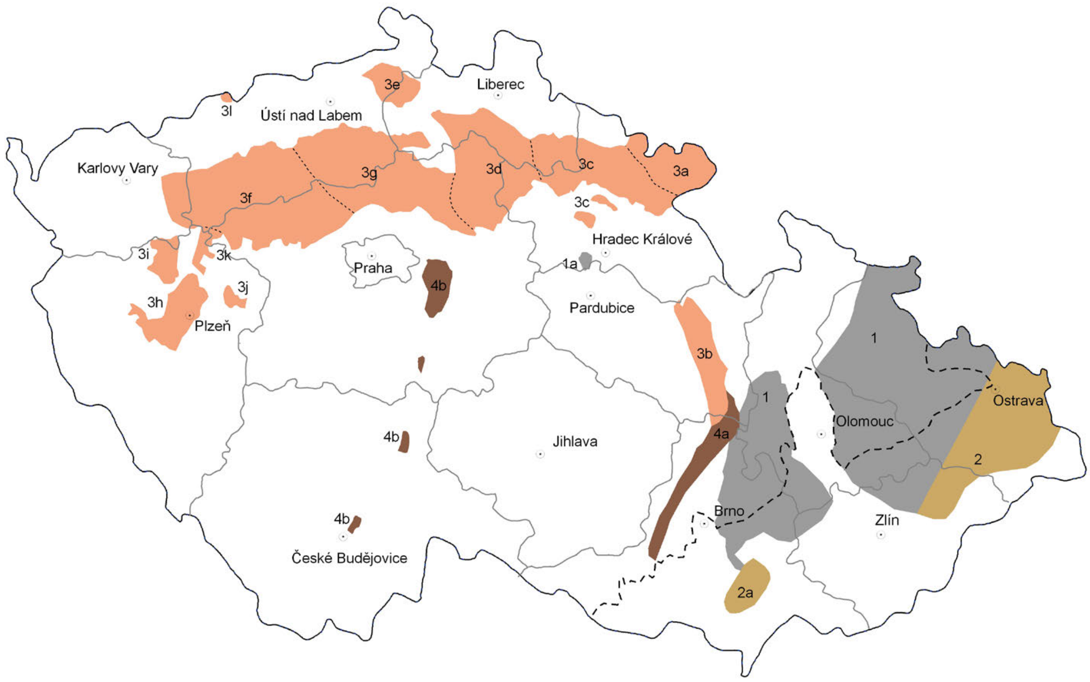
Sedimentation of the Devonian rocks continued in the Upper Devonian only in the area of the Krkonoše Mts. (on Ještěd Mt.) and especially in Moravia in the Jeseníky Mts. and in the Moravian Karst. Evolution of the Devonian in Moravia differed from that on the Bohemian territory. Transgressive complex of the siliciclastic and volcanic rocks with stratiform deposits of Fe, Cu, Au, Zn and Pb overlie the old Brunovistulian basement in its western, more mobile part. This clastic sedimentation continues also in the Mississippian (Lower Carboniferous). The Devonian rocks on the more stable Brunovistulian basement in the south and east begin by clastic rocks, which in places reach over 1,000 m in thickness. Limestones appear only in the Upper Devonian and their evolution continues until the Mississippian (Lower Carboniferous). There is therefore no manifestation that the sedimentation was interrupted by the Hercynian orogeny in Moravia. Sedimentation spaces just moved to the east to Ostrava region and to today's Carpathian basement. Limestones of the Upper Devonian form important deposits especially in central Moravia (e.g. Mokrá, Líšeň, Hranice etc.).

A change in the character of the sedimentation in the end of the Devonian is an expression of the ***Hercynian orogeny***, which affected (about 340–310 Ma ago) the majority of the Czech lands with a high intensity and expressed itself by the development of the nappe structure and a very strong metamorphism of large areas. Even the crystalline complexes formed during the Cadomian orogeny were metamorphosed again. Vast massifs of granitoid magmatic rocks of several thousand km^2 extent, not yet completely uncovered by denudation, formed practically simultaneously. Their intrusions were accompanied also by extensive surface volcanic activity and the development of very numerous deposits of variable genetic types (e.g. Krušné Hory Mts. massifs and Sn, W, Li, Ag, U, Co, Ni mineralization in the Saxothuringicum or Central Bohemian and Moldanubian Plutons in the Moldanubicum and Au, Sb, Ag, Pb, Zn, U mineralization). Granitoid massifs represent an important resource of building and dimension stone as well as feldspar raw materials. Weathered crusts of granitoids (e.g. Krušné hory Mts. massifs, Dyje Massif) are an important source of kaolin, too.

There are two different types of the ***Carboniferous*** and its rocks in the Bohemian Massif as a result of the Hercynian orogeny. The Mississippian (Lower Carboniferous) is represented in Bohemia only by restricted relics of marine sediments found by drillings under the Bohemian Cretaceous Basin E of Hradec Králové, and by weakly metamorphosed slates in the Ještěd Ridge SW of Liberec. The sedimentation of the continental type begins in the intra-mountain basins only in the Pennsylvanian (Upper Carboniferous, Westphalian) and continues in the Permian. Basins with partly individual evolution extend in the Plzeň (Pilsen) surroundings towards the North and Northeast as far as the Broumov area in the NE tip of the Bohemian part of the Czech Republic (Fig. 4), where their stratigraphic extent is the largest and the sedimentation finishes as late as the Lower Triasic. They are to a large extent overlain by sediments of the Bohemian Cretaceous Basin. River and lake deposits – conglomerates, arkoses and shales with layers of tuffs, tuffites and lavas – are in many places accompanied also by formation of coal seams, which were and still are of a high economic importance. Some seams show an elevated U content making them even potential deposits. The Carboniferous arkoses in the Plzeň (Pilsen) and Podbořany regions gave rise to important deposits of kaolin. Carboniferous mainly refractory clay and claystone are important, too. The Bohemian Massif reached the equator on its way to the north and coal formation reflects the dominating tropical climate.

In Moravosilesian area, which was just weakly influenced by the Hercynian orogeny thanks to the solid Brunovistulian basement, the Devonian sedimentation was continuous until the Mississippian (Lower Carboniferous), when the formation of limestones terminated. It was followed by flyshoid sedimentation of conglomerates, greywackes and shales in multiple alternation of individual layers (Culm development). The greywackes represent a resource of a high-quality building stone. The depositional environment gradually changed from marine to fresh-water during the latest Mississippian and the Pennsylvanian (Upper Carboniferous) and important deposits of bituminous coal (paralic basins of the Ostrava, and limnic basins of the Karviná region) formed in the coastal marshes. The Czech part of the Upper Silesian Basin represents the most important bituminous coal mining district in the Czech Republic. The Carboniferous system in the Czech Republic was, and remains, not only an important energy base of the state but also a world-known classical area of Carboniferous flora and fauna.

The Hercynian mountains were rapidly lowered by erosion and denudation in the ***Permian***, and thick formations of red-brown conglomerates, sandstones, arkoses and shales formed.



1 - Marine Mississippian (Lower Carboniferous - Culm); a - occurrence near Hradec Králové, 2 - Pennsylvanian (Upper Carboniferous) of the Upper Silesian Basin; a - occurrence in South Moravia, 3 - Limnic Permo - Carboniferous; partial basins: a - Intrasudetic B.; b - Orlice B.; c - Krkonoše Piedmont B.; d - Mnichovo Hradiště B..; e - Česká Kamenice B.; f - Kladno-Rakovník B.; g - Mšeno-Roudnice B. (Mělník B.); h - Plzeň B.; i - Manětín B.; j - Radnice B.; k - Žihle B; l - Brandov occurrence 4 - Permo - Carboniferous of the grabens: a - Boskovice G., b - Blanice G.
--- border of the Western Carpathians, ······· boundary of basins.

Fig. 4: Carboniferous and Permian in the Bohemian Massif and in the basement of the Western Carpathians on the territory of the Czech Republic

Sedimentation was accompanied also by basaltoid, andesitoid up to rhyolitic volcanism of the intra-plate type and sedimentation of clastic rocks with elevated Cu content. A substantial change of climate, caused by the shift of the lithospheric plate with the Bohemian Massif further north, into the belt between the equator and tropic of Cancer, resulted in the formation of deserts, which covered most of Europe. These sediments are today preserved in the Bohemian Massif only in relics. They reach the highest thickness – up to 3 km – in tectonic troughs of roughly N-S direction, so-called grabens (Boskovice and Blanice grabens). Coal seams (today already mined out) of Upper Stephanian age occur locally on the basis of the Permian in these grabens, and higher horizons contain restricted lake and river calcareous sediments. These are commonly overfilled by relics of Stegocephalians and especially of the Permian insects, which made the Boskovice Graben famous.

The Bohemian Massif was slowly uplifted as a compact block after the Hercynian consolidation and it remained mainly land almost until the end of Mesozoic. White lake sandstones of the ***Triassic*** are represented only to minor extent in NE Bohemia in the Krkonoše Mts. Piedmont and Intra-Sudetic Basins. Sea penetrated from the Carpathian area to northern Germany by a narrow channel across northern Bohemia (roughly between Brno and Dresden) in the ***uppermost Jurassic***. This channel linked the deep Tethys on the SE with the shallow shelf sea to the north from the Bohemian Massif. Limestones (Oxfordian–Kimmeridgian) are exposed only in small islands along the Lužice Fault. In the consolidated Bohemian Massif was the ***Alpine orogeny*** represented mainly by origin of faults or rejuvenation of older fault

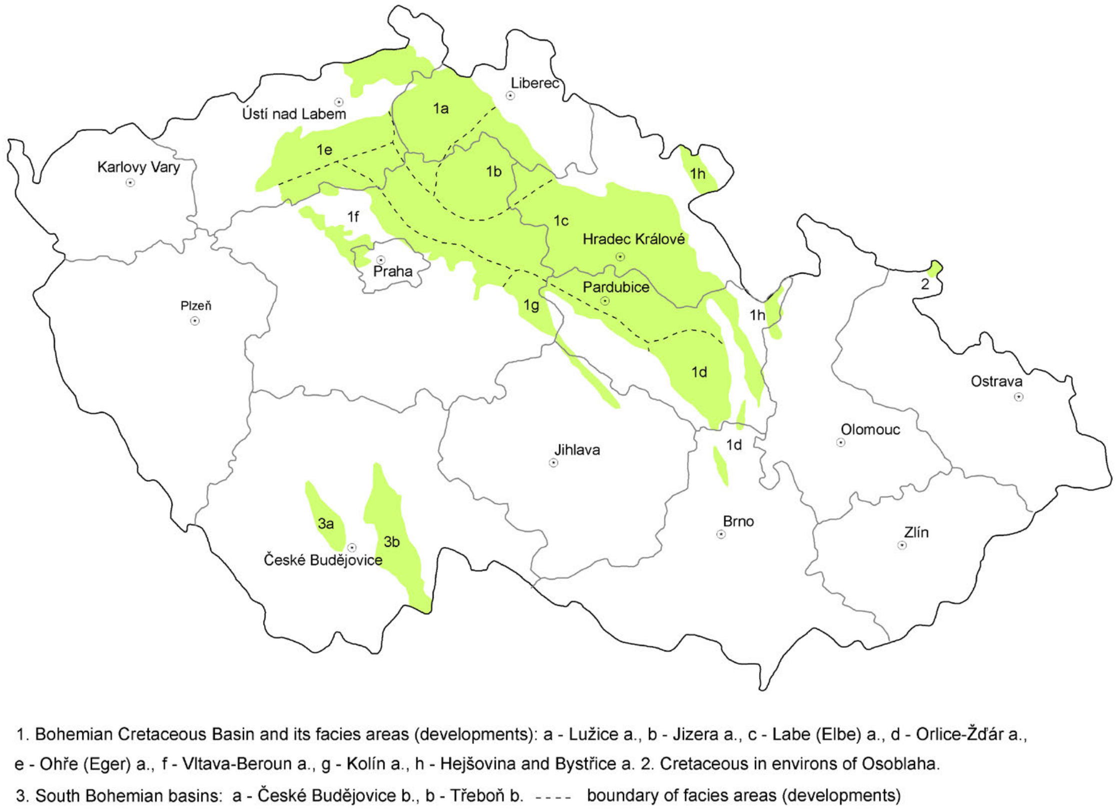


Fig. 5: Upper Cretaceous in the Bohemian Massif on the territory of the Czech Republic

systems. ***Transgression of the Upper Cretaceous sea***, which flooded all the northern and partly also the central part of the Bohemian Massif, was of much higher importance. Several hundreds meters thick strata of the Upper Cretaceous claystones, marlites, sandy marlites and sandstones (the Bohemian Cretaceous Basin – Fig. 5) developed there. The Bohemian Cretaceous Basin is divided into facies areas (developments) shown in Fig. 5 based on character of sedimentation in particular parts of the Basin. Rock complexes of the Basin represent the most important underground water reservoir in the Czech Republic and also an important raw material resource (ceramic and refractory clay, glass, foundry and mortar sand, cement raw materials, building and sculpture stone but also uranium). A small occurrence of Upper Cretaceous sediments near Osoblaha is an extremity of the Polish Opole Cretaceous Basin. Smaller, but fresh-water Upper Cretaceous basins formed also in southern Bohemia. It is the České Budějovice Basin localized more westward and the Třeboň Basin localized more eastward.

The evolution in Moravia was different. The Triassic is not represented at all, whereas in the ***Jurassic*** the sea penetrated from the Mediterranean area far to the NW and flooded the eastern margin of the Bohemian Massif. Jurassic sediments are nowadays to a large extent covered by rocks of the Neogene or the Outer Flysh Carpathian nappes. Tectonic blocks of the Jurassic limestones, exhumed from depth in front of the Carpathian nappes and forming isolated klippen by Štramberk and in the Pavlovské vrchy Hills, represent an important land-forming element and also an important resource of very pure carbonate raw material.

The character of the sedimentation in the Outer Carpathians markedly changed in the ***Cretaceous***. Sediments formed in deeper sea from submarine slides and turbidite currents,

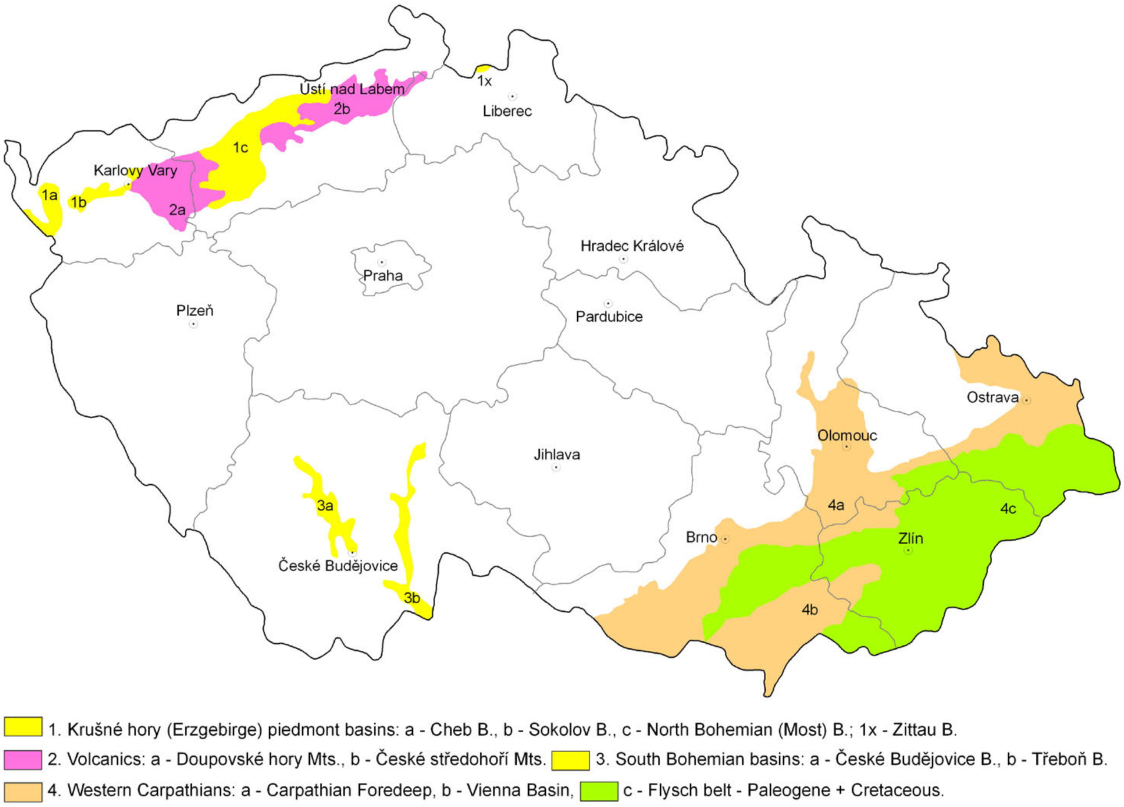


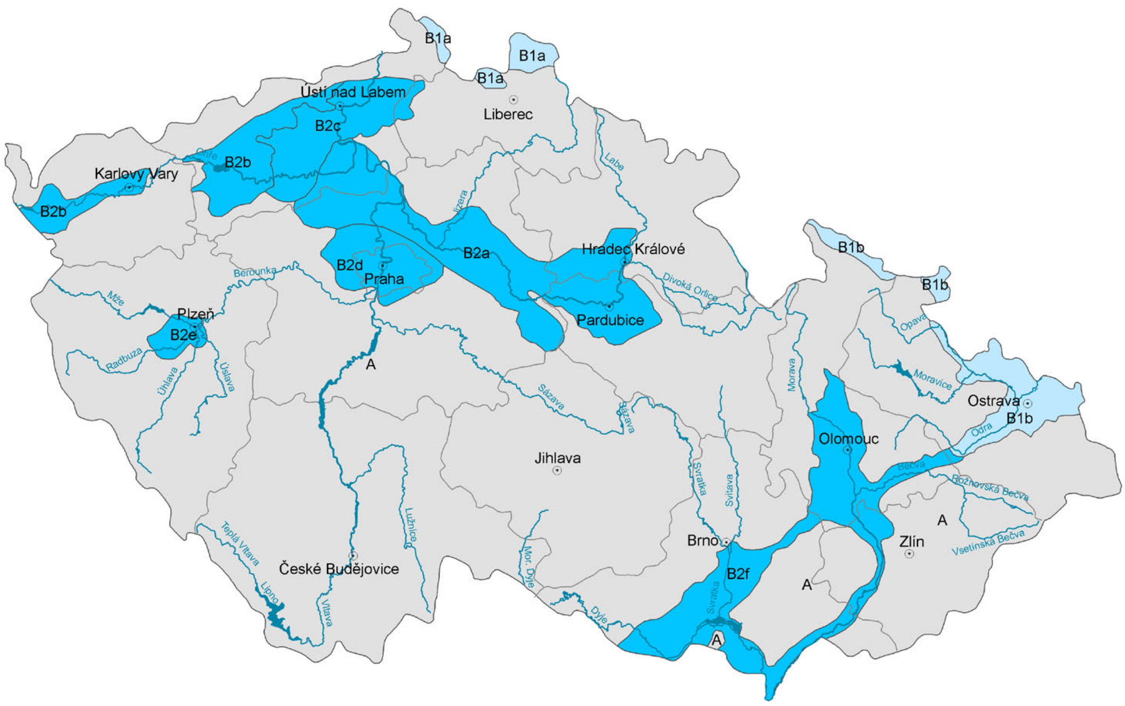
Fig. 6: Tertiary in the Bohemian Massif and Western Carpathians on the territory of the Czech Republic

transporting clastic material far from the land. They are characterized by multiple alternations of sandy and clayey layers of a low thickness (dm to m) and infrequently also sandstone benches, which are collectively called **flysh**. The sediments reach even many thousand meters in thickness. The flysh sedimentation continued in this area also in the Paleogene (Fig. 6).

The Bohemian Massif remained land which was only occasionally flooded in the east by shallow epicontinental sea from the Carpathian area. Nevertheless, several depressions with intensive freshwater sedimentation were formed as a result of strong tectonic movements in the Alpine and Carpathian space in the end of the ***Paleogene and in the Neogene***. This is the area of the South Bohemian basins (the České Budějovice Basin and the Třeboň Basin) with lignite, clay and diatomite deposits and also a marked tectonic trough of the SSW-NNE direction (Ohře Rift) in north-western Bohemia, where the Krušné Hory Piedmont basins (Cheb, Sokolov, North Bohemian and Zittau) formed – see Fig. 6. Sandstones and especially clays and claystones with thick (exceptionally and locally up to 60 m) brown coal seams sedimented in these basins. Brown coal deposits in the North Bohemian and Sokolov basins represent the most important brown coal deposits in the Czech Republic. Important deposits of Neogene clays then occur in the Cheb Basin. Formation of basins was accompanied by very intensive **volcanic activity** and a large accumulation of lavas and pyroclastics (the Doupovské hory Mts. Volcanic Complex, České středohoří). The rocks are mainly various types of olivine basalts and alkaline basaltic rocks, to lesser extent also more acid phonolites. Volcanic conduits and necks give today's landscape a beautiful character. The main volcanic activity took place 35–17 Ma ago, a younger phase 8 Ma ago and the last minor volcanoes are just several thousand years old (Komorní and Železná hůrka). The area represents a classical example of alkaline volcanism and it played an important role in the evolution of geosciences. The rocks are important not only as a building stone but also as a raw material for manufacture of molten basalt products. Deposits of the Bohemian garnets at the southern margin of České středohoří are related to the volcanic activity, too (pyropes were carried up by volcanic necks from the ultrabasic rocks in the crystalline basement). Weathering and decomposition of tuffs of the Doupovské hory and České středohoří Mts. resulted in the formation of important bentonite deposits.

The flysh complexes of the Carpathian area were folded and thrust in the form of nappes (verified by exploration) over a distance of several tens of kilometres towards the west and southwest over the Bohemian Massif in the end of the ***Paleogene***. The Carpathian Foredeep, partly still covered by the arriving nappes, formed in front of the thrust nappes in the ***Neogene*** (Miocene). The sediments of the Vienna Basin (of up to 5 km in thickness) were subsequently hardly folded. These are represented mainly by marine clay, marl and sand, just partially diagenetically consolidated, which contain smaller deposits of oil and gas. The depositional setting of the younger formations became progressively fresh-water. The youngest ones contain deposits of lignite.

Important tectonic processes expressing themselves by marked vertical movements of individual crustal segments operated in the Bohemian Massif in the end of the Tertiary and beginning of the Quaternary. In this way, the marginal mountains – Šumava Mts., Český les Mts., Krušné hory Mts., Krkonoše Mts., Orlické hory Mts. as well as Hrubý Jeseník Mts. – were uplifted by up to 1,000 m and the Bohemian basin was formed. This is sometimes considered as being formed by the impact of a large meteorite, but this is a nonsense resulting from the



A - Quaternary of the denudation areas, B1 - Quaternary areas of the continental glaciation: a - North Bohemian Area, b - North Moravian Area, B2 - Quaternary of the extra glacial areas: a - Labe (Elbe) a., b - Krušné hory (Erzgebirge) piedmont basins, c - České středohoří Mts., d - Praha Plain, e - Plzeň Basin, f - Moravian dales.

Fig. 7: Quaternary division on the territory of the Czech Republic

interpretation of satellite images without knowledge of the real structure of the massif. The Bohemian Massif was influenced by several phases of continental and mountain **glaciations** during the ***Quaternary***. A periglacial climate dominated here, which resulted in the formation of massive stony debris and block-seas, terrace system of the rivers (Fig. 7) as well as really extensive loesses. Terrace sediments of rivers especially form important deposits of sand and gravel and feldspar raw materials, and loesses of brick clays. The continental ice sheet reached as far as the northern margin of the massif and left sediments of frontal moraines in the Ostrava region, on the northern piedmont of the Hrubý Jeseník Mts. and in the Šluknov and Frýdlant extremities. Mountain glaciers modified morphology of the marginal mountains, especially the Krkonoše Mts., to a lesser extent also the Jeseníky Mts. and Šumava Mts., where even minor glacier lakes formed.

Figures in this chapter were adapted by the author from:

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Regional geological units and minerals associated with them

(that minerals are indicated whose deposits belong to the units; digits of figures and units are related to the previous chapter “Geological evolution of the area of the Czech Republic”)

Arnošt Dudek

Bíteš orthogneiss – mostly muscovite orthogneiss of the Cadomian age, characteristic of the Moravicum of the Dyje and Svratka domes between Krems in Austria and Svojanov in the Czech Republic (opal, kaolin, crushed stone) – Fig. 3 – unit 5a

Blanice Graben **–** fault system of the NNE-SSW direction in central and southern Bohemia, marked also by downthrown islands of the uppermost Carboniferous and Permian with hard coal and anthracite seams. It continues as Rodel line in Austria (Au-Ag-ores) – Fig. 4 – unit 4b

Bohemian Cretaceous Basin **–** sediments of the Upper Cretaceous (Cenomanian to Santonian), overlying mainly crystalline complexes and Upper Paleozoic rocks in the northern part of the Bohemian Massif. Based on the lithological character, it has been regionally classified into facial developments as follows:

- *Lužice* (U-Zr-ores, glass and foundry sand) – Fig. 5 – unit 1a
- *Jizera* (glass and foundry sand, dimension stone) – Fig. 5 – unit 1b
- *Orlice-Žďár* (foundry sand) and its *east Bohemian* (clays) and *Moravian parts* (clay) Fig. 5 – unit 1d
- *Ohře (Eger)* – the Most, Teplice (quartzite, corrective additives for cement production) and Louny part (clay) Fig. 5 – unit 1e
- *Vltava-Beroun* including Prague surroundings (clay, dimension stone) Fig. 5 – unit 1f

Boskovice Graben – tectonic trench of the NNE-SSW direction in western Moravia filled with sediments of the uppermost Carboniferous and Permian (hard coal) Fig. 4 – unit 4a

Bory granulite massif – a small granulite body in the Moldanubicum N of Velké Meziříčí in western Moravia (feldspar, crushed stone) – Fig. 4 – unit 4a

Brno Massif **–** a large massif in western Moravia built by a variable series of both acid and basic plutonic rocks of the Cadomian age (feldspar, crushed stone) – Fig. 2 – unit 10

Carpathian Flysh **–** a part of the Outer Carpathians in eastern Moravia built by clayey and sandy Cretaceous and Paleogene sediments, with a marked nappe structure of the pre-Miocene age. It composes the Chřiby Mts. and the Ždánice Forest and mountain ranges on the border with Slovakia – the Beskydy, Javorníky and Bílé Karpaty Mts. (natural gas) – Fig. 6 – unit 4c

Carpathian Foredeep – the external part of the Carpathian mountain chain in eastern Moravia, which was formed in front of the Outer Carpathian nappes and overlies the south-eastern slope of the Bohemian Massif. It is filled with the Miocene sediments of the Egerian to Badenian (oil, natural gas, clay, bentonite, gypsum in the Opava Basin) – Fig. 6 – unit 4a

Central Bohemian Pluton – an extensive Hercynian granitoids pluton on the border between Bohemicum and Moldanubicum, more basic than the massifs of the Krušné hory Mts. and in Českomoravská vrchovina Highlands (granodiorites, tonalite, diorite). Important deposits in the exocontact (U, Au, Ag-Pb-Zn-ores, feldspar, quartz, dimension and building stone) – Fig. 2 – unit 6

Cheb Basin – the westernmost of the Tertiary basins, at the crossing of the Ohře rift and the Tachov Graben. Sedimentation continued from Eocene until Pliocene (brown coal, kaolin, clay, diatomite, glass and foundry sand – numerous conflicts of interest) – Fig. 6 – unit 1a

České Budějovice Basin – a smaller, western basin of South Bohemian basins, filled with fresh-water sediments of the Upper Cretaceous and to a minor extent Neogene and Quaternary. Episodic ingressions of the sea from the Alpine foredeep (lignite, tectites, diatomite, sand and gravel) – Fig. 6 – unit 3a

České středohoří Mts. – a classical area of the Tertiary alkaline volcanic rocks (olivine basalts to phonolites) exposed in the Ohře (Eger) rift between Chomutov and Nový Bor, with the main volcanic centre in Roztoky nad Labem (pyrope, diatomite, feldspar substitutes, crushed stone) – Fig. 6 – unit 2b

Čistá-Jesenice Massif – a minor granitoid massif in western Bohemia composed of both Cadomian and Hercynian bodies. It is covered from a large part by Carboniferous and Permian sediments (feldspar, dimension and building stone) – Fig. 2 – unit 4

Domažlice Crystalline Complex – south-western part of the upper Proterozoic of the Bohemicum in the Šumava piedmont, metamorphosed during both Cadomian and Hercynian orogeny, with minor massifs of granitoids and gabbroic rocks and abundant pegmatites (feldspar) – Fig. 2 – unit 17

Doupovské Hory Mts. – a volcanic complex of the Tertiary age at the crossing of the Ohře rift with the Jáchymov fault, between Karlovy Vary and Kadaň. Alkaline volcanic rocks are represented mainly by olivine basalt, "leucitic" tephrite and abundant tuffs. Phonolites are missing (bentonite, crushed stone) – Fig. 6 – unit 2a

Dyje Massif – a massif of the Cadomian granitoids in the Dyje Dome of the Moravicum in SW Moravia, extending from the northern vicinity of Znojmo almost to Danube. It was affected by a strong tropical weathering in the Jurassic and Neogene and from a large part covered by sediments of the Carpathian foredeep (kaolin, feldspar, building stone) – Fig. 2 – unit 11

Hroznětín Basin – the northern extremity of the Sokolov Basin N of Karlovy Vary (bentonite) – Fig. 6 – unit 1b

Intra-Sudetic Basin – southern extremity of the Lower Silesian Basin in the NE tip of Bohemia, with sedimentary fill from the Mississippian (Lower Carboniferous) to Upper Cretaceous about 3,000 meters in thicknes, and Pennsylvanian and Permian volcanites. (hard coal) – Fig. 4 – unit 3a

Islet zone of the Central Bohemian Pluton – a number of both large and minor blocks of the contact metamorphosed Proterozoic and Lower Paleozoic rocks from the mantle of the pluton, downthrown into granitoids (Au, building stone, barite, limestone) – Fig. 2 – unit 6

Jílové Belt – a belt of the Upper Proterozoic volcanic (basalt, andesite, boninite and rhyolites), subvolcanic and acid plutonic rocks extending over 120 km in NNE-SSW direction south of Prague, from a major part enclosed in granitoids of the Central Bohemian Pluton (Au-ores, building stone) – Fig. 2 – unit 6

Kdyně Massif – a complex of metabasic, gabbroic and dioritic rocks in the Domažlice Crystalline Complex on the border of Šumava and Bohemian Forest (dimension and building stone) – Fig. 2 – unit 12

Kladno-Rakovník Basin – one of the basins of the Central Bohemian limnic Carboniferous, partly covered by Cretaceous sediments (hard coal, kaolin, claystone) – Fig. 2 – unit 12

Krkonoše-Jizera Crystalline Complex – western part of the Lužice area built by metamorphic rocks of the Proterozoic and Lower Paleozoic age (limestone, dolomite) and intruded by plutons of the Cadomian (Lužice) and Hercynian (Krkonoše-Jizera) age (feldspar, dimension and building stone). Fe-bearing skarns, Sn and W-ores, fluorite and barite occur in the exocontact of the plutons – Fig. 2 – unit 14

Krkonoše-Jizera Massif – Hercynian granitoid massif building the border range with Poland (excellent dimension stone, feldspar) – Fig. 2 – unit 2

Krkonoše Mts. piedmont basin – one of the Sudetic (Lugian) Upper Paleozoic basins partially covered with Cretaceous sediments. Formations encompass Westphalian C, Stephanian, whole Permian and extend up to the lowermost Triasic (Cu-ores, Au paleoplacers, bituminous coal, pyrope) – Fig. 4 – unit 3c

Krušné hory Mts. Piedmont basins – a group of limnic Tertiary basins associated with the Ohře Rift SE of the Krušné hory Mts. From WSW to ESE, these are: Cheb, Sokolov and North Bohemian basins. – Fig. 6 – unit 1

Krušné hory Mts. Pluton – a large Hercynian granitoid pluton underlying metamorphic rocks of the Krušné Hory and Smrčiny Mts., exposed by erosion only in numerous partial massifs (Sn-W-ores, Li-Rb-Cs ores, kaolin, feldspar, quartz, building stone) – Fig. 2 – unit 3

Krušné hory Mts. Crystalline Complex – a part of the Saxothuringicum built by metamorphic complexes mostly of the Proterozoic, subordinately also of the Lower Paleozoic age (U, Ag, Bi, Co, As-ores, Cu-ores, Sn-skarns, fluorite, barite, kaolin) and intruded by Hercynian granitoids. – Fig. 3 – unit 3 (Fig. 2 – unit 15)

Lužice Massif – an extensive Cadomian granitoids massif predominantly on the German territory, extending into the Jizera Mts. (quartz, dimension and building stone) – Fig. 2 – unit 1

Moldanubian Pluton – the largest Hercynian granitoids complex in the Bohemian Massif in Českomoravská vrchovina Highlands, Šumava and Waldviertel (dimension and building stone; Au-W and U-ores and Ag-Pb-Zn-ores in the exocontact) – Fig. 2 – unit 8

Moldanubicum – basement of the southern part of the Bohemian Massif built by high-grade metamorphic complexes of Proterozoic and probably also Lower Paleozoic age. The cadomian tectonometamorphic processes were followed by hercynian high temperature and low pressure metamorphism and the whole complex was penetrated by numerous late-Hercynian granitoid plutons. – Fig. 3 – unit 1

Moravian-Silesian Devonian – weakly metamorphosed volcano-sedimentary unites in the Jeseníky Mts. – *Vrbno Strata, Šternberk-Benešov Belt* (Fe-ores, Cu-ores, Pb-Zn-ores, barite, quartzite, dolomite) – Fig. 2 – unit 19

Moravian-Silesian Carboniferous – marine flyshoid Mississippian (Lower Carboniferous) of the Nízký Jeseník Mts. and Drahany Highlands (slate, quartz) and productive paralic Mississippian to limnic Pennsylvanian (Upper Carboniferous) of the Ostrava region (Upper Silesian Basin – hard coal, natural gas) – Fig. 4 – unit 1, 2

Mšeno-Roudnice Basin – one of the Central Bohemian Carboniferous to Permian basins, completely overlain by the Bohemian Cretaceous Basin (hard coal) – Fig. 4 – unit 3g

Nasavrky Massif – a minor however very complex Hercynian granitoid body exposed in the Železné hory Mts. (pyrite, dimension and building stone; fluorite and barite in the exocontact) – Fig. 2 – unit 7

North Bohemian Basin – the largest Tertiary basin of the Ohře Rift between the Doupov Mts. and České středohoří Mts. (brown coal, clay, bentonite, diatomite, quartzite) – Fig. 6 – unit 1c

Ohře rift **–** a prominent fault structure in the south-eastern piedmont of the Krušné hory Mts. delimited by the Krušné hory and Litoměřice faults and their directional continuations. Tertiary alkaline volcanites, coal-bearing basins and mineral as well as thermal waters are associated with the rift – Fig. 3 – unit 3a

Orlické hory Mts.-Kłodzko Crystalline Complex **–** metamorphic complexes of probably Proterozoic age in the eastern part of the Lužice area in the Orlické hory and Rychleby Mts. and in Kłodzko – Fig. 2 – unit 18

Outer klippen zone of the Western Carpathians **–** extensive fragments of Jurassic and Cretaceous sediments brought up from depth in front of the flysh nappes – Štramberk, Pavlovské vrchy (limestone) – Fig. 2 and 6 – unit 4c

Plzeň Basin **–** an independent basin at the SW margin of the West Bohemian Carboniferous (hard coal, kaolin, clay) **–** Fig. 4 **–** unit 3a

Quaternary alluvia – alluvia and terraces of majority of larger water courses (feldspar, sand and gravel, in south Bohemia and SW Moravia also tectites) **–** Fig. 7 **–** units B2a, B2b, B2f

Quaternary placers – in piedmont of the Šumava and Jeseníky Mts. (Au), Krušné Hory Mts. (Sn), southern piedmont of the České středohoří Mts. (pyrope)

Sokolov Basin – the smallest Tertiary basin of the Ohře Rift WSW of the Doupovské hory Mts. with important deposits of energy minerals (brown coal, U, clay, bentonite) – Fig. 6 – unit 1b

South Bohemian Basins – freshwater sedimentation space of the Upper Cretaceous and Tertiary age, where the Rudolfov horst separates the smaller České Budějovice Basin in the west from the larger Třeboň Basin in the east – Fig. 6 – unit 3

Svratka Dome of the Moravicum – the northern of the domes built by metamorphic rocks of the Moravicum W of Brno (graphite, feldspar, limestone, building stone) – Fig. 3 – unit 5a

Syrovice-Ivaň terrace **–** a higher located Quaternary terrace between the Jihlava and Svratka rivers S of Brno (feldspar) – Fig. 7 – unit B2f

Teplá Crystalline Complex – the NW part of the Proterozoic of the Central Bohemian area (Bohemicum) with a rapid succession of metamorphic zones from SE to NW into the Slavkov Forest (feldspar) – Fig. 2 – unit 16

Tertiary relics of the Plzeň region **–** relics of the formerly more extensive Tertiary sediments on the site of a river paleostream discharging into the North Bohemian Basin (clay, bentonite) – not shown on scale of the maps

Třebíč Massif **–** an extensive massif of the Hercynian melanocratic granitoids and syenitoids (durbachites) in the Českomoravská vrchovina Highlands (amethyst, morion, feldspar, dimension stone) – Fig. 2 – unit 9

Třeboň Basin – a larger, eastern basin of South Bohemian basins with continental Cretaceous and Tertiary sediments (kaolin, clay, bentonite, diatomite) **–** Fig. 6 **–** unit 3b

Upper Silesian Basin – a Carboniferous basin formed by sediments of Upper Mississippian and Pennsylvanian situated predominantly in Poland and extending to the Czech Republic only by its SW part. It is formed by volcanoclastic sediments with numerous hard coal seams. On the Czech territory, it is further subdivided into i) western, more mobile paralic Ostrava part, ii) eastern, platform limnic Karviná part and iii) southern Beskydy part (hard coal, natural gas) – Fig. 4 – unit 2

Variegated Group of the Moldanubicum **–** metamorphic complexes of paragneisses and migmatites with numerous intercalations of amphibolites, marbles, quartzites, graphitic rocks and skarns (Fe-skarns, graphite, feldspar, limestone, dolomite, fluorite, building stone) – part of the Modanubian unit 1, in Fig. 3

Vienna Basin – an extensive Tertiary Neogene basin with marine sedimentary fill gradually becoming freshwater of more than 5,000 m in thickness (lignite, oil, natural gas) – Fig. 6 – unit 4b

Železné hory Mts. area – part of Bohemicum built by weakly metamorphosed volcano-sedimentary series of the Upper Proterozoic and sediments of the Lower Paleozoic (Mn-Fe-carbonates, pyrite, fluorite, barite, limestone) and the Hercynian granitoid Nasavrky Massif – Fig. 2 – unit 20

Zittau Basin – a Tertiary basin in the continuation of the Ohře Rift, extending only by a negligible south-eastern extremity into the Czech territory (brown coal, lignite, clay) – Fig. 6 – unit 1d

Žulová Massif – a minor Hercynian granitoid massif in the northern tip of the Moravian-Silesian area (kaolin, quartz, dimension and building stone) – Fig. 2 – unit 5

Geodynamics of the origin of the Bohemian Massif covering the territory of the Czech Republic

Karel Schulmann, Vojtěch Janoušek, Ondrej Lexa

The Bohemian Massif represents one of the largest exposure of the European Variscan belt located at its eastern extremity (Figure 1). The Variscan architecture of the Bohemian Massif can be defined by four major tectonic units: 1) The Saxothuringian Neoproterozoic continental basement with its Palaeozoic cover, 2) The Teplá-Barrandian (Bohemicum) Neoproterozoic basement and its Early Palaeozoic cover of the Prague Basin (the Bohemia Terrane of South Armorica), 3) The Moldanubian high- to medium-grade metamorphic unit intruded by numerous Carboniferous granitic plutons, altogether forming the high-grade core of the orogen, 4) The easterly Brunia Neo-Proterozoic basement with Early to Late Palaeozoic cover.

The Gondwana faunas of Lower Palaeozoic (Cambrian and Ordovician) sediments of the Saxothuringian and Teplá-Barrandian domains and numerous isotopic and U-Pb zircon data imply affinity to northern Gondwana margin. Schulmann et al. (2009) suggested that the Variscan structure of the Bohemian Massif resulted from Andean type convergence and formed as a typical upper plate orogen located above a long lasting Devonian-Carboniferous subduction system. These authors shown that all the current criteria defining an Andean type of convergent margin are present and surprisingly well preserved. In particular it is: 1) the development of blueschist facies metamorphism along the Saxothuringian margin, 2) calc-alkaline to potassium rich (shoshonitic) arc type magmatism in distance 150–200 km from the suture zone (Žák et al., 2005), 3) back-arc basin developed on continental upper plate crust later replaced by thick continental root (Schulmann et al., 2005), 4) deep granulite facies metamorphism associated with supposed underplating of the crust by mafic magmas at the bottom of the root and 5) continental lithosphere underthrust underneath the thickened root system. Based on these criteria, the architecture of the eastern Variscan belt is interpreted as the result of a large-scale and long-lasting subduction process associated with crustal tectonics, metamorphism, magmatic and sedimentary additions that developed over the width of at least 500 km, in present coordinates, and time scale of ~80 Ma.

Present day architecture of the Bohemian Massif and location of Palaeozoic sutures

Saxothuringian is represented by Neoproterozoic par-autochthon represented by migmatites and paragneisses dated at ~580–550 Ma. These rocks are intruded by Cambro-Ordovician calc-alkaline porphyritic granodiorites converted to augen orthogneiss during the Variscan orogeny. The basement is unconformably covered by Cambrian and Ordovician sequences overlain by Late Ordovician to Famennian pelagic sediments and Famennian to Visean flysh. The par-autochthon is thrust by allochthonous units containing deep water equivalents of the Ordovician to Devonian rocks of the para-autochthon and proximal flysh sediments.

The allochthonous are represented by pile of thrust sheets marked by decreasing pressure and metamorphic age from the top to the bottom (Franke, 2000; Konopásek and Schulmann, 2005).

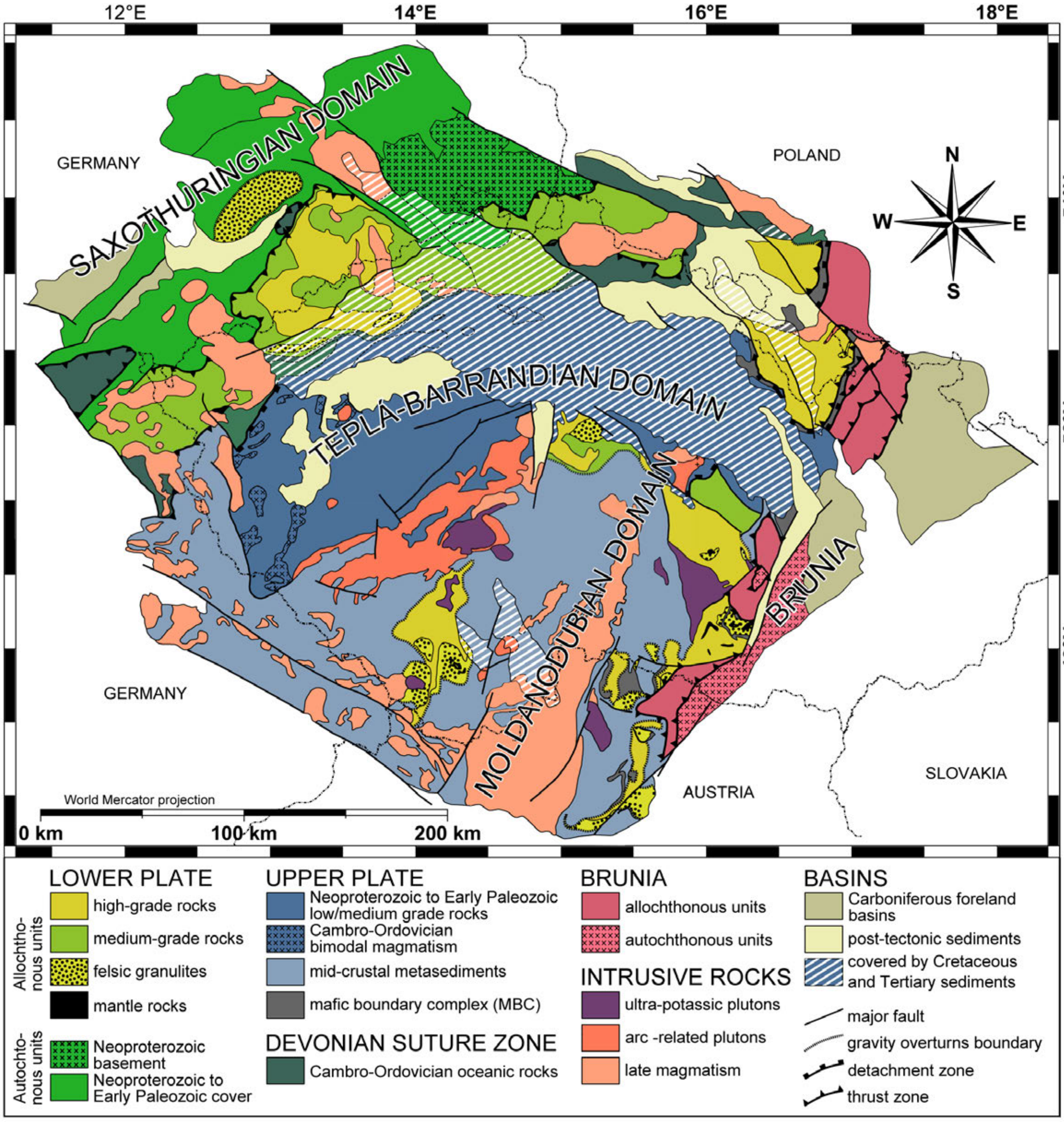


Figure 1. Plate tectonic map of the Bohemian Massif

In the highest structural position occur thrust sheets with metabasites of Ordovician protolith age eclogitized during Devonian (~395 Ma). Structurally deeper occur sheets associated with middle pressure assemblages and Late Devonian zircon and Hbl cooling ages (~365 Ma). This rock pile represents Late Ordovician to Devonian passive margin imbricated during Devonian convergence. In the Sudetic part (Figure 1, Figure 2a-c) of the Bohemian Massif, the Ordovician rift sequences are characterized by the presence of deep marine sediments and MORB type volcanics followed by Silurian and Devonian sedimentary sequences. The Ordovician oceanic rocks are metamorphosed at blueschist-facies conditions probably at Late Devonian.

The oceanic subduction stage was followed by Carboniferous continental subduction of the Saxothuringian continental rocks underneath easterly Teplá-Barrandian block which was responsible for the eclogitization of continental crust at ~350–340 Ma (Schmädicke et al., 1995). This event is responsible for the global reworking of the Saxothuringian at high pressure conditions, thrusting of subducted continental crust and exhumation of deep rocks.

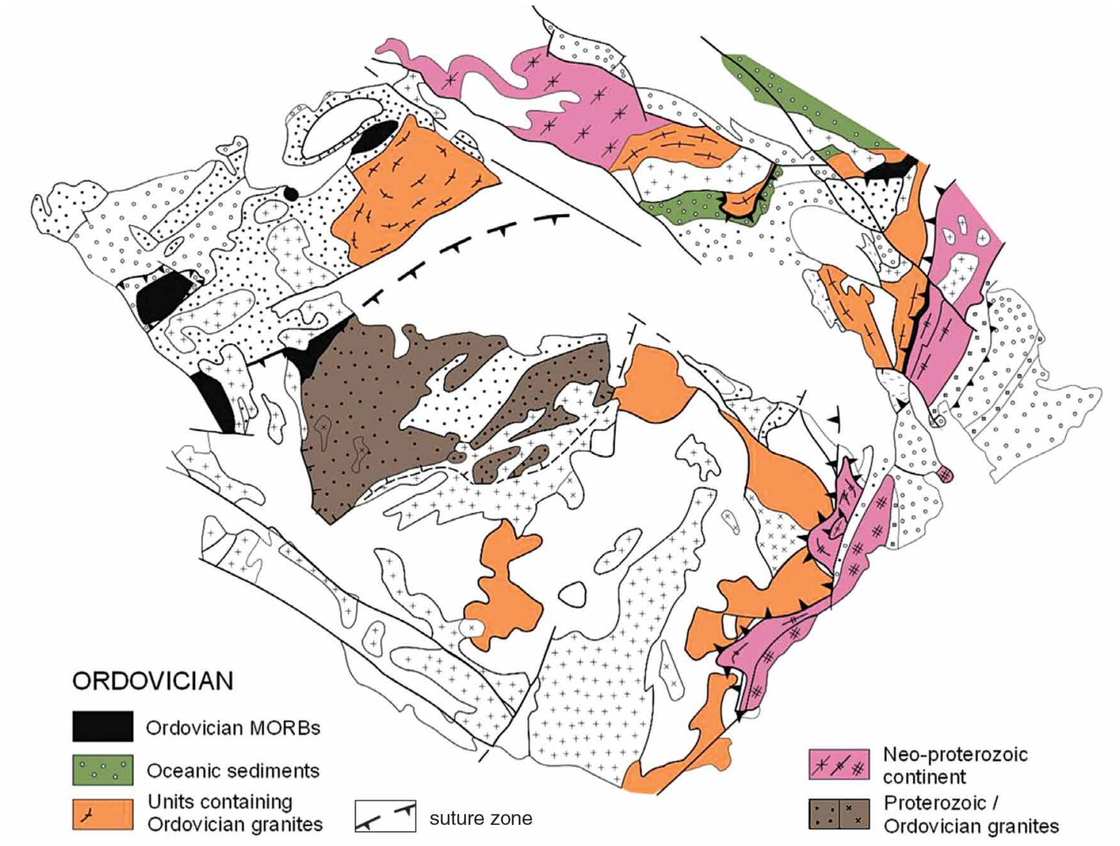


Figure 2a. Architectural evolution of the Bohemian Massif – Ordovician stage

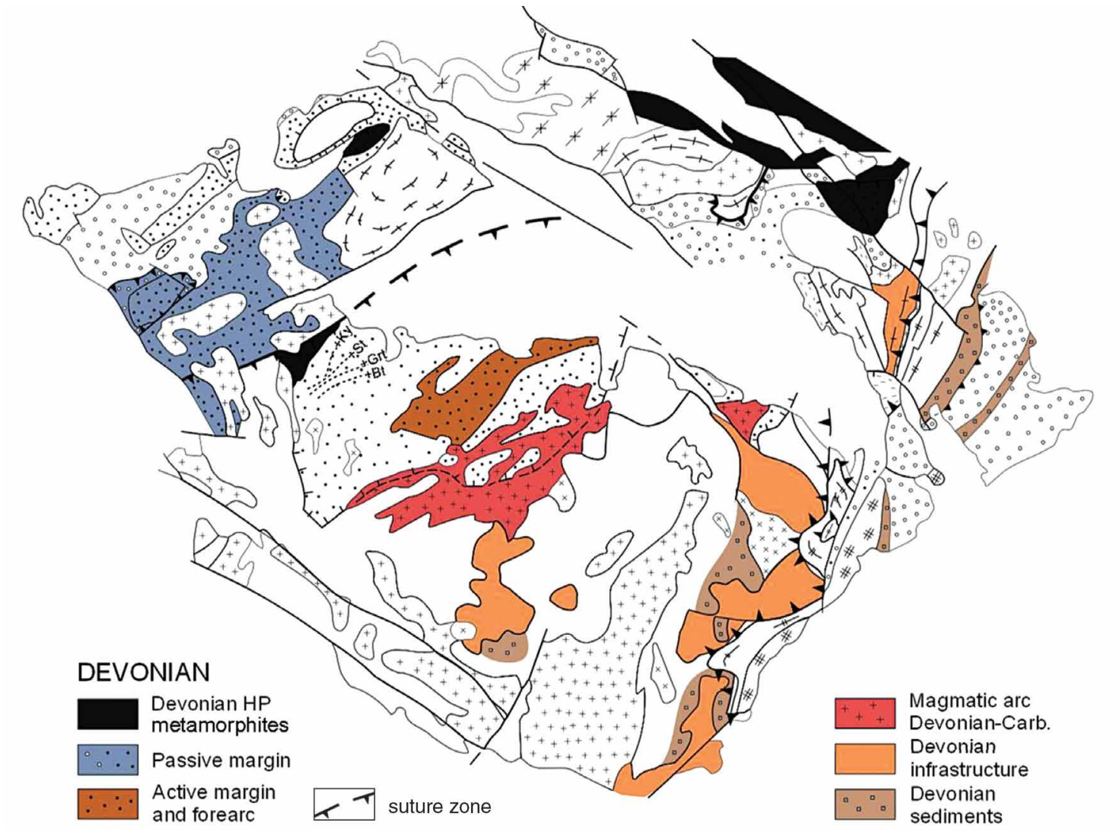
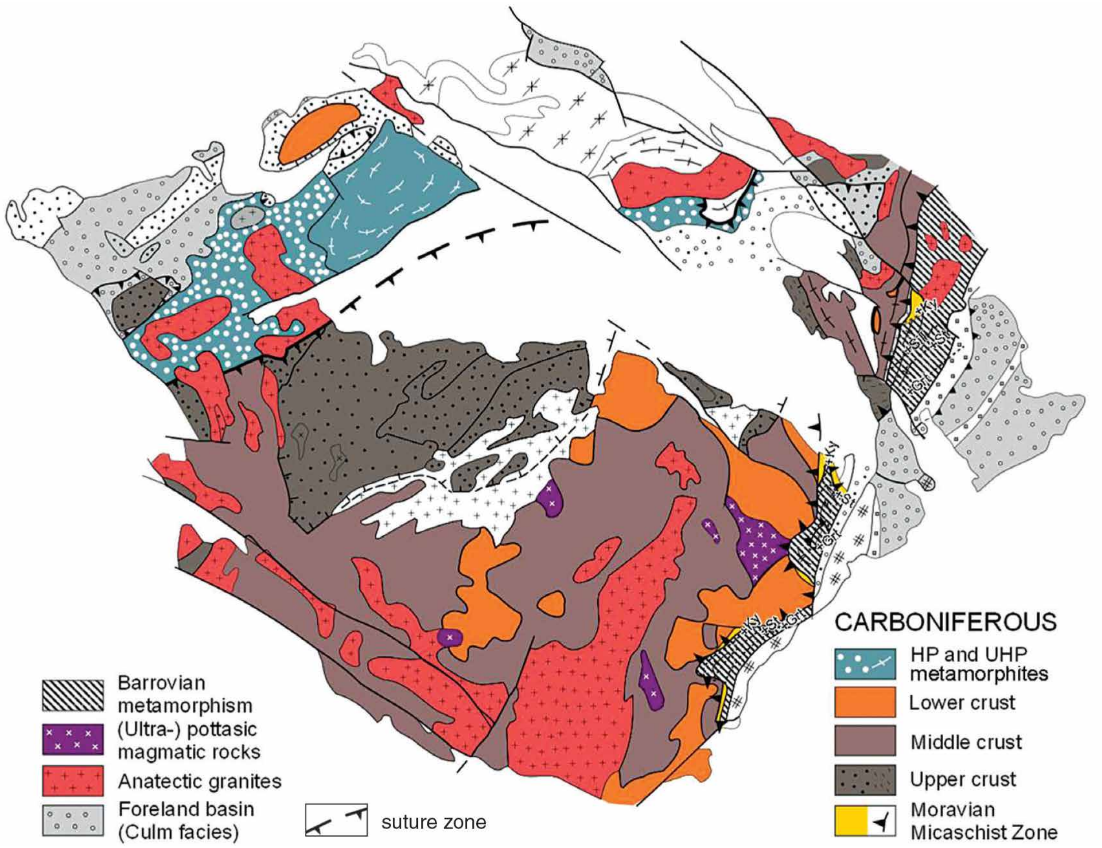


Figure 2b. Architectural evolution of the Bohemian Massif – Devonian stage



Metamorphic zones and facies: Ky – kyanite zone, St – staurolite zone, amphibolite facies, Grt – granulite facies, Bt – blueschist facies

Figure 2c. Architectural evolution of the Bohemian Massif – Carboniferous stage

The Saxothuringian – Teplá-Barrandian boundary is characterized by presence of units with high proportions of ultramafic and mafic high pressure rocks (Figure 1). Represented by serpentinites at the bottom and thick body of amphibolites, eclogites and metagabbros (Medaris et al., 1995). The protolith of gabbros and eclogites was dated as Cambrian and Ordovician while the Devonian metamorphic and cooling ages range between 410 and 370 Ma. The metamorphic evolution started with eclogite-facies metamorphism and terminated by granulite and amphibolite-facies retrogression. These rocks are interpreted as the oceanic fragment at suture position.

Teplá-Barrandian (the Bohemicum) consists of Neoproterozoic basement with the lower arc-related volcano-sedimentary sequence, followed by siliceous black shales and a flyshoid sequence (shales, greywackes and conglomerates. The Neoproterozoic basement is unconformably overlain by a thick sequence (1500–2000 m) of Lower Cambrian conglomerates, graywackes, and sandstones and Upper Cambrian volcanics. The Lower Palaeozoic Prague Basin is characterized by Early Ordovician (Tremadocian) transgression followed by mid-Ordovician rift related volcanics. Sedimentation of Silurian graptolite shales was associated with important volcanic activity accompanied by basaltic and ultramafic intrusions. The sedimentation continued from Upper Silurian to Devonian by carbonate dominated sequence and terminated at mid-Devonian with Givetian calc turbidites.

The whole sedimentary package is folded by steep folds presumably of Late Devonian age as indicated by Culm facies sediments unconformably deposited on folded Early Paleozoic strata.

The deformation affected also the underlying Neoproterozoic basement, with the intensity and age increasing progressively to the west (Zulauf, 2001). In the same direction rises also the metamorphic degree, reaching amphibolite-facies conditions close to the Teplá-Barrandian/Saxothuringian boundary. In this area is developed a typical Barrovian metamorphic zonation ranging from biotite zone in the east up to kyanite zone in the west dated at middle Devonian by $^{40}Ar/^{39}Ar$ method (Dallmeyer and Urban, 1988).

The Teplá-Barrandian and Moldanubian domain boundary is masked by the Central Bohemian Plutonic Complex. Its activity started with intrusions of calc-alkaline Devonian (~370 Ma) tonalites to granodiorites transformed into orthogneisses. The first unmetamorphosed plutonic rocks were Late Devonian (~354 Ma) calc-alkaline tonalites, granodiorites, trondhjemites, quartz diorites and gabbros. The source of the basic magmas was a slightly depleted mantle above a subduction zone. Further south/southeast occur Early Carboniferous (~349–346 Ma) high-K calc-alkaline plutonic bodies (mainly granodiorites with minor quartz monzonite and monzogabbro bodies). The intermediate rock types resulted from mixing of slightly enriched mantle-derived and crustal magmas. Finally, further east occur syn-deformational bodies or post-tectonic elliptical intrusions of magnesio-potassic rocks of mid-Carboniferous (~343–337 Ma) ages. The plutonic bodies contain numerous xenoliths, screens of the Barrandian-like Palaeozoic and Neo-Proterozoic rocks.The Central Bohemian Plutonic Complex is interpreted as a relatively shallow section (< 10 km) through the Devonian-Carboniferous magmatic arc, which widened and expanded to the east with time.

The Moldanubian is subdivided into two tectonic units: The Drosendorf Unit composed of the “Monotonous Group” represented by Proterozoic metasediments, with numerous Late Proterozoic to Early Palaeozoic orthogneisses, quartzites and amphibolites and the “Varied Group” composed of plagioclase-bearing paragneiss quartzites and marbles intercalated with amphibolites and leptynites (Tollmann et al., 1982). The protoliths of varied metasediments are supposed to be at least partly Early Palaeozoic in age. Structurally highest is the “Gföhl Unit” composed of orthogneiss with Ordovician protolith ages, amphibolitized eclogites, granulites, garnet- and spinel-bearing peridotites surrounded by felsic migmatites.

Two NW-SE trending belts of high-pressure rocks (granulites, eclogites and peridotites) are distinguished: the western belt located close to the Barrandian–Moldanubian boundary, and the eastern belt rimming the eastern margin of the Bohemian Massif (Medaris et al., 1995). These two belts alternate with NW-SE trending wide belts represented by the Varied and Monotonous groups.

The amphibolite-facies metamorphism developed on the regional scale in the Drosenforf Unit and reflects maximal pressures of 10 kbar at temperatures of 650–700 °C. However, higher grade (eclogitic) boudins have been identified, generally at the boundary between both groups. Metamorphism of the Gföhl unit is characterized by early eclogite facies followed with granulite-facies and amphibolite-facies retrogression (O’Brien and Rötzler, 2003). The age of early high-pressure metamorphism was probably Late Devonian and the granulite-facies overprint is of Viséan age as shown by a number of zircon ages.

The deformation history in the Moldanubian Zone reveals early vertical NNE-SSW trending fabrics, associated with crystallization of high-pressure mineral assemblages. These steep foliations are reworked by flat deformation fabrics that are associated with medium- to low-pressure and high-temperature mineral assemblages. The sub horizontal foliations bear intense NE-SW trending mineral lineation that is commonly associated with generalized ductile flow towards NE. The early sub-vertical fabrics is dated at 350 to 340 Ma, while the ages for the sub-horizontal vary around 335 Ma. In the SW part of the Moldanubian domain, younger set of steep NW-SE metamorphic fabrics reworks the flat foliation, having been associated with low-pressure metamorphic conditions at around 325–315 Ma (Schulmann et al., 2005).

The Moldanubian metamorphic units are commonly intruded by numerous Variscan plutons including magnesio-potassic syenites to melagranites (durbachites), and S-type granitoids. The magnesio-potassic syenites to melagranites are spatially, structurally and temporally associated with high-pressure granulites (Janoušek and Holub, 2007). These rocks have isotopic signatures indicating a metasomatized lithospheric mantle source, presumably contaminated by subducted mature crustal material.

The Moldanubian – Brunia continental transition zone was defined as a zone of medium grade metamorphism called the Moravo-Silesian Zone (Suess, 1926). This zone of intense deformation resulted from thrusting of the Moldanubian over Brunia continent to the east. The contact between these units is marked by a particular unit, the Moravian "micaschist zone", which is composed of kyanite-bearing micaschists. This first order tectonic boundary contains boudins of eclogites, high-pressure granulites and peridotites embedded in the metapelites of both Moravian and Moldanubian parentage order tectonic boundary.

The underlying Moravo-Silesian Zone is characterized by two nappes composed of orthogneiss at the bottom and metapelite sequence at the top. This nappe sequence is overlying Neoproterozoic basement which is often imbricated with Pragian to Givetian cover. The orthogneisses of the Moravian Zone are derived from the underlying Brunia continent. This zone of intense deformation, 50 km wide and 300 km long, is marked by a tectonically inverted metamorphic sequence ranging from chlorite to kyanite-sillimanite zones. The metamorphism is interpreted as a result of continental underthrusting associated with intense top to the NNE oriented shearing. The subsequent deformation is connected with recumbent folding and imbrication of Neoproterozoic gneisses with Devonian cover. The age of this later phase is constrained at 340–325 Ma $^{40}Ar/^{39}Ar$ ages (Fritz et al., 1996).

The Brunia continent originally called the Brunovistulicum by Dudek (1980) consists of Neoproterozoic migmatites and schists dated at ~680 Ma and intruded by 550 Ma old granites. This basement is unconformably overlain by Cambrian and Ordovician strata followed by Lower Devonian quartzites and conglomerates and Givetian carbonate platform sedimentation. Since Early to Late Carboniferous (~350–300 Ma), foreland sedimentary environment developed resulting in deposition of 7.5 km thick Variscan flysch (Culm facies). Low-grade source rocks gradually pass to high-grade metamorphic source material marked by pyrope-rich mineral fraction and granulite pebbles dated at 340–330 Ma (Hartley and Otava, 2001, Kotková et al., 2007). Since 310 Ma deformation started of the flysch basin characterized by metamorphism and intense deformation in the west. The deformation terminated by folding of molasse sediments at ~300 Ma.

Geodynamic evolution of the Bohemian Massif

The succession of tectonic events (Figure 3) can be interpreted in terms of south-eastward (in the present-day coordinates) oceanic subduction of large Saxohuringian ocean underneath an active continental margin, obduction of the passive margin units, formation of a fore-arc region, growth of a magmatic arc and development of a large-scale back-arc system on the continental lithosphere. The early Saxothuringian oceanic subduction event was followed by a continental underthrusting of Saxothuringian continent leading to gradual flattening of the subduction zone marked by eastward migration of arc depocenters and subsequent crustal

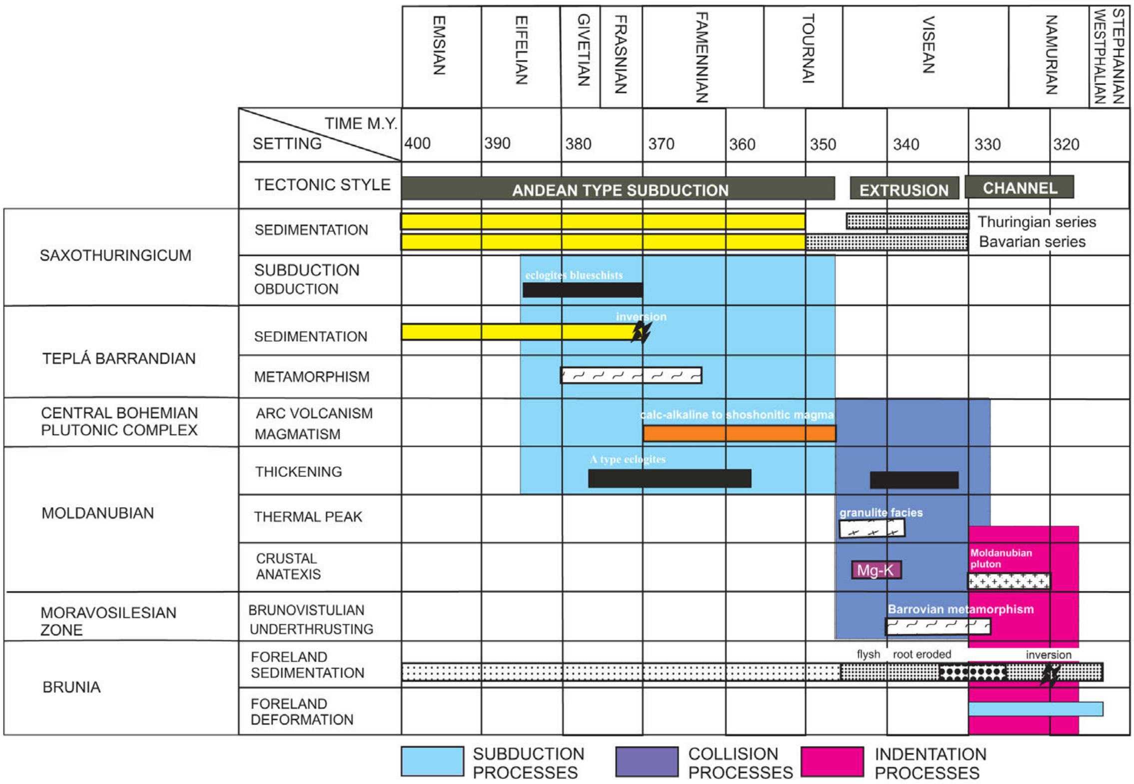


Figure 3. Chronological chart of tectonic events forming Bohemian Massif

thickening. The latter event was responsible for the development of a thick continental root at the expense of the upper plate composed of the Teplá-Barrandian and Moldanubian units. The final evolution is marked by the continental indentation of easterly Brunia continent, exhumation of the Moldanubian lower crust, collapse of the Teplá-Barrandian and Moldanubian thrusting over Brunia platform.

Early Devonian oceanic subduction underneath the continental margin (Figure 4) is marked by relics of Ordovician to Lower Devonian passive margin metamorphosed under blueschist–eclogite facies conditions indicating a Mid-Devonian oceanic subduction. These units are obducted above a continuously underthrust continental Saxothuringian plate. The Barrovian metamorphic zonation and related deformation in the overriding Teplá-Barrandian continental margin are interpreted as ductile part of the Barrandian crust extruded during early stage of upper plate Late Devonian shortening. The steep folding of central part of anchimetamorphic Barrandian Neoproterozoic sequences is interpreted as a same deformation event but occurring in more shallow crustal levels. The subduction of a Saxothuringian oceanic crust underneath the Tepla-Barrandian crust is responsible for the origin of a magmatic arc represented by Devonian calc-alkaline orthogneisses and tonalities of the Central Bohemian Magmatic Complex and by isolated granodiorite stocks intruding Neoproterozoic sediments. At this stage the Barrandian basin operated as fore-arc domain as it is indicated by Devonian zircons in the sediments of the same age in the Prague basin. It is difficult to evaluate the original depositional origin of Moldanubian metasediments, metabasites and other high grade rocks due to severe and polyphase reworking.

Amphibolites derived from Siluro-Devonian tholeiitic basalts associated with carbonates, widespread in Lower Austria and south Bohemia, are interpreted as volcanic products of a large-scale back-arc system. In addition, the felsic metavolcanics and amphibolite layers in the Varied Group are regarded as continuity of back-arc bimodal volcanism till Givetian. The back-arc hypothesis corroborates with impressive amount of marbles with high Sr isotopic ratios that indicate shallow marine environment during Palaeozoic. A back-arc environment is further supported by bimodal volcanic activity in narrow Devonian basins developed on the north-eastern margin of the Brunia continent suggesting only minor thinning of continental crust at the easternmost termination of the back-arc system. In this concept the rest of Brunia represents a stable continental domain not affected by the back-arc spreading.

The Barrandian became a for-arc region, while the future Moldanubian continued to evolve as a crustal back-arc system. The position of high-pressure rocks, existence of the Mariánské Lázně Complex at suture position and location of calc-alkaline magmatic rocks confirm a polarity of the oceanic subduction underneath the easterly fore-arc and magmatic arc system during Late Devonian. The distance of the arc from the trench area represented by the suture indicates that the dip of subduction zone was probably moderate (30–40 degrees). The migration of magmatic centres to the east associated with temporal evolution of magma geochemistry from calc-alkaline to more potassic/shoshonitic affinities (from 370 to 336 Ma) are compatible with flattening of the subduction zone during Early Carboniferous.

The Carboniferous crustal thickening is recognized in all units except the Teplá-Barrandian. The Saxothuringian domain is characterized by the arrival of the continental crust and its subduction underneath the easterly Teplá-Barrandian–Moldanubian. The main thrust boundary migrated further west, so that the continent was thrust underneath the fossil Devonian suture and former fore-arc region. At the same time the deformation regime changed in the far field back-arc region, which recorded progressive thickening of the whole previously thinned and thermally softened domain. Recent structural studies have shown that the earliest preserved fabrics have been sub-horizontal, which may indicate that the lower crustal material was flowing horizontally from the area of subduction channel towards region of easterly back stop.

Indeed, the influx of lower crustal material transported by east dipping Saxothuringian continental subduction zone underneath the fore arc (Teplá-Barrandian) and subsequently towards the former back-arc domain is regarded to be at the origin of the future “Gföhl Unit”. This hypothesis is in line with the whole-rock geochemical and Sr-Nd isotopic composition as well as the zircon inheritance patterns in the Moldanubian HP-HT granulites. Importantly, the crustal material involved in the subduction and extruded over the sub-arc and sub-back arc mantle lithosphere may have developed voluminous high-pressure granulites known from many regions of the Bohemian Massif. Alternatively, the back-arc domain with inherited high thermal budget from Devonian stretching may have been thickened and the partially molten lower crust may have been transported downwards and transformed to high-pressure granulites.

The onset of thickening of the root is not recorded in the Teplá domain, which behaved as a supra-structural domain at this time, but it is shown by deformation in the Barrandian domain. Here, the steep fabric is well dated by adjacent syntectonic calc-alkaline plutons at about 355–345 Ma. In contrast to the west, the eastern sector records onset of loading of the Brunia platform at Tournaisian manifested by sedimentation of coarse basal clastics and destruction of the Givetian carbonate platform.

Late Visean exhumation of orogenic lower crust of the upper plate during Early Carboniferous is exemplified by the two NE–SW trending belts of granulites, eclogites and peridotites intimately associated with the magnesio-potassic plutons. The first belt, recognized west of the magmatic arc, was exhumed along huge west dipping detachment zone, which was also responsible for collapse of the upper part of the magmatic arc system and downthrow of the

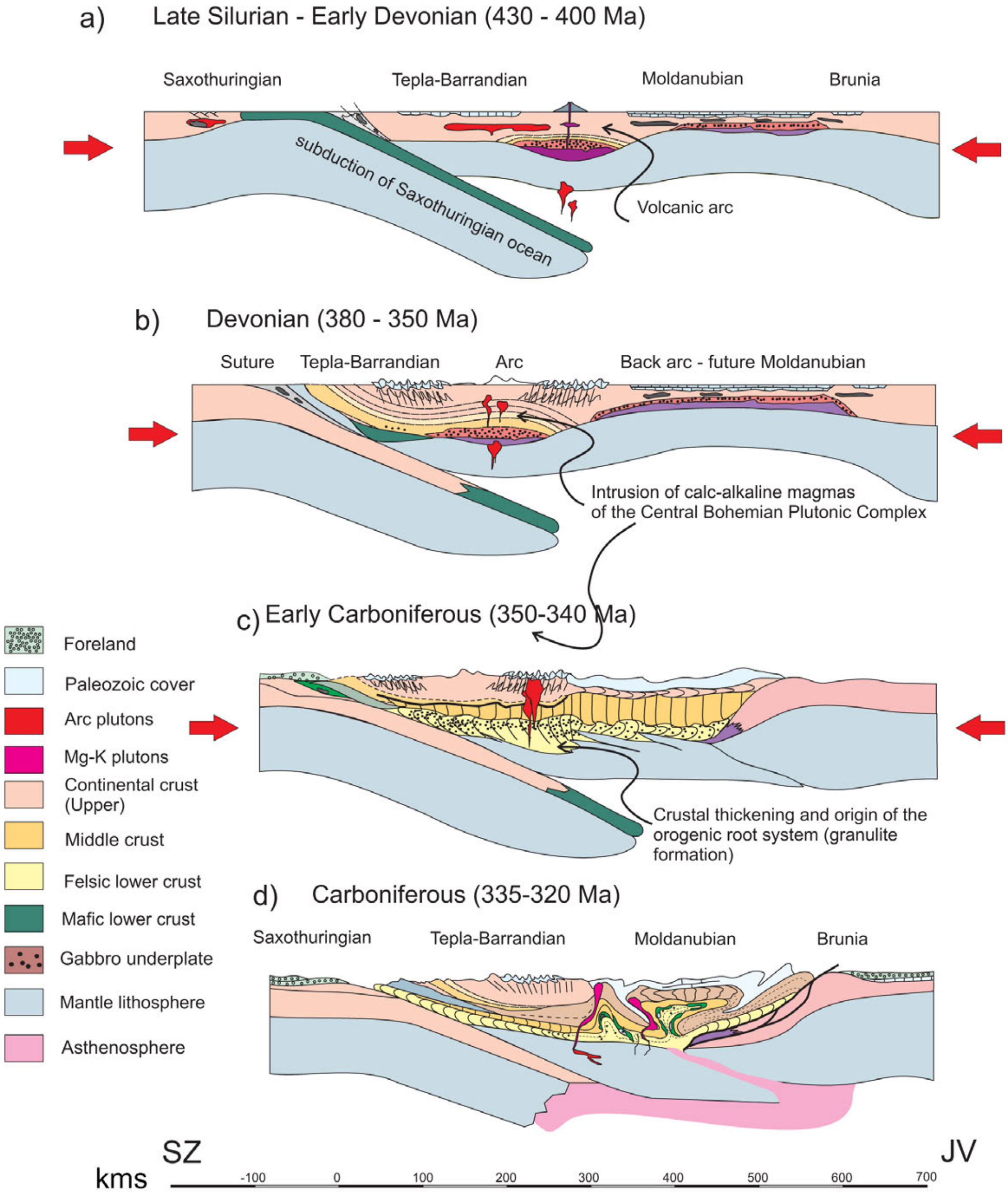


Figure 4. Geodynamics of the Bohemian Massif

whole Barrandian section. Such a huge vertical material transfer could have been responsible for vertical exchange of lower crustal and upper crustal material in a range of 50 km with final throw of 15 km. The cooling ages from the lower crustal domain show that the granulites passed the 300 °C isotherm during Carboniferous, suggesting that the lower crustal bulge reached very shallow position in the upper plate.

The second lower crustal belt rims the eastern margin of the Bohemian Massif, i.e. the boundary with the Brunia continent. Here the fabric of granulites is also vertical and is interpreted in terms of massive vertical exchanges with orogenic middle crust. The zone of lower crustal bulge is interpreted as enormous anticline extrusion surrounded by middle crust coevally transported downwards in form of huge crustal scale synforms. The model of vertical extrusion is based on the concept of buckling of lower and mid-crustal interface followed by growth of crustal scale antiforms. This process is thought to be triggered by rheological and thermal instabilities in the arc region, while to the east it is forced by rigid back-stop, preserved only locally.

However, the most important feature of the eastern Variscan front is the development of horizontal fabrics in the Moldanubian root zone, parallel to the Brunia continental margin. The intense deformation of the Brunia leading to the formation of Moravo-Silesian imbricated nappe system, the origin of crustal mélange forming the Moravian micaschist zone and mixed high-pressure rocks and migmatites in the overlying Moldanubian nappe have been recently interpreted in terms of indentation of the Brunia continent into the hot and thick continental root. This lower crustal indentation and flow of hot lower crustal rocks in supracrustal levels are consistent with the model of continental channel flow driven by arrival of crustal plunger, a model which is advocated for two decades for the deformation of the Eastern Cordillera in the Andes. Finally, the load of Brunia platform related to deep indentation process, leads to the development and easterly propagation of the foreland basin associated with progressive involvement of the early clastic basin infill into the channel flow process. In our model (Schulmann et al., 2008) as the hot Moldanubian rocks advances over the Brunia platform, the imbricate footwall nappe system of the Moravian zone is generated and thrust over the foreland basin rocks.

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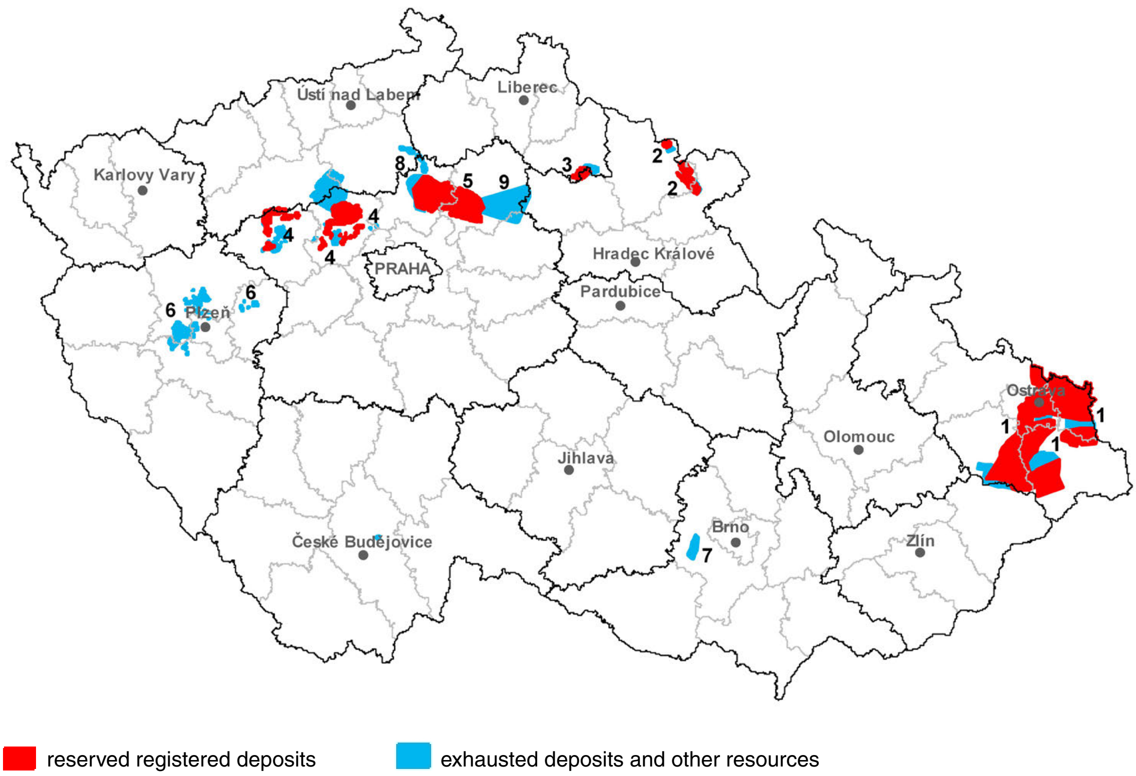
MINERALS CURRENTLY MINED IN THE CZECH REPUBLIC

ENERGY MINERALS

Bituminous coal

1. Registered deposits and other resources of the Czech Republic



Coal basins:

(Names of basins with mined deposits are indicated in ***bold type****)*

1 **Czech part of the Upper-Silesian Basin**
2 Czech part of the Intra-Sudetic Basin
3 Krkonoše Mts. Piedmont Basin
4 Central Bohemian Basins (namely Kladno-Rakovník Basin)
5 Mšeno Part of Mšeno-Roudnice Basin
6 Plzeň Basin and Radnice Basin
7 Boskovice Graben
8 Roudnice Part of Mšeno-Roudnice Basin
9 Mnichovo Hradiště Basin

2. Basic statistical data of the Czech Republic as of December 31

Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number	62	62	62	62	62
exploited	8	8	8	8	7
Total mineral *reserves, kt	16 315 667	16 304 609	16 304 846	16 285 605	16 283 583
economic explored reserves	1 487 287	1 475 446	1 475 464	1 465 793	1 460 044
economic prospected reserves	5 993 801	5 993 812	5 746 510	5 991 317	5 991 133
potentially economic reserves	8 834 579	8 835 351	8 839 345	8 828495	8 832 406
exploitable (recoverable) reserves	66 301	56 569	41 844	25 199	22 513
Mine production, kt	8 610	8 341	7 640	6 074	4 870

** See **NOTE** in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic** of this yearbook*

Approved prognostic resources P_1, P_2, P_3

Year	2013	2014	2015	2016	2017
P1, kt	590 300	590 300	590 300	590 300	590 300
P2	–	–	–	–	–
P3	–	–	–	–	–

3. Foreign trade

2701 – Bituminous coal, briquettes and similar solid fuels made of bituminous coal

		2013	2014	2015	2016	2017
Import	kt	2 153	3 138	2 886	3 163	3 729
Export	kt	4 845	4 315	3 565	3 438	2 321

2701 – Bituminous coal, briquettes and similar solid fuels made of bituminous coal

		2013	2014	2015	2016	2017
Average import prices	CZK/t	2 472	2 161	2 058	1 763	2 959
Average export prices	CZK/t	2 377	2 303	2 255	2 059	3 335

2704 – Coke and semi-coke from bituminous coal, brown coal or peat, agglomerated retort coal

		2013	2014	2015	2016	2017
Import	kt	438	787	413	487	228
Export	kt	450	518	523	583	744

2704 – Coke and semi-coke from bituminous coal, brown coal or peat, agglomerated retort coal

		2013	2014	2015	2016	2017
Average import prices	CZK/t	4 696	6 387	4 345	4 166	5 160
Average export prices	CZK/t	7 366	6 719	6 376	5 844	6 906

4. Prices of domestic market

Average sale prices of bituminous coal EXW (EUR/tonne) recalculated to CZK/tonne with using of Czech National Bank CZK/EUR exchange rate annual averages

Coal type/Year		2013	2014	2015	2016	2017
coking coal	EUR/tonne	98	85	90	N	N
steam coal	EUR/tonne	56	54	50	N	N
exchange rate	CZK/EUR	26.0	27.5	27.3	–	–
coking coal	CZK/tonne	2 548	2 228	2 457	–	–
steam coal	CZK/tonne	1 456	1 540	1 365	–	–

Sources:
For 2011 – 2013 – New World Resources Annual Report and Accounts 2013. New World Resources Plc, p. 45.
For 2014 – New World Resources Annual Report and Accounts 2014. New World Resources Plc, p. 43.
For 2015 – New World Resources Annual Report and Accounts 2015. New World Resources Plc, p. 34.

OKD, a.s. bituminous coal sales

Coal type/Year			2013	2014	2015	2016	2017
coking coal	sales	tonnes	4 290 210	4 225 372	3 760 717	3 479 663	5 296 946
	revenue	ths CZK	11 147 387	10 806 786	9 573 614	7 515 000	10 645 000
	average price	CZK/ tonne	2 598	2 558	2 546	2 160	2 010
steam coal	sales	tonnes	5 079 459	3 834 365	3 674 358	3 866 140	1 936 842
	revenue	ths CZK	7 371 043	7 141 678	6 894 975	5 238 000	2 790 000
	average price	CZK/ tonne	1 451	1 863	1 877	1 355	1 441

Sources:
For 2013 – OKD výroční zpráva 2013, OKD, a.s., p. 12.
For 2014 – OKD výroční zpráva 2014, OKD, a.s., pp. 11, 74.
For 2015 – OKD výroční zpráva 2015, OKD, a.s., pp. 7, 13, 54.
For 2016 – OKD výroční zpráva 2016, OKD, a.s., pp. 10, 14, 15.
For 2017 – OKD výroční zpráva 2017, OKD, a.s., pp. 15, 64.

5. Mining companies in the Czech Republic as of December 31, 2017

OKD, a.s., Ostrava

6. World production and world market prices

World mine production

During 2012 and 2016, world production of bituminous coal developed as follows:

	2013	2014	2015	2016	2017
Steam coal (WBD), mill t	5,896.6	5,820.6	5,627.9	5,255.0	N
Coking coal (WBD), mill t	1,084.7	1,114.8	1,100.0	1,082.8	N
Bituminous coal total (WBD), mill t	6,981.3	6,935.3	6,727.6	6,337.7	N

After Coal Information 2018 production of bituminous coal reached these numbers (mill t:)

	2015	2016	2017[e]
Steam coal	5 819,7	5 463,4	5 677,9
Coking coal	1 087,6	1 040,1	1 039,9
Bituminous coal total	6 907,3	6 503,5	6 757,8

e – preliminary values

Main producers according to WBD

2016			2016		
Steam coal			Coking coal		
country	mill tonnes	%	country	mill tonnes	%
China	2 492	47.4	China	592	54.7
India	601	11.4	Australia	189	17.5
USA	554	10.5	Russia	84	7.8
Indonesia	459	8.7	India	62	5.7
South Africa	253	4.8	USA	51	4.7
Australia	250	4.8	Canada	26	2.4
Russia	227	4.3	Mongolia	23	2.1
Colombia	86	1.6	Poland	13	1.2
Kazakhstan	82	1.6	Kazakhstan	10	0.9
Poland	57	1.1	Ukraine	7	0.6
world	**5 255**	**100.0**	**world**	**1 083**	**100.0**

Main producers according Coal Information, IAE

2017^{e}			2017^{e}		
Steam coal			Coking coal		
country	mill tonnes	%	country	mill tonnes	%
China	2 837	50.0	China	540	52.0
India	641	11.3	Australia	190	18.3
USA	573	10.1	Russia	86	8.3
Indonesia	486	8.6	USA	65	6.3
Australia	254	4.5	India	41	3.9
South Africa	253	4.5	Canada	27	2.6
Russia	226	4.0	Mongolia	26	2.5
Kazakhstan	85	1.5	Kazakhstan	16	1.5
Colombia	83	1.5	Poland	9	0.9
Poland	54	1.0	Mozambique	7	0.7
world	**5 678**	**100.0**	**world**	**1 039**	**100.0**

e – preliminary values

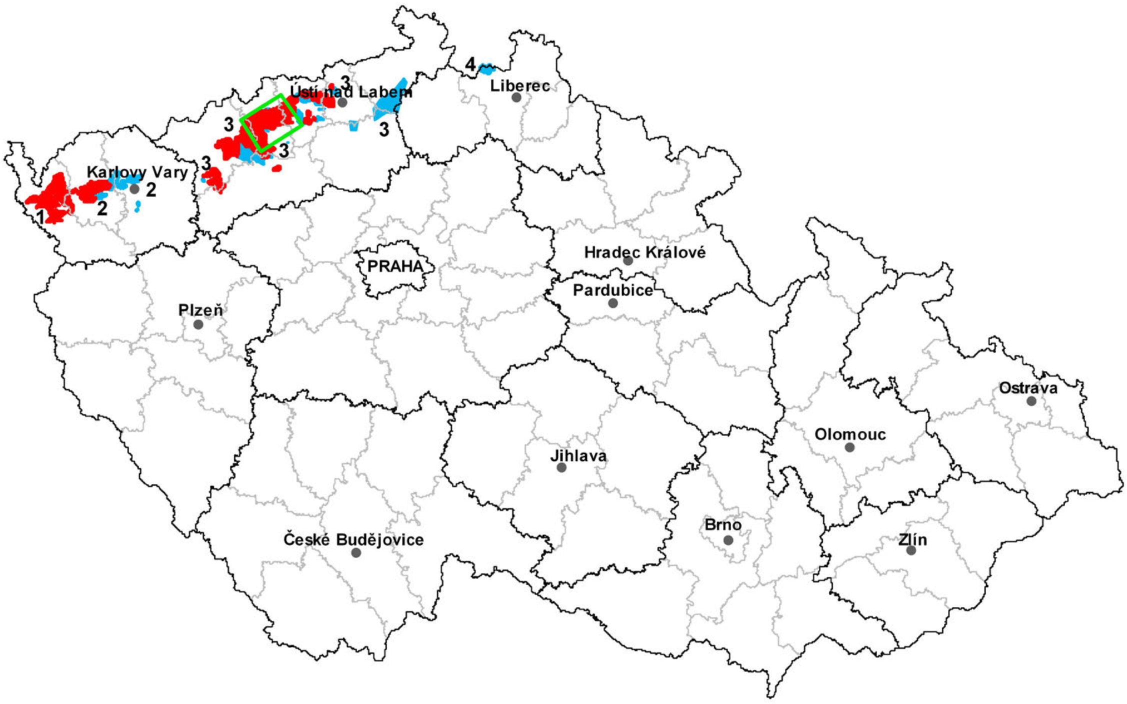
World market prices

BP Statistical Review of World Energy (BP) and the World Bank-The Pink Sheet (WB) report average prices of some types of coal (USD/t):

Year	2013	2014	2015	2016	2017
Market price in NW Europe (BP)	81.69	75.38	56.79	59.87	84.51
Spot prices of the US Central Appalachian coal	71.39	69.00	53.59	53.556	63.83
The price of Japanese imports coking coal CIF (BP)	140.45	114.41	93.85	N	N
Spot price of Japanese imports of steam coal CIF (BP)	90.07	76.13	60.10	71.66	96.02
Asian market price (BP)	90.90	77.89	63.52	N	N
Spot price of coal, China Qinhangdao (BP)	95.42	84.12	67.53	71.35	94.72
Australian steam coal, 6,300kcal CIF Neawcastle (WB)	84.56	70.13	57.51	65.9	88.4
Colombian coal (WB)	71.88	65.73	52.51	67.6	77.8
South African coal (WB)	80.24	72.34	57.04	64.1	81.9

Brown coal

1. Registered deposits and other resources of the Czech Republic



reserved registered deposits

exhausted deposits and other resources

area of ecological territorial limits for mining (Government Resolution no. 444/1991)

Coal basin

(Names of basins with mined deposits are indicated in ***bold type****)*

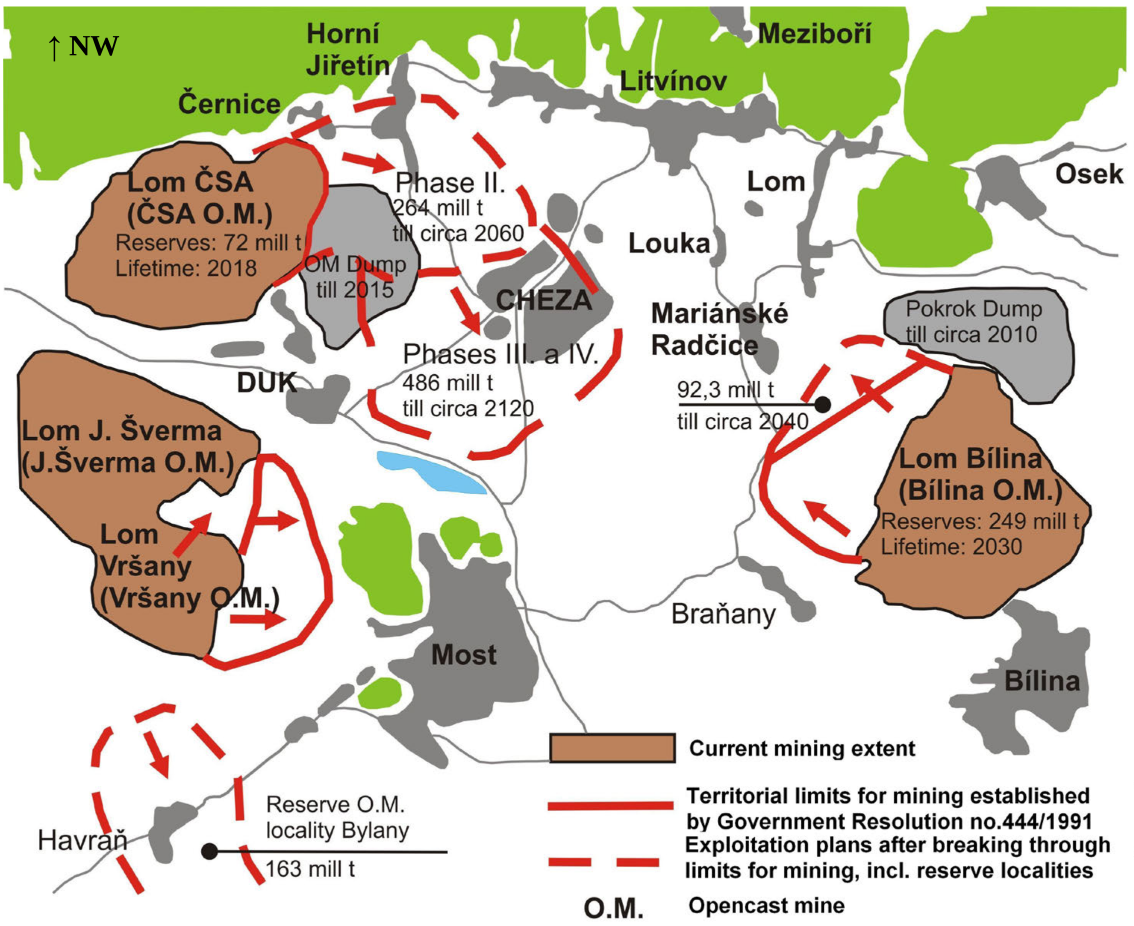
1 Cheb Basin	3 **North–Bohemian Basin**
2 **Sokolov Basin**	4 Czech part of the Zittau (Žitava) Basin

Territorial ecological mining limits

Josef Godány

The relatively large reserves of brown coal in Northern Bohemia (North Bohemian coal basin) are blocked by "Regional environmental limits" for brown coal mining in Northern Bohemia (today this relates only to the North Bohemian coal basin). The limits were set by Czech Government Resolutions Nos. 166, 443, and 490 of 1991 (for the Sokolov coal basin) and Resolution No. 444 of the same year (for the North Bohemian coal basin). The Government Resolutions define mining areas which should remain unexcavated. The main reason for setting the limits was environmental and landscape protection of Northern Bohemia. However, territorial limits for the Sokolov coal basin were removed relatively soon by Government Decree No. 511 of 1993.

With diminishing reserves of brown coal in mined areas there is an escalating pressure to reconsider or amend the original decision of 1991, i.e. the preserved Government Resolution No. 444/1991. There was a minor change to the territorial environmental limits in the foreground of the large opencast mine Bílina (deposit in Bílina) by Government Resolution No. 1176/2008 and the subsequent Government Resolution No. 827/2015 which repealed Government Resolution No. 1176/2008 and significantly moved the environmental limit boundary – to the distance of 500 m from the urban area of MariánskéRadčice. This shifted the anticipated end of mining in the mine from 2038 to 2055. The mining company has been



© VÚHU Most 2003 (modified)

ordered to primarily use the mined coal to meet the needs of the heating industry. Government Resolution No. 444/1991 still applies to the remaining deposit area, including the large opencast mine ČSA (deposit in Ervěnice – ČSA mine). The question of breaking the territorial environmental limits in the ČSA opencast mine will remain conditionally open until 2020 (if the current territorial environmental limits are preserved, the mining is expected to end in 2024). The coal reserves behind the territorial environmental limits in the ČSA opencast mine are of the highest quality (the calorific value of coal from this deposit area is at least 17 MJ/kg).

Overall, the environmental territorial limits block about 954 million tonnes of coal reserves. The truth is that brown coal and nuclear power are still the only relevant sources for our energy sector. Brown coal is also the most important raw material for the Czech heating industry. The main product of the brown coal industry is a dusty brown coal for power stations and heating plants. In the long term, approximately 93 % of brown coal produced is consumed by these facilities. Graded coal production for households accounts for the remaining 7 %.

2. Basic statistical data of the Czech Republic as of December 31

Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number	53	52	52	51	52
exploited	11	10	9	10	10
Total mineral* reserves, kt	8 859 890	8 826 333	8 775 056	8 729 236	8 673 268
economic explored reserves	2 308 649	2 273 951	2 239 329	2 203 911	2 210 477
economic prospected reserves	2 062 445	2 062 445	2 062 445	2 059 859	2 059 859
potentially economic reserves	4 488 796	4 489 937	4 473 282	4 465 466	4 402 932
exploitable (recoverable) reserves	825 322	796 277	749 075	714 356	681 540
Mine production, kt	40 585	38 348	38 351	38 646	39 310

Notes:
** See **NOTE** in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic** of this yearbook*

3. Foreign trade

2702 – Brown coal, also agglomerated, except jet

		2013	2014	2015	2016	2017
Import	kt	447	1 470	1 102	210	331
Export	kt	1 250	932	928	921	987

2702 – Brown coal, also agglomerated, except jet

		2013	2014	2015	2016	2017
Average import prices	CZK/t	1 263	606	653	2 136	1 938
Average export prices	CZK/t	1 643	1 714	1 686	1 680	1 621

Note: Jet is a compact black variety of brown coal used in (mourning) jewelry

4. Prices of domestic market

Domestic brown coal prices*

Product specification	2013	2014	2015	2016	2017
graded; cube coal II; 17.6 MJ/kg; Severočeské doly	1 263	606	653	2 136	1 938
graded; nut coal I; 17.6 MJ/kg; Severočeské doly	1 800–1 850	1 910–1 920	1 950–1 970	1 970	2 020
graded; nut coal II; 17.6 MJ/kg; Severočeské doly	1 700–1 800	1 870–1 900	1 985 –2 020	2 020	2 070
coarse coal dust I, II; Severočeské doly; 16.9 MJ/kg	N	N	N	N	N
industrial mixture; 10.5–15.6 MJ/kg; Severočeské doly	N	N	N	N	N

** Prices given without taxes on solid fuels.*

Sokolovská uhelná Company has not been producing graded coal since 2009. Mostecká uhelná Company has been selling the coal in auctions, price lists will no longer be issued.

Domestic steam coal for hoseholds CZK/tonne according to IEA

Product specification	Price components	2013	2014	2015	2016	2017
brown coal; nut coal no 1; net calorific value 3 500–4 000 kcal/kg = 14.6-16.7 MJ/kg	ex-tax basis	2 656	2 640	2 617	2700	2 796
	excise tax	133	133	133	133	133
	VAT	586	583	578	595	615
	total tax	719	716	711	728	748
	selling price	3 375	3 356	3 328	3 428	3 545

Source: Energy prices and taxes 2018. Quarterly statistics. 2nd quarter 2018. OECD/IEA

5. Mining companies in the Czech Republic as of December 31, 2017

Severočeské doly, a.s., Chomutov
Vršanská uhelná a.s., Most
Sokolovská uhelná, právní nástupce, a.s., Sokolov
Severní energetická a.s., Most

6. World production and world market prices

World mine production

According to Coal coal trends 2018, main producers were

2017e		
country	**mill tonnes**	**%**
Germany	171	20.6
Russia	75	9.1
Turkey	74	8.9
USA	64	7.7
Poland	61	7.4
Australia	57	6.9
India	48	5.7
Serbia	40	4.8
Czech Republic	39	4.7
Greece	37	4.5
world	**831**	**100.0**

e – preliminary values

In the five-year period 2013–2017, world production of brown coal developed as follows:

	2013	2014	2015	2016	2017e
Brown coal and lignite (WBD), mill t	859.9	822.4	815.6	805.9	N
Brown coal and lignite (IAE), mill t	N	N	823.7	820.7	831.0

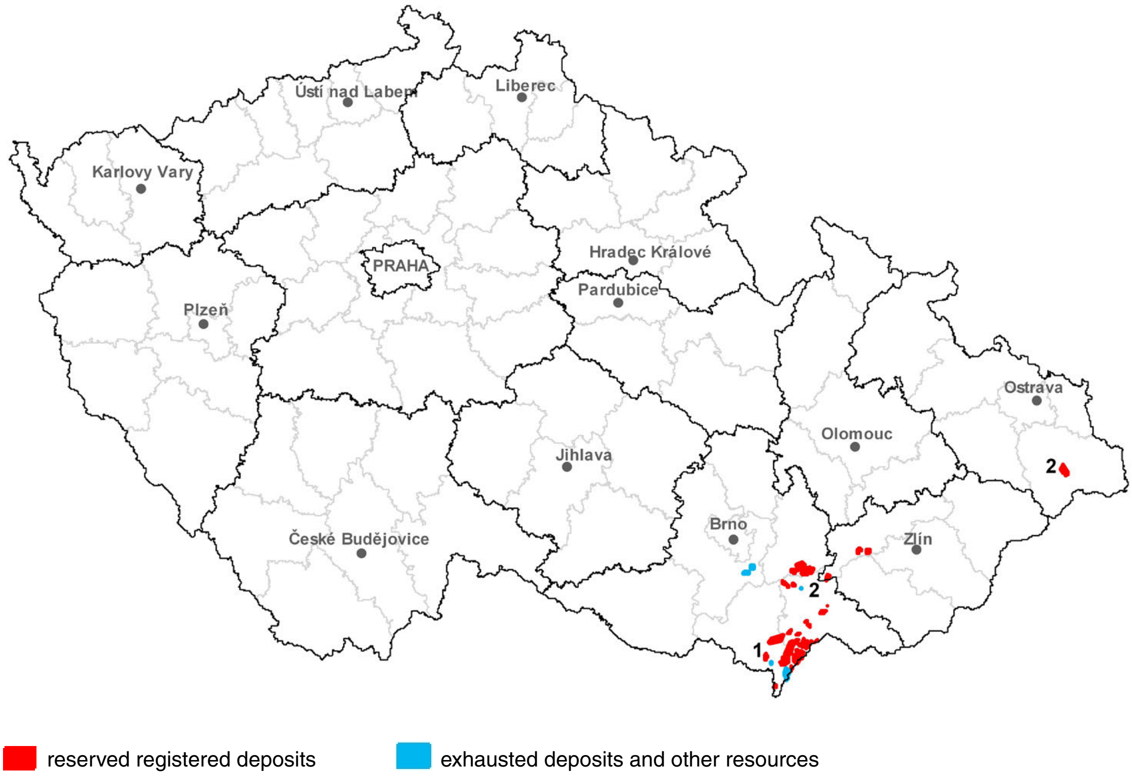
e – preliminary values

Market and prices

Brown coal is subject to world trade to a limited extent only. Compared to the trade with bituminous coal, brown coal does not pay off when being transported over long distances. Therefore, trade mainly takes place between neighbouring countries on the basis of contract prices that are not available in the published statistics.

Crude oil

1. Registered deposits and other resources of the Czech Republic



Principal areas of deposits presence:

*(names of areas with exploited deposits are indicated in **bold type**)*

1 **Vienna Basin**	2 **West–Carpathian Foredeep**

2. Basic statistical data of the Czech Republic as of December 31

Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number	39	37	38	39	39
exploited	30	29	28	33	33
Total mineral *reserves, kt	28 811	27 094	28 953	28 959	30 546
economic explored reserves	21 236	21 100	21 402	21 428	21 386
economic prospected reserves	1 758	1 747	1 735	3 355	3 345
potentially economic reserves	5 817	5 816	5 816	5 816	5 815
exploitable (recoverable) reserves	1 534	1 449	1 379	1 504	1 401
Mine production, kt	152	148	126	116	107

** See **NOTE** in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic** of this yearbook*

3. Foreign trade

2709 – Petroleum oils and oils obtained from bituminous minerals, crude

		2013	2014	2015	2016	2017
Import	kt	6 631	7 313	7 239	5 325	7 814
Export	kt	25	27	28	28	24

2709 – Petroleum oils and oils obtained from bituminous minerals, crude

		2013	2014	2015	2016	2017
Average import prices	CZK/t	15 966	16 018	10 500	7 781	9 498
Average export prices	CZK/t	14 988	14 119	9 088	7 280	8 870

271011 – Petrol (Gasoline)

		2013	2014	2015	2016	2017
Import	kt	561	451	522	N	N
Export	kt	332	459	593	N	N

271011 – Petrol (Gasoline)

		2013	2014	2015	2016	2017
Average import prices	CZK/t	N	N	N	N	N
Average export prices	CZK/t	N	N	N	N	N

Czech Republic crude oil import by country and import costs

		2013	2014	2015	2016	2017
Kazakhstan	kt	620	817	702	305	986
Russian Federation	kt	4 213	4 164	4 025	3 424	4 100
Hungary	kt	–	6	22	28	16
Other non-OECD Europe/Eurasia (Azerbaijan)	kt	1 659	2 317	2 383	1 489	2 425
Algeria	kt	60	36	–	–	108
Saudi Arabia	kt	–	–	–	79	179
Total	kt	6 552	7 371	7 132	5 325	7 814
Import costs, average unit value, CIF	USD/bbl	110.26	102.13	54.91	42.80	53.69
	USD/ tonne*	812.62	752.70	404.69	315.44	395.70

*Note: *1 tonne = 7.37 bbl (in average)*
Sources: Oil information 2014. International Energy Agency Statistics. OECD/IEA, 2014.
Oil information 2015. International Energy Agency Statistics. OECD/IEA, 2015.
Oil information 2016. International Energy Agency Statistics. OECD/IEA, 2016.
Oil information 2017. International Energy Agency Statistics. OECD/IEA, 2017.
Oil information 2018. International Energy Agency Statistics. OECD/IEA, 2018.

4. Prices of domestic market

Prices of domestic producers are not open to public.

5. Mining companies in the Czech Republic as of December 31, 2017

MND a.s., Hodonín
LAMA GAS & OIL s.r.o., Hodonín

6. World production and world market prices

World production

World crude oil production reached these amounts in recent years:

	2013	2014	2015	2016	2017
World crude oil production (WBD), mill t	4 065.1	4 158.3	4 296.4	4 301.8	N
World crude oil production (BP), mill t	4 130.2	4 220.6	4 361.9	4 377.1	4 387.1

Note: BP – BP Statistical Review of World Energy. 2017

Main producers according to BP

2017^{e}		
country	**mil tonnes**	**%**
USA	571	13.0
Saudi Arabia	562	12.8
Russia	554	12.6
Canada	238	5.4
Iran	234	5.3
Iraq	222	5.1
China	192	4.4
United Arab Emirates	176	4.0
Kuwait	146	3.3
Brazil	143	3.3
world	**4 387**	**100.0**

e – preliminary values

World market prices

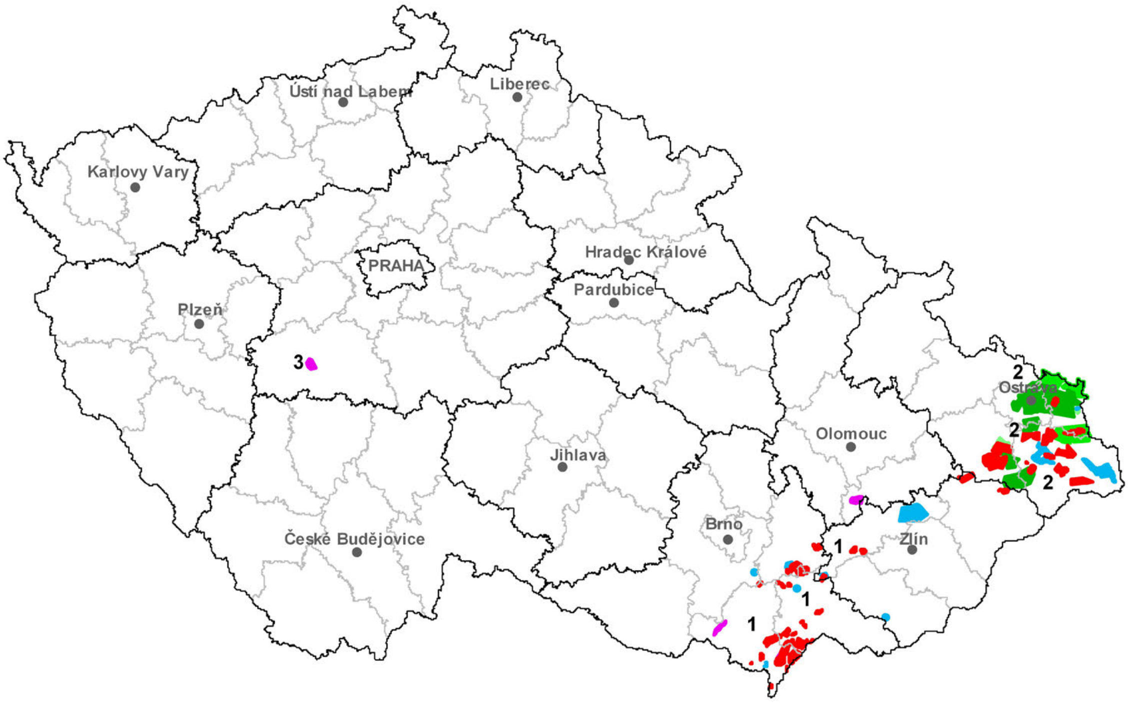
The average price quotations of crude oil purchases according to the IEA and BP (USD/bbl)

Commodity/ Year	Units	Conversion factor	2013	2014	2015	2016	2017
Brent Crude, CIF Rotterdam	USD/bbl	1 t = 7.560 bbl	108.66	98.95	52.39	43.73	54.49
	USD/t		821.47	748.06	396.07	330.60	411.94
Dubai Crude, CIF Rotterdam	USD/bbl	1 t = 7.596 bbl	105.47	97.07	51.20	41.19	53.13
	USD/t		801.15	737.34	388.923	312.88	403.58
West Texas Intermediate (WTI), CIF Rotterdam	USD/bbl	1 t = 7.400 bbl	97.99	93.28	48.71	43.34	50.79
	USD/t		725.13	690.27	360.45	299.10	375.85
Nigerian Forcados Crude, CIF Rotterdam	USD/bbl	1 t = 7.500 bbl	111.95	101.35	54.41	44.54	54.31
	USD/t		839.63	760.13	408.08	334.05	407.33
OPEC basket, CIF Rotterdam	USD/bbl	1 t = 7.090 bbl	105.00	96.29	49.52	40.65	52.40
	USD/t		744.45	682.70	351.10	321.14	371.52

Note: bbl = abbreviation of term barrel

Natural gas

1. Registered deposits and other resources of the Czech Republic



reserved registered deposits of natural gas
exhausted deposits and other resources of natural gas
reserved registered deposits of natural gas adsorbed on coal seams
other resources of natural gas adsorbed on coal seams
underground gas reservoirs

Principal areas of deposits and underground gas reservoirs:

*(Names of regions with mined deposits are indicated in **bold type**)*

1 **South-Moravian region**	2 **North-Moravian region**	3 underground gas reservoir Háje

2. Basic statistical data of the Czech Republic as of December 31

Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number	96	93	95	96	96
exploited	40	40	46	64	64
Total mineral *reserves, mill m^3	31 085	27 949	30 948	30 839	30 546
economic explored reserves	7 646	7 491	7 494	7 381	7 236
economic prospected reserves	2 981	2 956	2 998	2 977	2 951
potentially economic reserves	20 458	20 458	20 456	20 481	20 479
exploitable (recoverable) reserves	5 512	5 064	5 057	4 918	4 801
Mine production, mill m^3	207	198	200	169	171

** See **NOTE** in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic** of this yearbook*

Approved prognostic resources P_1, P_2, P_3

Year		2013	2014	2015	2016	2017
P_1,	mill m^3	16 767	16 767	16 767	16 767	16 767
P_2		–	–	–	–	–
P_3		–	–	–	–	–

3. Foreign trade

271121 – Natural gas

		2013	2014	2015	2016	2017
Import	ths m^3	N	N	N	N	N
Export	ths m^3	N	N	N	N	N

271121 – Natural gas

		2013	2014	2015	2016	2017
Average import prices	CZK/ths m^3	N	N	N	N	N
Average export prices	CZK/ths m^3	N	N	N	N	N

Czech Republic natural gas import by country and import costs

		2013	2014	2015	2016	2017
Norway	million m^3	4	699	99	2	14
Russian Federation	million m^3	8 475	6 550	7 375	8 121	7 460
Total	million m^3	8 479	7 249	7 474	8 123	8 889
Average pipeline import prices	USD/million Btu	12,10	8,97	6,97	5,23	5,76
	USD/MWh	41,30	30,61	23,79	17,83	19,66
	USD/m^3	0,45	0,33	0,26	0,19	0,21

Sources:
Natural gas information 2013. International Energy Agency Statistics. OECD/IEA, 2013.
Natural gas information 2014. International Energy Agency Statistics. OECD/IEA, 2014.
Natural gas information 2015. International Energy Agency Statistics. OECD/IEA, 2015.
Natural gas information 2016. International Energy Agency Statistics. OECD/IEA, 2016.
Natural gas information 2017. International Energy Agency Statistics. OECD/IEA, 2017.
Notes:
1) Own conversion of prices from USD/million Btu to USD/m^3 by equations 1 ft^3 (cubic foot) of natural gas = 1 050 Btu (British thermal unit); 1m^3 = 35.31ft^3; 1m^3 = 37 075.5 Btu
2) 3 412 969 Btu = 1 MWh

4. Prices of domestic market

Prices of domestic producers are open to public incompletely.

Unigeo a.s. shows data in its Annual Reports for 2013–2017 which allow to deduct approximate average prices of natural gas supply to local gas distribution systém (GasNet s.r.o.):

	2013	2014	2015	2016	2017
Unigeo a.s. price – CZK/m^3	< 9	< 12	< 8	< 5.7	< 4.8

Trading on the Energy Exchange of the Czech Moravian Commodity Exchange Kladno (CMKBK) with the SSDP (composite natural gas supply services of gas products (commodity)) – price quotation*) averages weighted by realized quantity

		2013	2014	2015	2016	2017
To 630 MWh/delivery point (630 MWh = 59 684 m^3)	CZK/MWh **)	715	660	442	442	455
	CZK /ths m^3 ***)	7 547	6 960	4 660	4 660	4 803
Over 630 MWh/delivery point (630 MWh = 59 684 m^3)	CZK /MWh **)	703	681	561	440	460
	CZK /ths m^3 ***)	7 420	7 180	5 910	4 640	4 858

Source: Czech Moravian Commodity Exchange Kladno
Explanations:
*SSDP (***sdružené služby dodávky zemního plynu***) = composite natural gas supply services of gas products (commodity) = natural gas physically delivered into the customers offtake point on the territory of the Czech Republic with obligation of the customer to take delivery of the gas from the distribution network (gas grid) and responsibility of the holder of the natural gas trading licence (supplier) for any deviations in line with relevant legal regulations according to the Energy Act and the relevant implementing and related regulations in force including distribution of natural gas and the system services.*
**) Prices are quoted in CZK without VAT, gas tax or any other indirect tax or similar payment and do not include distribution of natural gas and related services*
***) Original format of quoted prices*
****) Recalculated quoted prices with using of calorific value 1 MWh = 94.74 m^3 of natural gas*

5. Mining companies in the Czech Republic as of December 31, 2017

MND a.s., Hodonín
Green Gas DPB, a.s., Paskov
LAMA GAS & OIL s.r.o., Hodonín
UNIMASTER spol. s r.o., Praha
Unigeo a.s., Ostrava – Hrabová

6. World production and world market prices

World mine production

The volumes of world natural gas production in recent years were as follows

	2013	2014	2015	2016	2017
World natural gas production (WBD), mill m^3	3 518.7	3 580.9	3 634.3	3 672.6	N
World natural gas production (BP), mill m^3	3 371.5	3 398.7	3 474.2	3 574.2	3 670.4

Note: BP – BP Statistical Review of World Energy 2018.

Main producers according to BP

2017		
country	**bn m³**	**%**
USA	735	20.0
Russia	636	17.3
Iran	224	6.1
Qatar	176	4.8
Canada	176	4.8
China	149	4.1
Norway	123	3.3
Saudi Arabia	114	3.1
Nigeria	111	3.0
Indonesia	91	2.5
world	**3 680**	**100.0**

Natural gas prices in various countries according to the Statistical Review of World Energy 2018 (USD/mill Btu converted to USD/m³ and USD/MWh)

Country/Year		2013	2014	2015	2016	2017
Germany, average import price	USD/mill Btu	10.73	9.11	6.72	4.93	5.62
	USD/MWh	36.59	31.09	22.93	16.83	16.33
	USD/m³	0.4	0.33	0.23	0.18	0.20
United Kingdom, Heren NBP Index	USD/mill Btu	10.63	8.22	6.53	4.69	6.80
	USD/MWh	36.28	28.05	22.29	16.01	20.0
	USD/m³	0.39	0.30	0.25	0.17	0.25
USA, Henry Hub, spot price	USD/mill Btu	3.71	4.35	2.60	2.45	2.96
	USD/MWh	12.66	14.85	8.87	8.36	10.10
	USD/m³	0.14	0.16	0.10	0.09	0.11
Canada (Alberta)	USD/mill Btu	2.93	3.87	2.01	1.55	1.50
	USD/MWh	10.00	13.21	6.86	5.29	5.12
	USD/m³	0.11	0.14	0.07	0.06	0.06

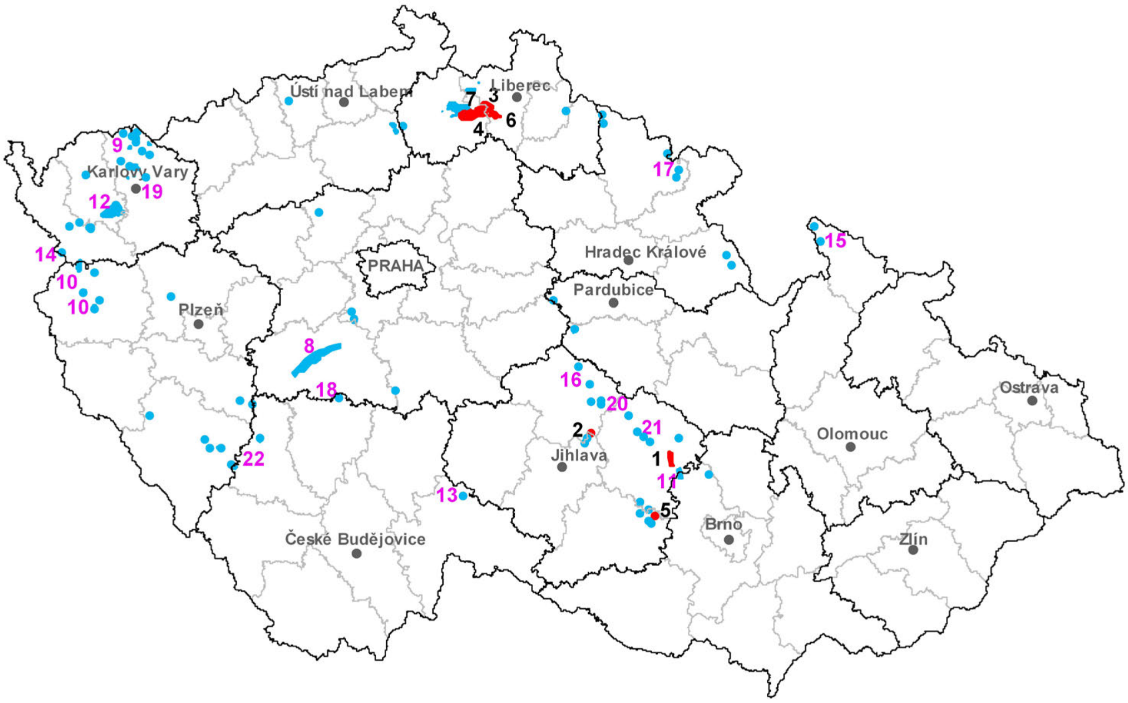
Note:

1) The price conversion from USD/mil. Btu to USD/m³ was performed by the use of the following ratios:
1 ft³ (cubic foot) of natural gas = 1,050 Btu (British thermal unit); 1 m³ = 35.31 ft³; 1 m³ = 37,075.5 Btu

2) 3,412,969 Btu = 1 MWh

Uranium

1. Registered deposits and other resources of the Czech Republic



reserved registered deposits   exhausted deposits and other resources

Reserved registered deposits

(Names of mined deposits are indicated in ***bold type****)*

1 **Rožná**	3 Břevniště pod Ralskem	5 Jasenice-Pucov	7 Stráž pod Ralskem*
2 Brzkov	4 Hamr pod Ralskem	6 Osečná-Kotel	

** uranium is recovered only as a byproduct from the treatment of groundwater and technological solutions during mine liquidation and reclamation work upon termination of in-situ leaching (ISL), otherwise in situ recovery (ISR), of uranium ores*

Exhausted deposits and other resources

8 Příbram	13 Okrouhlá Radouň	18 Předbořice
9 Jáchymov	14 Dyleň	19 Hájek + Ruprechtov
10 Zadní Chodov + Vítkov 2	15 Javorník	20 Chotěboř
11 Olší	16 Licoměřice-Březinka	21 Slavkovice
12 Horní Slavkov	17 Radvanice + Rybníček + Svatoňovice	22 Mečichov-Nahošín

2. Basic statistical data of the Czech Republic as of December 31

Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number	7	7	7	7	5
exploited	1	1	1	1	1
Total mineral * reserves, t U	135 144	135 071	135 037	135 015	134 948
economic explored reserves	1 327	1 321	1 330	1 337	1 300
economic prospected reserves	19 427	19 463	19 448	19 448	19 448
potentially economic reserves	114 391	114 287	114 259	114 230	114 200
exploitable (recoverable) reserves	284	314	308	313	276
Mine production, t U	232	165	134	128	56
Production of concentrate, t U **	206	146	122	137	59

** See **NOTE** in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic** of this yearbook*
*** sales production (without ore milling losses)*

Approved prognostic resources P_1, P_2, P_3

Year		2013	2014	2015	2016	2017
P_1,	t U	19 025	19 025	19 025	214 253	214 253
P_2,	t U	2 181	2 181	2 181	12 319	12 319
P_3		–	–	–	–	–

Other* prognostic resources P_1, P_2, P_3

Year		2013	2014	2015	2016	2017
P_1,	t U	202 827	–	–	–	–
P_2,	t U	16 522	–	–	–	–
P_3		–	–	–	–	–

** Prognostic resources of uranium-bearing sandstones type in the Bohemian Cretaceous Basin, unexploitable at the present time*

3. Foreign trade

28441030 – Natural uranium – wrought

		2013	2014	2015	2016	2017
Import	t U	N	N	N	N	N
Export	t U	0.004	0.003	118	0.004	0.003

28441030 – Natural uranium – wrought

		2013	2014	2015	2016	2017
Average import prices	CZK/kg U	N	N	N	N	N
Average export prices	CZK/kg U	189 838	197 793	10 183	163 344	122 544

4. Prices of domestic market

5. Mining companies in the Czech Republic as of December 31, 2017

DIAMO, s.p., Stráž pod Ralskem

6. World production and world market prices

World mine production

In recent years, the volume of world production of uranium expressed in terms of the U_30_8 content of ores was as follows:

	2013	2014	2015	2016	2017
Uranium production, U_3O_8 (according to WBD)	70 653	68 314	72 561	62 366	N
Uranium production, t U (according to WNA*)	59 331	56 041	60 496	62 366	59 531

Note:
*1) * Uranium mining production. World Nuclear Association. July 2018.*
2) 1 t U = 1.179 t U_3O_8

Main producers according to WNA

2017		
U_3O_8		
country	**tonnes**	**%**
Kazakhstan	23 391	39.3
Canada	13 116	22.0
Australia	5 882	9.9
Namibie	4 224	7.1
Niger	3 449	5.8
Russia	2 917	4.9
Uzbekistan	2 404	4.0
China	1 855	3.1
USA	940	1.6
Ukraine	550	0.9
world	**59 531**	**100.0**

ESA average annual prices of natural uranium (EUR/kg U) according to EU Nuclear Observatory

	2013	2014	2015	2016	2017
Long-term price	85.19	78.31	94.30	86.62	55.16
Spot price	78.24	74.65	88.73	88.56	23.97

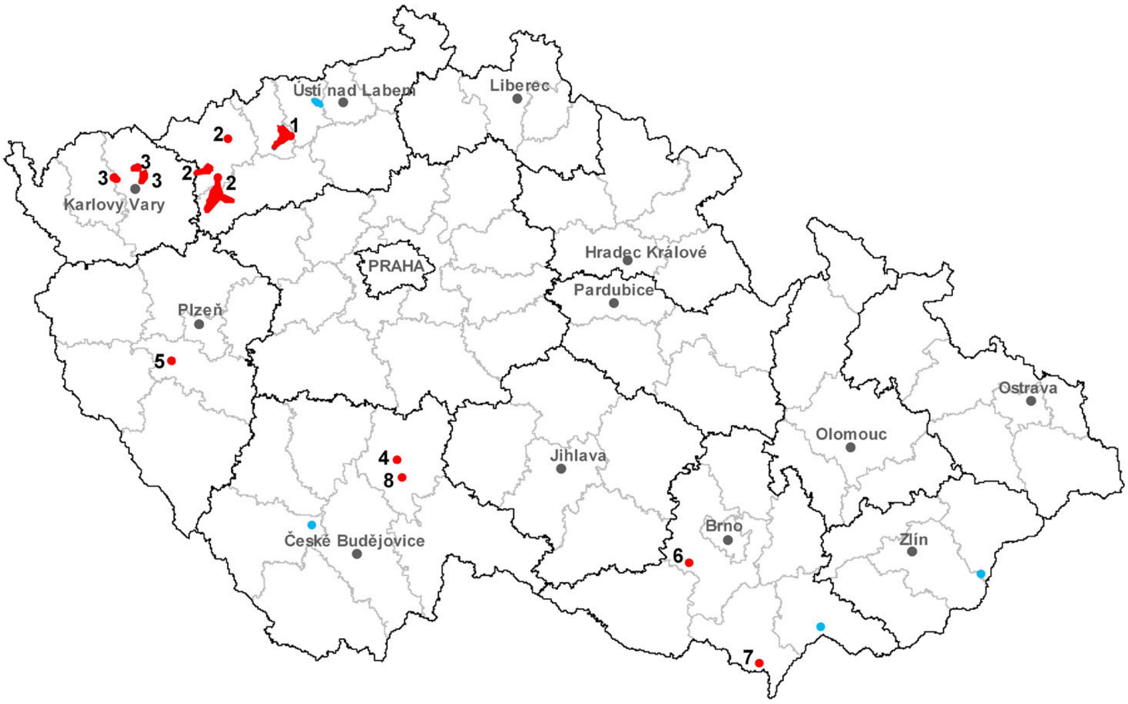
Note: ESA - Euratom Supply Agency, the European Agency for the common supply policy based on the principle of fair and equitable supplies of nuclear fuels to European users

As shown in the table above, 2015 saw the highest uranium prices in the last five years.

INDUSTRIAL MINERALS

Bentonite

1. Registered deposits and other resources of the Czech Republic



reserved registered deposits   exhausted deposits and other resources

Principal areas of deposits and deposits outside them

*(Names of areas and the mined deposit outside are indicated in **bold type**)*

1 České středohoří Mts.

2 Doupovské hory Mts.

3 Sokolov Basin

4 Maršov u Tábora

5 Dněšice – Plzeňsko jih

6 Ivančice – Réna

7 Poštorná

8 Rybova Lhota

2. Basic statistical data of the Czech Republic as of December 31

Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number	35	37	36	38	38
exploited	6	8	7	7	9
Total mineral *reserves, kt	294 885	306 992	306 793	306 911	310 367
economic explored reserves	73 703	73 515	73 316	74 648	78 103
economic prospected reserves	128 326	128 326	128 326	126 877	126 877
potentially economic reserves	105 151	105 151	105 151	105 386	105 387
exploitable (recoverable) reserves	30 493	30 843	30 656	28 671	30 396
Mine production, kt**	226	301	369	374	254

** See __NOTE__ in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic** of this yearbook*
*** Including montmorillonite clays from kaolin deposits overburden*

Approved prognostic resources P_1, P_2, P_3

Year		2013	2014	2015	2016	2017
P_1,	kt	27 017	27 017	27 017	27 017	27 017
P_2,	kt	36 874	36 361	36 361	36 361	36 361
P_3		–	–	–	–	–

3. Foreign trade

250810 – Bentonite

		2013	2014	2015	2016	2017
Import	kt	45	63	65	63	70
Export	kt	163	168	169	165	170

250810 – Bentonite

		2013	2014	2015	2016	2017
Average import prices	CZK/t	2 752	2 090	2 238	2 061	1 934
Average export prices	CZK/t	2 846	2 958	2 996	3 114	3 112

250820 – Decolourizing earths and fuller's earth

		2013	2014	2015	2016	2017
Import	kt	0	0	0	0	0
Export	kt	0	0	0	0	0

250820 – Decolourizing earths and fuller's earth

		2013	2014	2015	2016	2017
Average import prices	CZK/t	–	–	–	–	–
Average export prices	CZK/t	–	–	–	–	–

4. Prices of domestic market

Bentonite prices are not quoted.

5. Mining companies in the Czech Republic as of December 31, 2017

Sedlecký kaolin a.s., Božičany
KERAMOST, a.s., Most
KSB s.r.o., Božičany

6. World production and world market prices

World mine production

	2013	2014	2015	2016	2017[e]
World mine production (according to MCS), kt	12 000	16 100	16 000	16 200	19 000
World mine production (according to WBD), kt	16 190.7	1 860.8	17 702.7	16 045	N

e – preliminary values

Main producers according to MCS

2017e		
country	**kt**	**%**
China	5 600	29.5
USA	3 700	19.5
Turkey	3 400	17.9
India	2 800	14.7
Greece	2 800	14.7
Mexico	470	2.5
Iran	440	2.3
Brazil	400	2.1
Germany	400	2.1
Czech Republic	370	1.9
world	**19 000**	**100.0**

e – preliminary values

Main producers according to MCS

2016		
country	**kt**	**%**
China	5 600	29.5
USA	3 600	18.9
Turkey	3 135	16.5
Greece	808	4.3
India	802	4.2
Mexico	470	2.5
Iran	436	2.3
Brazil	405	2.1
Germany	395	2.1
Czech Republic	369	1.9
world	**19 000**	**100.0**

Main producers according to WBD

2016		
country	**kt**	**%**
USA	3 600	22.4
China	3 600	22.4
Turkey	1 745	10.9
India	1 600	10.0
Greece	883	5.5
Russia	680	4.2
Japan	500	3.1
Brazil	405	2.5
Germany	393	2.4
Czech Republic	374	2.3
world	**16 045**	**100.0**

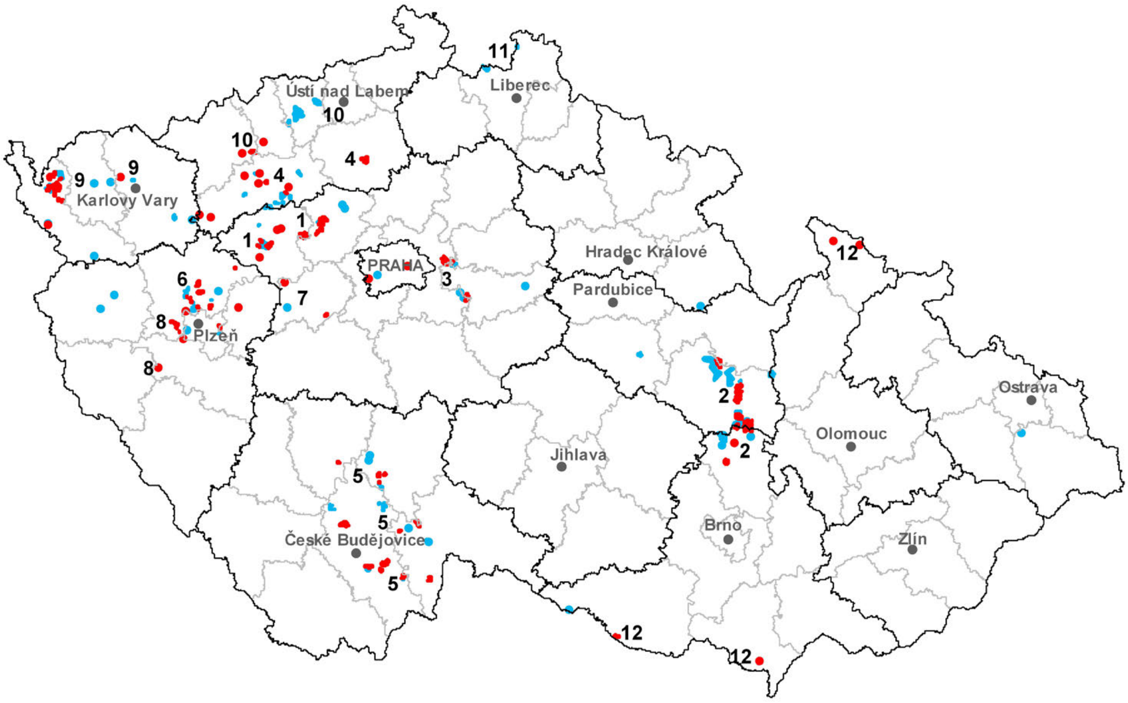
Prices of traded commodities (according to IM)

Commodity/Year		2013	2014	2015	2016	2017
Bentonite, cat litter, grade1–5 mm, bulk, FOB main European port	EUR/t	42–60	42–60	42–60	40–62	40–42
Bentonite, Indian, cat litter grade, crushed, dried, loose in bulk, FOB Kandla	USD/t	34–38	34–38	32–35	32–35	30–35
Bentonite, API grade, bagged, rail-car, ex-works Wyoming	USD/st	90–130	90–130	95–135	86–125	86–125
Bentonite, foundry grade, bagged, rail-car, ex-works Wyoming	USD/st	97–124	97–124	97–124	97–124	97–124
Bentonite, IOP grade, crude, bulk, ex-works Wyoming	USD/st	66–72	66–72	60–72	50–65	50–65
OCMA/Foundry grades, crude & dried, bulk, FOB Milos	EUR/t	60–80	60–80	60–80	60–80	60–80
Bentonite, dried material in bulk, FOB Greece	EUR/t	65–75	65–75	65–75	65–75	65–75
Bentonite, cat litter grade, ex-works Wyoming	USD/st	50–60	50–65	47–65	47–59	47–59

The price range includes the lowest and highest monthly price quotes for a given year
Note: st – short ton; 1 st = 0,9072 t

Clays

1. Registered deposits and other resources of the Czech Republic



reserved registered deposits   exhausted deposits and other resources

Major deposit areas:

(Names of areas with exploited deposits are in ***bold****)*

1 **Kladno-Rakovník Carboniferous**
2 **Moravian and East Bohemian Cretaceous**
3 **Cretaceous around Prague**
4 **Louny Cretaceous**
5 **South Bohemian Basins**
6 **Plzeň Basin**
7 **Tertiary relicts of Central Bohemia**
8 **Tertiary relicts of West Bohemia**
9 **Cheb Basin and Sokolov Basin**
10 **North Bohemian Basin**
11 Zittau Basin
12 Tertiary and Quaternary in Moravia

2. Basic statistical data of the Czech Republic as of December 31

Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number	108	108	108	108	108
exploited	18	18	17	19	19
Total mineral *reserves, kt	923868	922 396	921 734	920 056	915 914
economic explored reserves	176 926	176 291	175 766	173 407	164 828
economic prospected reserves	399 072	398 263	398 216	397 403	391 585
potentially economic reserves	347 870	347 842	347 752	349 246	359 501
exploitable (recoverable) reserves	42 839	42 102	43 485	42 916	45 096
Mine production, kt	465	518	569	538	537

** See **NOTE** in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic** of this yearbook*

Approved prognostic resources P_1, P_2, P_3

Year		2013	2014	2015	2016	2017
P_1,	kt	331 988	331 988	331 988	331 988	331 988
P_2,	kt	38 196	38 196	38 196	38 196	38 196
P_3		–	–	–	–	–

3. Foreign trade

2508 – Other clays (not including expanded clays of heading 6806), andalusite, kyanite and sillimanite, whether or not calcined; mullite; chamotte or dinas earth

		2013	2014	2015	2016	2017
Import	t	84 299	95 314	99 527	94 504	102 122
Export	t	295 808	324 716	307 902	282 328	281 636

2508 – Other clays (not including expanded clays of heading 6806), andalusite, kyanite and sillimanite, whether or not calcined; mullite; chamotte or dinas earth

		2013	2014	2015	2016	2017
Average import prices	CZK/t	3 981	3 454	3 565	3 256	3 141
Average export prices	CZK/t	2 797	2 693	2 731	2 813	2 951

250830 – Refractory (fire) clay

		2013	2014	2015	2016	2017
Import	t	11 350	9 182	9 285	9 004	7 418
Export	t	10 869	21 211	17 547	18 206	17 926

250830 – Refractory (fire) clay

		2013	2014	2015	2016	2017
Average import prices	CZK/t	3 353	3 457	3 568	3 237	3 660
Average export prices	CZK/t	2 042	3 457	1 358	1 543	1 755

250840 – Other clays

		2013	2014	2015	2016	2017
Import	t	14 004	14 721	9 240	11 556	14 796
Export	t	62 632	71 729	82 239	57 504	47 233

250840 – Other clays

		2013	2014	2015	2016	2017
Average import prices	CZK/t	14 721	9 240	11 059	4 090	4 229
Average export prices	CZK/t	1 472	911	956	984	1 060

250870 – Chamotte or dinas earth

		2013	2014	2015	2016	2017
Import	t	6 812	8 505	7 555	4 946	4 552
Export	t	50 377	53 254	49 880	41 623	46 924

250870 – Chamotte or dinas earth

		2013	2014	2015	2016	2017
Average import prices	CZK/t	5 970	6 384	7 166	7 298	7 907
Average export prices	CZK/t	4 681	4 842	4 842	4 752	4 717

4. Prices of domestic market

Various qualities of clay have different market prices. Prices are made public in the limited extent only (some producers do not publish them at all). They fluctuate generally between CZK 70–4 400 per tonne.

5. Mining companies in the Czech Republic as of December 31, 2017

Whiteware clays
KERACLAY, a.s., Brník
LB MINERALS, s.r.o., Horní Bříza

Refractory clays for grog
KERACLAY, a.s., Brník
České lupkové závody, a.s., Nové Strašecí
P-D Refractories CZ a.s, Velké Opatovice
RAKO - LUPKY s.r.o., Lubná u Rakovníka

Other refractory clays (ball clays)
LB MINERALS, s.r.o., Horní Bříza

Non-refractory ceramic clays
LB MINERALS, s.r.o., Horní Bříza
Kaolin Hlubany, a.s.

6. World production and world market prices

World mine production

There are no recognised figures of world production and world trade with clays (referred to as other refractory clays in our terminology) because of difficulties in classifying these clays on a uniform basis and the questionability of their direct comparability based on quality and use. However, the world‘s leading producer and exporter of high-quality other refractory clays is the United Kingdom (Source: Ball clay. Mineral Planning Factsheet.-British Geological Survey-National Environment Research Council 2011).

Mine production of clays in the United Kingdom

		2013	2014	2015	2016	2017
Clays and slate	kt	6 464	6 806	N	N	N
Other refractory clays	kt	740	733	N	N	N

Source: United Kingdom minerals yearbook 2015.- British Geological Survey, Keyworth, Nottingham, 2016.

World fuller's earth production (MCS):

MCS statistics contains worldwide values of fuller's earth production:

	2013	2014	2015	2016	2017
World production, kt	3 000	3 260	3 240	3 290	3 400

World production of fuller's earth (MCS):

2016			2017[e]		
country	**kt**	**%**	**country**	**kt**	**%**
USA	1 680	12.6	USA	1 700	12.7
Spain	647	4.9	Spain	650	4.9
Mexico	250	1.9	Mexico	260	1.9
Greece	238	1.8	Greece	240	1.8
Senegal	188	1.4	Senegal	190	1.4
Turkey	10	0.1	Turkey	10	0.1
India	6	0.0	India	6	0.0
world	**13 290**	**100.0**	**world**	**13 400**	**100.0**

e – preliminary values

In statistics, the group of clays also includes raw materials consisting of minerals and rocks serving for non-clay refractory material production: kyanite, sillimanite, shales, siliceous sandstone (quartzite) – dinas.

World clay resources are extremely extensive.

World market prices

Clay prices are generally not provided. In the reporting period of 2011–2015, Industrial Minerals quoted indicative prices of minerals belonging to the sillimanite group:

Commodity/Year	2013	2014	2015	2016	2017
Andalusite, 55%–59% Al_2O_3, FOB European port, EUR/t	350–425	350–425	355–425	240–299	240–290
Andalusite, 57%–58% Al_2O_3, 2,000 t. batches, bulk, FOB Transvaal, EUR / t	235–280	235–280	235–290	355–425	355–425
Kyanite, 54% –60% Al_2O_3, 18–22 st batches, raw, ex–works USA, USD/st	224–320	224–320	225–320	225–320	225–320
Kyanite, 54%–60% Al_2O_3, 18–22 st batches, calcined, ex–works USA, USD/st	373–439	373–439	375–440	375–440	375–440
Mulcoa *products, 47% Al_2O_3, bagged, FOB USA USD/t	198	198	195–200	195–200	195–200

Note:
st – short ton; 1 st = 0,9072 t
** – Mulcoa is a registered trademark of calcined aluminosilicate produced in Georgia, USA. It is a clay with a high mullite content produced by calcining of clays with a low content of alkali to obtain stable quality and chemical composition.*
Mulcoa product business numbers are 45, 60, 70. The products are used to produce high quality solid clay and refractory products.

Diatomite

1. Registered deposits and other resources of the Czech Republic

reserved registered deposits   exhausted deposits and other resources

Exploited deposit: 1 Borovany-Ledenice

2. Basic statistical data of the Czech Republic as of December 31

Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number	1	1	1	1	1
exploited	1	1	1	1	1
Total mineral *reserves, kt	2 520	2 482	2 463	2 434	2 397
economic explored reserves	1 808	1 772	1 755	1 728	1 693
economic prospected reserves	0	0	0	0	0
potentially economic reserves	712	710	708	706	704
exploitable (recoverable) reserves	1 624	1 590	1 575	1 549	1 515
Mine production, kt	49	34	15	26	31

** See NOTE in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic** of this yearbook*

3. Foreign trade

2512 – Siliceous fossil meal*, siliceous earth

		2013	2014	2015	2016	2017
Import	t	3 703	6 927	8 929	10 484	11 146
Export	t	7 031	8 438	12 401	16 127	16 675

2512 – Siliceous fossil meal*, siliceous earth

		2013	2014	2015	2016	2017
Average import prices	CZK/t	9 034	6 868	6 302	5 939	5 663
Average export prices	CZK/t	6 548	6 111	5 416	4 658	3 846

*Note: * diatomite*

6901 – Bricks, blocks, tiles and other ceramic goods of siliceous fossil meals

		2013	2014	2015	2016	2017
Import	t	12 425	13 715	24 918	27 302	23 423
Export	t	72	31	73	185	90

6901 – Bricks, blocks, tiles and other ceramic goods of siliceous fossil meals

		2013	2014	2015	2016	2017
Average import prices	CZK/t	1 294	1 473	1 253	1 573	1 236
Average export prices	CZK/t	23 292	24 847	3 754	1 982	23 643

4. Prices of domestic market

Diatomite was sold domestically for CZK 9 800–16 500 per tonne.

5. Mining companies in the Czech Republic as of December 31, 2017

LB MINERALS, s.r.o., Horní Bříza

6. World production and world market prices

World mine production

World production of diatomite in the past five years was as follows:

	2013	2014	2015	2016	2017^e
World mine production (according to MCS), kt	2 270	2 360	2 670	2 950	3 000
World mine production (according to WBD), kt	2 161.5	2 341.0	2 150.0	1 938.0	N

e – preliminary values

Main producers according to MCS

	2017^e	
country	**kt**	**%**
USA	700	23.3
Czech Republic	450	15.0
Denmark	440	14.7
China	420	14.0
Argentina	200	6.7
Peru	120	4.0
Japan	100	3.3
Mexico	90	3.0
France	75	2.5
Russia	70	2.3
world	**3 000**	**100.0**

e – preliminary values

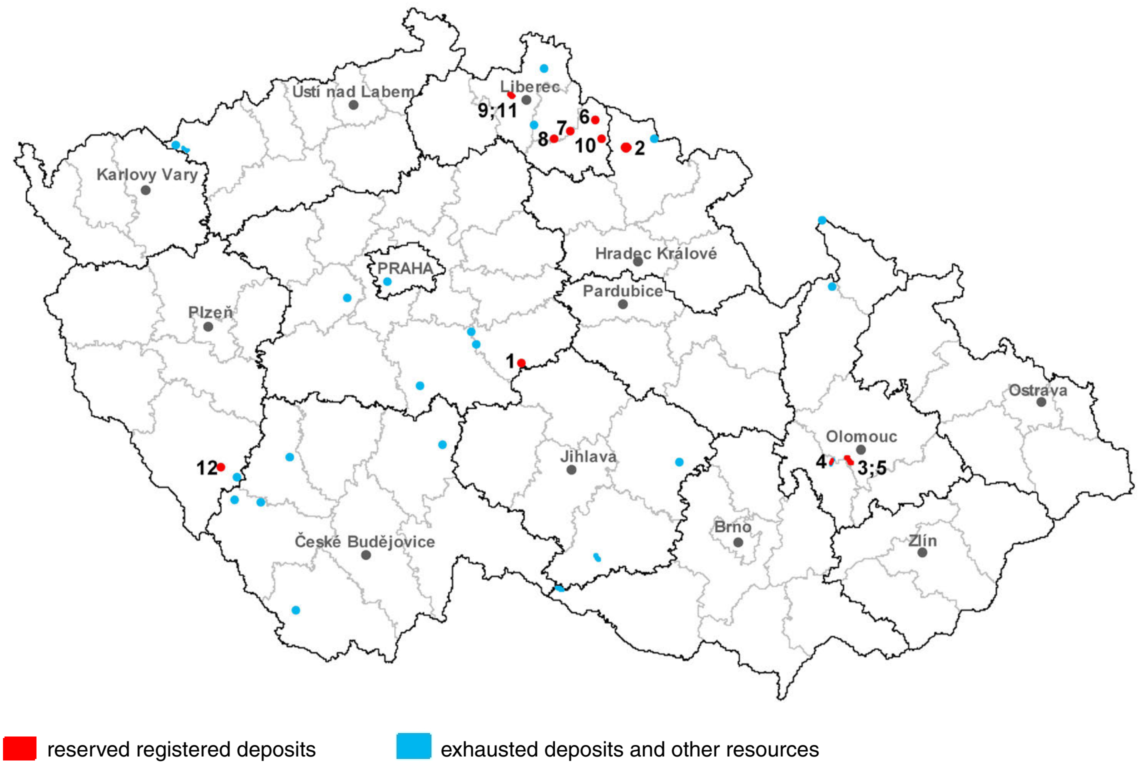
Prices of traded commodities (USD/t) according to IM

Commodity/Yeark	2013	2014	2015	2016	2017
US, calcined filter-aid grade, FOB plant	575–640	575–670	605–670	635–670	635–670
US, flux-calcined filter-aid grade, FOB plant	580–825	580–865	610–880	640–880	640–880

The price range includes the lowest and highest monthly price quotes for a given year.

Dolomite

1. Registered deposits and other resources of the Czech Republic



Principal areas of deposits presence:

(Names of exploited deposits are in ***bold type)***

1 **Bohdaneč**	5 Hněvotín	9 Kryštofovo Údolí
2 **Lánov**	6 Horní Rokytnice	10 Křížlice
3 Bystročice	7 Jesenný-Skalka	11 Machnín-Karlov pod Ještědem
4 Čelechovice na Hané	8 Koberovy	12 Podmokly

2. Basic statistical data of the Czech Republic as of December 31

Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number	12	12	12	12	12
exploited	2	2	2	2	2
Total mineral *reserves, kt	526 826	526 376	525 936	524 464	525 046
economic explored reserves	85 316	84 866	84 426	83 872	83 536
economic prospected reserves	348 288	348 288	348 288	348 288	348 288
potentially economic reserves	93 222	93 222	93 222	93 222	93 222
exploitable (recoverable) reserves	12 212	11 770	11 320	10 879	10429
Mine production, kt	392	449	451	440	450

** See **NOTE** in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic** of this yearbook*

Approved prognostic resources P_1, P_2, P_3

Year		2013	2014	2015	2016	2017
P_1,	kt	23 946	23 946	23 946	23 946	23 946
P_2		–	–	–	–	–
P_3		–	–	–	–	–

3. Foreign trade

2518 – Dolomite calcined, roughly trimmed or cut; agglomerated

		2013	2014	2015	2016	2017
Import	t	433 785	408 916	444 044	390 592	452 305
Export	t	77	39	86	176	133

2518 – Dolomite calcined, roughly trimmed or cut; agglomerated

		2013	2014	2015	2016	2017
Average import prices	CZK/t	299	254	260	251	252
Average export prices	CZK/t	2 599	16 098	8 220	5 972	5 747

4. Prices of domestic market

Average domestic prices of traded commodities

Product specification	2013	2014	2015	2016	2017
Dolomite aggregates, CZK/t	200–371	205–380	185–357	265–435	406–499
Ground calcitic dolomite, bulk, CZK/t	634–695	634–695	634–695	674–723	729
Ground calcitic dolomite, bagged, CZK/t	1 615	1 620	1 625	1 625	1 675–1 800

5. Mining companies in the Czech Republic as of December 31, 2017

Krkonošské vápenky Kunčice, a.s.
UNIKOM, a.s., Kutná Hora

6. World production and world market prices

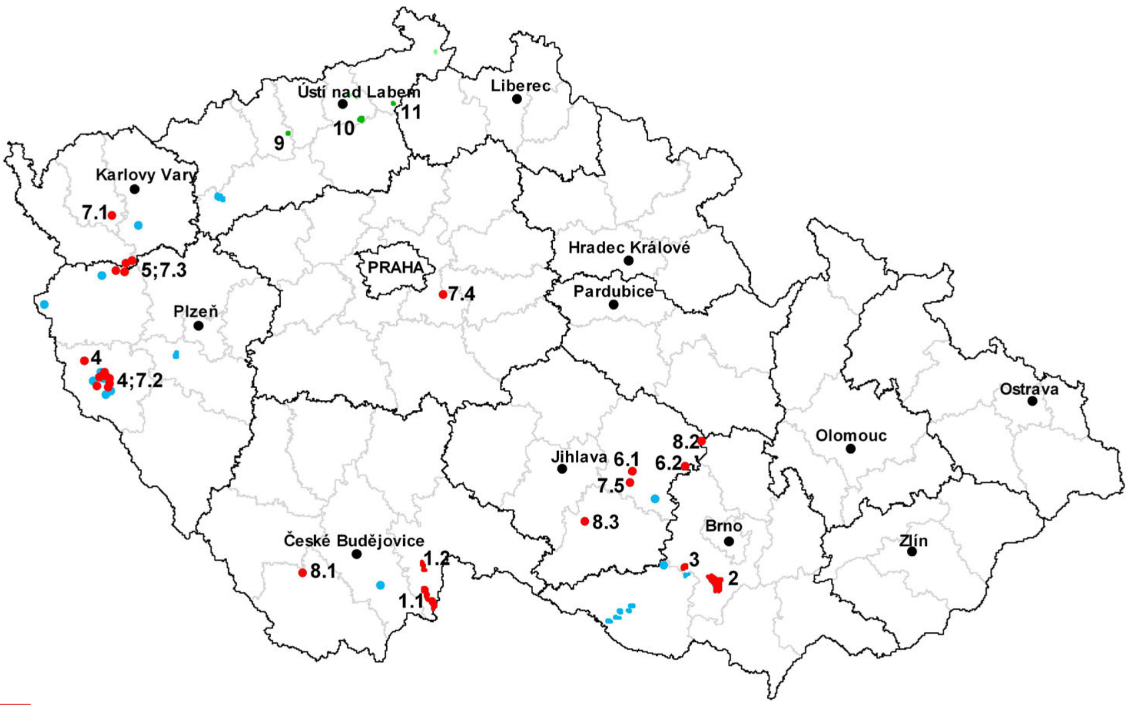
World mine production

World dolomite production is not listed in the statistics. Even though dolomite is considered to be a main potential source of magnesium in the lithosphere, it is currently not used for the production of magnesium. Otherwise, calcined dolomite with a minimum magnesium content of 8 % is suitable for this purpose.

World dolomite prices are not included in international overviews.

Feldspar

1. Registered deposits and other resources of the Czech Republic



reserved registered deposits
exhausted deposits and other resources
feldspar mineral substitutes (reserved registered exploited deposit and and other resources)

Feldspar minerals:

*(Names of exploited deposits are in **bold type**)*

1 Sediments of the Lužnice River region:
- 1.1 **Halámky**
- 1.2 Dvory nad Lužnicí – Tušť
- 1.1 Krabonoš
- 1.2 Majdalena
- 1.1 Tušť – Halámky

2 Sediments of the Jihlava River (the Syrovice-Ivaň Terrace):
- 2 **Bratčice**
- 2 **Hrušovany u Brna**
- 2 **Hrušovany u Brna – Protlas**
- 2 **Ledce – Hrušovany u Brna**
- 2 Medlov
- 2 Medlov – Smolín
- 2 Smolín – Žabčice

3 Sediments of the Jihlava River (the Ivančice region):
- 3 Ivančice – Němčice

4 Pegmatites (the Poběžovice--Domažlice region):
- 4 **Luženičky**
- 4 **Ždánov**
- 4 Bozdíš
- 4 Luženičky – NE
- 4 Meclov 2
- 4 Meclov – Airport
- 4 Meclov – West
- 4 Mutěnín
- 4 Ohnišťovice – Za Kulichem

5 Pegmatites (the Teplá region):
- 5 Beroun – Tepelsko
- 5 Křepkovice – Nezdice
- 5 Zhořec 1
- 5 Zhořec 2 – Hanov zone

6 Pegmatites (the western Moravia region):
- 6.1 Bory – Olší
- 6.2 Smrček

7 Granitoids:
- 7.1 **Krásno – Vysoký kámen**
- 7.2 **Mračnice**
- 7.3 Hanov u Lestkova
- 7.4 Štíhlice
- 7.5 Velké Meziříčí – Lavičky

8 Others:
- 8.1 Chvalšiny
- 8.2 Malé (Velké) Tresné
- 8.3 Markvartice u Třebíče

Feldspar mineral substitutes (nepheline phonolites):

9 **Želenice**	10 Tašov-Rovný	11 Valkeřice-Zaječí vrch

2. Basic statistical data of the Czech Republic as of December 31

Feldspar
Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number	37	36	36	39	39
exploited	9	9	9	9	9
Total mineral *reserves, kt	70 184	69 729	69 271	76 476	76 063
economic explored reserves	25 889	25 456	25 048	24 593	24 415
economic prospected reserves	30 815	30 793	31 052	36 185	36 162
potentially economic reserves	13 480	13 480	13 171	15 698	15 698
exploitable (recoverable) reserves	24 299	23 887	28 041	22 981	22 872
Mine production, kt	411	412	433	454	368

** See* ***NOTE*** *in the chapter* ***Introduction*** *above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter* ***Mineral reserve and resource classification in the Czech Republic*** *of this yearbook*

Approved prognostic resources P_1, P_2, P_3

Year	2013	2014	2015	2016	2017
P_1, kt	48 530	48 530	48 530	48 530	48 530
P_2	–	–	–	–	–
P_3	–	–	–	–	–

Number of deposits; reserves; mine production
Feldspar substitutes (nepheline phonolites)

Year	2013	2014	2015	2016	2017
Deposits – total number	3	3	3	3	3
exploited	1	1	1	1	1
Total mineral *reserves, kt	199 876	199 859	199 838	199 807	199 773
economic explored reserves	0	0	0	0	0
economic prospected reserves	199 876	199 859	199 838	199 838	199 773
potentially economic reserves	0	0	0	0	0
exploitable (recoverable) reserves	24 306	24 289	24 269	24 237	24 203
Mine production, kt	15	17	21	31	34

** See **NOTE** in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic** of this yearbook*

Approved prognostic resources P_1, P_2, P_3

Year		2013	2014	2015	2016	2017
P_1		–	–	–	–	–
P_2,	kt	30 300	30 300	30 300	30 300	30 300
P_3		–	–	–	–	–

3. Foreign trade

252910 – Feldspar

		2013	2014	2015	2016	2017
Import	t	5 946	5 575	5 325	6 341	9 373
Export	t	173 282	164 127	177 722	208 227	223 768

252910 – Feldspar

		2013	2014	2015	2016	2017
Average import prices	CZK/t	1 962	3 633	3 596	3 537	2 506
Average export prices	CZK/t	1 045	1 262	1 260	1 186	1 044

252930 – Leucite, nepheline and nepheline syenite

		2013	2014	2015	2016	2017
Import	t	2 338	3 250	3 192	2 986	3 421
Export	t	3	1	1	5	2

252930 – Leucite, nepheline and nepheline syenite

		2013	2014	2015	2016	2017
Average import prices	CZK/t	6 802	7 089	6 794	6 654	6 315
Average export prices	CZK/t	12 830	13 844	11 024	10 977	9 114

4. Prices of domestic market

Feldspars are sold domestically for CZK 97–4 800 per tonne depending on their chemism and usage.

5. Mining companies in the Czech Republic as of December 31, 2017

Feldspar
KMK GRANIT, a.s., Krásno
LB MINERALS, s.r.o., Horní Bříza
Družstvo DRUMAPO, Němčičky
Moravia Tech, a.s., Brno
České štěrkopísky spol. s r.o., Praha

Feldspar substitutes
KERAMOST, a.s., Most

6. World production and world market prices

World mine production

The data on world feldspar production and on the production of countries from various sources differ considerably:

Year	2013	2014	2015	2016	2017[e]
World mine production of feldspar (according to MCS), kt	21 200	20 000	22 700	23 600	23 000
World mine production of feldspar (according to WBD), kt	35 107.8	29 510.1	30 513.1	29 864.0	N

e – preliminary values

Main producers according to MCS

2017^{e}		
country	**kt**	**%**
Turkey	5 500	23.9
Italy	3 500	15.2
China	3 500	15.2
India	1 500	6.5
Thailand	1 300	5.7
Iran	1 000	4.3
Poland	600	2.6
Spain	600	2.6
South Korea	600	2.6
USA	530	2.3
world	**23 000**	**100.0**

e – preliminary values

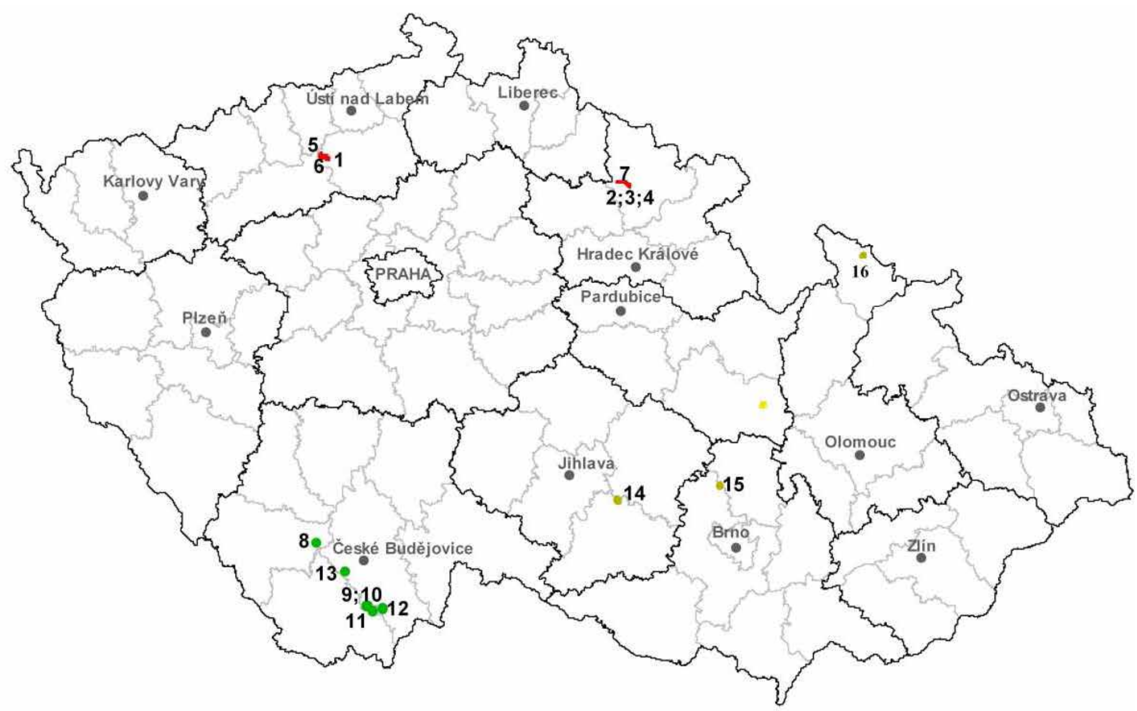
Prices of traded commodities (USD/t) (according to IM)

Commodity/Year		2013	2014	2015	2016	2017
Turkish Na feldspar, crude, max. 10 mm size bulk, FOB Gulluk	USD/t	22–23	22–23	22–23	22–23	22–23
Turkish, Na feldspar, glass grade, max. 500 microns, bagged, FOB Gulluk	USD/t	70	70	70	70	70
Ceramic grade South African, bagged, FOB Durban	USD/t	N	168	168	168–176	168–176
Ceramic grade, 170–200 mesh, (Na), bagged, ex-works USA	USD/st	N	150–180	150–180	150–180	150–180
Na feldspar, floated –150 microns, bagged, FOB Gulluk, Turkey	USD/t	N	53–55	53–55	53–55	53–55
Na feldspar, floated –500 microns, bulk, FOB Gulluk, Turkey	USD/t	N	38–40	38–40	38–40	38–40

The price range includes the lowest and highest monthly price quotes for a given year.

Gemstones

1. Registered deposits and other resources of the Czech Republic



- reserved registered deposits of pyrope-bearing rock
- exhausted deposits and other resources of pyrope-bearing rock
- reserved registered deposits of moldavite-bearing rock
- exhausted deposits and other resources of moldavite-bearing rock
- reserved registered deposits of other gemstones
- exhausted deposits and other resources of other gemstones

Pyrope-bearing rock:	**Moldavite-bearing rock:**	**Other gemstones:**
1 **Podsedice-Dřemčice**	8 **Hrbov u Lhenic**	14 Bochovice *
2 Dolní Olešnice	9 **Chlum nad Malší-východ**	15 Rašov **
3 Horní Olešnice 1	10 **Ločenice-Chlum**	16 Velká Kraš***
4 Horní Olešnice 2	11 Besednice	
5 Linhorka-Staré	12 Slavče-sever	
6 Třebívlice	13 Vrábče-Nová Hospoda	
7 Vestřev		

** amethyst, ** opal, ***gem varieties of quartz*

*(Names of mined deposits are indicated in **bold type**)*

2. Basic statistical data of the Czech Republic as of December 31

Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number [a)]	15	13	16	16	13
exploited [b)]	3	3	3	3	3
Total mineral *reserves, kt [a)]	19 443	19 425	19 408	19 400	19 366
economic explored reserves	3 260	3 242	3 225	3 217	3 183
economic prospected reserves	13 002	13 002	13 002	13 002	13 002
potentially economic reserves	3 181	3 181	3 181	3 181	3 181
exploitable (recoverable) reserves	1 148	1 066	3 960	2 982	1 415
Total mineral *reserves, m^3 [c)]	686 591	641 561	574 348	510 977	434 592
economic explored reserves	141 638	130 310	114 511	95 605	43 025
economic prospected reserves	541 854	508 152	456 738	415 372	388 468
potentially economic reserves	3 099	3 099	3 099	3 099	3099
exploitable (recoverable) reserves	636 789	591 759	524 546	464 274	291 406
Total mineral *reserves, kt (1 m^3 = 1.8 t) [c)]	1 236	1155	1 034	925	782
economic explored reserves	255	235	206	96	77
economic prospected reserves	975	915	822	415	388
potentially economic reserves	6	3	6	3	3
exploitable (recoverable) reserves	1146 220	1 065 166	944 183	835 692	692 622
Mine production, kt [a)]	16	18	17	8	34
Mine production, ths m^3 [c)]	41	45	67	71	54
Mine production, kt [c)] (1 m^3 = 1.8 t)	74	81	120	128	97

** See __NOTE__ in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic** of this yearbook*

[a)] *pyrope-bearing rock*

[b)] *one deposit of pyrope and two deposits of moldavite*

[c)] *moldavite-bearing rock*

Approved prognostic resources P_1, P_2, P_3

Year			2013	2014	2015	2016	2017
P_1,			–	–	–	–	–
P_2,	a)	t	100	100	100	100	100
P_2,	b)	kt	749	749	749	749	749
P_2,	c)	ths m^3	66	66	66	66	66
P_2,	c)	kt	119	118	118	118	118
P_3			–	–	–	–	–

Notes: [a] jasper, [b] pyrope-bearing rock, [c] moldavite-bearing rock

3. Foreign trade

7102 – Diamonds, whether or not worked, but not mounted or set

		2013	2014	2015	2016	2017
Import	kg	636	480	243	248	9 157
Export	kg	444	380	167	61	155

7102 – Diamonds, whether or not worked, but not mounted or set

		2013	2014	2015	2016	2017
Average import prices	CZK/kg	543 657	952 238	825 524	904 798	25 234
Average export prices	CZK/kg	339 054	868 734	645 772	965 033	329 884

7103 – Precious (other than diamond) and semi-precious stones, whether or not worked or graded but not strung, mounted or set

		2013	2014	2015	2016	2017
Import	kg	249 855	216 981	311 215	399 913	151 617
Export	kg	1 135	6 591	65 986	66 371	71 058

7103 – Precious (other than diamond) and semi-precious stones, whether or not worked or graded but not strung, mounted or set

		2013	2014	2015	2016	2017
Average import prices	CZK/kg	282	1 300	244	283	354
Average export prices	CZK/kg	9 980	3 570	813	965	729

251320 – Emery, natural corundum, natural garnet and other natural abrasives

		2013	2014	2015	2016	2017
Import	t	3 103	3 478	4 779	4 559	4 336
Export	t	339	184	149	133	213

251320 – Emery, natural corundum, natural garnet and other natural abrasives

		2013	2014	2015	2016	2017
Average import prices	CZK/t	6 638	6 809	6 495	6 889	7 266
Average export prices	CZK/t	54 923	86 332	88 991	84 203	53 849

4. Prices of domestic market

The international gemstone trade is currently so globalized that no substantial price differences exist anywhere in the world including the Czech Republic. The only difference is that rather lower-quality gemstones are imported due to lower purchasing power as well as to less experienced jewellers and customers; high-quality gemstones in the Czech market are rare.

Company Granát, cooperative of art manufacturing in Turnov, purchased Czech garnets (pyropes) under following conditions in 2017:

Purchase prices of raw Czech garnets by size classes:

Class	Screen size (mm)	Minimum thickness (mm)	Price CZK/g
IV.	2.6–2.9 mm	2.6 mm	10 CZK /g
III.	3.0–3.9 mm	2.6 mm	20 CZK /g
II.	4.0–4.9 mm	3.0 mm	50 CZK /g
I.	5.0–5.9 mm	3.5 mm	120 CZK /g
E0 and bigger	from 6.0 mm and more	4.5 mm	from 250 CZK /g

In the year 2017 Company Granát bought for the jewelery processing also moldavites (solid, intact stones) weighing from 1g to 10g and bought also the moldavite raw material (broken stones and fragments) for the cutting in a weight of 1g above and a minimum material thickness of 5 mm.

The actual purchase price of moldavites, depending on the size and quality of the stones, ranges from 32 to 55 CZK per gram.

Internet wholesales NATERSHOP.cz and MALACHIT-OBCHOD.cz offered moldavites in the following size–shape-number-price relations (each moldavite was packaged separately in a plastic box with its description):

Mine locality	Weight (g)	Number of pieces	Price (CZK)
Besednice *	0.57–0.92	1	270–440
	1.16–1.98	1	550–940
	1.99–2.45	1	945–1 100
	2.60–2.73	1	1 170–1 450
	3.3–4.54	1	1 520–1 950
	5.61–5.83	1	3 350–3 490
	6.03–7.81	1	3 650–4 990
	4.28–5.63	1	856–1 125
	6.73–7.18	1	1 275–1 435
	7.6–8.01	1	960–1600
	9.15	1	1 830
	9.62	1	1 925
	9.9	1	1 980
	11.23	1	2 245
Netolice	0.7–1.49	1	180–220
	1.53–2.32	1	230–350
	2.39–3.02	1	360–460
	3.36–6.40	1	495–712
	21.9	6	2 410
	24.4	7	2 590
Slavče	2.02–5.45	1	390–665

*Note: * moldavites from this locality are visually regarded as the best*

5. Mining companies in the Czech Republic as of December 31, 2017

Pyrope-bearing rock
Granát, družstvo umělecké výroby, Turnov

Moldavite-bearing rock
MAWE CK s.r.o., Český Krumlov
Monday Morning s.r.o., Praha

6. World production and world market prices

World production

Statistical data on gem-quality garnet production are not available. MCS overviews provide the following data on global production of industrial garnets in recent years:

	2013	2014	2015	2016	2017[e]
World production, t	1 660 000	1 660 000	1 690 000	1 540 000	1 100 000

e – preliminary value

World statistics include principally diamond mining, both gem-grade and industrial ones.

World gem-grade diamond production was as follows:

	2013	2014	2015	2016	2017[e]
World mine production (according to WBD), ths ct (ct = carat; 1 ct = 0.2 g)	76 063.4	75 741.8	76 377.1	75 696.4	N
World mine production (according to MCS), mil USD	70 600	71 200	70 900	73 400	73 000

e – preliminary values

Main producers according to MCS

2016		
Gem-quality diamonds		
country	**ths carats**	**%**
Russia	22 600	30.8
Botswana	14 400	19.6
Canada	13 000	17.7
Angola	8 120	11.1
South Africa	6 650	9.1
D.R. Congo	4 640	6.3
Namibia	1 720	2.3
Sierra Leone	439	0.6
Lesotho	439	0.6
Australia	280	0.4
world	**73 400**	**100.0**

2017[e]		
Gem-quality diamonds		
country	**ths carats**	**%**
Russia	23 000	31.5
Botswana	14 000	19.2
Canada	13 000	17.8
Angola	8 100	11.1
South Africa	6 700	9.2
D.R. Congo	4 600	6.3
Namibia	1 700	2.3
Sierra Leone	440	0.6
Lesotho	340	0.5
Australia	280	0.4
world	**73 000**	**100.0**

e – preliminary values

2016		
Industrial diamonds		
country	**ths carats**	**%**
D.R. Congo	19	30.6
Australia	14	22.6
Botswana	6	9.7
South Africa	2	3.2
Zimbabwe	2	3.2
world	**62**	**100.0**

2017e		
Industrial diamonds		
country	**ths carats**	**%**
D.R. Congo	19	30.6
Austrálie	14	22.6
Botswana	6	9.7
South Africa	2	3.2
Zimbabwe	2	3.2
world	**62**	**100.0**

e – preliminary values

World production of industrial diamonds was as follows:

	2013	2014	2015	2016	2017e
World production (according to WBD), ths carats	56 115.2	50 608.8	51 403.6	50 310.4	N
World production (according to MCS), ths carats	60 000	53 000	57 000	62 000	62 000

e – preliminary values

World market prices

Gemstone prices depend on the type, size, and quality of the stones while the price ranges are considerable.

Approximate price of diamonds: Global average price in USD per carat (plus five-year forecast). Does not include synthetic diamonds

Year	Average price USD/carat
2004	64
2005	66
2006	68
2007	71
2008	78
2009	69
2010	89
2011	115
2012	99
2013	108
2014	103
2015 (forecast by Paul Zimnisky)	103
2016 (forecast by Paul Zimnisky)	107
2017 (forecast by Paul Zimnisky)	114
2018 (forecast by Paul Zimnisky)	117
2019 (forecast by Paul Zimnisky)	120
2020 (forecast by Paul Zimnisky)	120

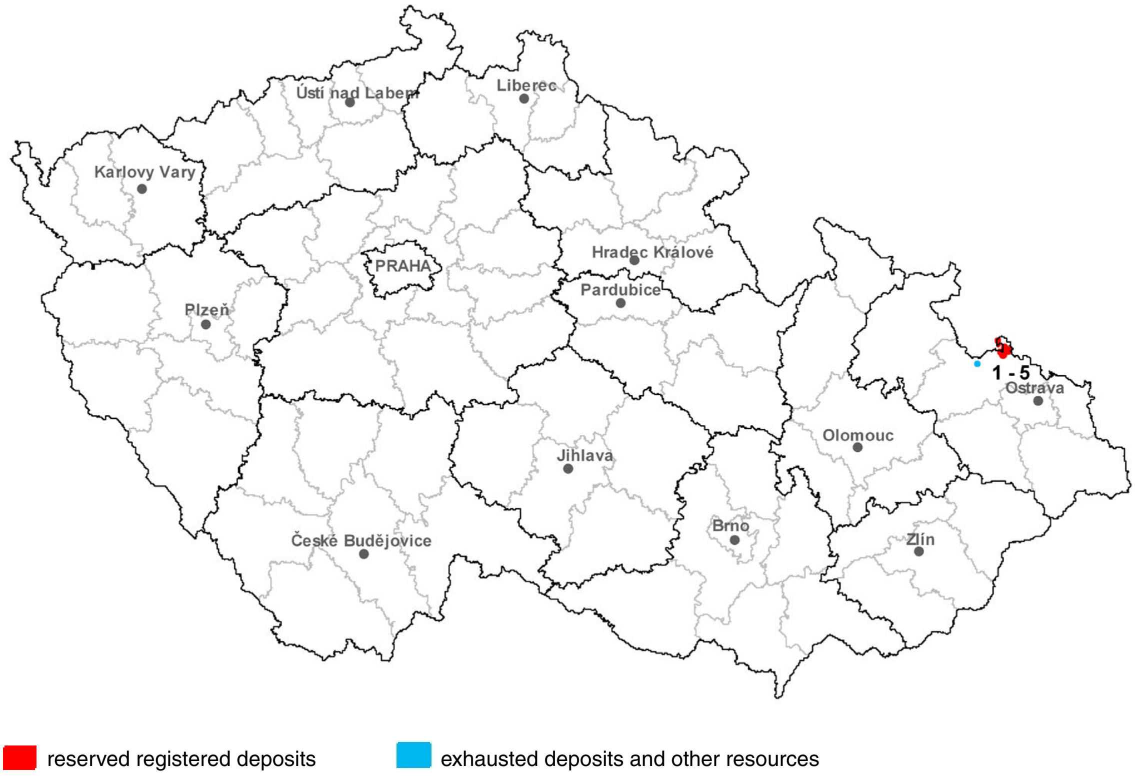
Source: Zimnisky P.(2015): Global diamond output to rise in 2015.-Mining Journal special publication-PDAC 2015, pp.17–18.

According to https://www.creditdonkey.com/diamond-prices.html following pricing points indicate where you get the best balance of price, quality, and beauty in a gem-quality diamond in 2018 (the actual price range is much wider):

Weight ct	Price USD
0.5	1 500
1.0	4 500–6 000
2.0	18 000–21 000

Gypsum

1. Registered deposits and other resources of the Czech Republic



1 **Kobeřice ve Slezsku-jih**	3 Rohov-Strahovice	5 Třebom
2 Kobeřice ve Slezsku-sever	4 Sudice	

*(Names of mined deposits are indicated in **bold type**)*

2. Basic statistical data of the Czech Republic as of December 31

Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number	5	5	5	5	5
exploited	1	1	1	1	1
Total mineral *reserves, kt	504 227	504 205	504 205	504 183	503 168
economic explored reserves	119 100	119 088	119 088	119 056	118 041
economic prospected reserves	302 990	302 990	302 990	302 990	302 990
potentially economic reserves	82 137	82 137	82 137	82 137	82 137
exploitable (recoverable) reserves	2 259	2 247	2 247	2 215	2 200
Mine production, kt	11	11	11	10	7

** See **NOTE** in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic** of this yearbook*

3. Foreign trade

252010 – Gypsum, anhydrite

		2013	2014	2015	2016	2017
Import	t	42 413	48 453	48 106	78 937	59 069
Export	t	70 706	88 861	118 047	89 138	81 208

252010 – Gypsum, anhydrite

		2013	2014	2015	2016	2017
Average import prices	CZK/t	2 396	2 419	2 070	1 464	2 236
Average export prices	CZK/t	174	185	225	46	45

4. Prices of domestic market

Average prices of traded commodities on the domestic market

	2013	2014	2015	2016	2017
mined gypsum, CZK/t	N	N	N	N	N
grey gypsum binder, bagged in 30 kgs, pallets, CZK/t	3 574	3 672	3 672	3 672	4 087
white gypsum binder, bagged in 30 kgs, paliets, CZK/t	6 044	6 210	6 210	6 210	6 913

5. Mining companies in the Czech Republic as of December 31, 2017

GYPSTREND s.r.o., Kobeřice

6. World production and world market prices

World mine production

Data on world production of primary gypsum in recent years:

	2013	2014	2015	2016	2017^e
World mine production of gypsum (according to MCS), kt	245 000	244 000	261 000	480 000	210 000
World mine production of gypsum (according to WBD), kt	163 428.3	164 400.1	164 136.9	174 640.4	N

e – preliminary values

Main producers according to WBD

2017^e		
country	**kt**	**%**
China	58 000	33.2
Iran	17 000	9.7
USA	15 715	9.0
Thailand	11 747	6.7
Turkey	10 124	5.8
Spain	8 771	5.0
Mexico	7 858	4.5
Oman	7 683	4.4
Italy	4 200	2.4
Russia	3 972	2.3
world	**174 640**	**100.0**

Main producers according to MCS

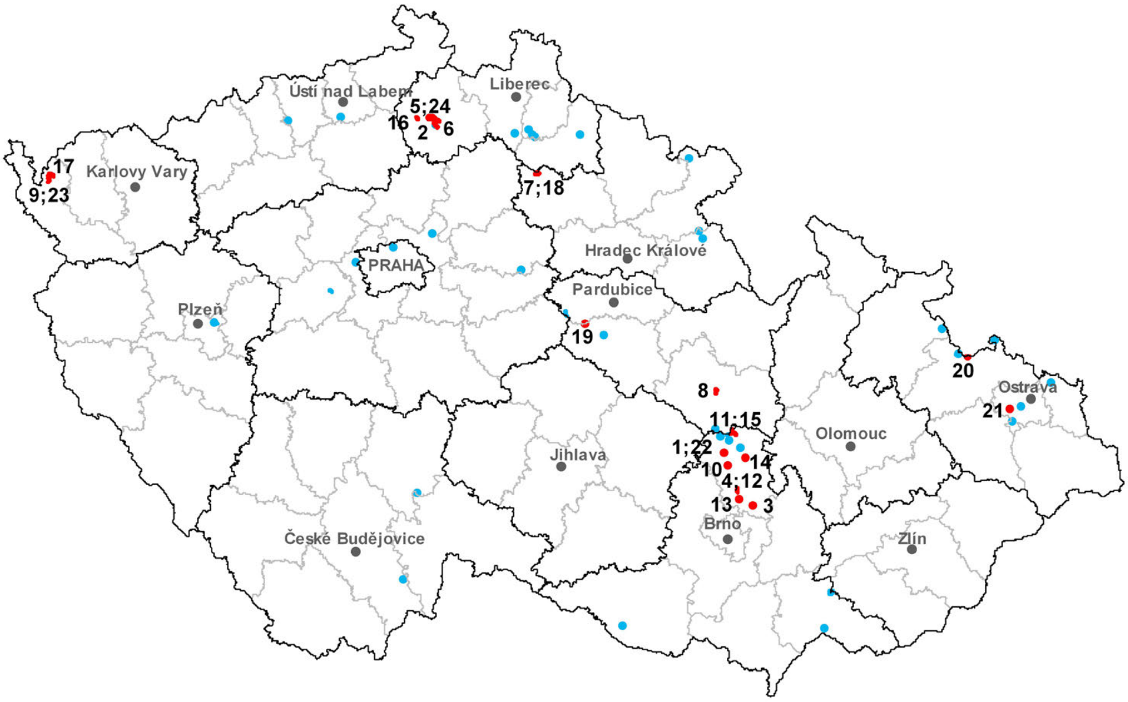
2017^e		
country	**kt**	**%**
China	130 000	50.0
Iran	17 500	6.7
USA	16 000	6.2
Turkey	11 000	4.2
Thailand	9 000	3.5
Italy	8 600	3.3
Spain	7 000	2.7
Oman	6 000	2.3
Mexico	4 700	1.8
Japan	4 400	1.7
world	**260 000**	**100.0**

e – preliminary values

There are no global indicative prices of gypsum.

Industrial sands

1. Registered deposits and other resources of the Czech Republic



reserved registered deposits exhausted deposits and other resources

1 **Nýrov****
2 Provodín*
3 **Rudice-Seč****
4 **Spešov-Dolní Lhota****
5 **Srní-Okřešice***
6 **Srní 2-Veselí***
7 **Střeleč***
8 **Svitavy-Vendolí****
9 **Velký Luh***
10 **Voděrady****
11 Babolky**
12 Blansko 1-Jezírka**
13 **Blansko 2-Mošna****
14 Boskovice-Chrudichromy**
15 Deštná-Dolní Smržov**
16 Holany**
17 Lomnička u Plesné**
18 Mladějov v Čechách*
19 Načešice**
20 Palhanec-Vávrovice**
21 Polanka nad Odrou**
22 Rudka-Kunštát**
23 Velký Luh 1**
24 Zahrádky-Srní**

* *deposits of glass and foundry sands*
** *deposits of foundry sands*

(Names of exploited deposits are in **bold type***)*

2. Basic statistical data of the Czech Republic as of December 31

Glass sand
Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number	6	6	6	6	6
exploited	4	4	4	4	4
Total mineral *reserves, kt	254 872	254 063	253 186	252 337	249 379
economic explored reserves	84 755	83 971	83 170	82 321	80 232
economic prospected reserves	25 077	25 077	25 077	25 077	24 415
potentially economic reserves	145 040	145 015	144 939	144 939	144 847
exploitable (recoverable) reserves	78 429	77 789	76 914	76 093	76 612
Mine production, kt	862	734	812	801	755

** See **NOTE** in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic** of this yearbook*

Approved prognostic resources P_1, P_2, P_3

Year		2013	2014	2015	2016	2017
P_1,	kt	0	0	0	0	0
P_2,	kt	14 927	14 927	14 927	14 927	14 927
P_3		–	–	–	–	–

Foundry sand
Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number	23	25	25	25	25
exploited	8	7	8	8	8
Total mineral *reserves, kt	408 726	408 071	407 488	406 935	409 489
economic explored reserves	127 937	127 394	126 901	126 366	126 323
economic prospected reserves	133 377	133 370	133 360	133 342	136 319
potentially economic reserves	147 412	147 307	147 227	147 227	146 732
exploitable (recoverable) reserves	78 250	77 778	77 303	76 774	76612
Mine production, kt	412	603	535	521	556

** See **NOTE** in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic** of this yearbook*

Approved prognostic resources P_1, P_2, P_3

Year		2013	2014	2015	2016	2017
P_1,	kt	15 157	15 157	15 157	15 157	15 157
P_2,	kt	14 723	14 723	14 723	14 723	14 723
P_3		–	–	–	–	–

3. Foreign trade

250510 – Silica sands and quartz sands

		2013	2014	2015	2016	2017
Import	t	267 037	263 025	254 669	259 316	263 278
Export	t	388 054	370 169	395 217	434 836	485 914

250510 – Silica sands and quartz sands

		2013	2014	2015	2016	2017
Average import prices	CZK/t	292	691	790	868	855
Average export prices	CZK/t	561	497	592	467	444

7001 – Cullet and other waste and scrap of glass; glass in the mass

		2013	2014	2015	2016	2017
Import	t	133 440	168 023	188 212	173 488	205 167
Export	t	8 864	11 469	17 120	39 182	29 191

7001 – Cullet and other waste and scrap of glass; glass in the mass

		2013	2014	2015	2016	2017
Average import prices	CZK/t	1 933	1 949	1 882	1 927	1 670
Average export prices	CZK/t	1 976	1 189	870	1 240	1 291

4. Prices of domestic market

Prices of industrial sands are not open to public.

5. Mining companies in the Czech Republic as of December 31, 2017

Glass sand
Sklopísek Střeleč, a.s., Mladějov
Provodínské písky a.s., Provodín
LB MINERALS, s.r.o., Horní Bříza

Foundry sand
Provodínské písky a.s., Provodín
Sklopísek Střeleč, a.s., Mladějov
LB MINERALS, s.r.o., Horní Bříza
SEDOS doprava a.s., Drnovice
Kalcit s.r.o., Brno
PEDOP s.r.o., Lipovec
SETRA s.r.o., Brno

6. World production and world market prices

World mine production

The published statistics on the production of industrial sand do not distinguish between glass and foundry sands. Their total production has developed as follows in recent years:

	2013	2014	2015	2016	2017[e]
Industrial sands (according to MCS), kt	141 000	196 000	181 000	180 000	210 000

e – preliminary values

Main producers according to MCS

2017[e]		
country	**kt**	**%**
USA	105 000	50.0
Italy	13 900	6.6
Malaysia	10 400	5.0
France	8 800	4.2
Turkey	8 000	3.8
India	8 000	3.8
Germany	7 500	3.6
Spain	6 300	3.0
United Kingdom	4 000	1.9
Australia	3 000	1.4
world	**210 000**	**100.0**

e – preliminary values

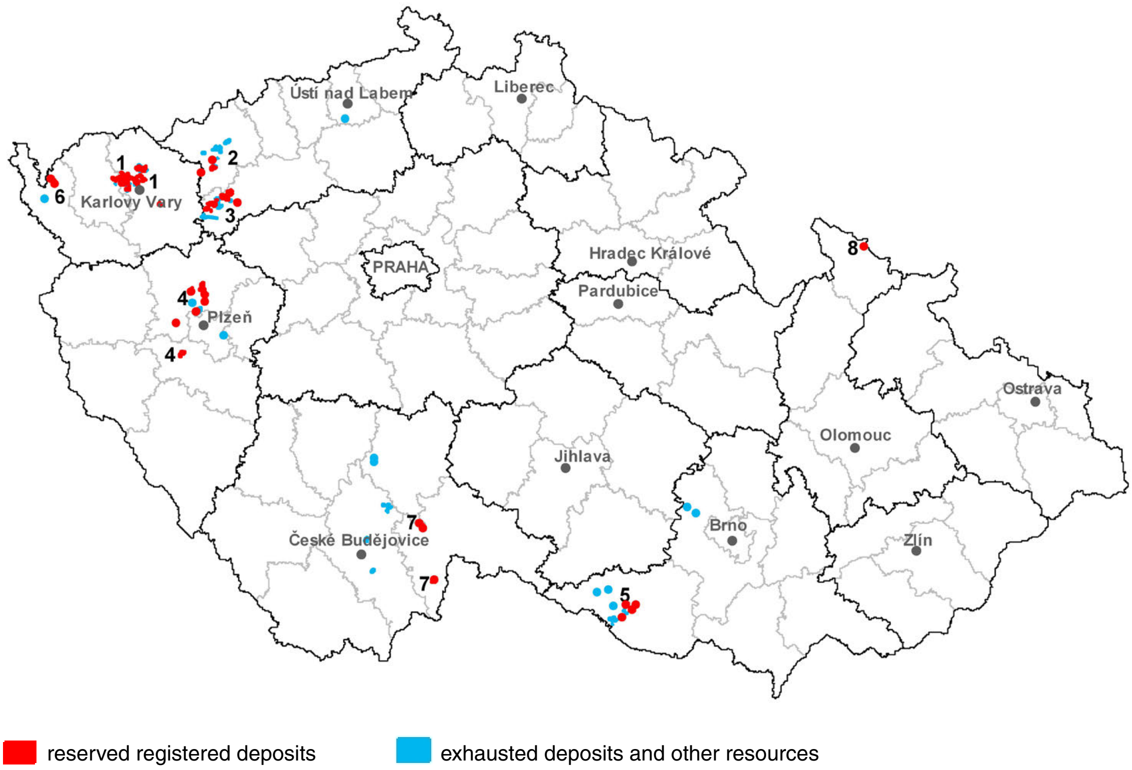
Prices of traded commodities – silica sand (according to IM)

Commodity/Year		2013	2014	2015	2016	2017
SiO_2 sand, minus 20 micron, bagged, > 92 brightness, FOB Durban	USD/t	295	295	300–375	300–375	300–375
Glass sand, container, ex–works USA	GBP/t	20–26	20–26	27–30	27–30	27–30

The price range includes the lowest and highest monthly price quotes for a given year.

Kaolin

1. Registered deposits and other resources of the Czech Republic



Major deposit areas:

*(Names of areas with exploited deposits are in **bold**)*

1 **Karlovy Vary Region**
2 **Kadaň Region**
3 **Podbořany Region**
4 **Plzeň Region**
5 Znojmo Region
6 Cheb Basin
7 Třeboň Basin
8 Vidnava

2. Basic statistical data of the Czech Republic as of December 31

Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number	70	71	71	71	71
exploited	15	15	15	15	15
Total mineral *reserves, kt	1 191 129	1 189 075	1 180 891	1 175 592	1 171 402
economic explored reserves	225 092	231 203	225 756	221 720	217 351
economic prospected reserves	506 010	499 854	499 669	498 980	499 514
potentially economic reserves	460 027	458 018	455 466	454 892	454 537
exploitable (recoverable) reserves	98 199	104 177	98 842	95 400	92 037
Mine production, kt [a)]	3 108	3 281	3 454	3 543	3669
Beneficiated (water-washed) kaolin production, kt	609	617	644	648	676

** See **NOTE** in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic** of this yearbook*
[a)] Raw kaolin, total production of all technological grades

Approved prognostic resources P_1, P_2, P_3

Year		2012	2013	2014	2015	2016
P_1,	kt	29 708	25 115	25 115	25 115	17 197*
P_2,	kt	4 998	–	–	–	–
P_3		–	–	–	–	–

*Note: * Kaolin for ceramics manufacturing*

The data of kaolin for production of porcelain and fine ceramics and kaolin used as fillers in paper industry have been stated separately due to great varieties of end use and prices of the individual kaolin types.

Number of deposits; reserves; mine production

Kaolin for production of porcelain and fine ceramics	2013	2014	2015	2016	2017
Deposits – total number	30	30	30	30	30
exploited	7	7	7	7	7
Total mineral *reserves, kt	252 089	250 856	251 667	245 550	245 209
economic explored reserves	49 242	49 009	48 700	48 432	48 094
economic prospected reserves	111 713	110 713	111 713	107 617	107 617
potentially economic reserves	91 134	91 134	91 254	89 501	89 498
exploitable (recoverable) reserves	17 122	16 851	16 545	16 340	16 086
Mine production, kt [a)]	308	279	290	254	304

** See **NOTE** in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic** of this yearbook*

[a)] Exploited deposits: Božičany-Osmosa-jih, Jimlíkov, Krásný Dvůr-Podbořany, Mírová, Podlesí 2, Podlesí-Čapí hnízdo, Ruprechtov

Number of deposits; reserves; mine production

Kaolin for paper industry	2013	2014	2015	2016	2017
Deposits – total number	25	25	25	26	26
exploited	7	7	7	7	7
Total mineral *reserves, kt	294 576	292 385	290 775	289 209	287 352
economic explored reserves	52 228	54 589	53 046	51 591	49 765
economic prospected reserves	183 929	179190	179 190	179 190	179 190
potentially economic reserves	58 419	58 606	58 539	58 428	58 397
exploitable (recoverable) reserves	31 319	34 638	33 283	32 116	30 878
Mine production, kt [a)]	851	1 021	1 167	1 238	1 420

** See **NOTE** in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic** of this yearbook*

[a)] Exploited deposits: Horní Bříza-Trnová, Chlumčany-Dnešice, Kaznějov-jih, Lomnička-Kaznějov, Otovice-Katzenholz, Rokle

3. Foreign trade

2507 – Kaolin and other kaolinic clays, whether or not calcined

		2013	2014	2015	2016	2017
Import	t	15 848	16 758	18 641	22 162	26 670
Export	t	504 180	504 709	539 738	541 051	557 456

2507 – Kaolin and other kaolinic clays, whether or not calcined

		2013	2014	2015	2016	2017
Average import prices	CZK/t	4 567	4 640	4 951	4 838	4 246
Average export prices	CZK/t	2 925	2 955	2 921	2 852	2 806

25070020 – Kaolin

		2013	2014	2015	2016	2017
Import	t	11 777	12 165	13 259	16 871	19 720
Export	t	503 580	504 509	539 647	540 532	557 456

25070020 – Kaolin

		2013	2014	2015	2016	2017
Average import prices	CZK/t	4 959	5 182	5 768	5 396	4 602
Average export prices	CZK/t	2 923	2 954	2 920	2 848	2 802

25070080 – Kaolinic clay (other than kaolin)

		2013	2014	2015	2016	2017
Import	t	4 071	4 593	5 202	5 291	6 959
Export	t	503 580	504 509	539 647	540 532	286

25070080 – Kaolinic clay (other than kaolin)

		2013	2014	2015	2016	2017
Average import prices	CZK/t	3 434	3 259	2 911	3 060	3 236
Average export prices	CZK/t	2 923	2 954	2 920	2 848	9 110

4. Prices of domestic market

Average prices of traded kaolin on the domestic market

Product specification	2013	2014	2015	2016	2017
Ceramic grade kaolin, CZK/t	2 000–3 000	2 200–3 000	2 200–3 000	2 200–3 000	2 200–3 000
Paper grade kaolin, CZK/t	2 100–3 400	2 100–3 500	2 100–3 500	2 100–3 500	2 100–3 500
Beneficiated kaolin from Podbořany KD, CZK/t	N	N	N	N	N
Kaolin for manufacture of fine porcelain and glazes, CZK/t	2 600–4 600	3 000–4 800	3 000–4 800	3 000–4 800	3 000–4 800
Activated kaolin from Podbořany KDA, CZK/t	N	N	N	N	N

5. Mining companies in the Czech Republic as of December 31, 2017

Kaolin for manufacture of porcelain and fine ceramics
Kaolin Hlubany, a.s.
Sedlecký kaolin a.s., Božičany
KSB s.r.o., Božičany

Kaolin for ceramics manufacturing
LB MINERALS, s.r.o., Horní Bříza
Sedlecký kaolin a.s., Božičany
KSB s.r.o., Božičany

Kaolin for paper industry
LB MINERALS, s.r.o., Horní Bříza
KERAMOST, a.s., Most
Sedlecký kaolin a.s., Božičany

Titanium-bearing kaolin
Sedlecký kaolin a.s., Božičany

Feldspar-bearing kaolin
In 2017 there were no companies mining feldspar-bearing kaolin on the territory of the Czech Republic

6. World production and world market prices

World mine production

World kaolin production in recent years was as follows:

	2013	2014	2015	2016	2017e
World mine production (according to MCS), kt	40 3 00	33 500e	36 400	35 500	37 000
World mine production (according to WBD), kt	38 411.7	38 479.5	38 585.1	38 985.4	N

e – preliminary values

Main producers according to WBD

2016		
country	**kt**	**%**
China	7 240	18.6
USA	5 170	13.3
Germany	4 740	12.2
India	4 110	10.5
Czech Republic	3 540	9.1
Ukraine	2 335	6.0
Brazil	1 917	4.9
Turkey	1 283	3.3
United Arab Emirates	1 020	2.6
Iran	868	2.2
world	**38 985**	**100.0**

Main producers according to MCS

2017^{e}		
country	**kt**	**%**
USA	5 500	14.9
Germany	4 300	11.6
India	4 100	11.1
Czech Republic	3 500	9.5
China	3 200	8.6
Brazil	2 100	5.7
Turkey	1 900	5.1
Ukraine	1 800	4.9
United Arab Emirates	1 000	2.7
Iran	790	2.1
world	**37 000**	**100.0**

2016		
country	**kt**	**%**
USA	5 170	14.6
Germany	4 300	12.1
India	4 110	11.6
Czech Republic	3 450	9.7
China	3 200	9.0
Brazil	2 100	5.9
Turkey	1 890	5.3
Ukraine	1 820	5.1
United Arab Emirates	1 010	2.8
Iran	791	2.2
world	**35 500**	**100.0**

e – preliminary values

As for the order of producers according to the two sources, the major inconsistencies commented on in previous yearbooks were removed in 2014. The biggest differences occurred in the data on production of kaolin in Iran. According to MCS statistics, Iran was on the 7th place both in 2014 and 2015. In WBD statistics Iran is eleventh with the share of 2.3%.

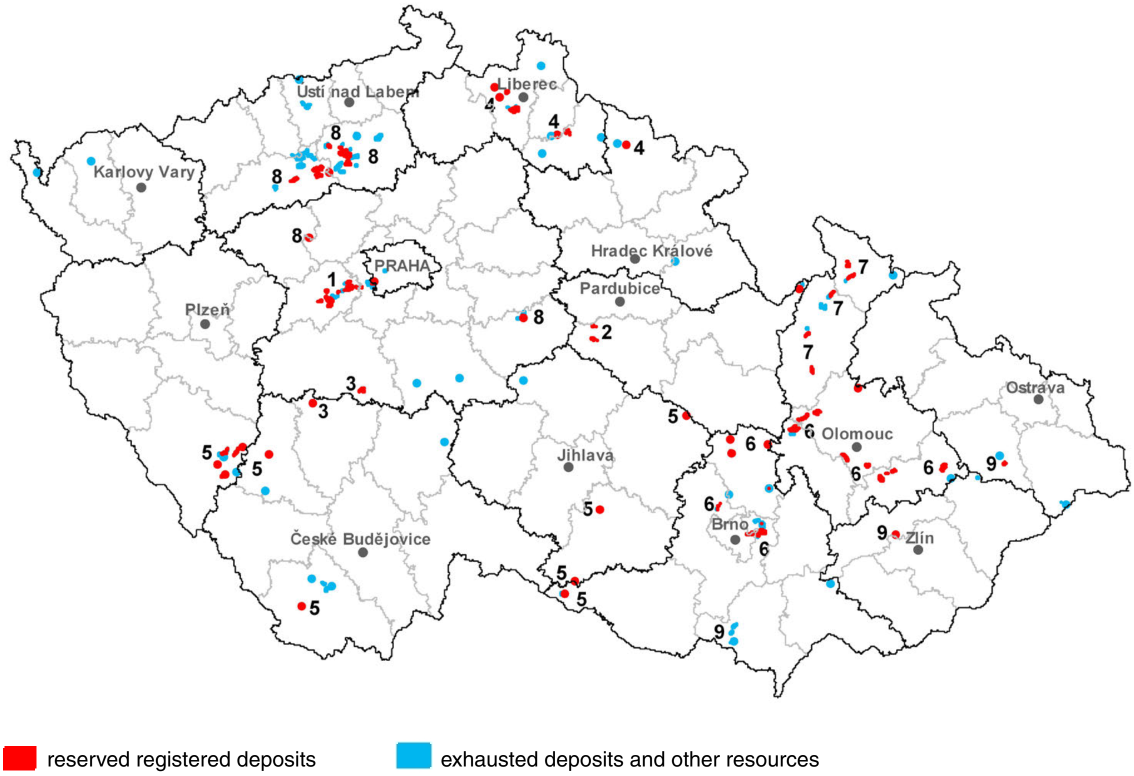
Prices of traded commodities (according to IM)

Commodity/Year		2013	2014	2015	2016	2017
№ 1 paper coating grade, Ex-Georgia plant	USD/st	144–207	130–207	137–190	147–203	147–203
№ 2 paper coating grade, Ex-Georgia plant	USD/st	112–173	112–185	118–185	126–198	126–198

Note: st – short ton; 1 st = 0,9072 t
The price range includes the lowest and highest monthly price quotes for a given year.

Limestones and corrective additives for cement production

1. Registered deposits and other resources of the Czech Republic



Major deposit areas:

*(Names of areas with exploited deposits are in **bold**)*

1 **Devonian of the Barrandian**

2 **Paleozoic of the Železné hory Mts.**

3 **Central Bohemian Islet Zone**

4 **Krkonoše Mts.-Jizerské hory Mts. Crystalline Complex**

5 **South-Bohemian and Moravian Moldanubicum**

6 **Moravian Devonian**

7 **Silesicum (Branná Group), Orlické hory Mts.-Kladsko Crystalline Complex and Zábřeh Group**

8 **Bohemian Cretaceous Basin**

9 **Outer Klippen Belt of the Western Carpathians**

2. Basic statistical data of the Czech Republic as of December 31

Limestones – total number
Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number	85	85	85	85	85
exploited	22	22	22	22	22
Total mineral *reserves, kt	4 232 061	4 053 524	4 757 736	4 105 042	4 728 765
economic explored reserves	1 710 231	1 694 225	1 983 957	1 916 799	2 024 489
economic prospected reserves	1 776 915	1 600 932	1 894 356	1 737 433	1 814 997
potentially economic reserves	744 752	758 367	879 423	755 003	889 279
exploitable (recoverable) reserves	1 335 540	1 326 321	1 514 091	1 342 816	932 830
Mine production, kt	9 269	10 041	10 568	10 995	10 787

** See **NOTE** in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic** of this yearbook*

Limestones – total number
Approved prognostic resources P_1, P_2, P_3

Year		2013	2014	2015	2016	2017
P_1,	kt	82 489	82 489	82 489	76 667	76 667
P_2,	kt	350 957	350 957	350 957	350 957	350 957
P_3		–	–	–	–	–

Owing to the importance and considerable differences in technological use and prices, high--percentage limestones, corrective additives for cement production and other limestones are monitored separately.

High-percentage limestones containing 96 % or more of $CaCO_3$
Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number	27	27	27	27	27
exploited	10	10	10	10	10
Total mineral *reserves, kt	1 351 882	1 346 635	1 336 827	1 143 440	1 292 797
economic explored reserves	619 681	614 434	635 755	442 368	689 757
economic prospected reserves	546 096	546 096	515 010	515 010	417 911
potentially economic reserves	186 105	186 105	186 062	186 062	185 129
exploitable (recoverable) reserves	726 258	722 519	737 738	626 585	621 932
Mine production, kt	4 491	4 526	4 395	4 653	4 661

* See ***NOTE*** in the chapter ***Introduction*** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter ***Mineral reserve and resource classification in the Czech Republic*** of this yearbook

High-percentage limestones containing 96 % or more of $CaCO_3$
Approved prognostic resources P_1, P_2, P_3

Year		2013	2014	2015	2016	2017
P_1,	kt	5 400	5 400	5 400	5 400	5 400
P_2,	kt	26 345	26 345	26 345	26 345	26 345
P_3		–	–	–	–	–

Other limestones
Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number	48	48	48	48	48
exploited	17	17	16	16	17
Total mineral *reserves, kt	2 259 004	2 257 213	2 231 936	2 231 936	2 308 294
economic explored reserves	946 496	936 892	914 988	1 040 060	964 765
economic prospected reserves	795 276	789 474	789 412	789 274	807 152
potentially economic reserves	517 232	530 847	527 536	527 526	536 377
exploitable (recoverable) reserves	551 654	547 021	543 886	672 427	666 927
Mine production, kt	3 932	4 667	5 041	5 500	4 833

** See **NOTE** in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic** of this yearbook*

Other limestones
Approved prognostic resources P_1, P_2, P_3

Year	2013	2014	2015	2016	2017
P_1, kt	103 070	71 267	71 267	71 267	71 267
P_2, kt	–	–	–	–	–
P_3	–	–	–	–	–

Corrective additives for cement production
Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number	14	14	14	13	13
exploited	4	4	2	3	2
Total mineral *reserves, kt	617 930	617 622	583 223	524 464	524 071
economic explored reserves	336 735	336 427	302 028	241 321	240 928
economic prospected reserves	156 785	154 785	156 785	156 785	156 785
potentially economic reserves	124 410	124 410	124 410	126 358	126 358
exploitable (recoverable) reserves	183 408	183 101	176 527	152 999	152 582
Mine production, kt	336	302	291	417	388

** See **NOTE** in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic** of this yearbook*

Corrective additives for cement production (CK)
Approved prognostic resources P_1, P_2, P_3

Year	2013	2014	2015	2016	2017
P_1, kt	86 880	86 880	84 493	84 493	84 493
P_2	–	–	–	–	–
P_3	–	–	–	–	–

In many limestone deposits, high-percentage limestones and other limestones are extracted together. Five out of fourteen corrective additives for cement production deposits make part of other limestones deposits.

3. Foreign trade

2521 – Limestone flux; limestone and other calcareous stone, of kind used for the manufacture of lime or cement

		2013	2014	2015	2016	2017
Import	t	527 774	569 427	507 648	522 152	328 117
Export	t	147 783	86 094	60 136	70 000	219 222

2521 – Limestone flux; limestone and other calcareous stone, of kind used for the manufacture of lime or cement

		2013	2014	2015	2016	2017
Average import prices	CZK/t	185	174	163	158	201
Average export prices	CZK/t	510	646	681	773	524

2522 – Quicklime, slaked lime and hydraulic lime

		2013	2014	2015	2016	2017
Import	t	98 967	118 373	83 119	100 761	59 437
Export	t	167 085	198 204	168 993	233 910	247 694

2522 – Quicklime, slaked lime and hydraulic lime

		2013	2014	2015	2016	2017
Average import prices	CZK/t	1 824	1 791	2 015	1 698	1 831
Average export prices	CZK/t	2 247	2 267	2 237	2 008	2 022

2523 – Portland cement, aluminous cement, slag cement, supersulphate cement and similar hydraulic cements, whether or not coloured or in the form of clinkers

		2013	2014	2015	2016	2017
Import	t	757 746	720 643	624 051	526 193	625 363
Export	t	596 748	602 499	570 295	586 721	588 589

2523 – Portland cement, aluminous cement, slag cement, supersulphate cement and similar hydraulic cements, whether or not coloured or in the form of clinkers

		2013	2014	2015	2016	2017
Average import prices	CZK/t	1 576	1 568	1 669	1 728	1 673
Average export prices	CZK/t	1 416	1 499	1 861	1 516	1 461

4. Prices of domestic market

Average prices of traded commodities on the domestic market

Product specification	2013	2014	2015	2016	2017
Cement CEM I, 42,5 R, on pallets, CZK/t	2 640	2 640	2 640	2 640	2 640
Cement CEM I, 42,5 R, on pallets, covered with foil, CZK/t	2 700	2 700	2 700	2 700	2 700
Cement CEM III A, 32,5 R, on pallets, CZK/t	2 300	2 300	2 300	2 300	2 300
Cement CEM III A, 32,5 R, on pallets, covered with foil, CZK/t	2 360	2 360	2 360	2 360	2 360
Dolomitic hydrated lime, bulk, CZK/t	3 540	3 790	3 790	3 790	3 000–3 790
Quicklime, ground, bulk, CZK/t	1 722	1 773	1 773	1 773	1 773–2 755
Limestone, ground, bulk, CZK/t	592–643	592–643	570–650	570–650	595–669
Limestone, crushed, CZK/t	185–1 408	157–1 408	157–1 408	157–1 408	189–1 408

5. Mining companies in the Czech Republic as of December 31, 2017

High-percentage limestones
Velkolom Čertovy schody a.s., Tmaň
Kotouč Štramberk s.r.o.
Vápenka Vitošov s.r.o.
LOMY MOŘINA spol. s r.o., Mořina
Omya CZ s.r.o.
CEMEX Cement, k. s.
Českomoravský cement, a.s., Mokrá – Horákov
Vápenka Vitoul s.r.o., Mladeč
Agir spol. s r.o., Petrovice

Other limestones
Českomoravský cement, a.s., Mokrá – Horákov
Cement Hranice, a.s.
CEMEX Cement, k. s.
HASIT Šumav. vápenice a omítkárny, s.r.o., V. Hydčice
LOMY MOŘINA spol. s r.o., Mořina
Krkonošské vápenky Kunčice, a.s.
Kotouč Štramberk s.r.o.

Omya CZ s.r.o.
Kalcit s.r.o., Brno
LB Cemix, s.r.o., Borovany
KLCT s.r.o.

Clayey limestones
Lafarge Cement, a.s., Čížkovice

Carbonates for agricultural use
PRACTIC 99, s.r.o., Brno

Corrective additives for cement production
Českomoravský cement, a.s., Mokrá – Horákov
Cement Hranice, a.s.

6. World production and world market prices

World mine production

World limestone production is estimated at billions of tonnes. Its amount may be inferred from data on lime and cement manufacture. According to MCS data, world production of these two commodities in recent years was as follows:

	2013	2014	2015	2016	2017^e
World cement production, mill t	4 080	4 180	4 100	4 100	4 100
World lime production, mill t	353	350	350	350	350

e – preliminary values

The same table as the previous one, but including limestone; calculations are based on the relationship: 2 tonnes of limestone = 1 tonne of lime or 2 tonnes of cement (limestone production for construction purposes is not taken into account)

Commodity/Year	2013	2014	2015	2016	2017^e
World limestone production derived from the global cement production, mil. t	4 080	4 180	4100	4 100	4 100
World limestone production derived from the global lime production, mil. t	706	700	700	700	700
World limestone production derived from the global lime production and cement production, mil. t	4 786	4 880	4 800	4 800	4 800

e – preliminary values

Main producers according to MCS

2017[e]			2017[e]		
Cement			Lime		
country	**kt**	**%**	**country**	**kt**	**%**
China	2,350,000	58.5	China	230,000	65.7
India	270,000	6.6	USA	19,000	5.4
USA	83,400	2.1	India	16,000	4.6
Turkey	77,000	1.9	Russia	11,000	3.1
Indonesia	72,000	1.6	Brazil	8,300	2.4
South Korea	65,000	1.6	Japan	7,800	2.2
Iran	65,000	1.4	Germany	6,900	2.0
Egypt	63,000	1.3	South Korea	5,000	1.4
Brazil	55,000	1.3	Turkey	4,300	1.2
Japan	55,000	1.3	France	3,800	1.1
world	**4,100,000**	**100.0**	**world**	**350,000**	**100.0**

e – preliminary values

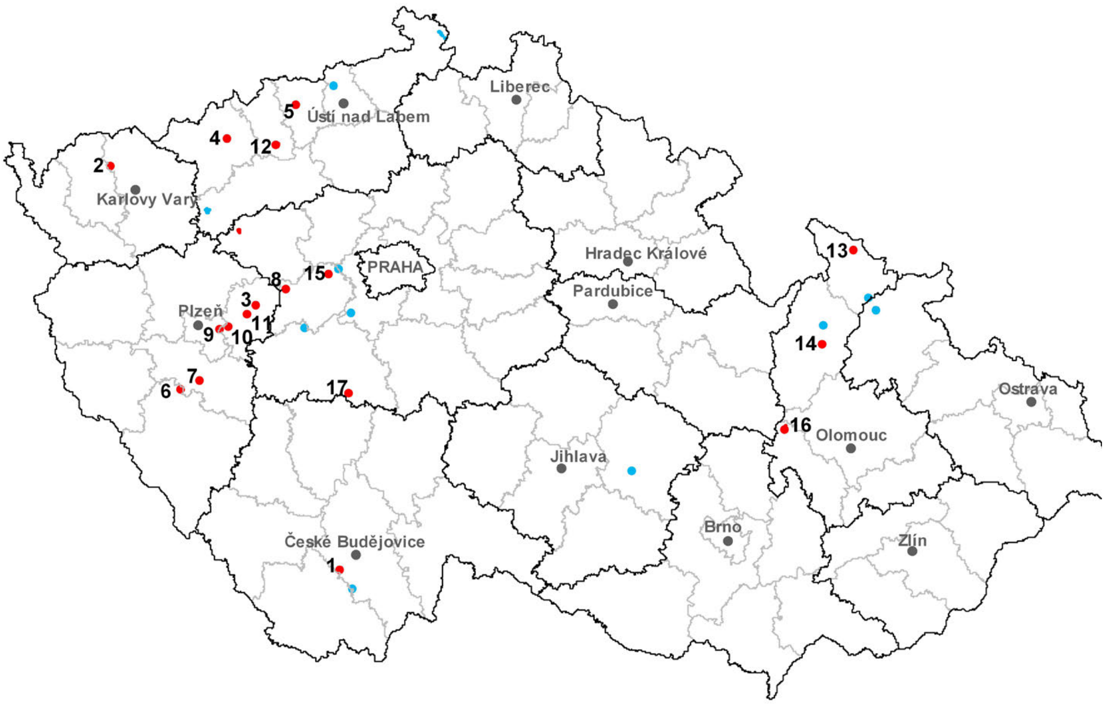
Prices of traded commodities – calcium carbonate (according to IM)

Commodity/Year		2013	2014	2015	2016	2017
$CaCO_3$, (GCC), fine grade, coated, ex–works UK	GBP/t	80–103	80–110	90–110	95–115	95–115
$CaCO_3$, (PCC), coated, ex–works UK	GBP/t	370–550	370–575	388–575	407–603	407–603
$CaCO_3$, (PCC), uncoated, ex–works	GBP/t	340–550	357–575	357–575	375–603	375–603

The price range includes the lowest and highest monthly price quotes for a given year.

Silica minerals

1. Registered deposits and other resources of the Czech Republic



reserved registered deposits   exhausted deposits and other resources

Quartz – quartzites:

1 **Vrábče-Boršov**	6 Kaliště	11 Sklená Huť
2 Černava-Tatrovice	7 Kbelnice	12 Stránce
3 Drahoňův Újezd-Bechlov	8 Kublov-Dlouhá Skála	13 Velká Kraš
4 Chomutov-Horní Ves	9 Kyšice-Pohodnice	14 Vikýřovice
5 Jeníkov-Lahošť	10 Litohlavy-Smrkový vrch	15 Železná

Quartz for special glass:

16 Dětkovice	17 Krašovice

*(Names of exploited deposits are in **bold type**)*

2. Basic statistical data of the Czech Republic as of December 31

Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number	15	15	15	14	14
exploited	1	1	1	1	1
Total mineral *reserves, kt	25 749	25 732	25 651	25 632	25 182
economic explored reserves	763	763	763	763	763
economic prospected reserves	20 297	20 280	20 266	20 247	20 230
potentially economic reserves	4 689	4 689	4 622	4 622	4 189
exploitable (recoverable) reserves	528	511	497	394	377
Mine production, kt	15	16	14	18	17

** See **NOTE** in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic** of this yearbook*

Approved prognostic resources P_1, P_2, P_3

Year		2013	2014	2015	2016	2017
P_1,	kt	4 533	4 533	4 533	4 533	4 533
P_2		–	–	–	–	–
P_3		–	–	–	–	–

3. Foreign trade

2506 – Quartz (other than natural sands); quartzite, whether or not roughly trimmed or merely cut

		2013	2014	2015	2016	2017
Import	t	8 232	10 809	17 722	13 444	10 310
Export	t	15	11	39	11	85

2506 – Quartz (other than natural sands); quartzite, whether or not roughly trimmed or merely cut

		2013	2014	2015	2016	2017
Average import prices	CZK/t	3 101	2 921	2 479	2 402	2 467
Average export prices	CZK/t	68 861	126 898	47 564	164 636	20 889

720221 – Ferrosilicon

		2013	2014	2015	2016	2017
Import	t	26 029	26 872	27 463	26 755	23 883
Export	t	6 915	5 473	8 607	8 268	7 124

720221 – Ferrosilicon

		2013	2014	2015	2016	2017
Average import prices	CZK/t	27 869	30 208	30 345	25 114	31 189
Average export prices	CZK/t	25 631	25 634	26 719	22 435	26 221

4. Prices of domestic market

Prices of silica minerals are not open to public.

5. Mining companies in the Czech Republic as of December 31, 2017

Budějovické štěrkopísky, spol. s r.o., Vrábče

6. World production and world market prices

World mine production

World production of silicon in recent years:

	2013	2014	2015	2016	2017[e]
Silicon production (according to MCS), kt	7 880	8 110	7 630	7 600	7 400

e – preliminary values

Main producers according to MCS – Si metal and Si in ferrosilicon

country	2017^e	
	kt	%
China	4 800	64.9
Russia	750	10.1
USA	405	5.5
Norway	380	5.1
France	120	1.6
Brazil	110	1.5
Malaysia	110	1.5
South Africa	85	1.1
Island	79	1.1
Spain	75	1.0
world	**7 400**	**100.0**

e – preliminary values

Regarding the production of ferrosilicon, China was followed by Russia and Norway.

Prices of traded commodities –
– silicon (EUR/t), free market, in warehouse, annual average of 2015 according to DERA Preismonitor (2016) 2,319.04.

– silicon carbide (EUR/tonne) according to Industrial Minerals

Commodity/Year	2013	2014	2015	2016	2017
FEPA*) 8–220, black, Grade 1, CIF UK	1 900–2 100	1 900–2 100	1 900–2 100	1900–2 100	1 900–2 100
FEPA 8–220, black, Grade 2, CIF UK	1 500–1 650	1 500– 1 650	1 500–1 650	1 500–1 650	1 500–1 650
Refractory grade, min. 98% SiC, CIF UK	1 500–1 800	1 500–1 800	1 500– 1 800	1 500–1 800	1 500–1 800
Refractory grade, min. 95% SiC, CIF UK	1 350–1 450	1 350–1 450	1 350–1 450	1 350–1 450	1 350– 1 450

**) Federation of European Producers of Abrasives (FEPA) grain standards*

The price range includes the lowest and highest monthly price quotes for a given year **– ferrosilicon** (EUR/t) according to Metal Bulletin

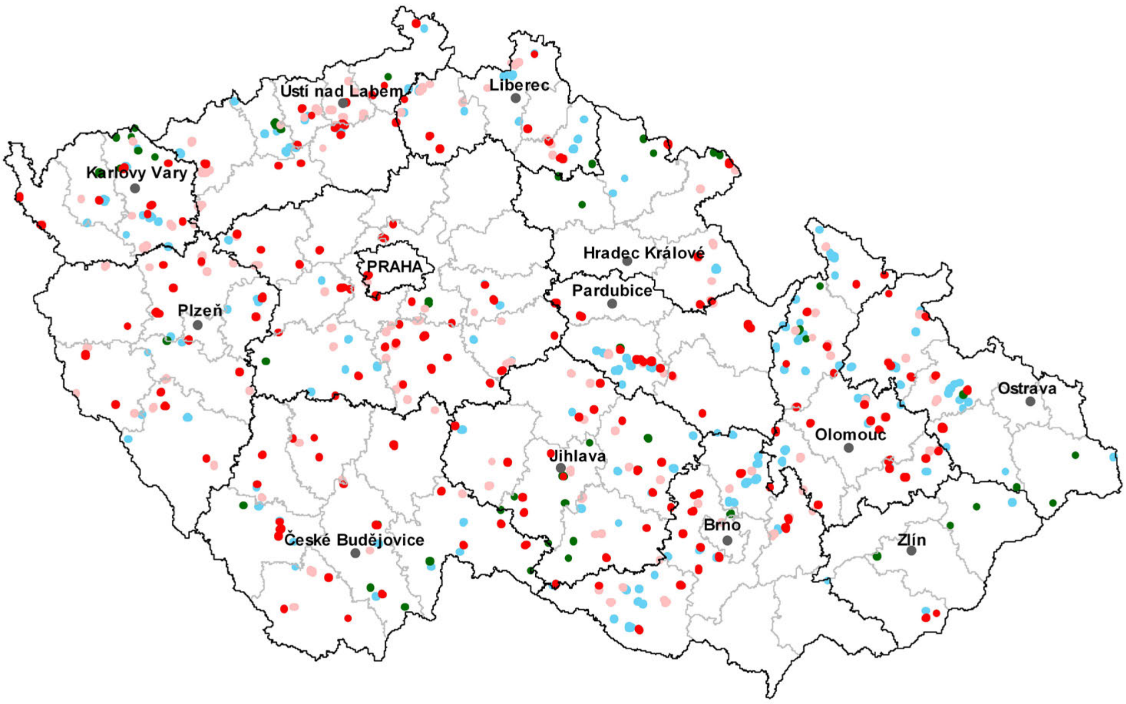
Commodity/Year	2013	2014	2015	2016	2017
Piece basis, 75% Si (proportionally by Si content)	1 060–1 180	1 080–1 220 1 134,38*	870–1 250 1 148,96*	855–1 130	1 100–1 650

**) yearly average according to D-R*

CONSTRUCTION MINERALS

Crushed stone

1. Registered deposits and other resources of the Czech Republic



reserved deposits – exploited 178
reserved deposits – unexploited 143
non-reserved deposits – exploited 46
non-reserved deposits – unexploited 180

Because of the large number of crushed stone deposits in the Czech Republic, they are not listed.

2. Basic statistical data of the Czech Republic as of December 31

Reserved deposits: Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number	319	319	320	320	321
exploited	169	172	166	176	178
Total mineral *reserves, ths m^3	2 383 849	2 373 413	2 416 382	2 400 765	2 427 689
economic explored reserves	1 089 703	1 142 842	1 165 330	1 160 712	1 179 031
economic prospected reserves	1 149 727	1 086 152	1 107 722	1 097 145	1 103 824
potentially economic reserves	144 419	144 419	143 330	142 908	144 827
exploitable reserves	704 187	649 252	665 434	1 257 960	713 100
Mine production in reserved deposits, ths m^3	11 420	12 341	13 740	12 385	12 776

** See **NOTE** in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic** of this yearbook*

Approved prognostic resources P_1, P_2, P_3

Year		2013	2014	2015	2016	2017
P_1,	ths m^3	61 357	61 357	61 357	3 040	3 040
P_2,	ths m^3	408 807	408 807	408 807	–	–
P_3		–	–	–	–	–

Non-reserved deposits: Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number	219	218	221	223	223
exploited	40	39	44	42	46
Total mineral *reserves, ths m^3	1 022 363	1 022 822	1 028 758	905 311	1 026 215
economic explored reserves	42 452	42 182	39 582	39 509	39 428
economic prospected reserves	896 645	897 496	906 032	905 311	908 480
potentially economic reserves	83 266	83 144	83 144	83 144	78 307
exploitable reserves	45 084	45 084	52 897	52 379	48 720
Mine production in non-reserved deposits, ths m^3 [a)]	969	982	1 171	1 408	1 251

** See **NOTE** in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic** of this yearbook*

[a)] estimate

3. Foreign trade

251710 – Pebbles, gravel, broken or crushed stone

		2013	2014	2015	2016	2017
Import	t	290 563	525 436	546 089	577 094	217 704
Export	t	432 645	573 767	465 801	386 445	482 285

251710 – Pebbles, gravel, broken or crushed stone

		2013	2014	2015	2016	2017
Average import prices	CZK/t	297	241	227	226	236
Average export prices	CZK/t	168	180	217	239	237

4. Prices of domestic market

Domestic prices of crushed stone – nationwide

Product specification	2013	2014	2015	2016	2017
crushed stone, spilite, fraction 4–8mm, CZK/t	274	273	283	290	298
crushed stone, amphibolite, fraction 4–8 mm, CZK/t	345	351	351	353	357
crushed stone, granite, fraction 4–8 mm, CZK/t	332	325	324	331	331
crushed stone, gneiss, fraction 4–8 mm, CZK/t	317	328	336	335	325
crushed stone, porphyry, fraction 4–8 mm, CZK/t	290	281	298	307	321
crushed stone, granodiorite, fraction 4–8 mm, CZK/t	319	311	314	320	330
crushed stone, greywacke, fraction 4–8 mm, CZK/t	315	307	326	328	327
crushed stone, basalt, fraction 4–8 mm, CZK/t	299	318	310	305	318
crushed stone, hornfels, fraction 4–8 mm, CZK/t	239	264	264	268	299
crushed stone, limestones, fraction 4–8 mm, CZK/t	259	300	285	302	297
crushed stone, spilite, fraction 8–16 mm, CZK/t	269	267	266	276	267
crushed stone, amphibolite, fraction 8–16 mm, CZK/t	270	272	269	270	270
crushed stone, granite, fraction 8–16 mm, CZK/t	248	250	256	256	258
crushed stone, gneiss, fraction 8–16 mm, CZK /t	252	259	260	265	264
crushed stone, porphyry, fraction 8-16 mm, CZK/t	–	268	292	294	262
crushed stone, granodiorites, fraction 8–16 mm, CZK /t	263	252	261	265	273
crushed stone, greywacke, fraction 8–16 mm, CZK /t	263	257	265	275	282
crushed stone, basalt, fraction 8–16 mm, CZK /t	269	278	282	271	282
crushed stone, hornfels, fraction 8–16 mm, CZK /t	224	251	234	250	264
crushed stone, limestones, fraction 8–16 mm, CZK /t	232	237	252	249	253

Average domestic prices of crushed stone in 2017 – subdivided by rocks and regions which the rocks are mined in

2017		Average prices of (listed) fractions (CZK/t)								
Rock-mineral	Size fraction / Region/average of fraction price	0-4 mm	0-32 mm	0-63 mm	4-8 mm	8-16 mm	32-63 mm	LK unsorted	In region	In all regions
opoka-sandstone	Central Bohemia	FN	FN	140	FN	FN	FN	FN	140	
	Zlín	FN	150	150	FN	FN	FN	FN	150	
	Average of fraction price	FN	150	145	FN	FN	FN	FN		145
serpentine	Central Bohemia	140	159	165	291	241	204	200	200	
	Average of fraction price	140	159	165	291	241	204	200		200
limstone	Central Bohemia	180	100	170	260	233	195	300	205	
	Prague	205	205	205	295	269	240	400	260	
	Olomouc	142	200	195	373	263	205	225	229	
	South Bohemia	144	212	212	262	FN	214	189	206	
	Hradec Králové	357	FN	225	FN	FN	FN	FN	291	
	Moravia and Silesia	135	165	170	293	248	200	140	193	
	Average of fraction price	194	176	196	297	253	211	251		225
basaltic rocks	Karlovy Vary	254	198	194	326	276	229	183	237	
	Hradec Králové	203	176	186	270	245	230	168	211	
	Central Bohemia	182	190	176	300	264	243	268	232	
	Plzeň	185	163	176	299	273	212	173	212	
	Pardubice	171	FN	240	399	319	245	240	269	
	Prague	165	160	165	270	245	210	370	226	
	Moravia and Silesia	173	FN	FN	282	286	FN	203	236	
	Liberec	157	217	223	349	322	233	223	246	
	Ústí nad Labem	226	216	205	308	277	217	207	237	
	Average of fraction price	191	189	196	311	279	227	226		231
greywacke	South Bohemia	200	130	140	320	300	210	220	217	
	South Moravia	148	160	155	318	278	215	220	213	
	Olomouc	184	181	172	346	280	209	180	222	
	Moravia and Silesia	190	195	187	325	268	204	196	224	
	Average of fraction price	181	167	164	327	282	210	204		219
skarn	Central Bohemia	150	200	210	290	280	220	220	224	
	Average of fraction price	150	200	210	290	280	220	220		224
gneiss	Plzeň	155	181	185	285	245	193	158	200	
	South Moravia	68	143	163	303	235	195	195	186	
	Vysočina	143	183	185	316	270	228	211	219	
	Pardubice	180	150	168	336	265	223	206	218	
	Central Bohemia	115	209	219	385	310	248	290	254	
	Olomouc	190	197	195	380	279	207	180	233	
	Hradec Králové	204	176	186	270	245	230	168	211	
	Average of fraction price	151	177	186	325	264	218	201		217
hornfels	Pardubice	80	167	166	275	265	205	173	190	
	Central Bohemia	139	180	178	285	255	223	286	221	
	Average of fraction price	110	174	172	280	260	214	230		206
amphibolite	Plzeň	216	194	174	307	234	205	172	215	
	South Moravia	120	190	205	360	275	220	200	224	
	Olomouc	200	202	203	379	277	213	187	237	
	Central Bohemia	139	211	192	352	278	227	205	229	
	Hradec Králové	220	190	195	395	295	260	210	252	
	Vysočina	130	193	193	346	263	230	205	223	
	Average of fraction price	171	197	194	357	270	226	197		230
granitic rocks	South Moravia	112	167	179	318	259	207	201	206	
	Karlovy Vary	166	156	188	288	238	208	161	201	
	Pardubice	177	171	170	363	273	215	173	220	
	Hradec Králové	188	193	193	360	270	199	198	229	
	Central Bohemia	109	169	187	280	253	194	199	199	
	South Bohemia	193	204	203	354	282	215	184	234	
	Vysočina	176	195	192	353	270	227	207	231	
	Ústí nad Labem	130	130	185	FN	FN	FN	330	194	
	Average of fraction price	156	173	187	331	264	209	207		218
granulite	South Bohemia	226	219	217	352	284	239	193	247	
	Average of fraction price	226	219	217	352	284	239	193		247

Explanations:
FN: frction is not produced
LK: quarry stone
basaltic rocks: melaphyre+spilite+basalt+phonolite
granitic rocks: granodiorite+granite+syenite+diorite+porphyry
limestone: limestone+dolomite+marble
gneiss: orthogneiss+paragneiss

Average domestic prices of crushed stone in 2017 – subdivided by regions and rocks mined in them

Region	2017 Size fraction Rock-mineral/price	Average prices of (listed) fractions (CZK/t) 0-4 mm	0-32 mm	0-63 mm	4-8 mm	8-16 mm	32-63 mm	LK unsorted	In region
Plzeň	gneiss	155	181	185	285	245	193	158	
	granitic rocks	234	225	225	308	259	226	201	
	amphibolite	216	194	174	307	234	205	172	
	basaltic rocks	185	163	176	299	273	212	173	
	meta-greywacke	275	255	199	307	255	232	200	
	Average of fraction prices in the region	213	204	192	301	253	214	181	222
South Moravia	greywacke	148	160	155	318	278	215	220	
	gneiss	68	143	163	303	235	195	195	
	granitic rocks	112	167	179	318	259	207	201	
	amphibolite	120	190	205	360	275	220	200	
	Average of fraction prices in the region	112	165	176	325	262	209	204	207
Karlovy Vary	granitic rocks	166	156	188	288	238	208	161	
	basaltic rocks	254	198	194	326	276	229	183	
	trachyt	FN	165	165	FN	FN	180	FN	
	Average of fraction prices in the region	210	173	182	307	257	206	172	215
Moravia and Silesia	limestone	135	165	170	293	248	200	140	
	greywacke	190	195	187	325	268	204	196	
	basaltic rocks	173	FN	FN	282	286	FN	203	
	Average of fraction prices in the region	166	180	179	300	267	202	180	211
Pardubice	gneiss	180	150	168	336	265	223	206	
	granitic rocks	177	171	170	363	273	215	173	
	basaltic rocks	171	FN	240	399	319	245	240	
	hornfels	80	167	166	275	265	205	173	
	Average of fraction prices in the region	152	163	186	343	281	222	198	221
Olomouc	limestone	142	200	195	373	263	205	225	
	greywacke	184	181	172	346	280	209	180	
	gneiss	190	197	195	380	279	207	180	
	amphibolite	200	202	203	379	277	213	187	
	Average of fraction prices in the region	179	195	191	370	275	209	193	230
Central Bohemia	limestone	180	100	170	260	233	195	300	
	gneiss	115	209	219	385	310	248	290	
	granitic rocks	109	169	187	280	253	194	199	
	amphibolite	139	211	192	352	278	227	205	
	hornfels	139	180	178	285	255	223	286	
	basaltic rocks	182	190	176	300	264	243	268	
	opoka-sandstone	FN	FN	140	FN	FN	FN	FN	
	serpentine	140	159	165	291	241	204	200	
	skarn	150	200	210	290	280	220	220	
	Average of fraction prices in the region	144	177	182	305	264	219	246	220
Prague	basaltic rocks	165	160	165	270	245	210	370	
	limestone	205	205	205	295	269	240	400	
	Average of fraction prices in the region	185	183	185	283	257	225	385	243
South Bohemia	limestone	144	212	212	262	FN	214	189	
	greywacke	200	130	140	320	300	210	220	
	granitic rocks	112	167	179	318	259	207	201	
	granulite	226	219	217	352	284	239	193	
	Average of fraction prices in the region	171	182	187	313	281	218	201	222
Ústí nad Labem	granitic rocks	130	130	185	FN	FN	FN	330	
	basaltic rocks	226	216	205	308	277	217	207	
	Average of fraction prices in the region	178	173	195	308	277	217	269	231
Liberec	basaltic rocks	157	217	223	349	322	233	223	
	Average of fraction prices in the region	157	217	223	349	322	233	223	246
Vysočina	gneiss	143	183	185	316	270	228	211	
	granitic rocks	176	195	192	353	270	227	207	
	amphibolite	130	193	193	346	263	230	205	
	Average of fraction prices in the region	150	190	190	338	268	228	208	225
Hradec Králové	limestone	357	FN	225	FN	FN	FN	FN	
	gneiss	204	176	186	270	245	230	168	
	granitic rocks	188	193	193	360	270	199	198	
	amphibolite	220	190	195	395	295	260	210	
	basaltic rocks	203	176	186	270	245	230	168	
	Average of fraction prices in the region	234	184	197	324	264	230	186	231
Zlín	opoka-sandstone	FN	150	150	FN	FN	FN	FN	
	Average of fraction prices in the region	FN	150	150	FN	FN	FN	FN	150

Explanations:

FN: frction is not produced
LK: quarry stone
limestone: limestone+dolomite+marble
basaltic rocks: melaphyre+spilite+basalt+phonolite
granitic rocks: granodiorite+granite+syenite+diorite+porphyry
gneiss: orthogneiss+paragneiss

Average domestic prices of crushed stone in 2017 – by regional units

2017	Average prices of (listed) fractions (CZK/t)																		In regions
REGION	0-4 mm	0-8 mm	0-16 mm	0-32 mm	0-63 mm	0-125 mm	4-8 mm	8-16 mm	8-32 mm	11-22 mm	16-22 mm	16-32 mm	32-63 mm	63-125 mm	unsorted material	pit material	over - burden	for backfill	
Hradec Králové	232	167	FN	184	193	178	336	269	FN	285	FN	225	245	227	187	267	FN	FN	230
Plzeň	207	190	155	191	190	187	304	262	FN	263	267	243	214	195	176	250	60	FN	210
Central Bohemia	147	159	178	178	181	153	298	262	FN	245	257	245	214	194	244	373	68	115	207
Liberec	157	231	FN	217	223	FN	349	322	FN	306	325	311	233	FN	223	298	76	170	246
Pardubice	169	111	FN	172	173	155	353	273	230	266	259	220	218	193	185	251	FN	203	214
Ústí nad Labem	215	161	184	216	203	194	308	277	246	275	286	245	217	217	218	288	68	80	217
South Moravia	116	60	58	161	175	165	319	259	FN	240	FN	217	207	196	202	256	64	135	177
Karlovy Vary	215	143	130	181	192	184	310	257	193	24	270	236	219	200	174	318	78	90	190
South Bohemia	192	149	157	206	206	197	347	383	246	278	FN	251	222	209	187	241	75	106	215
Olomouc	182	164	193	189	183	154	359	277	221	259	281	245	209	206	186	351	72	233	220
Zlín	FN	100	FN	150	150	FN	FN	FN	FN	FN	FN	200	FN	FN	FN	400	FN	250	208
Moravia and Silezia	178	149	130	189	183	155	315	266	224	276	280	233	204	191	187	241	115	209	207
Vysočina	155	125	127	187	189	180	336	269	185	259	245	247	230	216	209	261	57	210	205
Prague	185	FN	165	183	185	165	283	257	FN	235	240	255	233	225	385	FN	FN	FN	230
Czech Republic - total	**181**	**147**	**148**	**186**	**188**	**172**	**324**	**279**	**221**	**247**	**271**	**241**	**220**	**206**	**213**	**292**	**73**	**164**	**213**

Explanation: FN – fraction is not produced

5. Mining companies in the Czech Republic as of December 31, 2017

Crushed stone – registered deposits

Českomoravský štěrk, a.s., Mokrá
EUROVIA Kamenolomy, a.s., Liberec
KAMENOLOMY ČR s.r.o., Ostrava – Svinov
KÁMEN Zbraslav, a.s.
COLAS CZ, a.s., Praha
Kámen a písek s.r.o. Český Krumlov
M – SILNICE a.s., Pardubice
BÖGL a KRÝSL, k.s., Praha
GRANITA s.r.o., Skuteč
CEMEX Sand, k.s., Napajedla
Basalt s.r.o., Zabrušany
BASALT CZ s.r.o, Všechlapy
Lom Klecany, s.r.o., Praha
Berger Bohemia a.s., Plzeň
LOMY MOŘINA spol. s r.o., Mořina
Kámen Brno s.r.o.
ZAPA beton a.s., Praha
SHB s.r.o., Bernartice
Rosa s.r.o., Drásov
Žula Rácov, s.r.o., Batelov
BES s.r.o., Benešov
DOBET s.r.o., Ostrožská Nová Ves
RENO Šumava a.s., Vlachovo Březí
C4SC78 s.r.o., Praha
Skanska a.s., Praha
Ludvík Novák, Komňa
Silnice Čáslav – Holding, a.s.
LOM DEŠTNO a.s., Sedlčany
Českomoravský cement, a.s., Mokrá – Horákov
Kalivoda DC s.r.o., Děčín
Zemědělské družstvo Šonov u Broumova
PEDOP s.r.o., Lipovec
PETRA – lom Číměř, s.r.o.
František Matlák, Mochov
HUTIRA – OMICE, s.r.o., Omice
KARETA s.r.o., Bruntál
Stavební recyklace s.r.o., Sokolov
Kozákov – družstvo, Záhoří
Madest s.r.o., Pavlice
EKOZIS spol. s r. o., Zábřeh
BISA s.r.o., Hradec Králové
LB spol. s r.o., Nová Role
EKOSTAVBY Louny s.r.o.
FORTEX – AGS, a.s., Šumperk
Moravské kamenolomy s.r.o.
Froněk s.r.o., Rakovník
ERB invest s.r.o., Praha
Thorssen s.r.o., Kamenolom Mladecko
Omnigon, s.r.o., Praha
SATES ČECHY, s.r.o., Telč
JHF Heřmanovice spol. s r.o.
NATRIX, a.s., Bojkovice
HERLIN s.r.o., Příbram
Obec Studená
GRANIO s.r.o., Chomutov

Kamenolom KUBO s.r.o., Malé Žernoseky
Weiss s.r.o., Děčín
Daosz, s.r.o., Jesenec
Pavel Dragoun, Cheb

Crushed stone – non-registered deposits
Sokolovská uhelná, právní nástupce, a.s., Sokolov
Kámen a písek s.r.o. Český Krumlov
SILNICE MORAVA s.r.o., Krnov
Českomoravský štěrk, a.s., Mokrá
Basalt s.r.o., Zabrušany
KAMENOLOMY ČR s.r.o., Ostrava – Svinov
LOM Babí, a.s., Trutnov
ZETKA Strážník a.s., Studenec
KÁMEN Zbraslav, a.s.
Stavební recyklace s.r.o., Sokolov
DOBET s.r.o., Ostrožská Nová Ves
COLAS CZ, a.s., Praha
EUROVIA Kamenolomy, a.s., Liberec
Moravské kamenolomy s.r.o.
SENECO s.r.o., Polná
Kamenolom Žlutava, s.r.o.
Stavoka Kosice a.s.
RENO Šumava a.s., Vlachovo Březí
ZAPA beton a.s., Praha
Kalcit s.r.o., Brno
LOMY MOŘINA spol.s r.o., Mořina
Vojenské lesy a statky ČR, s.p., Praha
Rovina stavební a.s.
KAVEX – GRANIT HOLDING a. s., Plzeň 2
Lesostavby Frýdek-Místek, a.s.
ZUD a.s., Zbůch
Obec Hošťálková
KÁMEN BARBORA s.r.o.
Daosz, s.r.o., Jesenec
EKOZIS spol. s r. o., Zábřeh
Lesy České republiky, s.p., Hradec Králové
Lesní družstvo obcí, Přibyslav
Kamena výrobní družstvo Brno
Pískovec Bělov s.r.o.

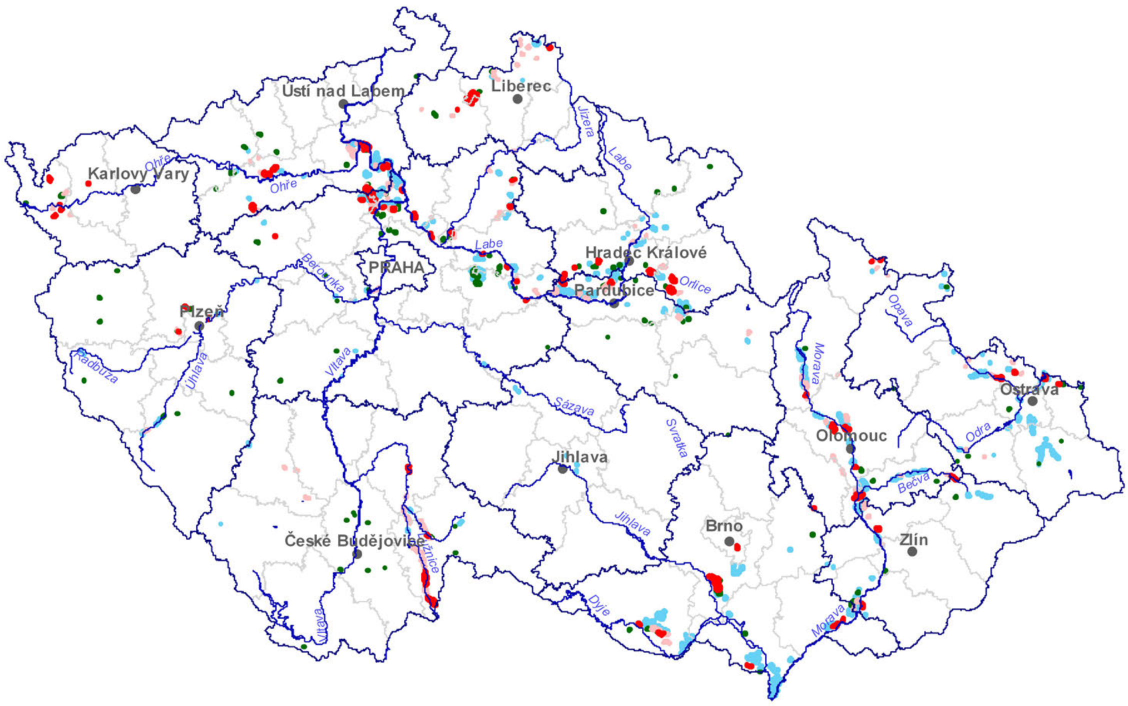
6. World production and world market prices

Mine production of the crushed stone is frequently reported together with sand and gravel under the term aggregates.

Crushed stone prices are not formed on the international market. Neither indicative regional prices are quoted.

Sand and gravel

1. Registered deposits and other resources of the Czech Republic



reserved deposits – exploited (69)
reserved deposits – unexploited (134)
non-reserved deposits – exploited (95)
non-reserved deposits – unexploited (263)

Because of their large number, deposits of sand and gravel are not listed.

2. Basic statistical data of the Czech Republic as of December 31

Reserved deposits: Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number	207	205	204	203	203
exploited	80	77	69	69	69
Total mineral *reserves, ths m^3	2 138 208	2 107 455	2 099 731	2 114 371	2 106 593
economic explored reserves	1 102 371	1 084 172	1 077 433	1 078 027	1 070 659
economic prospected reserves	813 918	794 870	793 371	797 577	798 996
potentially economic reserves	221 919	228 413	228 927	238 767	236 938
exploitable reserves	381 649	381 288	406 787	444 784	375 261
Mine production in reserved deposits, ths m^3	5 346	5 753	6 063	6 143	6 198

** See NOTE in the chapter Introduction above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter Mineral reserve and resource classification in the Czech Republic of this yearbook*

Approved prognostic resources P_1, P_2, P_3

Year		2013	2014	2015	2016	2017
P_1,	ths m^3	149 027	149 027	149 027	149 027	128 149
P_2,	ths m^3	946 239	946 239	946 239	946 239	651 586
P_3		–	–	–	–	–

Non-reserved deposits: Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number	342	347	351	355	357
exploited	84	83	94	95	94
Total mineral *reserves, ths m^3	2 107 576	2 108 029	2 102 560	2 100 304	2 096 952
economic explored reserves	106 863	106 102	104 879	104 723	104 485
economic prospected reserves	1 760 824	1 761 945	1 761 879	1 759 779	1 756 665
potentially economic reserves	239 889	239 982	235 802	325 802	426 488
exploitable reserves	50 695	50 694	53 524	49 549	62 683
Mine production in non-reserved deposits, ths m^3 [a)]	4 297	4 063	4 796	4 042	4 829

** See NOTE in the chapter Introduction above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter Mineral reserve and resource classification in the Czech Republic of this yearbook*

[a)] estimate

3. Foreign trade

250590 – Other sand (natural sand of all kinds, also coloured, except sand containing metals and except silica sand and quartz sand)

		2013	2014	2015	2016	2017
Import	kt	88 389	169 762	180 592	162 513	189 790
Export	kt	88 389	169 762	180 592	162 513	189 790

250590 – Other sand (natural sand of all kinds, also coloured, except sand containing metals and except silica sand and quartz sand)

		2013	2014	2015	2016	2017
Average import prices	CZK/t	486	287	337	386	418
Average export prices	CZK/t	767	1 689	1 805	158	209

4. Prices of domestic market

Average domestic prices of sand and gravel in 2017 – by regional units

2017	Average prices of (listed) fractions (CZK/t)																		in regions
REGION	0-1 mm	0-2 mm	0-4 mm	0-8 mm	0-16 mm	0-32 mm	0-63 mm	4-8 mm	8-16 mm	8-32 mm	11-22 mm	16-32 mm	22-63 mm	32-63 mm	unsorted material	pit material	over - burden	for backfill	
Hradec Králové	110	98	120	100	87	190	180	250	209	FN	207	223	69	225	119	97	65	73	142
Plzeň	100	244	222	161	FN	163	195	243	314	130	273	382	300	235	94	FN	75	109	203
Central Bohemia	103	122	126	123	90	110	133	196	197	FN	188	230	207	184	112	98	90	61	139
Liberec	FN	187	169	184	118	145	153	365	308	185	336	314	FN	242	138	145	104	FN	206
Pardubice	85	212	167	120	FN	90	160	282	253	FN	375	233	FN	137	86	60	FN	80	167
Ústí nad Labem	192	134	159	140	170	169	179	245	202	FN	224	256	450	310	111	145	90	105	193
South Moravia	40	103	142	143	152	141	116	211	206	FN	223	280	249	235	101	130	65	85	154
Karlovy Vary	FN	225	127	60	FN	160	160	268	286	FN	270	257	FN	170	85	95	60	90	165
South Bohemia	187	213	205	173	FN	173	138	295	274	FN	FN	294	FN	FN	142	160	55	90	185
Olomouc	275	241	211	233	231	184	198	275	252	FN	265	236	170	210	115	140	70	90	200
Zlín	165	235	240	FN	FN	250	250	343	331	FN	300	288	155	280	120	FN	FN	FN	246
Moravia and Silezia	210	249	263	265	235	210	160	320	320	FN	315	FN	264	320	FN	FN	96	119	239
Vysočina	In this region is not the sand-gravel material produced																		
Prague	FN	FN	145	FN	FN	FN	FN	240	240	FN	FN	FN	FN	FN	FN	FN	FN	FN	208
Czech Republic - total	**147**	**189**	**177**	**155**	**155**	**165**	**169**	**272**	**261**	**158**	**271**	**272**	**233**	**232**	**111**	**119**	**77**	**90**	**188**

Explanation: FN - fraction is not produced

5. Mining companies in the Czech Republic as of December 31, 2017

Sand and gravel – registered deposits
Českomoravský štěrk, a.s., Mokrá
CEMEX Cement, k. s.
LB MINERALS, s.r.o., Horní Bříza
České štěrkopísky spol. s r.o., Praha
KÁMEN Zbraslav, a.s.
CEMEX Sand, k. s., Napajedla
Písky – J. Elsnic s.r.o., Postoloprty
TVARBET Moravia a.s., Hodonín
Družstvo DRUMAPO, Němčičky
ZAPA beton a.s., Praha
Štěrkovny Olomouc a.s.

Městské lesy Hradec Králové a.s.
Václav Maurer, Lužec nad Vltavou
Kinský dal Borgo, a.s., Chlumec nad Cidlinou
Kaolin Hlubany, a.s.
KAMENOLOMY ČR s.r.o., Ostrava – Svinov
Písek – Beton a.s., Velký Osek
Budějovické štěrkopísky spol. s r.o., Vrábče
Obec Kostomlátky
BS Cost, s.r.o., Praha
EUROVIA Kamenolomy, a.s., Liberec
V.M.S. spol. s r.o., Louny
Písník Lípa, s.r.o.
MIROS MAJETKOVÁ a.s., Pardubice
Pískovna Sojovice, s.r.o.
Pískovna Černovice, s.r.o., Brno
Těžba štěrkopísku s.r.o., Brodek
NZPK s.r.o., Podbořany
Zechmeister, spol. s r.o., Praha
Oldřich Psotka, Mikulovice u Jeseníka
ZOD Zálabí, a.s.
ZOD Brniště a.s.
Ladislav Šeda, Turnov
KM Beta Moravia s.r.o., Hodonín
UNIM s.r.o., Všestudy u Veltrus
PÍSEK OSTRAVA s.r.o., Ostrava – Poruba
Lubomír Kruncl, Travčice

Sand and gravel – non-registered deposits

František Jampílek, Lázně Toušeň
České štěrkopísky spol. s r.o., Praha
Vltavské štěrkopísky s.r.o., Chlumín
CEMEX Sand, k.s., Napajedla
AZI spol. s r.o., Břeclav
Severočeské pískovny a štěrkovny s.r.o., Žatec
Písek Žabčice, s.r.o.
ZEPIKO spol. s r.o., Brno
realma-pískovna dolany s.r.o., Zlín
Lubomír Kruncl, Travčice
Písník Kinský, s.r.o., Kostelec nad Orlicí
Moravia Tech, a.s., Brno
DRACAR OLOMOUC, s.r.o.
Plzeňské štěrkopísky s.r.o., Plzeň
BEST a.s., Rybnice
ZS Kratonohy a.s.
DOBET s.r.o., Ostrožská Nová Ves
Českomoravský štěrk, a.s., Mokrá
Václav Maurer, Lužec nad Vltavou
Agropodnik Humburky, a.s.
Pískovna Mistřín s.r.o.
Sušárna a.s. Kratonohy
ACHP, spol. s r.o. Hradec Králové
Silnice Klatovy, a.s.
Rovina Písek, a.s., Písek u Chlumce n.C.
Kobra Údlice s.r.o.
Pískovny Hrádek a.s., Hrádek nad Nisou
CEMEX Cement, s.r.o.
SPONGILIT PP, spol. s r.o., Praha
TAPAS Borek, s.r.o., Stará Boleslav
NIKA Chrudim, s.r.o.
AG Skořenice, akciová společnost
Obec Osek nad Bečvou
VRAMAT CZ s.r.o., Tusko
ZEPOS a.s., Radovesice
Pískovna Klíčany HBH s.r.o.
Martin Čermák, Jablonné v Podještědí
FRISCHBETON s.r.o., Praha
Ing. Václav Luka, Český Brod
Vodohospodářské stavby Javorník-CZ s.r.o.
M&M Dresler s.r.o., Medlov
Hradecký písek a.s., Brno
SLOVÁCKÁ TĚŽEBNÍ, s.r.o., Uherské Hradiště
STAVOKA Hradec Králové, a.s.
Písky – Skviřín, s.r.o., Tachov
MORAS a.s., Moravany
INGEA realizace s.r.o., Ostrava – Svinov
AZS 98, s.r.o., Praha
SABIA s.r.o., Bohušovice nad Ohří
LIKOD s.r.o., Brno
Obecní lesy Bludov s.r.o.
Kateřina Zachová, Markvartice
Silnice Čáslav – Holding, a.s.
Václav Merhulík, Lety
Technické služby města Strakonice s.r.o.
Unigeo a.s., Ostrava – Hrabová
Ilona Seidlová, Jetřichov
Marie Beranová – Pískovna u Beranů, Daleké Dušníky

Pražské vodovody a kanalizace a.s.
MEASURER, s.r.o., Hradec Králové
Obec Rabštejnská Lhota
Recyklace-štěrkovna Frýdlant s.r.o.
Zemědělské družstvo Kokory
Lesy České republiky, s. p., Hradec Králové
Městys Polešovice
Ing.František Klika, Kladno
Jitka Mašková, Hýskov
Ing. Milan Tichý – Inženýrské stavby VOKA, Zahrádky
KAMENOLOMY ČR s.r.o., Ostrava – Svinov
Městské lesy Jaroměř s.r.o., Proruby
Ing. Josef Varhulík, Lány
Technické služby města Úpice
AGROSPOL HRÁDEK, spol. s r.o.
STAKUS – písek s.r.o., Tachov

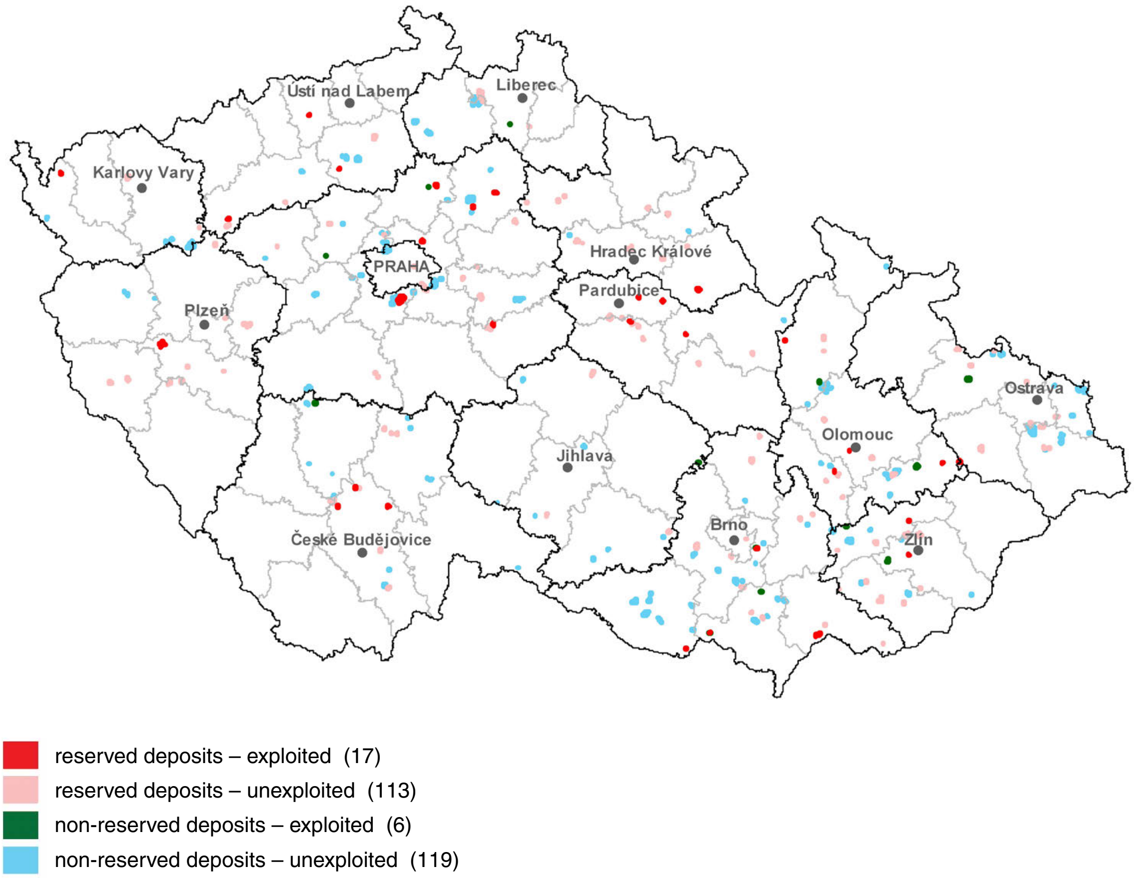
6. World production and world market prices

Sand and gravel extraction is often statistically recorded together with crushed stone extraction under the common term “aggregates”.

Sand and gravel prices are not created in the international market. Indicative and regional prices are also not quoted.

Brick clays and related minerals

1. Registered deposits and other resources of the Czech Republic



There are large numbers of brick mineral deposits registered in the Czech Republic and thus they are not listed in this overview. Their distribution over the Czech territory is rather uneven and consequently in some regions there is a shortage of these minerals (e.g. Českomoravská vrchovina Highlands covering most of the area of Vysočina Region with capital Jihlava).

2. Basic statistical data of the Czech Republic as of December 31

Reserved deposits: Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number	131	131	131	131	130
exploited	14	18	14	18	17
Total mineral *reserves, ths m^3	538 997	535 415	535 810	531 151	530 342
economic explored reserves	201 808	202 120	200 670	199 274	197 863
economic prospected reserves	232 522	232 197	232 227	228 964	228 242
potentially economic reserves	104 667	101 098	102 913	102 913	104 237
exploitable reserves	64 385	58 893	58 835	56 841	58 039
Mine production in reserved deposits, ths m^3	743	677	736	877	678

** See __NOTE__ in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic** of this yearbook*

Approved prognostic resources P_1, P_2, P_3

Year		2013	2014	2015	2016	2017
P_1,	ths m^3	25 691	25 691	25 691	25 691	25 691
P_2,	ths m^3	245 459	245 459	245 459	245 459	224 159
P_3		–	–	–	–	–

Non-reserved deposits: Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number	123	123	124	125	125
exploited	4	6	6	7	6
Total mineral *reserves, ths m^3	688 639	688 478	689 863	694 370	694 119
economic explored reserves	63 622	63 622	63 633	63 622	63 622
economic prospected reserves	518 164	518 003	519 377	523 895	523 644
potentially economic reserves	106 853	106 853	106 853	106 853	106 853
exploitable reserves	2 834	1 747	6 702	11 220	10 919
Mine production in non-reserved deposits, ths m^3 [a]	140	161	165	225	251

** See __NOTE__ in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic** of this yearbook*

[a] estimate

3. Foreign trade

690410 – Building bricks

		2013	2014	2015	2016	2017
Import	ths pcs	11 845	10 461	9 996	10 212	14 283
Export	ths pcs	12 375	9 931	10 971	13 287	14 134

690410 – Building bricks

		2013	2014	2015	2016	2017
Average import prices	CZK/piece	14.3	14.7	14.0	13.4	14.4
Average export prices	CZK/piece	22.6	24.9	27.5	30.1	29.1

690510 – Roof tiles

		2013	2014	2015	2016	2017
Import	ths pcs	7 311	7 737	7 331	7 621	8 251
Export	ths pcs	12 240	10 783	9 822	8 239	10 582

690510 – Roof tiles

		2013	2014	2015	2016	2017
Average import prices	CZK/piece	18.4	17.7	17.8	17.5	19.0
Average export prices	CZK/piece	18.1	19.2	19.0	20.9	18.0

4. Prices of domestic market

Domestic prices of brick clay and brick products

Product specification	2013	2014	2015	2016	2017
Brick clay; CZK/t	60–120	60–120	60–95	95	95
Full brick; CZK/piece	6–7	6–7	4–12	4–15	3.9–5.8
Honeycomb brick; CZK/piece	11–15	11–15	11–15	10.5–15	10.5–15
Facing bricks; CZK/piece	17–30	17–30	17–30	10.5–30	10.5–30
Brick blocks Porotherm; CZK/piece	22–90	22–90	24–110	24–110	24–110
Clay (ground clay bricks for tennis courts); CZK/t	1 450–2 140	1 450–2 140	1 450–2 140	1 450	1 450
Roof tiles; CZK/t	21–46	21–46	21–46	21–46	15.5–48
Ventilating, boundary tile; CZK/t	86–205	86–205	86–205	86–205	86–205
Classical shingle tile; CZK/t	12-60	12-60	12-60	12-60	12-60

5. Mining companies in the Czech Republic as of December 31, 2017

Brick clays and related minerals – reserved deposits
Wienerberger Cihlářský průmysl, a.s., Č. Budějovice
TONDACH Česká republika s.r.o., Hranice
HELUZ cihlářský průmysl v.o.s., Dolní Bukovsko
Cihelna Kinský s.r.o., Kostelec n.Orl.
Cihelna Hodonín, s.r.o.
Cihelna Polom, s.r.o.
LB MINERALS, s.r.o., Horní Bříza
Zlínské cihelny s.r.o., Zlín
Cihelna Vysoké Mýto s.r.o.

Brick clays and related minerals – non-reserved deposits
Wienerberger Cihlářský průmysl, a.s., Č. Budějovice
Wienerberger cihelna Jezernice, spol. s r.o.
HELUZ cihlářský průmysl v.o.s., Dolní Bukovsko
Ing. Jiří Hercl, cihelna Bratronice, Kyšice

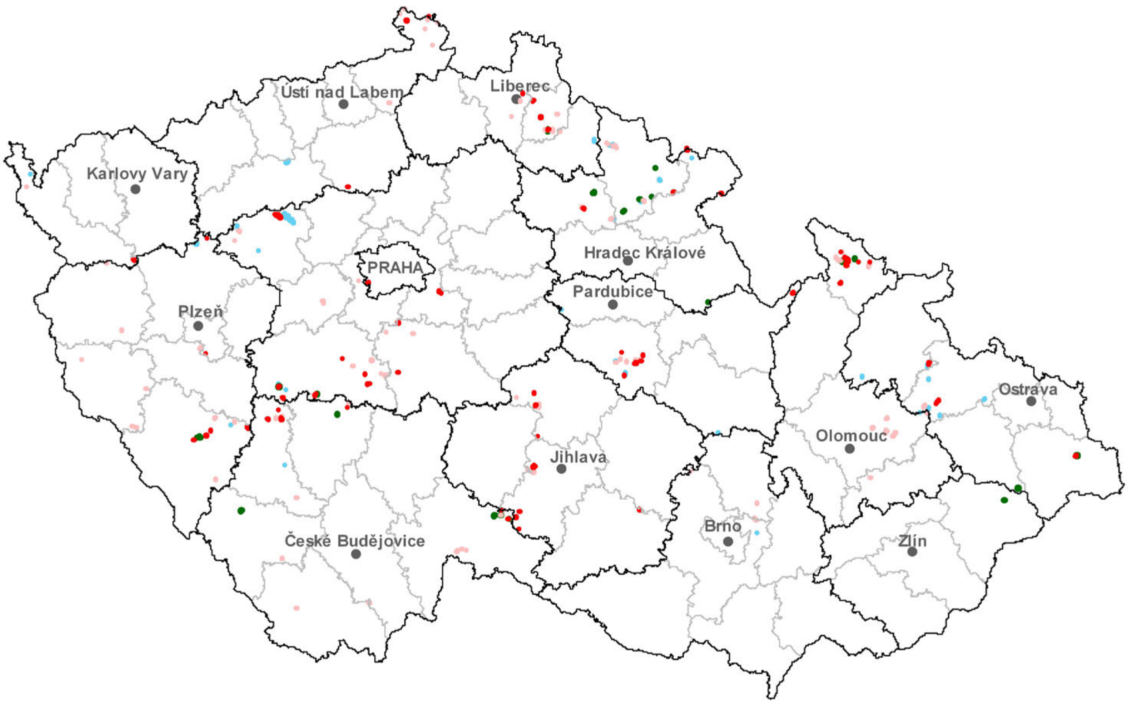
6. World production and world market prices

Global mining of brick clays is not statistically recorded and many states do not monitor it at all.

Brick clays are not subject to global trade.

Dimension stone

1. Registered deposits and other resources of the Czech Republic



- reserved deposits – exploited (63)
- reserved deposits – unexploited (96)
- non-reserved deposits – exploited (24)
- non-reserved deposits – unexploited (44)

There are many registered dimension stone deposits in the Czech Republic and therefore they are not listed.

2. Basic statistical data of the Czech Republic as of December 31

Reserved deposits: Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number	159	159	159	159	159
exploited	52	53	54	64	63
Total mineral *reserves, ths m^3	181 396	182 369	181 702	182 056	181 972
economic explored reserves	77 414	77 565	77 584	77 757	77 590
economic prospected reserves	64 393	65 248	65 233	65 414	64 888
potentially economic reserves	39 589	39 556	38 885	38 885	39 494
exploitable reserves	79 985	89 801	90 148	90 0951	89 048
Mine production in reserved deposits, ths m^3	140	145	187	156	111

** See **NOTE** in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic** of this yearbook*

Approved prognostic resources P_1, P_2, P_3

Year		2013	2014	2015	2016	2017
P_1,	ths m^3	5 043	5 043	5 043	3 026	3 026
P_2,	ths m^3	12 701	12 701	12 701	–	–
P_3		–	–	–	–	–

Non-reserved deposits: Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number	69	69	69	69	68
exploited	15	17	17	27	24
Total mineral *reserves, ths m^3	33 362	33 249	33 237	33 187	33 152
economic explored reserves	2 257	2 232	2 204	2 173	2 164
economic prospected reserves	28 146	28 101	28 077	28 058	28 032
potentially economic reserves	2 956	2 916	2 956	2 956	2 956
exploitable reserves	1 582	1 582	9 329	8 681	8790
Mine production in non-reserved deposits, ths m^3 [a)]	31	58	55	48	33

** See **NOTE** in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic** of this yearbook*

[a)] estimate

3. Foreign trade

2514 – Slate, also rougly worked or cut

		2013	2014	2015	2016	2017
Import	t	28 344	31 190	19 364	16 200	13 954
Export	t	4 201	5 094	4 124	7 088	5 483

2514 – Slate, also rougly worked or cut

		2013	2014	2015	2016	2017
Average import prices	CZK/t	1 200	1 095	1 308	1 251	1 316
Average export prices	CZK/t	1 369	1 319	1 036	1 020	1 091

2515 – Marble, travertine, ecaussine and other calcareous stone

		2013	2014	2015	2016	2017
Import	t	745	612	802	2 592	4 402
Export	t	47	10	2	1	1

2515 – Marble, travertine, ecaussine and other calcareous stone

		2013	2014	2015	2016	2017
Average import prices	CZK/t	17 239	15 438	12 146	9 296	8 002
Average export prices	CZK/t	34 714	2 500	3400	46 893	63 701

2516 – Granite, porphyry, basalt, sandstone and other stone

		2013	2014	2015	2016	2017
Import	t	8 755	5 978	8 886	6 470	5 640
Export	t	7 468	8 126	5 847	6 234	15 972

2516 – Granite, porphyry, basalt, sandstone and other stone

		2013	2014	2015	2016	2017
Average import prices	CZK/t	8 920	7 188	5 639	7 182	6 597
Average export prices	CZK/t	2 242	2 025	2 186	2 897	2 021

6801 – Setts, curbstones and flagstones of natural stone (except slate)

		2013	2014	2015	2016	2017
Import	t	12 705	15 202	16 480	14 607	14 597
Export	t	68 891	67 596	55 117	51 386	56 198

6801 – Setts, curbstones and flagstones of natural stone (except slate)

		2013	2014	2015	2016	2017
Average import prices	CZK/t	138 089	2 416	1 983	1 716	2 069
Average export prices	CZK/t	2 069	2 312	2 080	2 087	2 055

6802 – Worked monumental and crushed stone (except slate) and stonework

		2013	2014	2015	2016	2017
Import	t	27 220	22 653	23 849	24 110	27 255
Export	t	56 574	48 191	36 761	37 079	38 161

6802 – Worked monumental and crushed stone (except slate) and stonework

		2013	2014	2015	2016	2017
Average import prices	CZK/t	31 222	21 887	17 095	16 360	14 455
Average export prices	CZK/t	15 703	9 323	5 535	6 383	6 819

6803 – Worked slate and articles of slate or of agglomerated slate

		2013	2014	2015	2016	2017
Import	t	3 194	3 353	2 909	2 441	2 141
Export	t	80	59	77	40	105

6803 – Worked slate and articles of slate or of agglomerated slate

		2013	2014	2015	2016	2017
Average import prices	CZK/t	12 015	12 113	13 469	14 384	14 917
Average export prices	CZK/t	29 717	27 108	19 982	26 077	93 511

4. Prices of domestic market

Product specification			Unit	2013	2014	2015	2016	2017
greyish blue Hlinec granite	cobblestones		CZK/t	2 100–3 250	2 100–3 550	2 100–2 550	2 100–2 550	2 100–2 550
	margin stones		CZK/bm	320–400	320–400	320–400	320–400	320–400
	cleaved prisms		CZK/m^2	2 100	2 100	2 100	2 100	2 100
	curbstones		CZK/bm	1 000–1 200	1 000–1 200	1 000–1 200	1 000–1 200	1 000–1 200
	slabs	polished, thickness 2–8 cm	CZK /m^2	1 800–3 800	2050–4 530	1 800–3 800	1 800–3 800	1 800–3 800
		emery grounded, thickness 2–8 cm	CZK /m^2	1 600–3 600	1 780–4 100	1 600–3 600	1 600–3 600	1 600–3 600
		sand blasted finish, thickness 2–8 cm	CZK /m^2	1 400–3 100	1 565–3 600	1 400–1 200	1 400–1 200	1 400–1 200
		formatted suitable as pavement, thickness 3 cm	CZK /m^2	1 560–2 260	1 560–2 260	1 560–2 260	1 560–2 260	1 560–2 260
Granite Kozárvice Chlum Řečice		cobblestones 18/18-4/6	CZK/t	–	–	–	–	2 000–2 400
		curbstones 10/20/40–20/10/40	CZK/t	–	–	–	–	2 300 –2400
		margin stones	CZK/t	–	–	–	–	350
		blocks 0,5–0,99 až 2,0–2,49 m^3	CZK /m^3	–	–	–	–	5 500–7 600
		blocks 2,5–2,99 až 4,0–5,0 m^3	CZK /m^3	–	–	–	–	8 500–9 500
light Silesian granite	cobblestones		CZK/t	N	1 650–2 600	1 900–3 000	1 900–3 000	1 900–3 000
	margin stones		CZK/bm	N	320	300–330	300–330	300–330
	cleaved prisms		CZK/m^2	N	1500	1 650	1 650	1 650
Mrákotín type granite pavement slabs		sand blasted finish, thickness 2–8 cm	CZK/m^2	N	1 220–2 501	1 450–2 250	1 450–2 250	1 450–2 250
		emery grounded, thickness 2–8 cm	CZK/m^2	N	1 630–2 738	1 580–2 480	1 580–2 480	1 580–2 480
		polished, thickness 2–8 cm	CZK/m^2	N	1 640–2 786	1 900–2 700	1 900–2 700	1 900–2 700
granite blocks			Kč/m^3	≥ 5 500	<1.5 m^3 = 7 000 >1.5 m^3 = 9 000	<1.5 m^3 = 7 000 >1.5 m^3 = 9 000	<1,5 m^3 = 7 000 >1,5 m^3 = 9 000	<1,5 m^3 = 7 000 >1,5 m^3 = 9 000
sandstone – cut slabs	thickness 5 cm		CZK/m^2	1 000–1 930	1 000–1 930	1 000–1 930	1 000–1 930	1 000–1 930
	thickness 10 cm		CZK/m^2	2 770–3 410	2 770–3 410	2 770–3 410	2 770–3 410	2 770–3 410
	thickness 15 cm		CZK/m^2	4 190–5 180	4 190–5 180	4 190–5 180	4 190–5 180	4 190–5 180
marble – pavement	cut	Supíkovice marble	CZK/m^2	N	N	280–1 100	280–1 100	280–1 100
		Lipová marble	CZK/m^2	N	N	280–1 190	280–1 190	280–1 190
	smoothed	Supíkovice marble	CZK/m^2	N	N	360–1 240	360–1 240	360–1 240
		Lipová marble	CZK/m^2	N	N	360–1 350	360–1 350	360–1 350
	polished	Supíkovice marble	CZK/m^2	N	N	390–1 280	390–1 280	390–1 280
		Lipová marble	CZK/m^2	N	N	390–1 390	390–1 390	390–1 390

Notice: bm (běžný metr) – running metre

5. Mining companies in the Czech Republic as of December 31, 2017

Dimension stone – reserved deposits
HERLIN s.r.o., Příbram
Slezské kamenolomy a.s.
Plzeňská žula, Plzeň
Průmysl kamene a.s., Příbram
MEDIGRAN s.r.o., Plzeň
Granit Lipnice s.r.o., Dolní Město
KAVEX – GRANIT HOLDING a. s., Plzeň
Česká žula s.r.o., Strakonice
Granit Zedníček s.r.o., Kamenná
Těžba nerostů a.s., Plzeň
Josef Máca, Třešť
ABAKRON, s.r.o.
Obec Studená
Ligranit a.s., Liberec
SLEZSKÁ ŽULA spol. s r.o., Brno
SATES ČECHY, s.r.o., Telč
Kámen Hudčice s.r.o.
Lom Matula Hlinsko, a.s.
KÁMEN OSTROMĚŘ s.r.o.
GRANITES, s.r.o., Žulová
RESTA DAKON s.r.o.
JIHOKÁMEN, výrobní družstvo, Písek
COMING PLUS, a.s., Praha 4
GRANIO s.r.o., Chomutov
Kamenoprůmyslové závody s.r.o., Šluknov
GRANIT-ZACH, spol. s r.o., Praha
LOM DEŠTNO a.s., Sedlčany
M. & H. Granit s.r.o., Plzeň
Krákorka a.s., Červený Kostelec
Mramor Slivenec a.s., Dobřichovice
PURISON s.r.o.
TŘEBOCKÝ LOM CZ, s.r.o.
Lom Žernovka, s.r.o., Mukařov
Důl Radim a.s., Ostrava
REVLAN s.r.o., Horní Benešov
Mšenské pískovce s.r.o., Mšené - lázně

Dimension stone – non-reserved deposits
HERLIN s.r.o., Příbram
RENO Šumava a.s., Vlachovo Březí
WÜHNANOFF s.r.o.
Josef Máca, Třešť
KOKAM s.r.o., Kocbeře
Lom Horní Dvorce, s.r.o., Strmilov
Jiří Sršeň - TEKAM, Záměl
Lesostavby Frýdek-Místek, a.s.
SPONGILIT PP, spol. s r.o., Praha
Alfonz Dovičovič, Hořice
PROFISTAV Litomyšl, a.s.
Ing. Danuše Plandorová, Hážovice

6. World production and world market prices

Global mining of decorative stone is not statistically recorded and many states do not monitor it at all. The most important producer of dimension stone in Europe is Italy, in the world it is the US, Brazil, and China.

Dimension stone is subject to global trade while prices are determine by corporate price lists. Dimension stone prices depend on the quality and colour of the rock and the degree of processing. They can be estimated by price levels in the US market (*Source: Minerals Yearbook – Advance Data Release of the 2016 Annual Tables.-https://minerals.usgs.gov/minerals/pubs/commodity/stone-dimension/myb1-2016-stond-adv.xlsx)*

Dimension stone sold or used in the US in 2016, classification by types

	Amount, t	Value, ths. USD	Average price, USD/t
Granite	585,000	130,000	219
Limestone	1,130,000	168,000	123
Marble	59,900	17,000	320
Sandstone	473,000	58,400	127
Slate	42,900	19,100	455
Other types of stone	342,000	68,400	197

Dimension stone export from the US in 2016, classification by types

	Amount, ths. t	Value, ths. USD	Average value, USD/t	Main destination, by value
Marble, travertine, alabaster worked (further worked than simply cut with a flat surface)	89	8 930	100	Canada, 50 %
Marble, travertine, crude or roughly trimmed	11	10 900	991	Italy, 93 %
Marble, travertine, merely cut, by sawing or otherwise (blocks or slabs)	4	3 690	923	Canada, 34 %
Granite, crude or roughly trimmed	41	13 900	339	China, 53 %
Granite, merely cut, by sawing or otherwise (blocks or slabs)	22	7 140	325	Canada, 74 %
Slate, worked and articles of slate	N	2 270	N	Canada, 50 %
Slate, whether or not roughly trimmed or merely cut (blocks or slabs)	N	276	N	Canada, 43 %
Other calcareous, memorial, or building stone; alabaster (other than marble and travertine; crude, roughly cut or simply cut into blocks or slabs)	28	11 300	404	Canada, 89 %
Other monumental or building stone (other than calcareous stone and alabaster, granite, sandstone, slate, dolomite, quartzite, and steatite; crude, roughly trimmed or merely cut into blocks or slabs)	27	7 160	265	Canada, 89 %

Dimension stone import in the US in 2016, classification by types

		Amount	Value, ths. USD	Average value, USD/t or USD/ft^2 (USD/m^2)	Main source, according to the value
Marble and alabaster (simply cut with a flat surface)	tonnes	36,600	39,200	1,071	Italy, 27 %
Roofing slate	mil. ft^2	13	9,250	0.7 (7.7)	Spain, 43 %
Roughly trimmed or simply cut slate (rectangular blocks or slabs)	mil. ft^2	9,150	4,480	0.0005 (0.005)	China, 53 %
Worked slate and articles of slate products and other products (other than roofing products, including agglomerated slate)	mil. ft^2	N	56,500	N	China, 52 %
Travertine, monumental or building stone and products thereof (simply cut with a flat surface, other than tiles and granules)	mil. ft^2	22,700	11,700	0.0005 (0.006)	Mexico, 26 %
Travertine, worked monumental or building stone (dressed or polished but not further worked)	mil. ft^2	18,000	14,000	0.0008 (0.008)	Turkey, 45 %

Note: ft^2 – square foot; 1 ft^2 = 0.092903 m^2

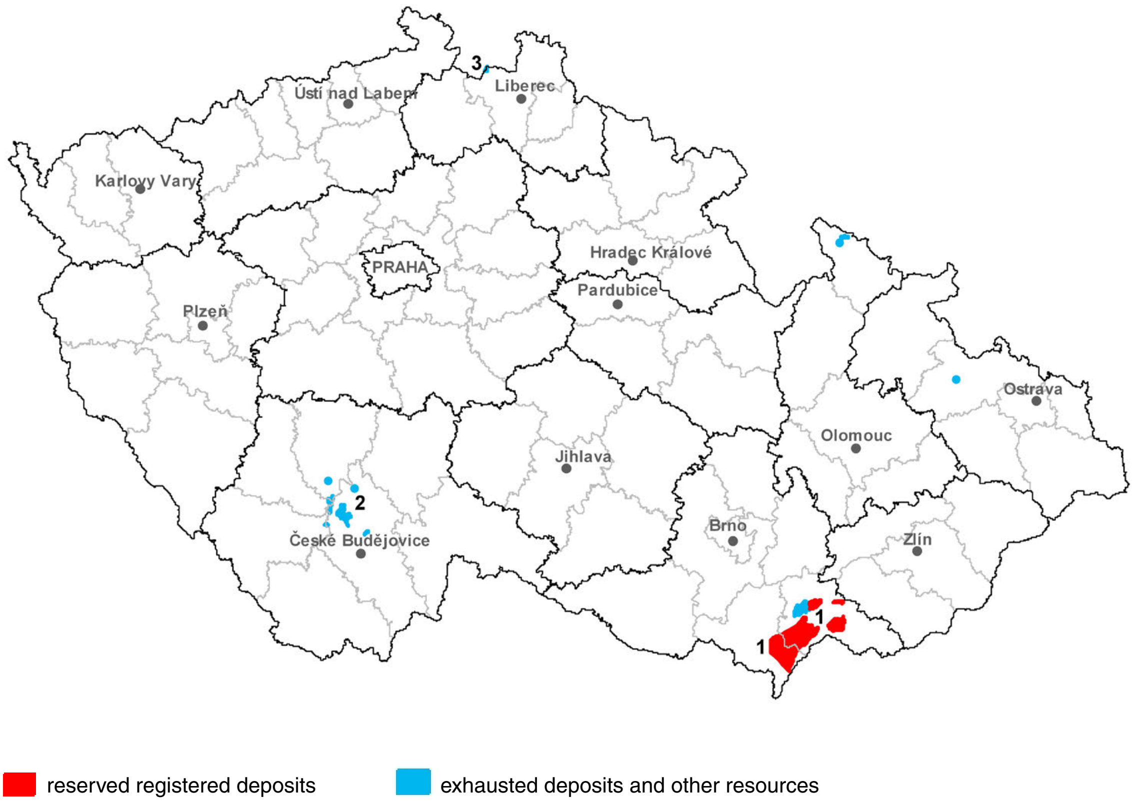
MINERALS CURRENTLY UNMINED IN THE CZECH REPUBLIC

MINERALS MINED IN THE PAST WITH RESOURCES AND RESERVES

ENERGY MINERALS

Lignite

1. Registered deposits and other resources of the Czech Republic



Principal areas of deposits presence:

(Names of regions with mined deposits are indicated in ***bold type****)*

1 Vienna Basin	2 České Budějovice Basin	3 Czech part of the Zittau (Žitava) Basin

2. Basic statistical data of the Czech Republic as of December 31

Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number	5	5	5	5	5
exploited	0	0	0	0	0
Total mineral reserves*, kt	997 229	997 229	997 229	997 229	997 229
economic explored reserves	619 652	619 652	619 652	619 652	619 652
economic prospected reserves	229 932	229 932	229 932	229 932	229 932
potentially economic reserves	147 645	147 645	147 645	147 645	147 645
exploitable (recoverable)	1 903	1 903	1 903	1 903	1 903
Mine production, kt	0	0	0	0	0

** See <u>**NOTE**</u> in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic** of this yearbook*

Lignite mining ended in 2009.

Approved prognostic resources P_1, P_2, P_3

Year		2013	2014	2015	2016	2017
P_1,	kt	169 262	169 262	177 351	177 351	177 351
P_2	kt	37 531	37 531	37 531	37 531	37 531
P_3		–	–	–	–	–

3. Foreign trade

No separate tariff item exists for lignite.

4. World production and world market prices

World mine production

Worldwide, lignite production is included in brown coal (lignite) production.

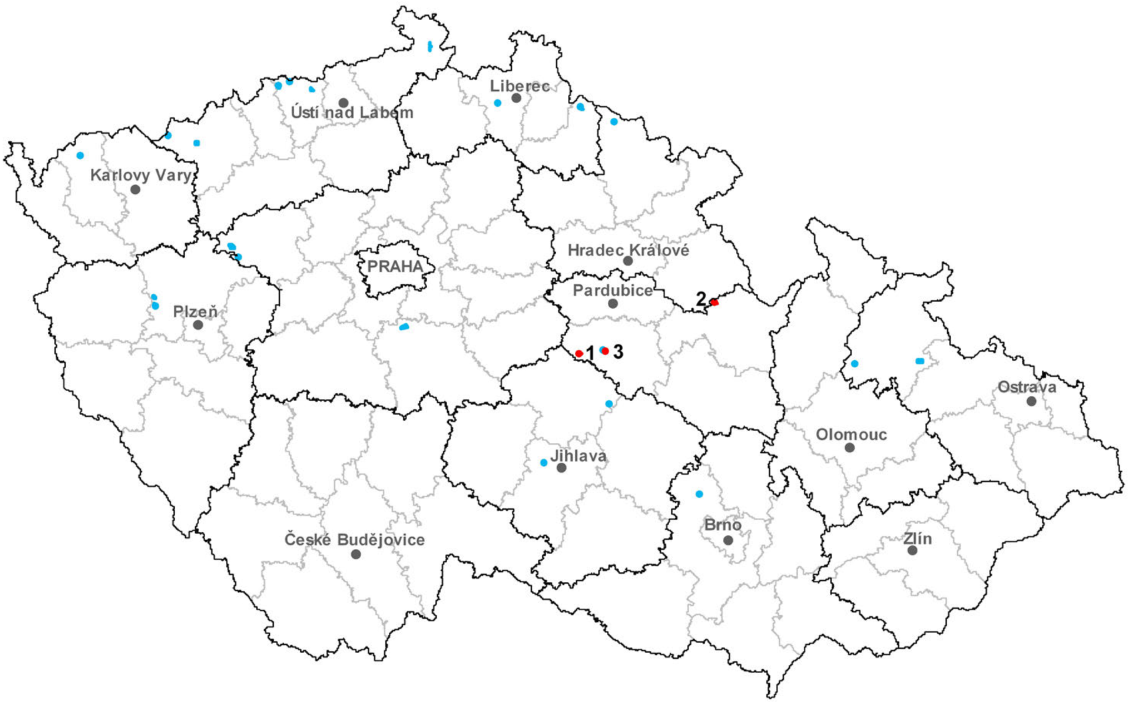
Prices of traded commodities

There are no international market for lignite commodities as lignite is generally not traded outside a producing country.

INDUSTRIAL MINERALS

Barite

1. Registered deposits and other resources of the Czech Republic



reserved registered deposits   exhausted deposits and other resources

Registered deposits and other resources are not mined

1 Běstvina	2 Bohousová	3 Křižanovice

2. Basic statistical data of the Czech Republic as of December 31

Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number [a]	3	3	3	3	3
exploited	0	0	0	0	0
Total mineral *reserves, kt	569	569	569	1 015	1 015
economic explored reserves	0	0	0	0	0
economic prospected reserves	0	0	0	0	0
potentially economic reserves	569	569	569	1 015	1 015
Mine production, kt	0	0	0	0	0

** See **NOTE** in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic** of this yearbook*

[a] Deposits with registered barite reserves

3. Foreign trade

251110 – Natural barium sulphate (barite)

		2013	2014	2015	2016	2017
Import	t	6 964	7 915	10 630	8 313	8 912
Export	t	464	178	241	191	200

251110 – Natural barium sulphate (barite)

		2013	2014	2015	2016	2017
Average import prices	CZK/t	8 969	9 064	8 147	9 182	10 521
Average export prices	CZK/t	15 382	14 010	15 141	15 110	15 451

251120 – Natural barium carbonate (witherite)

		2013	2014	2015	2016	2017
Import	t	0	0	8	0.001	11
Export	t	0	0	0	0	0

251120 – Natural barium carbonate (witherite)

		2013	2014	2015	2016	2017
Average import prices	CZK/t	–	–	10 000	21 730	10 000
Average export prices	CZK/t	–	–	–	–	–

4. World production and world market prices

World mine production

World baryte production was as follows in recent years:

	2013	2014	2015	2016	2017^e
World mine production of barite (according to MCS), kt	9 230	8 250	7 410	7 320	7 700
World mine production of barite (according to WBD), kt	9 959.9	9 679.0	9 397.5	9 130.6	N

e – preliminary values

Main producers according to MCS

country	2017^e	
	kt	%
China	3 100	40.3
India	1 100	14.3
Morocco	1 000	13.0
Mexico	500	6.5
Kazakhstan	500	6.5
Russia	430	5.6
Turkey	200	2.6
Thailand	150	1.9
Mexico	140	1.8
Pakistan	140	1.8
world	**7 700**	**100.0**

e – preliminary values

Prices of traded commodities (according to IM)

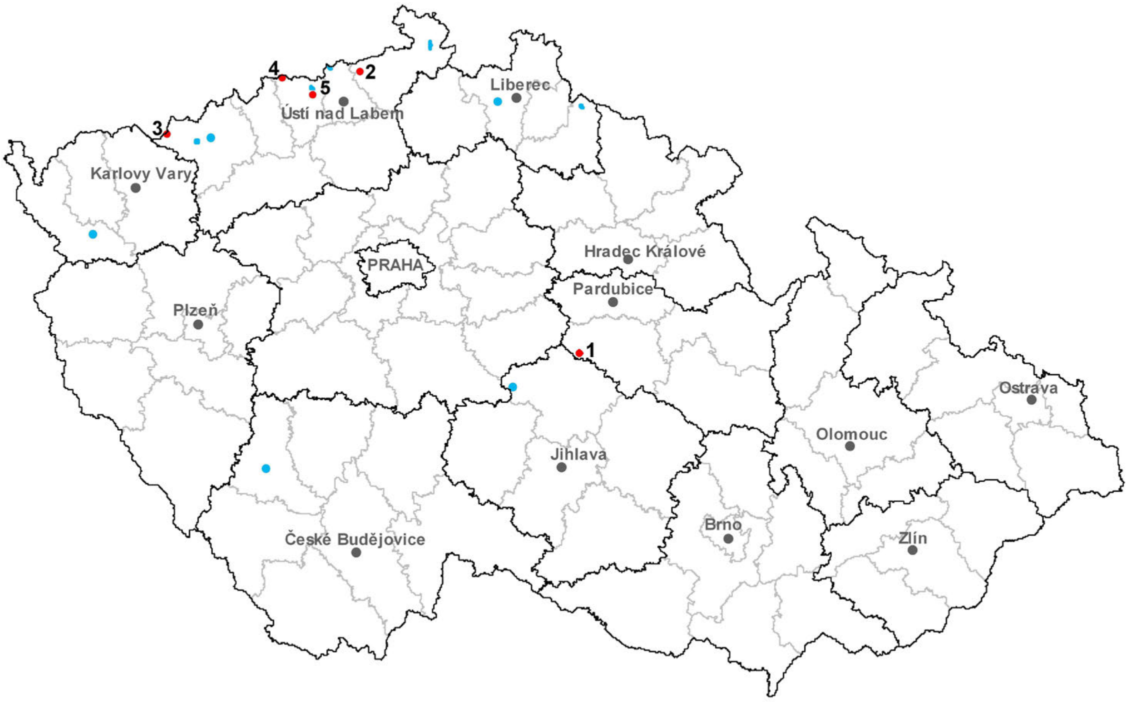
Barite is traded in three different quality grades: as a weighting agent in drilling muds and as white paint-grade and chemical-grade barite.

Commodity/Year			2013	2014	2015	2016	2017
Drilling grade, underground lump OCMA/API, bulk, s.g. 4.20							
FOB Chennai		USD/t	145–155	138–155	120–138	115–125	90–125
FOB Morocco		USD/t	105–130	105–130	115–140	105–140	70–125
FOB China		USD/t	120–140	115–140	115–140	90–118	70–110
C&F North Sea (Moroccan)		USD/t	145–160	145–160	145–172	125–135	100–135
API, CIF Gulf Coast	Chinese	USD/t	147–154	147–164	145–160	118–155	95–130
	Indian		157–171	157–171	158–171	120–171	105–130
Drilling-grade, ground							
OCMA, bulk, del. Aberdeen		GBP/t	95–105	95–105	95–130	110–130	140–125
OCMA, bulk, del. Gt Yamouth		GBP/t	110–120	110–125	112–150	110–150	110–150
OCMA/API, bulk (15t): FOB J.Turkey		USD/t	150–155	150–168	152–168	120–157	110–135
SG 4.22, bagged, FOB Morocco		USD/t	110–170	110–170	110–172	100–170	95–150
Paint grade, white 96-98% $BaSO_4$:							
350 mesh, 1–5 lots,del. UK		GBP/t	195–220	195–220	195–220	190–220	190–236
Chinese, lump CIF Gulf Coast		USD/t	235–275	235–275	235–290	215–310	215–250
325–350 mesh, 1–5 lots, ex–works USA		USD/st	315–400	315–400	315–400	315–400	315–370
Chemical grade							
Chinese, CIF Gulf Coast		USD/t	161–180	161–180	161–180	145–180	145–162

The price range includes the lowest and highest monthly price quotes for a given year.

Fluorspar

1. Registered deposits and other resources of the Czech Republic



reserved registered deposits   exhausted deposits and other resources

Registered deposits and other resources are not mined

1 Běstvina	3 Kovářská	5 Proboštov – tailing pond Přítkov
2 Jílové u Děčína	4 Moldava	

2. Basic statistical data of the Czech Republic as of December 31

Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number [a]	4	4	4	4	5
exploited	0	0	0	0	0
Total mineral *reserves, kt	2 033	2 033	2 033	2 033	2 210
economic explored reserves	0	0	0	0	0
economic prospected reserves	0	0	0	0	32
potentially economic reserves	2 033	2 033	2 033	2 033	2 178
Mine production, kt	0	0	0	0	0

** See **NOTE** in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic** of this yearbook*

[a] *Deposits with registered fluorspar reserves*

3. Foreign trade

252921 – Fluorspar, containing 97 wt % or less of calcium fluoride

		2013	2014	2015	2016	2017
Import	t	5 796	6 199	4 858	4 841	3 536
Export	t	1 686	1 729	1 562	895	1 983

252921 – Fluorspar, containing 97 wt % or less of calcium fluoride

		2013	2014	2015	2016	2017
Average import prices	CZK/t	6 325	6 713	6 548	7 976	6 035
Average export prices	CZK/t	8 176	9 160	10 355	10 254	3 011

252922 – Fluorspar, containing more than 97 wt % of calcium fluoride

		2013	2014	2015	2016	2017
Import	t	9 624	11 031	9 053	12 356	14 951
Export	t	7 948	8 993	8 133	8 082	9 636

252922 – Fluorspar, containing more than 97 wt % of calcium fluoride

		2013	2014	2015	2016	2017
Average import prices	CZK/t	8 515	7 214	6 729	6 601	6 360
Average export prices	CZK/t	12 273	11 422	10 627	10 196	9 063

4. World production and world market prices

World mine production

World fluorspar production in recent years was as follows:

	2013	2014	2015	2016	2017^{e}
World mine production of fluorspar (according to MCS), kt	6 770	6 390	6 670	5 930	6 000
World mine production of fluorspar (according to WBD), kt	6 418.3	6 819.0	5 790.0	6 008.6	N

e – preliminary values

Main producers according to MCS

country	2017^{e}	
	kt	%
China	3 800	63.3
Mexico	990	16.5
Mongolia	200	3.3
Vietnam	200	3.3
South Africa	200	3.3
Spain	130	2.2
Kazakhstan	110	1.8
Morocco	50	0.8
Germany	50	0.8
Kenya	43	0.7
world	**6 000**	**100.0**

e – preliminary values

Leading producers also include the USA, which, however, does not publish statistical data on fluorspar.

Prices of traded fluorspar commodities (USD/t) according to IM

Two grades of fluorspar are listed in market quotations: filtercake for the production of hydrofluoric acid and metallurgical fluorspar.

Filtercake, bulk, for production of hydrofluoric acid

Commodity/Year	2013	2014	2015	2016	2017
Mexican, < 5ppm As FOB Tampico	540–550	400–550	280–420	280–310	280*310
Mexican, FOB Tampico	350	310–350	260–330	260–280	260–280
Chinese, wet filtercake, CIF Rotterdam	310–330	350–420	270–360	250–300	250–400
Chinese, wet filtercake, FOB China	290–320	300–330	240–310	230–280	250–400
South African, dry basis, FOB Durban	380–450	310–450	250–330	200–270	200–230
Chinese, dry basis, CIF US Gulf Port	480–530	340–530	270–370	260–300	N

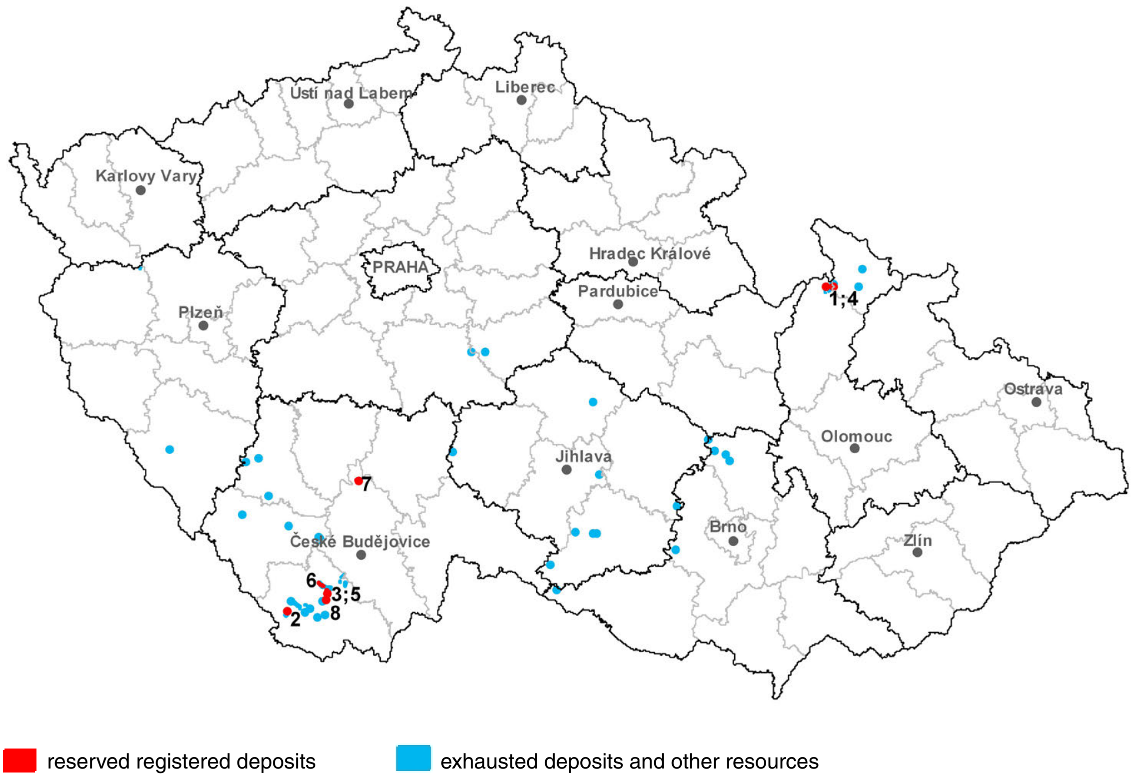
Metallurgical fluorspar

Commodity/Year	2013	2014	2015	2016	2017
Chinese, min. 85 % CaF_2, CIF Rotterdam	N	290–310	290–310	230–310	240–260
Mexican, FOB Tampico	230–270	230–270	230–270	230–270	230–250
Chinese, min.80 % CaF_2, wet bulk, FOB China	200–220	200–220	200–220	200–280	200–280
Chinese, min. 85 % CaF_2 CIF Rotterdam	290–310	230–250	230–260	240–290	240–280
Chinese, min. 90 % CaF_2, bulk FOB China	250–275	250–275	250–290	270–300	250–270

The price range includes the lowest and highest monthly price quotes for a given year.

Graphite

1. Registered deposits and other resources of the Czech Republic



Registered deposits and other resources are not mined

Amorphous graphite:	Crystalline graphite:	Mixed (from amorphous to crystalline) graphite:
1 Velké Vrbno-Konstantin	5 Český Krumlov-Městský vrch	8 Spolí
2 Bližná-Černá v Pošumaví	6 Lazec-Křenov	
3 Český Krumlov-Rybářská ulice	7 Koloděje nad Lužnicí-Hosty	
4 Velké Vrbno-Luční hora 2		

2. Basic statistical data of the Czech Republic as of December 31

Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number	8	8	8	8	8
exploited	1	0	0	0	0
Total mineral *reserves, kt [a)]	14 159	14 159	14 159	13 701	13 701
economic explored reserves	1 321	1 106	1 106	2 981	2 981
economic prospected reserves	4 041	2 606	2 606	4 935	4 935
potentially economic reserves	8 797	10 447	10 447	5 785	5 785
Mine production, kt [a)]	0	0	0	0	0

** See __NOTE__ in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic** of this yearbook*

[a)] Reserves and mine production are given for crude graphite (graphite "ore"); average graphite contents in the raw material range between 15 and 20 % (crystalline grade) and 25–35 % (amorphous grade), respectively

Approved prognostic resources P_1, P_2, P_3

Year		2013	2014	2015	2016	2017
P_1,	kt	3 878	3 997	3 997	3 280	3 280
P_2,	kt	5 279	5 279	5 279	8 895	8 895
P_3,	kt	1 505	1 505	1 505	2 627	2 627

3. Foreign trade

2504 – Natural graphite

		2013	2014	2015	2016	2017
Import	t	5 644	4 964	4 967	4 374	4 543
Export	t	2 675	2 982	2 670	2 592	2 876

2504 – Natural graphite

		2013	2014	2015	2016	2017
Average import prices	CZK/t	21 416	22 589	24 014	22 895	20 475
Average export prices	CZK/t	39 286	41 562	40 778	36 114	33 072

3801 – Artificial graphite; colloidal or semi-colloidal graphite; preparations based on graphite

		2013	2014	2015	2016	2017
Import	t	2 436	2 381	2 506	2 517	3 289
Export	t	1 483	1 806	1 487	1 399	2 306

3801 – Artificial graphite; colloidal or semi-colloidal graphite; preparations based on graphite

		2013	2014	2015	2016	2017
Average import prices	CZK/t	55 150	52 845	59 617	63 023	50 338
Average export prices	CZK/t	33 033	41 172	55 767	63 737	45 692

6903 – Other refractory ceramic goods (for example, retorts, crucibles, muffles, nozzles, plugs, supports, cupels, tubes, pipes, sheaths and rods)

		2013	2014	2015	2016	2017
Import	t	1 053	9 817	19 665	4 458	12 939
Export	t	20 069	21 655	29 609	22 393	24 340

6903 – Other refractory ceramic goods (for example, retorts, crucibles, muffles, nozzles, plugs, supports, cupels, tubes, pipes, sheaths and rods)

		2013	2014	2015	2016	2017
Average import prices	CZK/t	105 057	65 994	34 254	133 564	44 210
Average export prices	CZK/t	94 799	105 720	75 720	108 106	109 159

4. World production and world market prices

World mine production

	2013	2014	2015	2016	2017[e]
World mine production of graphite (according to MCS), kt	1 110	1 190	1 190	1 150	1 200
World mine production of graphite (according to WBD), kt	1 125.6	1 104.7	1 120.9	1 126.0	N

e – preliminary values

Main producers according to MCS

country	2017[e]	
	kt	%
China	780	65.0
India	150	12.5
Brazil	95	7.9
Canada	30	2.5
Mozambique	23	1.9
Russia	19	1.6
Ukraine	15	1.3
Pakistan	14	1.2
Norway	8	0.7
Madagascar	7	0.6
world	**1 200**	**100.0**

e – preliminary values

Prices of traded commodities (USD/t) according to IM

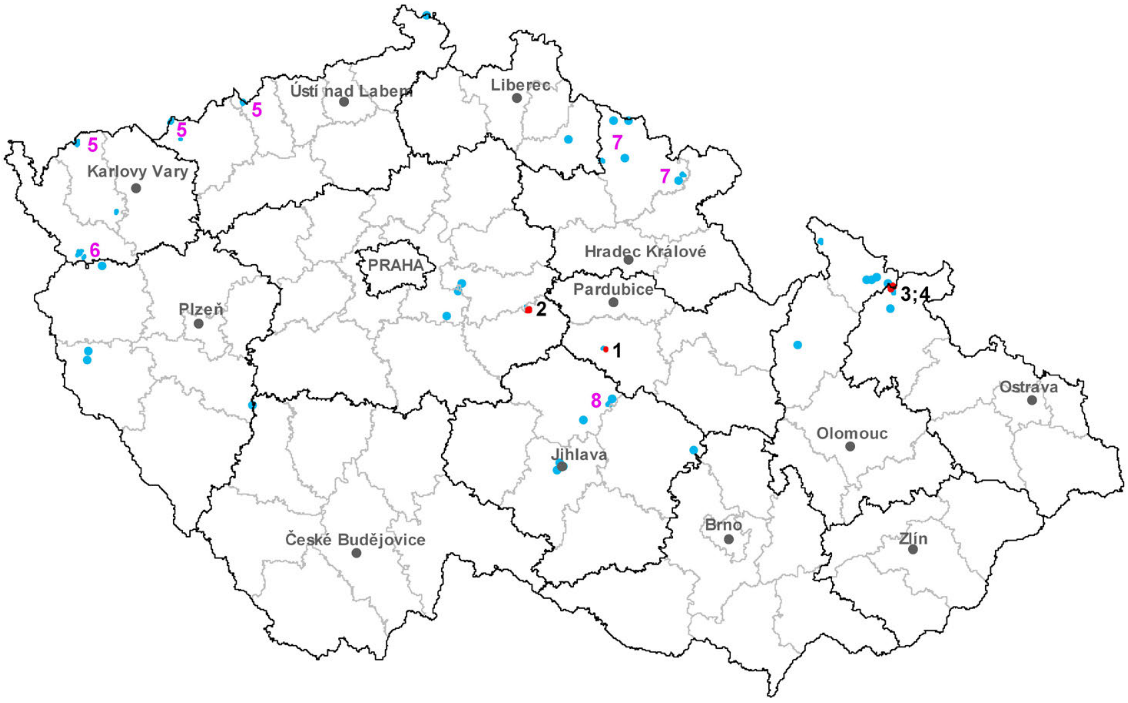
Commodity/ Year	2013	2014	2015	2016	2017
Crystalline graphite, large flake, 94–97 % C, +80 mesh, CIF main European port	1 250–1 300	1 350–1 400	1 050–1500	750–850	750–1 070
Crystalline graphite, medium flake, 94–97 % C, –80 mesh, CIF main European port*	1 050–1 150	850–1 200	900–1 300	700–750	700–1 040
Crystalline graphite, fine, 94–97 % C, +100 mesh, CIF main European port*	850–950	850–1 050	900–1 050	620–680	620–940
Crystalline graphite, large flake, 90 % C, +80 mesh, CIF UK port	1 100–1 150	1 100–1 200	750–1 200	600–650	600–650
Crystalline graphite, medium flake, 90 % C, +100–80 mesh, CIF main European port	900–1 000	900–1 000	700–1 050	550–620	550–620
Crystalline graphite, fine, 90 % C, –100 mesh, CIF main European port	750–850	750–850	600–800	500–550	500–550
Crystalline graphite, medium flake, 85–87 % C, +100–80 mesh, CIF main European port	700–800	700–800	550–800	400–500	400–450
Amorphous graphite, powder, 80–85 % C, Chinese CIF Europe	500–550	430–550	400–480	400–450	400–430

The price range includes the lowest and highest monthly price quotes for a given year.

METALLIC ORES

Copper

1. Registered deposits and other resources of the Czech Republic



reserved registered deposits   exhausted deposits and other resources

Registered deposits and other resources are not mined

Reserved registered deposits:

1	Křižanovice	3	Zlaté Hory-Hornické Skály
2	Kutná Hora	4	Zlaté Hory-východ

Exhausted deposits and other resources:

5	in Krušné hory Mts. (Erzgebirge Mts.) and Tisová	7	in Krkonoše Mts. Piedmont Basin and Intrasudetic Basin
6	Tři Sekery and surroundings	8	Staré Ransko

2. Basic statistical data of the Czech Republic as of December 31

Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number [a)]	4	4	4	4	4
exploited	0	0	0	0	0
Total mineral *reserves, kt Cu	49	49	49	49	50.7
economic explored reserves	0	0	0	0	0
economic prospected reserves	0	0	0	0	0
potentially economic reserves	49	49	49	49	50.7
Mine production, kt Cu	0	0	0	0	0

** See **NOTE** in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic** of this yearbook*

[a)] deposits with registered Cu content

3. Foreign trade

2603 – Copper ores and concentrates

		2013	2014	2015	2016	2017
Import	t	93	94	90	48	1
Export	t	4	0	0	4	24

2603 – Copper ores and concentrates

		2013	2014	2015	2016	2017
Average import prices	CZK/t	113 821	75 873	74 276	22 561	73 059
Average export prices	CZK/t	22 864	–	–	71 801	140 726

7402 – Unrefined copper

		2013	2014	2015	2016	2017
Import	t	112	287	23	427	62
Export	t	387	602	0.4	0.005	0.002

7402 – Unrefined copper

		2013	2014	2015	2016	2017
Average import prices	CZK/t	170 904	154 926	297 556	115 944	218 124
Average export prices	CZK/t	149 727	145 518	2 015 766	400 000	500 000

7403 – Refined copper and copper alloys

		2013	2014	2015	2016	2017
Import	t	35 174	16 450	6 772	5 984	7 340
Export	t	53 182	26 627	4 930	1 925	412

7403 – Refined copper and copper alloys

		2013	2014	2015	2016	2017
Average import prices	CZK/t	152 028	144 197	135 665	97 713	97 431
Average export prices	CZK/t	67 016	146 282	144 246	140 411	129 739

7404 – Copper waste and scrap

		2013	2014	2015	2016	2017
Import	t	14 164	9 449	5 706	5 451	7 733
Export	t	67 016	68 421	56 130	52 991	60 360

7404 – Copper waste and scrap

		2013	2014	2015	2016	2017
Average import prices	CZK/t	122 015	118 523	132 672	86 727	103 826
Average export prices	CZK/t	101 140	99 208	93 359	83 685	96 483

740311 – Copper cathodes and sections of cathodes unwrought

		2013	2014	2015	2016	2017
Import	t	32 531	14 778	3 147	865	1 228
Export	t	51 532	25 037	3 103	200	122

740311 – Copper cathodes and sections of cathodes unwrought

		2013	2014	2015	2016	2017
Average import prices	CZK/t	154 116	146 775	144 012	122 962	148 137
Average export prices	CZK/t	169 359	146 176	141 710	125 234	152 367

740321 – Copper-zinc base alloys, unwrought

		2013	2014	2015	2016	2017
Import	t	2 244	2 442	3 109	4 529	5 554
Export	t	1 154	1 301	1 573	1 504	1 664

740321 – Copper-zinc base alloys, unwrought

		2013	2014	2015	2016	2017
Average import prices	CZK/t	108 820	114 660	104 265	77 119	74 332
Average export prices	CZK/t	141 589	152 722	145 909	146 043	140 029

740322 – Copper-tin base alloys, unwrought

		2013	2014	2015	2016	2017
Import	t	53	57	45	74	208
Export	t	99	71	132	36	137

740322 – Copper-tin base alloys, unwrought

		2013	2014	2015	2016	2017
Average import prices	CZK/t	281 980	452 125	499 546	305 669	187 028
Average export prices	CZK/t	157 222	173 864	176 063	196 649	90 418

4. World production and world market prices

World mine production

World production of primary copper has been rising in recent years:

	2013	2014	2015	2016	2017^e
World mine production of copper (according to MCS), kt	17 900	18 500	19 100	20 100	19 700
World mine production of copper (according to WBD), kt	18 327.6	18 650.53	19 368.2	20 417.2	N

e – preliminary values

Main producers according to MCS

country	2017^e	
	kt	%
Chile	5 330	27.1
Peru	2 300	11.7
China	1 860	9.4
USA	1 270	6.4
Australia	920	4.7
D. R. Congo	850	4.3
Mexico	755	3.8
Zambia	755	3.8
Indonesia	650	3.3
Canada	620	3.1
world	**19 700**	**100.0**

e – preliminary values

Prices of traded commodities

According to the German Deutschland-Rohstoffsituation yearbooks for 2011–2014 (D-R), DERA Preismonitor 2015, and Metal Bulletin (MB), world copper prices (USD/t) developed as follows:

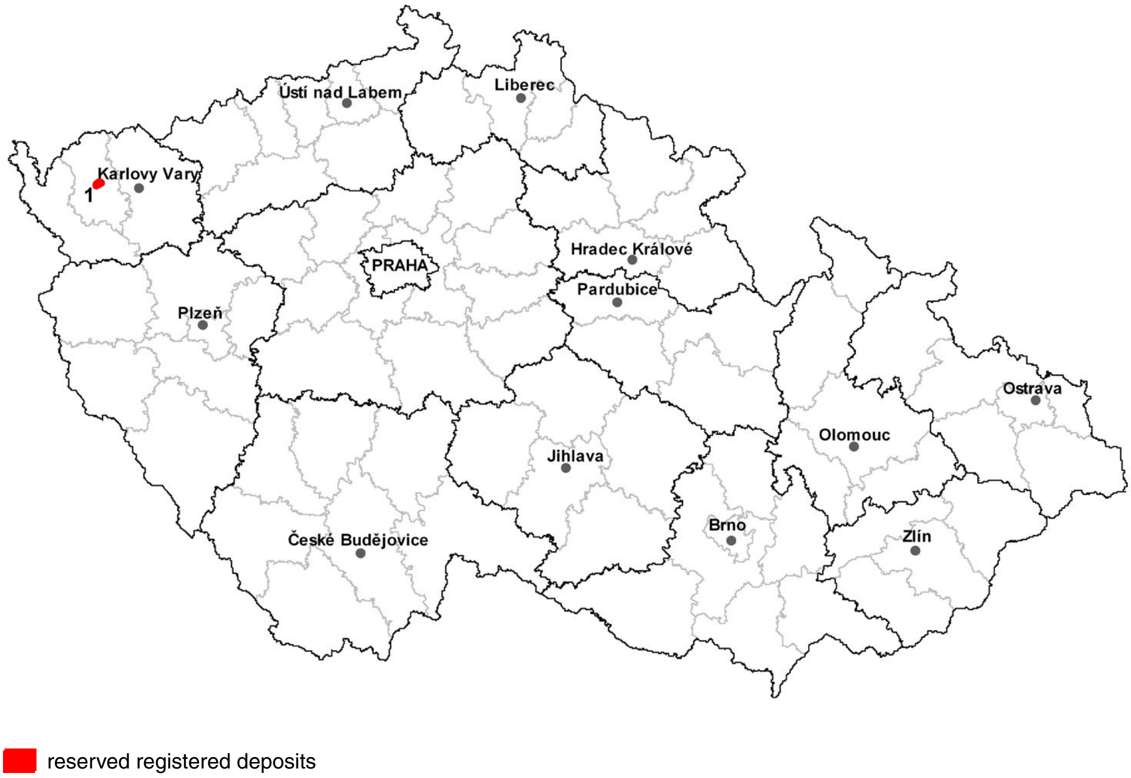
Commodity/ Year	2013	2014	2015	2016	2017
Electrolytic Cu, grade A, min. 99.9 %, LME, in warehouse, cash (according to D-R and DERA)	7 332.19	6 859.20	5 501.12	4 862.77	6 147.17 *)
Electrolytic Cu, grade A, min. 99.9935%, contractual price (according to WB)	7 332.10	6 863.40	5 510.46	4 868	6 170
Copper, grade A, LME cash (according to MB)	6 637.25–8 242.25	6 305.50–7 439.25	4 515.25–6 446.50	4 310.25–5 935.25	5 485.75–7 215.50
Copper, grade A, 3-month contract, LME (according to MB)	6 676.00–8 286.00	6 253.50–7 421.50	4 499.50–6 442.50	4 320.25–5 675.36	5 490.50–7 251.25

**) Engineering&Mining Journal: 12 monthly quotations average*

The price range according to MB includes the lowest and highest monthly price quotes for a given year.

Germanium

1. Registered deposits and other resources of the Czech Republic



The registered deposit is not exploited

1 Lomnice u Sokolova

2. Basic statistical data of the Czech Republic as of December 31

Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number	1	1	1	1	1
exploited	0	0	0	0	0
Total * reserves, t Ge	479	479	473	473	473
economic explored reserves	0	0	0	0	0
economic prospected reserves	0	0	0	0	0
potentially economic reserves	479	479	473	473	473
Mine production, t Ge	0	0	0	0	0

** See **NOTE** in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic and its evolutional comparison with international classifications** of this yearbook*

3. Foreign trade

81129295 – Unwrought germanium, germanium powders; excluding waste and scrap

		2013	2014	2015	2016	2017
Import	kg	40	26	< 1	< 1	2
Export	kg	1	0	1	1	1

81129295 – Unwrought germanium, germanium powders; excluding waste and scrap

		2013	2014	2015	2016	2017
Average import prices	CZK/kg	16 825	45 769	> 29 000	16 000	21 500
Average export prices	CZK/kg	57 000	–	75 000	69 000	90 000

4. World production and world market prices

World mine production

World germanium production was as follows in recent years:

	2013	2014	2015	2016	2017^e
World germanium production (according to MCS), t	155	165	160	126	134
World germanium production (according to WBD), t	117	124	139	122	N

e – preliminary values

The cited sources do not give any insight into their data, which differ considerably. It may be the difference between the metal and the oxide.

Main producers according to MCS

country	2017^e	
	kg	%
China	88 000	65.7
Russia	6 000	4.5
world	**134 000**	**100.0**

e – preliminary values

Average annual prices of germanium dioxide in USD/kg

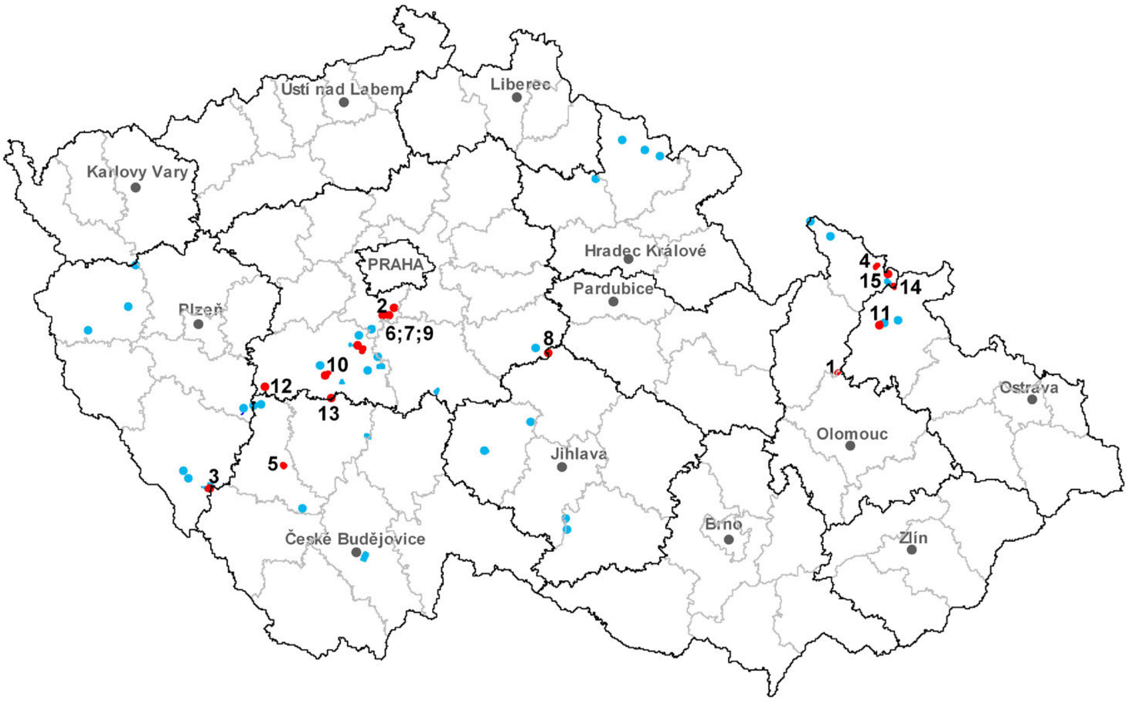
according to the German yearbooks Deutschland-Rohstoffsituation (2013–2014) and DERA (2015)

	2013	2014	2015	2016	2017
GeO_2, min. 99.99 %, MB free market, in warehouse, Rotterdam	1 313.54	1 312.50	1 203.76	787.37	736.42*

** Metal Bulletin, average prices 2017*

Gold

1. Registered deposits and other resources of the Czech Republic



reserved registered deposits   exhausted deposits and other resources

Registered deposits and other resources are not mined

1 Břevenec	6 Mokrsko	11 Suchá Rudná-střed
2 Jílové u Prahy	7 Mokrsko-východ	12 Vacíkov
3 Kašperské Hory	8 Podmoky	13 Voltýřov
4 Mikulovice u Jeseníka	9 Prostřední Lhota-Čelina	14 Zlaté Hory-východ
5 Modlešovice	10 Smolotely-Horní Líšnice	15 Zlaté Hory-Zlatý potok

2. Basic statistical data of the Czech Republic as of December 31

Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number	15	15	15	15	15
exploited	0	0	0	0	0
Total mineral *reserves, kg Au	238 900	238 900	238 900	238 900	238 900
economic explored reserves	48 740	48 740	48 740	48 740	48 740
economic prospected reserves	28 644	28 644	28 644	28 644	28 644
potentially economic reserves	161 516	161 516	161 516	161 516	161 516
Mine production, kg Au	0	0	0	0	0

** See __NOTE__ in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic** of this yearbook*

Approved prognostic resources P_1, P_2, P_3

Au metal in ores

Year		2013	2014	2015	2016	2017
P_1,	kg	60 221	60 221	60 221	60 221	60 221
P_2,	kg	65 846	65 846	65 846	65 846	52 246
P_3,		–	–	–	–	–

Au ore

Year		2013	2014	2015	2016	2017
P_1,	kt	16 700	16 700	16 700	16 726	16 726
P_2,	kt	20 341	23 191	23 191	27 331	27 331
P_3,	kt	2 850	–	–	–	–

3. Foreign trade

7108 – Gold in unwrought or semi-manufactured form, gold powder

		2013	2014	2015	2016	2017
Import	kg	6 892	6 129	5 888	5 040	6 198
Export	kg	91 636	8 405	13 760	4 945	5 089

7108 – Gold in unwrought or semi-manufactured form, gold powder

		2013	2014	2015	2016	2017
Average import prices	CZK/g	839.0	788.4	878.3	929	911.5
Average export prices	CZK/g	48.9	453.7	280.6	593	554.8

4. World production and world market prices

World mine production

Trend in the world's primary gold production

	2013	2014	2015	2016	2017[e]
Mine production of gold, t (according to MCS)	2 770	2 990	3 100	3 110	3 150
Mine production of gold, t (according to WBD)	2 908.0	3 020.8	3 088.0	3 214.1	N

e – preliminary values

Main producers according to MCS

country	2017[e]	
	t	%
China	440	14.0
Australia	300	9.5
Russia	255	8.1
USA	245	7.8
Canada	180	5.7
Peru	155	4.9
South Africa	145	4.6
Mexico	110	3.5
Uzbekistan	100	3.2
Brazil	85	2.7
world	**3 150**	**100.0**

e – preliminary values

Prices of traded commodities

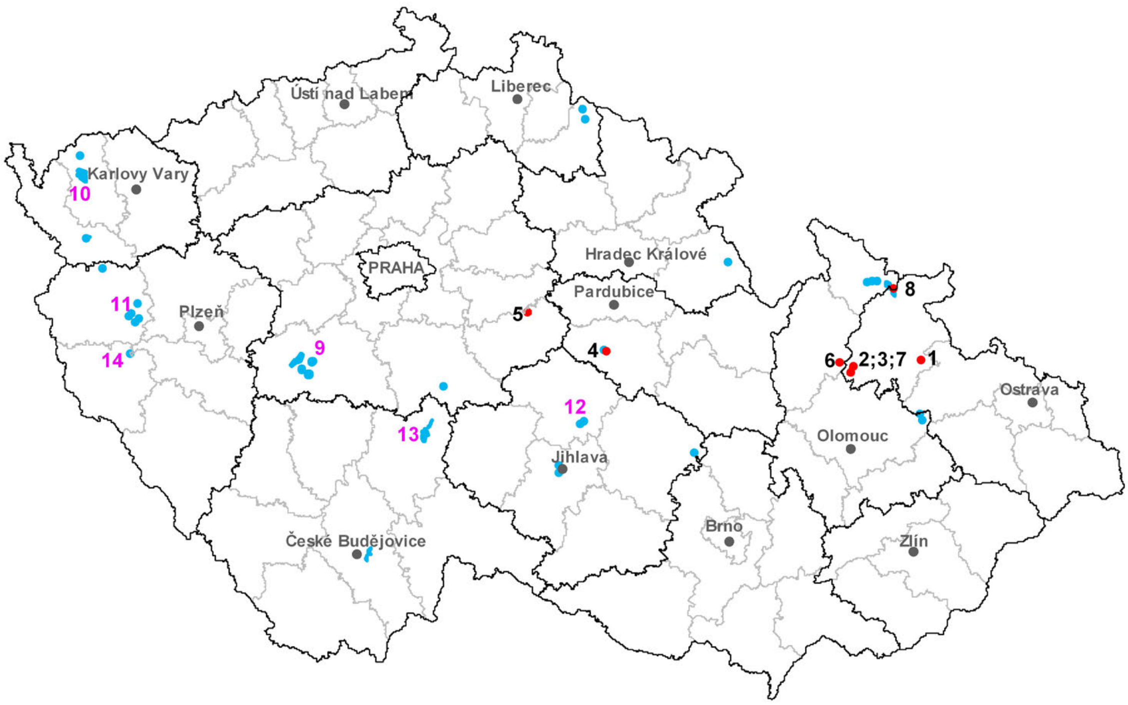
Average annual gold prices in USD/tr oz (1 tr oz (troy ounce) = 31.1035 g) according to the German Deutschland-Rohstoffsituation (D-R) yearbooks for 2011–2014 and DERA (2015) and the World Bank's "Pink Sheet" (WB)

Commodity/ Year	2013	2014	2015	2016	2017
Gold 99.9 %, LME, in warehouse (according to D-R, DERA)	1 410.80	1 266.344	1 160.59	1 248.16	1 253.84*)
Au 99.5% (UK), LME average daily quotation (WB)	1 411.46	1 265.43	1 160.66	1 249	1 258

**) Engineering&Mining Journal: 12 monthly quotations average*

Lead

1. Registered deposits and other resources of the Czech Republic



reserved registered deposits   exhausted deposits and other resources

Registered deposits and other resources are not mined

Reserved registered deposits:

1 Horní Benešov
2 Horní Město
3 Horní Město-Šibenice
4 Křižanovice
5 Kutná Hora
6 Oskava
7 Ruda u Rýmařova-sever
8 Zlaté Hory-východ

Exhausted deposits and other resources:

9 Březové Hory + Příbram-Bohutín
10 Oloví
11 Stříbro
12 Havlíčkův Brod (Dlouhá Ves + Bartoušov + Stříbrné Hory)
13 Ratibořské Hory + Stará Vožice
14 Černovice

2. Basic statistical data of the Czech Republic as of December 31

Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number [a]	8	8	8	8	8
exploited	0	0	0	0	0
Total mineral *reserves, kt Pb	152	152	152	152	161
economic explored reserves	0	0	0	0	0
economic prospected reserves	0	0	0	0	0
potentially economic reserves	152	152	152	152	161
Mine production, kt Pb	0	0	0	0	0

** See* ***NOTE*** *in the chapter* ***Introduction*** *above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter* ***Mineral reserve and resource classification in the Czech Republic*** *of this yearbook*

[a] Deposits with registered Pb content

Approved prognostic resources P_1, P_2, P_3
Polymetallic (Pb – Zn ± Cu) ores

Year		2013	2014	2015	2016	2017
P_1,		786	786	786	786	786
P_2,	kt	5 340	5 340	5 340	5 340	5 340
P_3,		–	–	–	–	–

3. Foreign trade

2607 – Lead ores and concentrates

		2013	2014	2015	2016	2017
Import	t	192	119	139	0	0
Export	t	0	0	0,5	0	0

2607 – Lead ores and concentrates

		2013	2014	2015	2016	2017
Average import prices	CZK/t	48 036	47 036	26 490	–	–
Average export prices	CZK/t	–	–	22 000	–	–

7801 – Unwrought lead

		2013	2014	2015	2016	2017
Import	t	104 857	127 977	122 156	64 999	146 423
Export	t	28 444	35 363	53 585	47 700	42 833

7801 – Unwrought lead

		2013	2014	2015	2016	2017
Average import prices	CZK/t	46 201	47 100	47 659	47 177	58 898
Average export prices	CZK/t	48 595	49 989	50 715	46 392	59 768

7802 – Lead waste and scrap

		2013	2014	2015	2016	2017
Import	t	4 179	4 915	2 666	10 790	7 232
Export	t	1 139	1 476	973	975	1 605

7802 – Lead waste and scrap

		2013	2014	2015	2016	2017
Average import prices	CZK/t	33 297	35 884	35 299	36 382	45 252
Average export prices	CZK/t	30 826	28 213	31 982	33 294	45 884

4. World production and world market prices

World mine production

According to MCS and WBD, global lead production was as follows in recent years:

	2013	2014	2015	2016	2017[e]
World mine production of lead (according to MCS), kt	5 400	4 870	4 950	4 710	4 700
World mine production of lead (according to WBD), kt	5 311.3	5 355.9	5 020.8	4 703.3	N

e – preliminary values

Main producers according to MCS

country	2017^{e}	
	kt	%
China	2 400	51.1
Astralia	450	9.6
USA	313	6.7
Peru	300	6.4
Russia	250	5.3
Mexico	230	4.9
India	150	3.2
Sweden	80	1.7
Bolivia	70	1.5
Turkey	70	1.5
world	**4 700**	**100.0**

e – preliminary values

Prices of traded commodities

World lead prices (USD/t) according to the German Deutschland-Rohstoffsituation yearbooks for 2011–2014 (D-R), DERA 2015, World Bank (WB), and Metal Bulletin (MB)

Commodity/ Year	2013	2014	2015	2016	2017
99.97 % Pb, LME (according to D-R and DERA)	2 141.83	2 096.78	1 786.08	1 870.33	2 360.83*)
Refined 99.97 %, contractual price (according to WB)	2 139.39	2 095.46	1 787.82	1 867	2 315
Lead, LME cash (according to MB)	1 948.50–2 447.50	1 813.75–2 268.50	1 554.50–2139.50	1 596.50–2 418.25	2 006.75–2 5966.00
Lead, LME 3-month contract (according to MB)	1 961.00–2 455.00	1 823.00–2 286.50	1 561.00–2 140.00	1 597.00–2 413.00	2 021.00–2 592.50

**) Engineering&Mining Journal: 12 montly quotations average*

The price range according to MB includes the lowest and highest monthly price quotes for a given year.

Manganese

1. Registered deposits and other resources of the Czech Republic

reserved registered deposits   exhausted deposits and other resources

Registered deposits and other resources are not mined

1 Chvaletice	2 Chvaletice – tailing ponds No 1 & No 2	3 Řečany – tailing pond No 3

2. Basic statistical data of the Czech Republic as of December 31

Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number	3	3	3	3	3
exploited	0	0	0	0	0
Total mineral *reserves, kt ores	138 801	138 801	138 801	138 801	135 685
economic explored reserves	0	0	0	0	23 372
economic prospected reserves	0	0	0	0	3 508
potentially economic reserves	138 801	138 801	138 801	138 801	108 805
Mine production, kt Mn	0	0	0	0	0

** See **NOTE** in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic** of this yearbook*

3. Foreign trade

2602 – Manganese ores and concentrates

		2013	2014	2015	2016	2017
Import	t	14 189	18 671	25 003	7 053	28 107
Export	t	65	32	42	72	26

2602 – Manganese ores and concentrates

		2013	2014	2015	2016	2017
Average import prices	CZK/t	6 511	7 020	4 245	4 048	3 037
Average export prices	CZK/t	14 397	15 239	15 263	59 930	17 427

720211; 720219 – Ferromanganese

		2013	2014	2015	2016	2017
Import	t	22 846	26 496	23 005	30 176	30 176
Export	t	2 107	1 780	1 158	1 130	1 130

720211; 720219 – Ferromanganese

		2013	2014	2015	2016	2017
Average import prices	CZK/t	23 556	23 116	23 256	21 281	34 726
Average export prices	CZK/t	18 580	21 130	21 411	21 679	35 861

720230 – Ferrosilicomanganese

		2013	2014	2015	2016	2017
Import	t	45 736	45 046	41 302	37 663	33 972
Export	t	4 676	2 187	1 135	1 094	1 515

720230 – Ferrosilicomanganese

		2013	2014	2015	2016	2017
Average import prices	CZK/t	22 301	22 523	21 409	18 162	27 841
Average export prices	CZK/t	21 798	21 834	23 154	21 679	27 825

8111 – Manganese and articles thereof, including waste and scrap

		2013	2014	2015	2016	2017
Import	t	678	734	718	949	1 235
Export	t	34	76	47	23	60

8111 – Manganese and articles thereof, including waste and scrap

		2013	2014	2015	2016	2017
Average import prices	CZK/t	56 726	60 363	58 004	42 924	50 111
Average export prices	CZK/t	39 478	67 176	62 338	50 582	55 804

2820 – Manganese oxides

		2013	2014	2015	2016	2017
Import	t	963	803	782	824	682
Export	t	24	23	14	65	37

2820 – Manganese oxides

		2013	2014	2015	2016	2017
Average import prices	CZK/t	20 106	26 340	25 876	24 148	37 864
Average export prices	CZK/t	19 667	36 072	103 044	28 761	36 223

4. World production and world market prices

World production

The world´s primary production of manganese in mined ores was as follows in recent years:

	2013	2014	2015	2016	2017^{e}
World mine production of manganese (according to MCS), kt	17 000	17 800	17 500	15 700	16 000
World mine production of manganese (according to WBD), kt	18 814.2	19 194.7	16 815.4	15 414.5	N

e – preliminary values

Main producers according to MCS

country	2017^{e}	
	kt	%
South Africa	5 300	33.1
China	2 500	15.6
Australia	2 500	15.6
Gabon	1 600	10.0
Brazil	1 200	7.5
India	790	4.9
Ghana	550	3.4
Ukraine	380	2.4
Malaysia	270	1.7
Kazakhstan	230	1.4
world	**16 000**	**100.0**

e – preliminary values

Prices of traded commodities

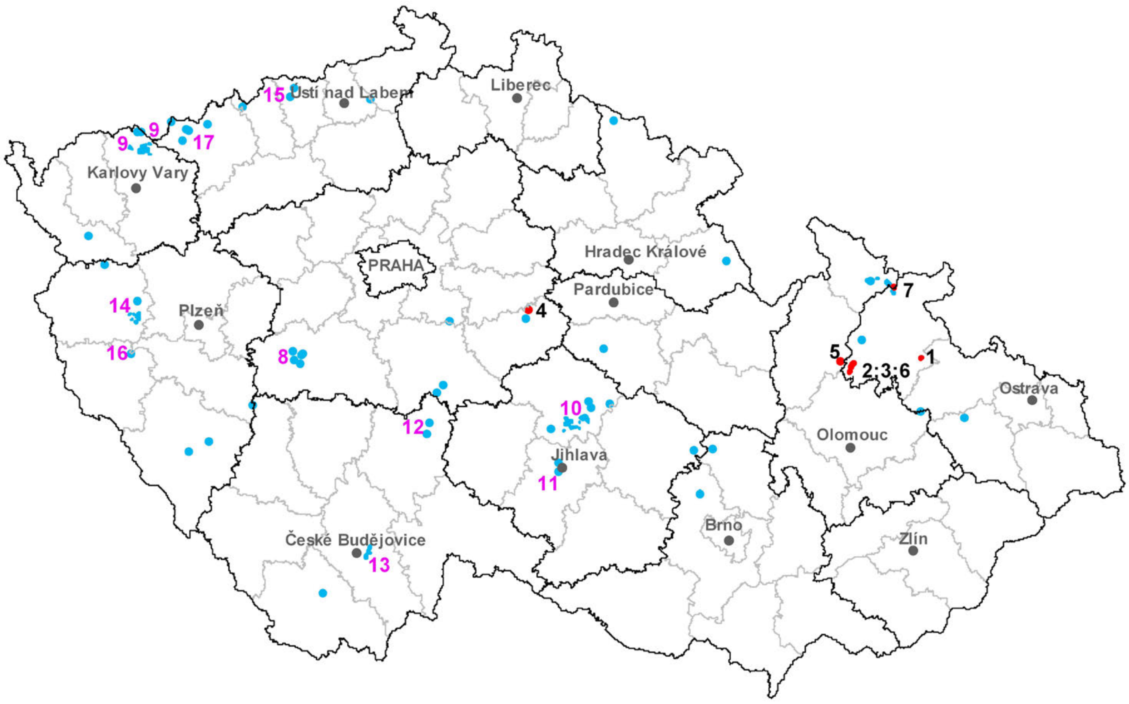
According to MB the average world prices of manganese commodities developed as follows in recent years:

Commodity/ Year		2013	2014	2015	2016	2017
Manganese, MB free market, in warehouse Rotterdam	USD/t	2 400	2 270	2 674	1 875	1 975
Ferro-manganese, 78% Mn, US free market, in warehouse Pittsburgh	USD/lt	1 070	1 000	916	865	1 482

Notice: 1 lt (long ton) = 1.016 046 9 tonne

Silver

1. Registered deposits and other resources of the Czech Republic



reserved registered deposits   exhausted deposits and other resources

Registered deposits and other resources are not mined

Reserved registered deposits:

1 Horní Benešov
2 Horní Město
3 Horní Město-Šibenice
4 Kutná Hora
5 Oskava
6 Ruda u Rýmařova-sever
7 Zlaté Hory-východ

Exhausted deposits and other resources:

8 Příbram surroundings
9 Jáchymov surroundings
10 Havlíčkův Brod surroundings
11 Jihlava surroundings
12 Ratibořské hory + Stará Vožice
13 Rudolfov
14 Stříbro
15 Hrob + Mikulov
16 Nalžovské hory
17 Vejprty + Hora sv. Kateřiny

2. Basic statistical data of the Czech Republic as of December 31

Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number [a)]	7	7	7	7	7
exploited	0	0	0	0	0
Total mineral *reserves, t Ag	532	532	532	532	532
economic explored reserves	0	0	0	0	0
economic prospected reserves	0	0	0	0	0
potentially economic reserves	532	532	532	532	532
Mine production, t Ag	0	0	0	0	0

** See* ***NOTE*** *in the chapter* ***Introduction*** *above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter* ***Mineral reserve and resource classification in the Czech Republic*** *of this yearbook*

[a)] Deposits with registered Ag content

Approved prognostic resources P_1, P_2, P_3
Ag metal in ores

Year		2013	2014	2015	2016	2017
P_1,	t	33	33	33	33	33
P_2,	t	4	4	4	4	4
P_3,		–	–	–	–	–

3. Foreign trade

261610 – Silver ores and concentrates

		2013	2014	2015	2016	2017
Import	kg	0	0	2	4	0
Export	kg	< 1	3 644	2 660	4 243	9

261610 – Silver ores and concentrates

		2013	2014	2015	2016	2017
Average import prices	CZK/kg	–	–	16 000	12 595	–
Average export prices	CZK/kg	> 37 000	7 740	13 462	9 090	10 888

7106 – Silver, unwrought or in semi-manufactured or powder form

		2013	2014	2015	2016	2017
Import	kg	868 439	151 155	99 458	121 240	123 915
Export	kg	433 158	215 046	54 772	46 407	39 649

7106 – Silver, unwrought or in semi-manufactured or powder form

		2013	2014	2015	2016	2017
Average import prices	CZK/g	1.7	8.4	7.1	8.4	7.9
Average export prices	CZK/g	5.7	13.0	13.2	13.4	12.7

4. World production and world market prices

World mine production

According to statistics, world production of primary silver was as follows in recent years:

	2013	2014	2015	2016	2017
World mine production of silver (according to MCS), kt	26 000	26 800	25 100	27 000	25 000
World mine production of silver (according to WBD), kt	25 951.9	27 094.4	27 688.7	27 268.7	N

e – preliminary values

Main producers according to MCS

country	2017^e	
	t	%
Mexico	5 600	22.4
Peru	4 500	18.0
China	2 500	10.0
Russia	1 600	6.4
Poland	1 400	5.6
Australia	1 200	4.8
Bolivia	1 200	4.8
Chile	1 200	4.8
Kazakhstan	1 200	4.8
USA	1 020	4.1
world	**25 000**	**100.0**

e – preliminary values

Prices of traded commodities

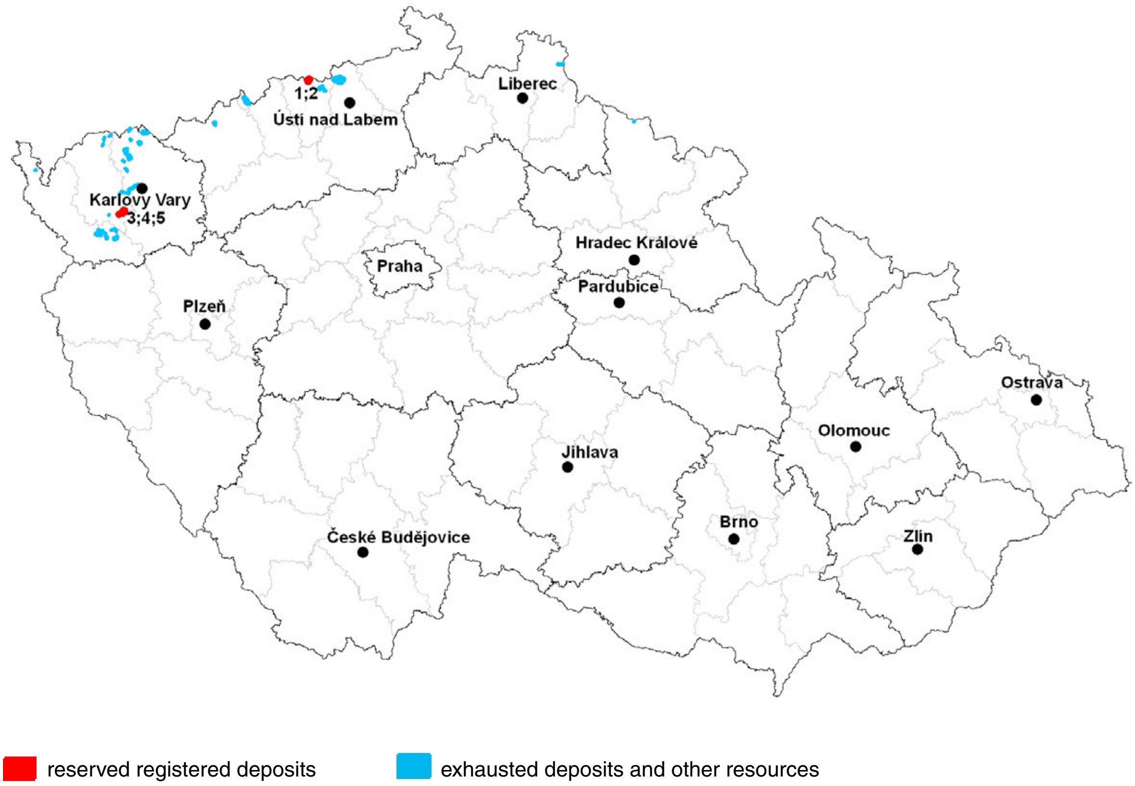
According to the German Deutschland-Rohstoffsituation (D-R) yearbooks for 2013–2014 and DERA 2015-2016 and the World Bank (WB), the world silver price in USD/ozt (1 ozt (troy ounce) = 31.1035 g) developed as follows in recent years:

Commodity/ Year	2013	2014	2015	2016	2017
Silver 99.5 %, LME, in warehouse, cash (according to D-R, DERA)	23.83	19.08	15.70	17.11	16.93*)
Refined. 99.9 %, Handy&Harman, New York (according to WB)	23.85	19.07	15.72	17.10	17.10

**) Engineering&Mining Journal: 12 monthly quotations average*

Tin

1. Registered deposits and other resources of the Czech Republic



Registered deposits and other resources are not mined

1 Cínovec-jih	3 Cínovec-severozápad	4 Krásno-Horní Slavkov
2 Cínovec-východ	3 Krásno	5 Krásno-Koník

2. Basic statistical data of the Czech Republic as of December 31

Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number [a]	4	5	5	5	6
exploited	0	0	0	0	0
Total mineral *reserves, t Sn	164 299	187 224	187 224	187 224	386 644
economic explored reserves	0	0	0	0	64 099
economic prospected reserves	0	6 887	6 887	6 887	66 737
potentially economic reserves	163 809	180 337	180 337	180 337	255 808
Mine production, t Sn	0	0	0	0	0

** See* ***NOTE*** *in the chapter* ***Introduction*** *above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter* ***Mineral reserve and resource classification in the Czech Republic*** *of this yearbook*

[a] Sn-W ore deposits

Approved prognostic resources P_1, P_2, P_3
Sn metal in ores

Year		2013	2014	2015	2016	2017
P_1,	t	2 960	2 960	2 960	2 960	2 960
P_2,		–	–	–	–	–
P_3,		–	–	–	–	–

3. Foreign trade

2609 – Tin ores and concretates

		2013	2014	2015	2016	2017
Import	t	0	27	0.4	1.4	4
Export	t	0.002	0	0	0	0

2609 – Tin ores and concretates

		2013	2014	2015	2016	2017
Average import prices	CZK/t	–	28 261	464 674	467 890	518 382
Average export prices	CZK/t	<1000	–	–	–	–

8001 – Unwrought tin

		2013	2014	2015	2016	2017
Import	t	1 402	1 041	959	888	1 012
Export	t	1 991	1 076	172	32	51

8001 – Unwrought tin

		2013	2014	2015	2016	2017
Average import prices	CZK/t	199 248	354 466	304 590	291 350	293 471
Average export prices	CZK/t	465 249	469 242	388 970	133 256	78 828

8002 – Tin waste and scrap

		2013	2014	2015	2016	2017
Import	t	1	0,1	92	27	23
Export	t	138	81	96	66	94

8002 – Tin waste and scrap

		2013	2014	2015	2016	2017
Average import prices	CZK/t	485 614	445 255	53 645	244 815	529 185
Average export prices	CZK/t	182 400	265 226	215 115	349 745	392 222

4. World production and world market prices

World mine production

World production of primary tin was as follows in recent years:

	2013	2014	2015	2016	2017^e
World mine production of tin (according to MCS), kt	294	286	289	288	290
World mine production of tin (according to WBD), kt	332.9	342.2	348.8	340.1	N

e – preliminary values

Main producers according to MCS

country	2017^{e}	
	kt	%
China	100 000	34.5
Myanmar	50 000	17.2
Indonesia	50 000	17.2
Brazil	25 500	8.8
Bolivia	18 000	6.2
Peru	18 000	6.2
Australia	7 000	2.4
D.R. Congo	5 800	2.0
Vietnam	5 400	1.9
Malaysia	4 000	1.3
world	**290 000**	**100.0**

e – preliminary values

Prices of traded commodities

According to Deutschland-Rohstoffsituation 2013-2014 and DERA 2015 (DERA) yearbooks and the World Bank (WB) and Metal Bulletin (MB), the world´s tin prices in USD/t developed as follows:

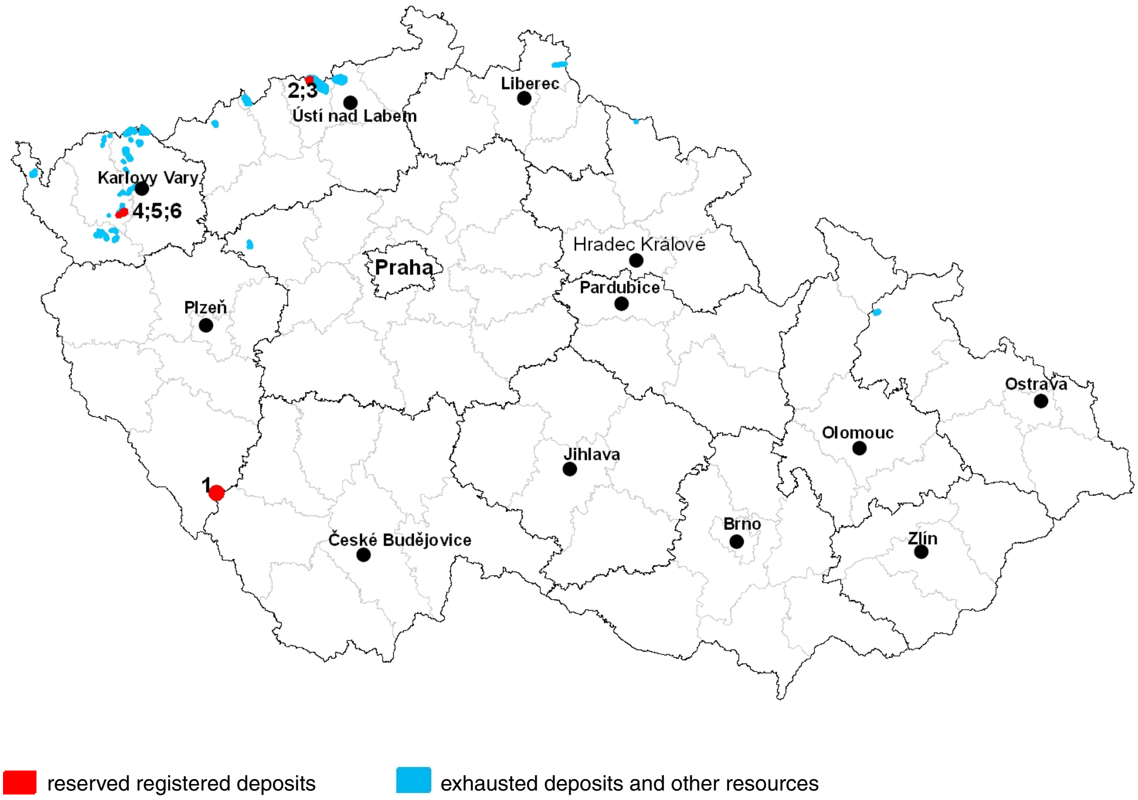
Commodity/ Year	2013	2014	2015	2016	2017
Tin, min. 99.85 %, LME, in warehouse, cash (according to DERA)	22 308.91	21 908.47	16 066.52	17 972.63	20 185.42*)
High grade min. 99,85 %, LME contractual (WB)	22 228	21 899	16 057	17 934	20 061
LME cash (according to MB)	19 262.50– 25 175.00	18 525.00– 23 902.50	13 892.50– 19 737.50	13 225.00– 21 942.50	18 757.50– 21 795.00
LME 3-month contract (according to MB)	19 300.00– 25 750.00	18 487.50– 23 765.00	13 837.50– 13 737.50	18 212.50– 21 747.50	18 755.00– 21 212.50

**) Engineering&Mining Journal: 12 monthly quotations average*

The price range according to MB includes the lowest and highest monthly price quotes for a given year.

Tungsten

1. Registered deposits and other resources of the Czech Republic



Registered deposits and other resources are not mined

1 Kašperské Hory	4 Krásno
2 Cínovec-jih	5 Krásno-Horní Slavkov
3 Cínovec-východ	6 Krásno-Koník

2. Basic statistical data of the Czech Republic as of December 31

Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number [a)]	4	4	4	4	6
exploited	0	0	0	0	0
Total mineral *reserves, t W	70 253	70 253	71 904	71 904	140 799
economic explored reserves	0	0	0	0	21 508
economic prospected reserves	0	0	865	865	19 131
potentially economic reserves	70 253	70 253	71 039	71 039	100 160
Mine production, t W	0	0	0	0	0

** See **NOTE** in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic** of this yearbook*

[a)] Sn-W and W ore deposits

Approved prognostic resources P_1, P_2, P_3
W metal in ores

Year		2013	2014	2015	2016	2017
P_1,	t	3 252	3 252	3 252	1 752	1 752
P_2,	t	10 703	10 703	10 703	19 791	19 791
P_3,		–	–	–	–	–

3. Foreign trade

2611 – Tungsten ores and concentrates

	2013	2014	2015	2016	2017
Import	100 090	2 201	55	55	804
Export	20 000	45 372	1 230	3 000	2 535

2611 – Tungsten ores and concentrates

	2013	2014	2015	2016	2017
Average import prices	12.3	215.4	1 091	1 800	182
Average export prices	244.5	41	198	299	547

8101 – Tungsten and its products, including waste and scrap

		2013	2014	2015	2016	2017
Import	kg	506 720	458 244	372 327	387 686	163 508
Export	kg	1 111 635	1 124 129	939 775	935 941	1 067 999

8101 – Tungsten and its products, including waste and scrap

		2013	2014	2015	2016	2017
Average import prices	CZK/kg	803.6	934.2	999.1	912.5	398.8
Average export prices	CZK/kg	791.2	975.0	882.1	834.0	793.0

720280 – Ferro-tungsten and ferrosilicotungsten

		2013	2014	2015	2016	2017
Import	kg	14 701	66 760	77 536	9 166	12 359
Export	kg	6 592	60 199	35 008	12 109	4 504

720280 – Ferro-tungsten and ferrosilicotungsten

		2013	2014	2015	2016	2017
Average import prices	CZK/kg	697.7	932.8	503.3	477.1	524.4
Average export prices	CZK/kg	796.9	966.7	593.9	460.6	546.0

810196 – Tungsten wires

		2013	2014	2015	2016	2017
Import	kg	70 056	114 112	99 842	110 836	63 988
Export	kg	10 080	12 751	29 804	33 933	29 769

810196 – Tungsten wires

		2013	2014	2015	2016	2017
Average import prices	CZK/kg	2 431	1 878	2 280	2 034	2 356
Average export prices	CZK/kg	3 992	5 021	4 601	4 277	3 872

4. World production and world market prices

World mine production

World production of primary tungsten

	2013	2014	2015	2016	2017^e
Mine production, kt (according to MCS)	81.4	86.8	89.4	88.1	95.0
Mine production, kt (according to WBD)	86.1	84.3	88.8	85.8	N

e – preliminary values

Main producers according to MCS

country	2017^e	
	kt	%
China	79 000	83.2
Vietnam	7 200	7.6
Russia	3 100	3.3
Bolivia	1 100	1.2
Great Britain	1 100	1.2
Austria	950	1.0
Portugal	680	0.7
Rwanda	650	0.7
Spain	570	0.6
Mongolia	150	0.2
world	**95 000**	**100.0**

e – preliminary values

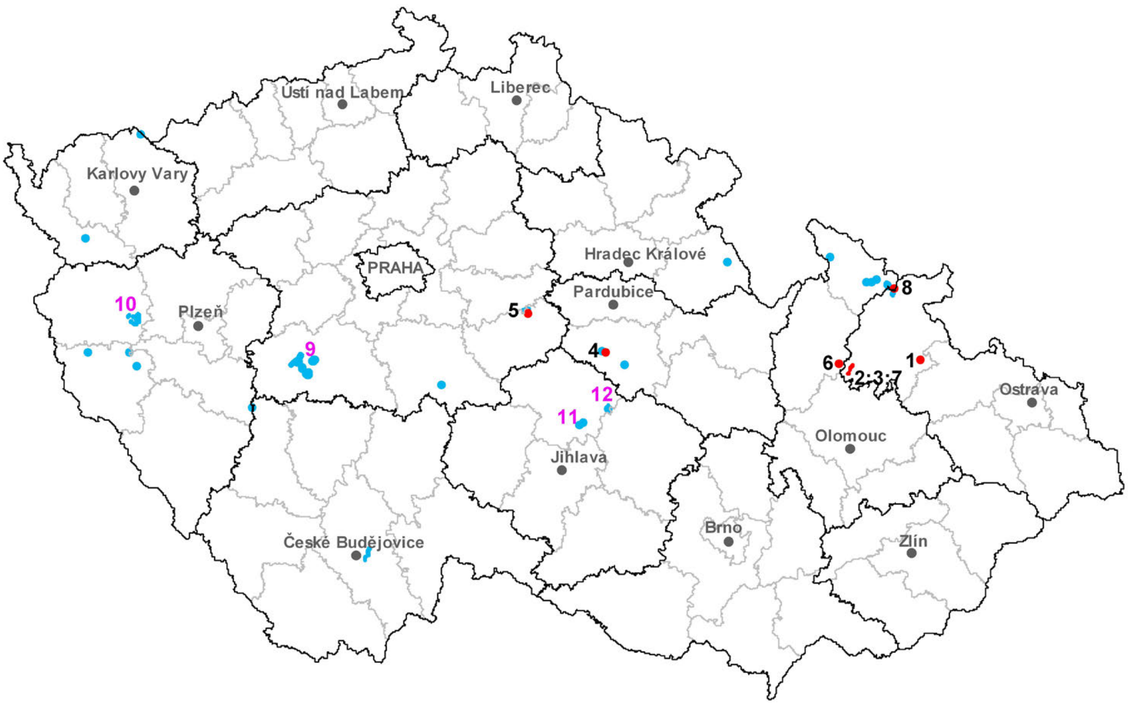
Prices of traded commodities

Commodity/Year		2013	2014	2015	2016	2017
Wolframite concentrate, min. 65 % WO_3, CIF main European port	USD/mtu WO_3	319.94	N	N	N	N
Concentrate 65 % WO_3, in warehouse China	CNY(RMB)/t	120.000–145.000	85.000–130.000	51.000–87.000	66.200–75.000	87.600–90.851**
	USD/mtu WO_3	300.19–362.73*	212.29–324.68*	124.94–213.13*	146.07–178.70*	129.55–134.35**
Average exchange rate	CNY(RMB)/USD	6.15*	6.16*	6.28*	6.53*	6.76***
Ferro-Tungsten, basis min. 75 % W, in warehouse Rotterdam	USD/kg W	45.37	34.83	28.58	25.05	30.1**
APT, European free market	USD/mtu WO_3	372	380–283	169–314	191.29	236–248**

Note: mtu – metric ton unit; 1 mtu = 1% = 10 kg WO_3 in 1 t of concentrate
** Own calculation using © X-Rates data*
*** Metal Bulletin, price average 2017*
**** Kurzycz (https://www.kurzy.cz)*
Yearly average prices or annual price ranges
RMB – Renminbi (= People's Currency) – officially CNY – Chinese yuan
Source: Deutschland-Rohstoffsituation 2013, DERA Preismonitor 2014, Metal Bulletin

Zinc

1. Registered deposits and other resources of the Czech Republic



reserved registered deposits   exhausted deposits and other resources

Registered deposits and other resources are not mined

Reserved registered deposits:

1 Horní Benešov	4 Křižanovice	7 Ruda u Rýmařova-sever
2 Horní Město	5 Kutná Hora	8 Zlaté Hory-východ
3 Horní Město-Šibenice	6 Oskava	

Exhausted deposits and other resources:

9 Březové Hory + Příbram + Bohutín	11 Havlíčkův Brod (Dlouhá Ves + Bartoušov + Stříbrné Hory)
10 Stříbro	12 Staré Ransko

2. Basic statistical data of the Czech Republic as of December 31

Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number [a)]	8	8	8	8	8
exploited	0	0	0	0	0
Total mineral *reserves, kt Zn	472	472	472	472	559.4
economic explored reserves	0	0	0	0	0
economic prospected reserves	0	0	0	0	0
potentially economic reserves	477	472	472	472	559.4
Mine production, t Zn	0	0	0	0	0

** See **NOTE** in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic** of this yearbook*

[a)] Deposits with registered Zn content

3. Foreign trade

2608 – Zinc ores and concentrates

		2013	2014	2015	2016	2017
Import	t	4	8	8	11	14
Export	t	3	1.4	1	0.2	2

2608 – Zinc ores and concentrates

		2013	2014	2015	2016	2017
Average import prices	CZK/t	148 826	114 274	135 250	138 480	111 692
Average export prices	CZK/t	53 387	50 534	88 000	88 235	84 424

7901 – Unwrought zinc

		2013	2014	2015	2016	2017
Import	t	32 843	83 035	75 150	31 035	37 976
Export	t	13 723	70 719	51 000	3 583	4 753

7901 – Unwrought zinc

		2013	2014	2015	2016	2017
Average import prices	CZK/t	42 815	50 384	56 607	55 494	71 256
Average export prices	CZK/t	41 311	51 524	58 563	55 774	69 465

7902 – Zinc waste and scrap

		2013	2014	2015	2016	2017
Import	t	187	161	280	997	1 102
Export	t	3 375	3 277	2 579	3 583	3 005

7902 – Zinc waste and scrap

		2013	2014	2015	2016	2017
Average import prices	CZK/t	21 422	25 504	11 221	14 548	20 324
Average export prices	CZK/t	25 233	32 969	35 662	37 962	48 584

4. World production and world market prices

World mine production

World production of primary zinc was as follows in recent years:

	2013	2014	2015	2016	2017[e]
Mine production of zinc, kt (according to MCS)	13 400	13 300	12 800	12 600	13 200
Mine production of zinc, kt (according to WBD)	13 600.9	13 633.4	13 296.5	12 524.6	N

e – preliminary values

Main producers according to MCS

country	2017[e] kt	2017[e] %
China	4 500	37.8
Peru	1 300	10.9
Australia	850	7.1
USA	780	6.6
Mexico	710	6.0
India	650	5.5
Bolivia	460	3.9
Kazakhstan	340	2.9
Canada	310	2.6
Sweden	250	2.1
world	**11 900**	**100.0**

e – preliminary values

Prices of traded commodities

According to Deutschland-Rohstoffsituation yearbooks for 2013_2014 (D-R), DERA (2015, 2016), World Bank (WB), and Metal Bulletin (MB), world zinc prices in USD/t developed as follows:

Commodity/ Year	2013	2014	2015	2016	2017
Special high grade, min. 99.995 % cash, LME, in warehouse (according to D-R)	1 910.04	2 161.67	1 932.14	2090.34	2 833.92*)
High quality min. 99.95 %, LME contractual price (according to WB)	1 910.26	2 160.97	1 931.58	2 090	2 891
Zinc, LME cash (according to MB)	1 783.75–2 187.25	1 941.75–2 419.75	1 461.25–2 402.50	1 453.26–2 906.50	2 434.25–3 369.75
Zinc, LME 3-month contract (according to MB)	1 820.50–2 214.00	1 947.75–2 409.50	1 482.75–2 376.50	1 466.50–2 910.50	2 450.25–3 306.50

**) Engineering&Mining Journal: 12 monthly quotations average*

The price range according to MB includes the lowest and highest monthly price quotes for a given year.

MINERALS MINED IN THE PAST WITHOUT RESOURCES AND RESERVES

Antimony

Foreign trade

261710 – Antimony ores and concentrates

		2013	2014	2015	2016	2017
Import	kg	48 174	25 030	18 303	9 766	8 500
Export	kg	0	0	0	1	0

261710 – Antimony ores and concentrates

		2013	2014	2015	2016	2017
Average import prices	CZK/kg	119	109	158	134	156
Average export prices	CZK/kg	–	–	–	–	–

8110 – Antimony and articles thereof, including waste and scrap

		2013	2014	2015	2016	2017
Import	t	42	103	21	56	102
Export	t	0	2	47	0,3	0

8110 – Antimony and articles thereof, including waste and scrap

		2013	2014	2015	2016	2017
Average import prices	CZK/t	216 831	207 080	192 290	193 269	220 720
Average export prices	CZK/t	–	274 331	62 422	239 057	–

World production and world market prices

World mine production

Trend in the world´s primary antimony production in 2013–2017

	2013	2014	2015	2016	2017^{e}
Mine production of antimony, kt (according to MCS)	163	160	142	148	150
Mine production of antimony, kt (according to WBD)	163.2	162.5	163.3	159.7	N

e – preliminary values

Main producers according to MCS

country	2017^{e}	
	kt	%
China	110 000	73.3
Tajikistan	14 000	9.3
Russia	8 000	5.3
Australia	5 000	3.3
Turkey	3 500	2.3
Bolivia	2 600	1.7
Myanmar	2 000	1.3
Kazakhstan	570	0.4
Laos	240	0.2
Iran	200	0.1
world	**150 000**	**100.0**

e – preliminary values

Prices of traded commodities (USD/t) according to IM

Commodity/ Year	2013	2014	2015	2016	2017
Antimony trioxide, typically 99.5 %, 5 tonne lots, CIF Antwerp/Rotterdam	9 000– 1 000	7 900– 9 200	4 800– 7800	4 500 6 800	6 600– 7 500
Antimony trioxide, typically 99.5 %, 20 tonne lots, FOB China	9 000– 10 100	7 700– 9 200–	4700– 7 850	4 500– 6 700	6 500– 8 050
Antimony trioxide, min. 99.65 %, ingot, CIF Rotterdam	9 950– 12 500	9 100– 9 500	4 800– 9000	4 750– 5 300	N
Antimony trioxide, min. 99.65 %, ingot, FOB China	9 550– 10 800	9 100– 9 500	4 750– 9100	4 650– 5 200	N
Antimony trioxide, 99.5 %, ex works USA	N	N	N	N	6 700– 8 300

The price range includes the lowest and highest monthly price quotes for a given year.

Arsenic

Foreign trade

280480 – Arsenic

		2013	2014	2015	2016	2017
Import	kg	6 032	8 636	13 560	10 372	10 287
Export	kg	0	0	0	0	0

280480 – Arsenic

		2013	2014	2015	2016	2017
Average import prices	CZK/kg	102	90	129	147	166
Average export prices	CZK/kg	–	–	–	–	–

World production and world market prices

World mine production

World production of primary arsenic was as follows in recent years:

	2013	2014	2015	2016	2017[e]
World production of arsenic, kt (according to MCS)	45.0	36.4	36.5	37.0	37.0
World production of arsenic, kt (according to WBD)	38.7	36.6	36.7	35.7	N

e – preliminary values

Main producers according to MCS

country	2017^{e}	
	t	%
China	25 000	67.6
Morocco	7 600	20.5
Namibie	1 900	5.1
Russia	1 500	4.1
Belgium	1 000	2.7
Japan	45	0.1
Bolivia	40	0.1
world	**37 000**	**100.0**

e – preliminary values

Prices of traded commodities

Metal Bulletin quoted the following prices:

Commodity/ Year	2013	2014	2015	2016	2017
Arsenic, USD/lb	0.75	0.75	0.82	1.08	0.90–1.25

Note: lb (pound); 1 lb = 0.4536 kg

Cobalt

Foreign trade

2605 – Cobalt ores and concentrates

		2013	2014	2015	2016	2017
Import	kg	410	350	700	326	400
Export	kg	0	0	0	250	0

2605 – Cobalt ores and concentrates

		2013	2014	2015	2016	2017
Average import prices	CZK/kg	1 515	1 726	1 479	1 411	1 605
Average export prices	CZK/kg	–	–	–	816	–

8105 – Cobalt mattes and other intermediate products of cobalt metallurgy; cobalt and articles thereof, including waste and scrap

		2013	2014	2015	2016	2017
Import	t	73	81	77	104	139
Export	t	24	30	26	38	50

8105 – Cobalt mattes and other intermediate products of cobalt metallurgy; cobalt and articles thereof, including waste and scrap

		2013	2014	2015	2016	2017
Average import prices	CZK/t	838 136	1 086 607	1 707 716	1 360 808	1 177 537
Average export prices	CZK/t	648 369	494 400	638 764	609 432	921 580

World production and world market prices

World mine production

Statistical data on world cobalt production:

	2013	2014	2015	2016	2017[e]
Mine production of cobalt (according to MCS), t	110 000	123 000	126 000	111 000	123 000
Mine production of cobalt (according to WBD), t	132 781	131 245	140 713	126 234	N

e – preliminary values

Main producers according to MCS

country	2017[e]	
	t	%
D.R. Congo	64 000	58.2
Russia	5 600	5.1
Australia	5 000	4.5
Canada	4 300	3.9
Cuba	4 200	3.8
Philippines	4 000	3.6
Madagascar	3 800	3.5
Papua New Guinea	3 200	2.9
Zambia	2 900	2.6
New Caledonia	2 800	2.5
world	**110 000**	**100.0**

e – preliminary values

Prices of traded commodities

Annual prices according to Deutschland-Rohstoffsituation yearbooks, DERA and MB

Commodity/ Year	2013	2014	2015	2016	2017
99.8 % Co free market, in warehouse, Rotterdam (USD/kg) (D-R, DERA)	29.01	31.81	29.11	26.43	54.65*)
96.3 % Co, LME, in warehouse, cash (USD/kg) (D-R, DERA	27 021.91	30 704.30	28 441.68	25 501.98	72 360.53**)

**) Engineering&Mining Journal: 12 monthly quotations average*
***) Metal Bulletin: average spot price*

Iron

Foreign trade

2601 – Iron ores and concentrates

		2013	2014	2015	2016	2017
Import	t	6 268 059	6 303 298	7 365 406	6 345 031	5 463 875
Export	t	1 797	12 210	25 387	10 519	104 308

2601 – Iron ores and concentrates

		2013	2014	2015	2016	2017
Average import prices	CZK/t	2 567	2 490	2 657	1 569	2 249
Average export prices	CZK/t	18 232	5 024	2 992	3 846	2 928

7201 – Crude iron

		2013	2014	2015	2016	2017
Import	t	65 307	71 395	63 499	61 026	58 192
Export	t	82 515	43 398	17 435	16 086	102 680

7201 – Crude iron

		2013	2014	2015	2016	2017
Average import prices	CZK/t	9 462	9 816	9 363	7 250	9 442
Average export prices	CZK/t	8 190	8 663	8 181	6 090	7 830

7204 – Ferrous waste and scrap, remelted scrap ingots or iron or steel

		2013	2014	2015	2016	2017
Import	t	554 034	571 427	497 268	476 683	461 000
Export	t	1 911 717	2 064 792	1 764 945	1 808 519	2 254 265

7204 – Ferrous waste and scrap, remelted scrap ingots or iron or steel

		2013	2014	2015	2016	2017
Average import prices	CZK/t	7 193	6 956	6 618	5 298	6 904
Average export prices	CZK/t	6 807	7 188	6 075	5 423	6 782

World production and world market prices

World mine production

World production of iron ore in recent years according to published statistics:

	2013	2014	2015	2016	2017^e
World mine production of iron ore (according to MCS), mill t	3 110	3 420	2 280	2 350	2 230
World mine production of iron ore (according to WBD), mill t	1 474.8	1 536.8	1 573.0	1 575.1	N

e – preliminary values

Main producers according to MCS

country	2017^e	
	millions of tonnes	%
Australia	880	40.8
Brazil	440	20.4
China	340	15.8
India	140	6.5
Russia	100	4.6
South Africa	68	3.2
Ukraine	63	2.9
Canada	47	2.2
USA	46	2.1
Iran	35	1.6
world	**2 159**	**100.0**

e – preliminary values

Prices of traded commodities

Average annual prices of iron ore according to Deutschland-Rohstoffsituation and DERA yearbooks and World Bank

Commodity/Year		2013	2014	2015	2016	2017
MB iron ore index (62 %), CFR China main port	USD/t	135.58	97.10	55.72	58.31	70.29**)
Iron ore, any origin, spot price, MBA (according to the World Bank) *)	USD/ dmt	114.82–154.64	96.94***)	40.50–60.50	58.4	71.8

Note:
**) The price range includes the lowest and the highest monthly price quotes for the given year.*
***) Engineering&Mining Journal: 12 monthly quotations average*
****) average annual price*
dmt – dry metric ton = one tonne of dry ore

Mercury

Foreign trade

280540 – Mercury

		2013	2014	2015	2016	2017
Import	kg	3 259	19 601	6 418	2 304	2 215
Export	kg	128	128	116	113	140

280540 – Mercury

		2013	2014	2015	2016	2017
Average import prices	CZK/kg	581	91	700	99	657
Average export prices	CZK/kg	1 102	1 031	1 440	1 168	1 414

World production and world market prices

World mine production

World mine production of mercury (t)

	2013	2014	2015	2016	2017[e]
World mine production of mercury (according to MCS)	1 880	2 350	3 270	2 500	2 500
World mine production of mercury (according to WBD)	2 184	2 834	2 422	4 005	N

e – preliminary values

Main producers according to MCS

country	2017[e]	
	t	%
China	2 000	80.0
Mexico	300	12.0
Kyrgyzstan	50	2.0
Peru	40	1.6
Tajikistan	30	1.2
world	**2 500**	**100.0**

e – preliminary values

Prices of traded commodities

Annual prices according to Deutschland-Rohstoffsituation yearbooks (2011–2014), DERA (2015) and MB

Commodity/ Year		2013	2014	2015	2016	2017
Mercury, min. 99.99 %, MB free market, in warehouse	USD/ flask	3 438.89	2 719.85	2 383.85	1 250.45	1600–1700

A flask of mercury is the equivalent of 34 kg.

Sulphur

Foreign trade

2503 – Sulphur of all kinds, other than sublimed, precipitated and colloidal

		2013	2014	2015	2016	2017
Import	t	54 002	63 382	17 860	77 704	72 711
Export	t	9 195	7 083	8 066	2 270	1 843

2503 – Sulphur of all kinds, other than sublimed, precipitated and colloidal

		2013	2014	2015	2016	2017
Average import prices	CZK/t	5 020	4 061	7 316	3 278	2 707
Average export prices	CZK/t	1 494	2 710	2 335	2 483	2 960

2802 – Sulphur, sublimed or precipitated; colloidal sulphur

		2013	2014	2015	2016	2017
Import	t	27 870	28 056	45 377	36 627	29 508
Export	t	142	172	169	0,1	1

2802 – Sulphur, sublimed or precipitated; colloidal sulphur

		2013	2014	2015	2016	2017
Average import prices	CZK/t	2 845	2 848	2 472	2 231	1 825
Average export prices	CZK/t	64 607	53 094	45 570	101 852	162 441

2807 – Sulphuric acid

		2013	2014	2015	2016	2017
Import	t	70 270	58 764	171 698	27 935	45 711
Export	t	29 465	55 006	51 326	63 987	70 399

2807 – Sulphuric acid

		2013	2014	2015	2016	2017
Average import prices	CZK/t	1 844	1 895	2 529	1 635	1 587
Average export prices	CZK/t	1 756	1 494	1 952	1 654	1 506

World production and world market prices

World mine production

World production of sulphur, primarily from the processing of liquid and gaseous hydrocarbons, has over the years had an upward trend. The trend was as follows in recent years:

	2013	2014	2015	2016	2017^e
World sulphur production (according to MCS), kt	70 400	70 000	69 400	83 000	83 000
World sulphur production (according to WBD), kt	67 355.0	70 086.0	67 892.3	67 980	N

e – preliminary values

Main producers according to MCS

country	2017^e	
	kt	%
China	17 000	20.5
USA	9 660	11.6
Russia	7 000	8.4
Canada	5 300	6.4
United Arab Emirates	5 300	6.4
Canada	5 300	6.4
Saudi Arabia	4 900	5.9
Germany	3 800	4.6
Japan	3 400	4.1
India	3 200	3.9
world	**83 000**	**100.0**

e – preliminary values

Prices of sulphur according to Industrial Minerals (IM) and MCS 2016 in USD/t

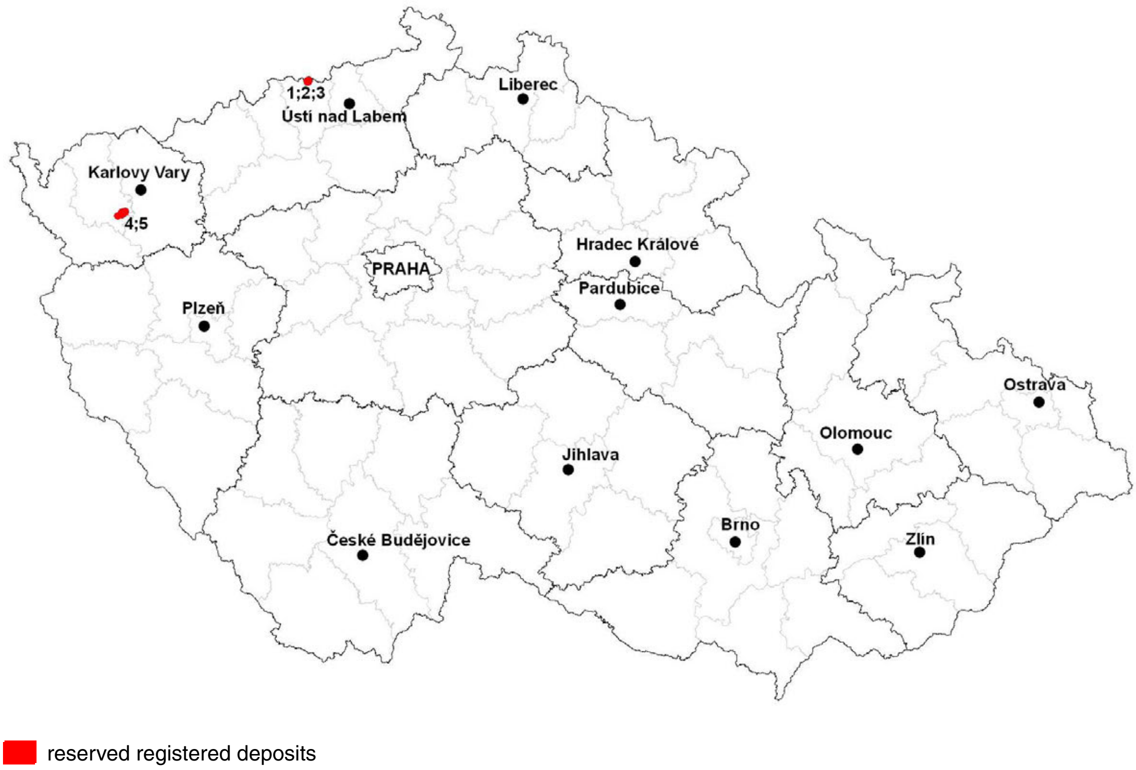
		2013	2014	2015	2016	2017
Canadian, solid, current price, FOB Vancouver	IM	N	170–200	140–155	140–155	140–155
Middle East, FOB	IM	N	160–195	119–195	175–195	119–135
USA, FOB mine or factory	MCS	68.71	80.07	100.00	65–110	65–110

Note:
IM prices represent the lowest and the highest monthly average of the respective year
MCS prices are average prices

MINERALS UNMINED IN THE PAST WITH RESOURCES AND RESERVES

Lithium, rubidium and cesium

Registered deposits and other resources of the Czech Republic



The registered deposit are not exploited

1 Cínovec-jih*	3 Cínovec-východ	5 Krásno-Koník
2 Cínovec odkaliště	4 Horní Slavkov-odkaliště	

Note:
** Deposit of also potentially economic reserves of Sn-W ores and contents of Ta and Nb in experimental concentrates*

Basic statistical data of the Czech Republic as of December 31

Number of deposits; reserves; mine production

Year	2013	2014	2015	2016	2017
Deposits – total number	1	1	5	5	5
Exploited	0	0	0	0	0
Total *reserves, t Li	112 775	112 775	159 993	454 577	454 577
economic explored reserves	0	0	2 331	52 283	52 283
economic prospected reserves	0	0	15 685	72 490	72 490
potentially economic reserves	112 775	112 775	141 977	329 804	329 804
Mine production, t Li	0	0	0	0	0

** See **NOTE** in the chapter **Introduction** above on a terminological difference between Czech official application of the term reserves and standard international application of the term. The relationship of domestic and foreign classifications of mineral reserves and resources is described in the separate chapter **Mineral reserve and resource classification in the Czech Republic and its evolutional comparison with international classifications** of this yearbook*

In the Czech Republic, it is possible to consider the entire Krušné hory Mts. as a lithium province. Around 300 million tonnes of ore with elevated lithium contents were identified in Cínovec and its surroundings alone. As for the potentially economic deposit of tin-tungsten ores of Cínovec-jih, 159,993 tonnes of lithium in 53.4 million tonnes of ore with an average lithium content of 0.117% are recorded in the *Balance of Reserves of Reserved Mineral Deposits of the Czech Republic*. In addition, byproduct amounts of 56 kt of rubidium and 1.8 kt of cesium were also evaluated in this deposit. Beside the *Balance of Reserves of Reserved Mineral Deposits of the Czech Republic* Li reserves are estimated also at former deposits Cínovec-sever-lomová těžba (79 kt), Cínovec-starý závod (3.8 kt), Vernéřov u Aše (15.2 kt) and Krásno-Koník (2 kt).

Brine reserves with anomalous bromine and lithium contents were calculated at 453.6 million m^3 in the mining lease of the Slaný deposit of bituminous coal. These groundwater reserves contain 123 kt of bromine, 15 kt of lithium and more than 18 million tonnes of NaCl.

Approved prognostic resources P_1, P_2, P_3 – Li in ore

Year		2013	2014	2015	2016	2017
P_1,	t	2 142	2 142	2 142	2 142	2 142
P_2,		–	–	–	–	–
P_3,		–	–	–	–	–

Foreign trade

280519 – Lithium, potassium, rubidium, cesium

		2013	2014	2015	2016	2017
Import	kg	65 388	18 041	23 014	9 007	8 250
Export	kg	1	3	< 1	< 1	500

280519 – Lithium, potassium, rubidium, cesium

		2013	2014	2015	2016	2017
Average import prices	CZK/kg	168	903	626	395	1 387
Average export prices	CZK/kg	2 000	42 000	> 30 000	1 000	18

28369100 – Lithium carbonates

		2013	2014	2015	2016	2017
Import	kg	75 096	87 693	88 728	103 858	362 598
Export	kg	2 095	502	0	411	3 798

28369100 – Lithium carbonates

		2013	2014	2015	2016	2017
Average import prices	CZK/kg	129	124	139	236	90
Average export prices	CZK/kg	621	717	–	591	32

World production and world market prices

World production

World lithium production had an upward trend in recent years:

	2013	2014	2015	2016	2017^e
World mine production of lithium (according to MCS), t	34 000	31 700	31 500	38 000	43 000
World mine production of Li_2O (according to WBD), t	63 633	69 050	68 349	78 549	N

e – preliminary value

Main producers according to MCS

country	2017[e]	
	t	%
Australia	18 700	43.5
Chile	14 100	32.8
Argentina	5 500	12.8
China	3 000	7.0
Zimbabwe	1 000	2.3
Portugal	400	0.9
Brazil	200	0.5
world	**43 000**	**100.0**

e – preliminary values

Data on world production of rubidium and cesium were not found.

Prices of traded commodities containing lithium according to IM

Commodity/Year		2013	2014	2015	2016	2017
Petalite, 4.2 % Li_2O, FOB Durban	USD/t	165–260	165–265	170–265	170–265[1)]	N
Spodumene concentrate, >7.25 Li_2O, FOB West Virginia	USD/st	N	680–775	700–775	700–775[2)]	N
Spodumene, glass trade, 5% Li_2O, FBO West Virginia FOB West Virginia	USD/st	460–510	400–510	400–450	420–450[2)]	N
Spodumene concentrate, 7.5% Li_2O, CIF Europe	USD/t	750–800	740–800	740–790	730–790[1)]	N
Spodumene conc. >7.5 % Li_2O, bulk, CIF Asia	USD/t	720–770*	720–775*	725–775	725–780[3)]	755–780
Spodumene conc. >5 % Li_2O, bulk, CIF Asia	USD/t	460–510*	300–400	310–410	350–410[3)]	350–410
Lithium carbonate, del. continental, USA large contracts	USD/lb	3–3.5	2.7–3.5	2.7–3.2	2.8–7.3[3)]	4.5–7.3
Lithium hydroxide, 56.5–57.5 % LiOH, large contracts, packed in drums or bags, CIF Europe or USA	USD/kg	5.5–7	5.5–8.5	7.5–9.0	8.2–20[3)]	14–20
Lithium hydroxide, Chinese (56.5–57.5 % LiOH), packed in drums or bags, large contracts, CIF Europe	USD/kg	7–8	7–8	7.2–9.0	8.3–20[3)]	14–20

*Notices: *CIF USA in USD/st,st – short ton; 1 st = 0.9072 t*

1) prices for January, February and September only

2) prices for January and February only

3) prices for January, February, September, October, November and December only

The price range includes the lowest and the highest monthly price quotes for the given year

Molybdenum

Registered deposits and other resources in the Czech Republic; basic statistical data of the Czech Republic as of December 31

In the Czech Republic, 80 million tonnes of prognostic resources (unapproved) of molybdenum ores with an average molybdenum content of 0.176 %, i.e. 14 037 tonnes of molybdenum, were estimated in the Hůrky locality in the Čistá-Jeseník Massif (L. Kopecký 1983).

Foreign trade

81029400 – Unwrought molybdenum, including bars, rods obtained by simple sintering

		2013	2014	2015	2016	2017
Import	kg	3 359	20	1 462	24 889	3
Export	kg	936	232	5 792	27 825	7 215

81029400 – Unwrought molybdenum, including bars, rods obtained by simple sintering

		2013	2014	2015	2016	2017
Average import prices	CZK/kg	334	1 100	630	297	6 000
Average export prices	CZK/kg	602	707	599	338	584

World production and world market prices

World mine production

According to statistics, world production of primary molybdenum developed as follows during 2011–2015:

	2013	2014	2015	2016	2017^{e}
World mine production of molybdenum (according to MCS), kt	258	281	235	229	290
World mine production of molybdenum (according to WBD), kt	278.7	297.1	264.3	279.3	N

e – preliminary value

Main producers according to MCS

country	2017^{e}	
	kt	%
China	130 000	44.8
Chile	58 000	20.0
USA	44 600	15.4
Peru	26 000	9.0
Mexico	12 000	4.1
Armenia	6 300	2.2
Iran	3 500	1.2
Canada	3 000	1.0
Russia	3 000	1.0
Mongolia	2 400	0.8
world	**290 000**	**100.0**

e – preliminary values

Prices of traded commodities

According to Deutschland-Rohstoffsituation yearbooks (2011–2014), DERA (2015), and Metal Bulletin (MB), world prices of molybdenum commodities (USD/kg Mo) developed as follows in recent years:

Commodity/Year	2013	2014	2015	2016	2017
Ferromolybdenum, 65–70 % Mo base, free European market (USD/kg) (according to D-R, DERA, MB)	25.87	23.14	17.09	16.26	15.81
Molybdic oxide, drummed, Europe, free market, in warehouse (USD/kg)	22.80	19.81	14.65	14.38	N
Molybdenum, LME cash (according to MB), (USD/t)	19 500–26 000	19 600–32 500	9 000–21 000	11 500–18 750	15 000–15 250

The price range of molybdenum according to MB includes the lowest and highest monthly price quotes for a given year.

Rare earths

Registered deposits and other resources in the Czech Republic; basic statistical data of the Czech Republic as of December 31

In the Czech Republic, there are descriptions of estimated resources (unapproved) of rare earth oxides from various mineralisations and geological formations. For example, the cerium content in uranium ores of uranium-bearing sandstone of the Stráž block in the Bohemian Cretaceous Basin was evaluated at 4,750 tonnes of cerium. Anomalous rare earth oxide contents are also assumed to occur in the Hůrky locality in the Čistá-Jeseník Massif (along with resources of Mo, Ta, Nb, Zr, and Hf), in alkaline volcanic rocks in the České Středohoří, in volcanic rocks of the Šternberk-Horní Benešov belt in the Nízký Jeseník Mts., in graphitic phyllites of the Železné Hory Mts. Proterozoic, in argillitised tuffs of the Upper Silesian Basin etc.

Foreign trade

28461000 – Cerium compounds

		2013	2014	2015	2016	2017
Import	kg	84 091	70 275	67 866	42 337	76 259
Export	kg	2 517	3 696	3 205	3 583	3 639

28461000 – Cerium compounds

		2013	2014	2015	2016	2017
Average import prices	CZK/kg	915	698	663	555	251
Average export prices	CZK/kg	1 249	1 059	579	604	32

28053010 – Rare earth metals, scandium and yttrium, intermixed or interalloyed

		2013	2014	2015	2016	2017
Import	kg	150	60	975	851	3 931
Export	kg	20	2 471	1 720	25	330

28053010 – Rare earth metals, scandium and yttrium, intermixed or interalloyed

		2013	2014	2015	2016	2017
Average import prices	CZK/kg	1 427	333	305	703	476
Average export prices	CZK/kg	2 050	106	1 982	1 000	400

28053090 – Rare earth metals, scandium and yttrium, not intermixed or interalloyed

		2013	2014	2015	2016	2017
Import	kg	375	714	40	0	0
Export	kg	2	0	0	0	0

28053090 – Rare earth metals, scandium and yttrium, not intermixed or interalloyed

		2013	2014	2015	2016	2017
Average import prices	CZK/kg	3 667	1 804	16 900	–	–
Average export prices	CZK/kg	7 000	–	–	–	–

World production and world market prices

World mine production

Statistical data on world production of rare earths for the past five years

	2013	2014	2015	2016	2017^e
World mine production, t (according to MCS)	110 000	123 00	130 000	126 000	130 000
World production of concentrates, t (according to WBD)	100 845	109 314	122 986	124 725	N

e – preliminary values

Main producers of rare earths according to WBD

country	2016	
	t	%
China	105 000	84.2
Australia	13 872	11.1
Russia	3 063	2.5
Brazil	2 200	1.8
Malaysia	600	0.5
world	**124 725**	**100.0**

Main producers of rare earths according to MCS

country	2017^e	
	t	%
China	105 000	80.8
Australia	20 000	15.4
Russia	3 000	2.3
Brazil	2 000	1.5
Thailand	1 600	1.2
India	1 500	1.2
Malaysia	1 300	1.0
world	**130 000**	**100.0**

e – preliminary values

According to MCS estimate, less than 5,000–7,000 tonnes yearly of Y_2O_3 were produced worldwide in present years.

Prices of traded commodities

According to yearbooks Deutschland–Rohstoffsituation for 2013–2016 and DERA 2015, 2016, world prices (USD/kg) of commodities with rare earths developed as follows in recent years:

Commodity/Year	2013	2014	2015	2016	2017
Cerium oxide, 99%, bulk, FOB China	7.90	4.90	2.39	1.63	N

Average prices of other rare earths according to DERA Preismonitor in (USD/kg):

	2016	2017		2016	2017
Dysprosium (metal), 99% min, FOB China	360.65	271.95	Praseodymium (oxide), min. 99 %, FOB Europe	66.77	49.64
Dysprosium (oxide), min. 99 %, FOB China	270.73	192.17	Praseodymium (oxide), min. 99 %, FOB China	67.40	47.99
Erbium (oxide), min. 99 %, FOB China	42.92	26.49	Samarium (metal), min. 99 %, FOB China	17.41	14.25
Europium (oxide), min. 99 %, FOB China	269.31	68.08	Samarium (oxide), min. 99 %, FOB China	2.50	1.92
Lanthanum (oxide) min. 99 %, FOB China	2.68	1.85	Scandium (oxide), min. 99.5 %, FOB China	11,352.79	9,581.10
Lanthanum (sulfur), min. 99.999 % FOB China	5.83	3.86	Terbium (metal), min. 99 %, FOB China	718.81	536.59
Neodymium (metal), min. 99 %, FOB China	63.30	50.20	Terbium (oxide), min. 99.9 %, FOB China	546.61	404.44
Neodymium (oxide), min. 99 %, FOB China	47.33	39.93	Yttrium (metal), min. 99 %, FOB China	44.38	34.79
Praseodymium (metal), min. 99 %, FOB China	101.73	73.95	Yttrium (oxide), min. 99.999 %, FOB China	6.81	3.67

According to Industrial Minerals, the prices of rare earth oxides (USD/kg) were as follows:

Commodity/Year		2013	2014	2015	2016	2017
Rare earth oxides, min.99%, large purchases, FOB China	Ce	4–6	4–6	1.8–5	1.5–2.3	1.5–1.6
	Dy	310–350	310–400	215–400	215–267	240–267
	Eu	700–900	700–950	120–750	95–210	95–165
	La	4–6	4–6	1.9–5.2	1.7–2.4	1.7–1.8
	Nd	40–60	40–70	39–68	39–42	39–42
	Pr	75–90	75–120	43–120	48–60	48–53
	Sm	5–7	5–7	1.9–6	1.9–2.9	1.9–2.5

The price range includes the lowest and highest monthly price quotes for a given year.

Selenium, tellurium

Registered deposits and other resources in the Czech Republic; basic statistical data of the Czech Republic as of December 31

In the Czech Republic unapproved prognostic resources of Se, in the Zn-Pb-Cu deposit Zlaté Hory-západ, were evaluated tentatively at more than 13 tonnes (K.Stuchlíková-I.Frolíková 1988).

Foreign trade

280490 – Selenium

		2013	2014	2015	2016	2017
Import	kg	6 007	56 118	6 440	9 007	6 458
Export	kg	510	< 1	1	2	1

280490 – Selenium

		2013	2014	2015	2016	2017
Average import prices	CZK/kg	1 568	141	798	395	881
Average export prices	CZK/kg	1 682	> 17 000	28 000	13 500	17 000

28045090 – Tellurium

		2013	2014	2015	2016	2017
Import	kg	2	< 1	9	< 1	1
Export	kg	1	–	–	–	–

28045090 – Tellurium

		2013	2014	2015	2016	2017
Average import prices	CZK/kg	18 500	>11 000	35 889	19 000	7 000
Average export prices	CZK/kg	48 000	–	–	–	–

World production and world market prices

World mine production

Statistical data on the production of selenium and tellurium are very fragmentary.

	2013	2014	2015	2016	2017
World production of selenium according to WBD, t	3 290	3 416	3 708	4 082	N
World production of tellurium according to WBD, t	129	132	183	164	N

Main producers of selenium according to WBD

country	2016	
	t	%
China	772	23.0
Japan	752	22.4
Germany	700	20.8
Belgium	200	6.0
Russia	185	5.5
Canada	176	5.2
Mexico	121	3.6
Finsko	118	3.5
Philippines	90	2.7
Poland	82	2.4
world	**3 360**	**100.0**

Main producers of selenium according to MCS

country	2017^e	
	t	%
China	930	28.2
Japan	760	23.0
Germany	710	21.5
Belgium	200	6.1
Canada	150	4.5
Russia	150	4.5
Sweden	100	3.0
Finsko	95	2.9
Poland	90	2.7
Peru	50	1.5
world	**3 300**	**100.0**

e – preliminary values

Main producers of tellurium according to WBD

country	2016	
	t	%
USA	50	27.8
Russia	40	22.2
Sweden	39	21.7
Japan	33	18.3
Canada	18	10.0
world	**180**	**100.0**

Prices of global commodities

According to Deutschland-Rohstoffsituation yearbooks for 2011–2014 and DERA (2015), the average world prices of selenium (USD/kg) were as follows:

Commodity/Year	2013	2014	2015	2016	2017
Selenium, min. 99.5 %, free market	72.95	53.40	33.50	18.48	37.83*
Tellurium, min. 99.99 %, Europe	127.42	129.17	88.64	48.79	40.42*

** Metal Bulletin, average prices*

Average prices of tellurium (USD/kg) in the USA (MCS 2018) were as follows:

Commodity/Year	2013	2014	2015	2016	2017
Tellurium, 99.95 %, FOB, U.S. warehouses	116	113	80	36	36

e – preliminary values

Tantalum, niobium

Registered deposits and other resources in the Czech Republic; basic statistical data of the Czech Republic as of December 31

In the Czech Republic, prognostic resources (unapproved) were evaluated at 3,238 tonnes in uranium deposits and uranium-bearing sandstone of the Stráž block in the Bohemian Cretaceous Basin (along with TR, Zr and Hf), and another 568 tonnes in the Hůrky locality in the Čistá-Jeseník Massif (along with Mo, TR, Zr and Hf), where 57 tonnes of prognostic tantalum resources were also calculated. Recoverable contents of tantalum and niobium are also known to occur in tungsten and tin concentrates, which were recovered experimentally during the exploration of the tin-tungsten ore deposit of Cínovec-jih (along with Li, Rb and Cs).

Foreign trade

26159010 – Tantalum and niobium ores and concentrates

		2013	2014	2015	2016	2017
Import	kg	2 604	2 371	4 953	19 775	14 411
Export	kg	75	1 200	19 878	5 471	27 714

26159010 – Tantalum and niobium ores and concentrates

		2013	2014	2015	2016	2017
Average import prices	CZK/kg	91	206	625	517	781
Average export prices	CZK/kg	67	205	421	1 112	1 030

810320 – Unwrought tantalum

		2013	2014	2015	2016	2017
Import	kg	184 971	212 871	133 153	142 654	109 479
Export	kg	81 263	92 820	72 446	54 475	86 095

810320 – Unwrought tantalum

		2013	2014	2015	2016	2017
Average import prices	CZK/kg	9 530	8 067	11 196	6 662	6 249
Average export prices	CZK/kg	9 528	8 672	10 292	10 137	9 362

World production and world market prices

World mine production

World production of tantalum and niobium in 2013–2017:

	2013	2014	2015	2016	2017e
World production of tantalum (according to MCS). t	1 170	1 100	1 100	1 220	1 300
World production of niobium (according to MCS). t	59 400	64 300	64 000	63 900	64 000

	2013	2014	2015	2016	2017
World production of tantalum (according to WBD). t	1 316	1 432	1 551	1 694	N
World production of niobium (according to WBD). t	83 021	95 956	91 224	91 827	N

e – preliminary values

Main producers of tantalum according to WBD

country	2016	
	t	%
D.R. Congo	845	49.9
Rwanda	290	17.1
China	120	7.1
Brazil	103	6.1
Ethiopia	101	6.0
Nigeria	66	3.9
Australia	60	3.5
Russia	49	2.9
Mozambique	41	2.4
Burundi	11	0.6
world	**1 694**	**100.0**

Main producers of tantalum according to MCS

country	2017e	
	t	%
Rwanda	390	30.0
D.R. Congo	370	28.5
Nigeria	190	14.6
Brazil	100	7.7
China	95	7.3
Ethiopia	60	4.6
world	**1 300**	**100.0**

e – preliminary values

Main producers of niobium according to WBD

country	2016	
	t	%
Brazil	84 000	91.5
Canada	6 099	6.6
D.R. Congo	797	0.9
Russia	628	0.7
Rwanda	190	0.2
China	40	0.0
Ethiopia	28	0.0
Nigeria	26	0.0
Burundi	8	0.0
Mozambique	7	0.0
world	**91 827**	**100.0**

Prices of traded commodities

	2013	2014	2015	2016	2017
Ta conc. 30 % Ta_2O_5, CIF China, USD/lb (according to DERA)	107.38	84.94	156.48 *	124.69	N
Ta pentoxide, min.99,5 %, FOB China, USD/kg (according to DERA)	334.37	252.73	224.46	182.87	N
Nb conc. min.50 % Nb_2O_5, min. 5 % Ta_2O_5, CIF China, USD/kg (according DERA)	36.46	27.35	22.00	20.87	N
Nb pentoxide, 99,5 %, FOB China USD/kg (according to DERA)	52.37	45.33	30.39	26.75	N
Feroniobium, imports to the US, USD/t (according to MCS)	27. 00	26. 00	24. 00	21. 00	18. 00

*Note: * USD/kg Ta_2O_5*

Zirconium, hafnium

Registered deposits and other resources in the Czech Republic; basic statistical data of the Czech Republic as of December 31

In the Czech Republic, prognostic resources of zirconium and hafnium in uranium deposits of uranium-bearing sandstone of the Stráž block in the Bohemian Cretaceous Basin (along with TR, Ta, Nb) were estimated at 71,800 tonnes of zirconium and 2,520 tonnes of hafnium. Another 122,370 tonnes of zirconium and 2,446 tonnes of hafnium are assumed to occur in fenites in the Hůrky locality in the Čistá-Jeseník Massif (along with Mo, TR, Ta, Nb). All the resources are unapproved.

Foreign trade

26151000 – Zirconium ores and concentrates

		2013	2014	2015	2016	2017
Import	kg	698 598	766 376	563 900	335 358	612 117
Export	kg	7 213	700	11 000	3 031	4 400

26151000 – Zirconium ores and concentrates

		2013	2014	2015	2016	2017
Average import prices	CZK/kg	55	51	41	69	40
Average export prices	CZK/kg	53	90	88	100	22

81129210 – Unwrought hafnium, hafnium waste and scrap, hafnium powders

		2013	2014	2015	2016	2017
Import	kg	0	0	142	11	2
Export	kg	0	14	140	122	0

81129210 – Unwrought hafnium, hafnium waste and scrap, hafnium powders

		2013	2014	2015	2016	2017
Average import prices	CZK/kg	–	–	9 049	26 455	23 000
Average export prices	CZK/kg	–	27 000	7 479	7 451	–

World production and world market prices

World mine production

Statistical data on zirconium production

	2013	2014	2015	2016	2017e
World production, kt (according to MCS)*	1 510	1 420	1 520	1320	1 600
World production, kt (according to WBD)	1 075.4	1 581.9	1 537.5	1 383.3	N

e – preliminary values
** Zr concentrates*

Main producers according to MCS
Zr concentrates

country	2017e	
	kt	%
Australia	600	37.5
South Africa	400	25.0
China	140	8.8
Indonesia	120	7.5
Mozambique	75	4.7
Senegal	60	3.8
USA	50	3.1
India	40	2.5
world	**1 600**	**100.0**

e – preliminary values

Prices of traded commodities

Average annual prices of zircon in USD/t (according to the Deutschland-Rohstoffsituation yearbook for 2011–2014) and DERA (2015, 2016):

Commodity/Year	2013	2014	2015	2016	2017
Zircon, standard, bulk shipments, FOB Australia	1 375.00	1 087.92	977.52	982.00*	975.00*

** Metal Bulletin, 2016, 2017 price averages*

The following prices (USD/t) were provided by Industrial Minerals:

Commodity/Year	2013	2014	2015	2016	2017
Zircon, bulk shipments, standard, FOB Australia	1 250– 1 550	1 080– 1 250	990– 1 050	950– 1 050	950– 1 000
Zircon, bulk shipments, premium, FOB Australia	1 350– 1 550	1 050– 1 350	1030– 1 150	1 000– 1 150	1 000– 1 270
Zircon, bulk shipments, standard, FOB USA	2 550– 2 750	950– 1 150	910– 1 150	950– 1 100	950– 1 100
Zircon, bulk shipments, premium, FOB USA	2 600– 3 000	1 050– 1 450	950– 1 450	1 050– 1 350	1 000– 1 150
Zircon, ceramic grade, bulk shipments, FOB South Africa	2 300– 2 650	1 000– 1 170	1 000– 1 150	1 000– 1 110	900– 1 000
Micronised zircon, 99.5%< 4μ, average particle size <0,95μ, C&F Asia	2 750– 2 800	1 500– 1 750	1 000– 1 750	1 500– 1 750	1 500– 1 750
Fused zirconia, monoclinic, refractory/abrasive, contract price, CIF main European port	6 500– 7 800	6 000– 7 800	6 000– 7 000	6 000– 7 200	6 000– 7 450
Fused zirconia, monoclinic, ceramic pigment grade, contract price, CIF main European port	3 800– 4 800	3 500– 4 800	3 600– 4 700	3 600– 4 800	3 500– 4 600
Fused zirconia, monoclinic, structural ceramic/electronic grade, contract price, CIF main European port	4 600– 6 000	4 600– 6 000	4 500– 5 900	4 300– 6 000	4 300– 6 000
Fused zirconia, monoclinic, technical ceramic grade, contract price, CIF main European port	15 900– 21 000	14 000– 21 000	14 000– 18 000	14 000– 19 000	15 000– 19 150
Fused zirconia, stabilised, refractory grade, contract price, CIF main European port	6 500– 7 800	6 000– 7 800	6 000– 7 200	6 000– 7 2000	6 000– 8 000
Fused zirconia, stabilised, technical ceramic grade, contract price, CIF main European port	5 000– 10 000	4 500– 10 000	4 500– 9 500	4 500– 10 000	4 300– 6 000
Zircon opacifier, micronised, 100 % < 6 μ, average 1–2 μ, bagged, CFR Asia	2 845– 3 400	1 500– 3 400	1 450– 2 100	1 500– 2 000	4 700– 9 650
Zircon opacifier, micronised, 100 % < 6 μ, average 1–2 μ, bagged, ex-works Europe	2 770– 3 400	1 500– 3 400	1 450– 2 100	1 500– 1 950	1 500– 1 950
Baddeleyite, ceramic grade (98 % $ZrO_2 + HfO_2$), contract price, CIF main European port	3 000– 3 300	2 500– 3 100	2 500– 3 000	2 500– 3 100	2 500– 3 100
Baddeleyite, refractory/abrasive grade, contract price, CIF main European port	2 500– 3 100	3 000– 3 300	2 500– 7 100	3 000– 3 300	3 000– 3 300
Baddeleyite, ceramic pigment grade, contract price, CIF main European port	3 200– 3 500	3 200– 3 500	3 000– 3 500	3 200– 3 500	3 200– 3 500

Note: μ – micrometer, μm (micron); 1 μm = 1/1,000,000 m
The price range includes the lowest and highest monthly price quotes for a given year.

MINERALS UNMINED IN THE PAST WITHOUT RESOURCES AND RESERVES

INDUSTRIAL MINERALS

Andalusite, kyanite, sillimanite, mullite

Foreign trade

250850 – Andalusite, kyanite and sillimanite

		2013	2014	2015	2016	2017
Import	t	7 986	4 919	4 147	5 647	4 920
Export	t	3	7	33	12	26

250850 – Andalusite, kyanite and sillimanite

		2013	2014	2015	2016	2017
Average import prices	CZK/t	9 925	11 168	11 546	9 426	10 372
Average export prices	CZK/t	31 343	34 017	30 554	30 405	29 081

250860 – Mullite

		2013	2014	2015	2016	2017
Import	t	1 152	713	2 212	616	572
Export	t	0.5	0.3	10	0.5	0.5

250860 – Mullite

		2013	2014	2015	2016	2017
Average import prices	CZK/t	23 773	26 467	13 085	20 478	15 564
Average export prices	CZK/t	57 778	136 000	24 322	109 848	133 332

Asbestos

Foreign trade

2524 – Asbestos

		2013	2014	2015	2016	2017
Import	t	10	10	0.05	0	0.35
Export	t	0	0	0	0	0

2524 – Asbestos

		2013	2014	2015	2016	2017
Average import prices	CZK/t	1 056 502	922 696	1 780 000	–	362 857
Average export prices	CZK/t	–	–	–	–	–

Magnesite

Foreign trade

251910 – Natural magnesium carbonate (magnesite)

		2013	2014	2015	2016	2017
Import	t	3 386	2 845	3 176	3 374	3 442
Export	t	0.06	41	0	6	15

251910 – Natural magnesium carbonate (magnesite)

		2013	2014	2015	2016	2017
Average import prices	CZK/t	3 798	2 185	2 072	1 958	1 993
Average export prices	CZK/t	607 140	34 780	–	8 167	9 761

251990 – Magnesia*, fused, dead-burned, other magnesium oxides

		2013	2014	2015	2016	2017
Import	t	46 434	58 397	60 681	52 112	56 133
Export	t	4 691	3 662	3 267	3 846	7 664

*Note: * – MgO*

251990 – Magnesia*, fused, dead-burned, other magnesium oxides

		2013	2014	2015	2016	2017
Average import prices	CZK/t	8 712	7 832	7 969	6 515	7 550
Average export prices	CZK/t	10 808	10 506	11 217	15 475	10 966

*Note: * – MgO*

Perlite

Foreign trade

25301010 – Perlite

		2013	2014	2015	2016	2017
Import	t	0	0	0	0	0
Export	t	0	0	0	0	0

25301010 – Perlite

		2013	2014	2015	2016	2017
Average import prices	CZK/t	–	–	–	–	–
Average export prices	CZK/t	–	–	–	–	–

Rock salt

Foreign trade

2501 – Salt (inclusive table and denaturated salt), and pure sodium chloride; also in water solution

		2013	2014	2015	2016	2017
Import	t	1 046 602	367 075	565 894	530 820	671 717
Export	t	79 401	24 915	37 282	21 444	43 072

2501 – Salt (inclusive table and denaturated salt), and pure sodium chloride; also in water solution

		2013	2014	2015	2016	2017
Average import prices	CZK/t	1 386	2 015	1 856	1 877	1 791
Average export prices	CZK/t	2 902	5 521	4 998	8 049	5 539

Talc

Foreign trade

2526 – Natural steatite; talc

		2013	2014	2015	2016	2017
Import	t	9 751	14 767	17 390	19 155	19 611
Export	t	269	376	437	388	428

2526 – Natural steatite; talc

		2013	2014	2015	2016	2017
Average import prices	CZK/t	8 040	7 831	8 738	8 144	8 074
Average export prices	CZK/t	17 400	14 661	14 685	19 568	23 674

Other raw materials used in industrial fertilizers production

Foreign trade

3102 – Nitrogenous fertilizers

		2013	2014	2015	2016	2017
Import	t	764 539	881 875	906 174	900 693	914 871
Export	t	485 196	499 933	203 406	481 360	565 344

3102 – Nitrogenous fertilizers

		2013	2014	2015	2016	2017
Average import prices	CZK/t	6 188	6 270	6 359	5 328	4 873
Average export prices	CZK/t	5 712	5 772	5 913	4 636	4 379

2510 – Natural phosphates

		2013	2014	2015	2016	2017
Import	t	35	37	152	284	281
Export	t	1,2	1	1	1	20

2510 – Natural phosphates

		2013	2014	2015	2016	2017
Average import prices	CZK/t	12 985	53 862	13 848	8 145	13 824
Average export prices	CZK/t	18 723	2 000	–	–	2 094

2809 – Phosphoric oxides and acids

		2013	2014	2015	2016	2017
Import	t	4 557	6 261	6 864	6 049	6 531
Export	t	55 215	56 692	49 616	41 646	43 967

2809 – Phosphoric oxides and acids

		2013	2014	2015	2016	2017
Average import prices	CZK/t	11 299	9 921	9 221	8 429	304 069
Average export prices	CZK/t	17 698	19 077	20 514	19 985	17 896

3103 – Phosphatic fertilizers

		2013	2014	2015	2016	2017
Import	t	16 377	27 652	23 718	21 814	19 264
Export	t	304	805	1 026	195	221

3103 – Phosphatic fertilizers

		2013	2014	2015	2016	2017
Average import prices	CZK/t	8 031	8 343	8 753	7 544	6 982
Average export prices	CZK/t	20 048	13 033	15 965	23 541	11 263

3104 – Potassic fertilizers

		2013	2014	2015	2016	2017
Import	t	75 755	94 918	90 194	87 743	87 576
Export	t	3 321	5 277	5 326	4 893	6 115

3104 – Potassic fertilizers

		2013	2014	2015	2016	2017
Average import prices	CZK/t	9 273	8 737	8 404	9 256	7 890
Average export prices	CZK/t	27 249	23 220	27 010	34 010	25 550

3105 – Fertilizers containing several elements

		2013	2014	2015	2016	2017
Import	t	146 855	164 005	171 233	173 787	187 630
Export	t	7 103	9 970	10 354	12 198	15 408

3105 – Fertilizers containing several elements

		2013	2014	2015	2016	2017
Average import prices	CZK/t	11 119	9 761	11 598	9 997	9 028
Average export prices	CZK/t	23 580	17 902	19 029	15 268	14 861

METALLIC ORES

Aluminium

Foreign trade

2606 – Aluminium ores and concentrates

		2013	2014	2015	2016	2017
Import	t	24 789	56 798	43 336	47 511	32 759
Export	t	5	8	55	1	0.2

2606 – Aluminium ores and concentrates

		2013	2014	2015	2016	2017
Average import prices	CZK/t	4 008	2 901	3 302	2 814	3 533
Average export prices	CZK/t	37 960	75 752	1 645	< 4 000	745 856

281820 – Aluminium oxide (other than synthetic corundum)

		2013	2014	2015	2016	2017
Import	t	9 138	10 230	9 691	11 574	14 111
Export	t	5 389	6 723	7 142	> 8 969	7 266

281820 – Aluminium oxide (other than synthetic corundum)

		2013	2014	2015	2016	2017
Average import prices	CZK/t	21 676	25 467	23 863	24 104	20 266
Average export prices	CZK/t	7 863	7 508	6 424	5 846	5 699

281830 – Aluminium hydroxide

		2013	2014	2015	2016	2017
Import	t	9 605	9 485	10 076	10 179	9 029
Export	t	26	39	121	59	133

281830 – Aluminium hydroxide

		2013	2014	2015	2016	2017
Average import prices	CZK/t	9 758	10 368	9 338	8 395	10 465
Average export prices	CZK/t	15 749	16 501	6 424	29 066	16 630

7601 – Raw (unwrought) aluminium

		2013	2014	2015	2016	2017
Import	t	239 519	267 522	289 587	295 863	304 932
Export	t	65 031	74 559	89 387	96 482	97 885

7601 – Raw (unwrought) aluminium

		2013	2014	2015	2016	2017
Average import prices	CZK/t	45 066	48 591	55 102	46 466	51 786
Average export prices	CZK/t	44 968	48 851	53 126	44 382	46 430

7602 – Aluminium waste and scrap

		2013	2014	2015	2016	2017
Import	t	81 577	74 356	81 142	120 131	115 096
Export	t	56 084	69 546	79 101	75 176	74 533

7602 – Aluminium waste and scrap

		2012	2013	2014	2015	2016
Average import prices	CZK/t	30 214	31 704	32 273	28 461	32 057
Average export prices	CZK/t	27 569	28 730	30 090	27 139	29 609

Beryllium

Foreign trade

811212 – Unwrought beryllium, beryllium powders

		2013	2014	2015	2016	2017
Import	kg	3	0	< 1	3	N
Export	kg	0	0	0	0	N

811212 – Unwrought beryllium, beryllium powders

		2013	2014	2015	2016	2017
Average import prices	CZK/kg	49 000	N	> 3 000	49 000	–
Average export prices	CZK/kg	–	–	–	–	–

Bismuth

Foreign trade

81060010 – Unwrought bismuth, including waste and scrap, powders

		2013	2014	2015	2016	2017
Import	kg	83 334	109 489	100 125	109 175	95 674
Export	kg	2 885	4 117	9 262	6 071	1 228

81060010 – Unwrought bismuth, including waste and scrap, powders

		2013	2014	2015	2016	2017
Average import prices	CZK/kg	364	493	369	236	249
Average export prices	CZK/kg	324	417	251	188	305

81060090 – Wrought bismuth, articles of bismuth, excluding unwrought bismuth, waste, scrap and powders

		2013	2014	2015	2016	2017
Import	kg	19 319	1 987	3 843	5 090	3 132
Export	kg	6 414	1 586	1 944	2 828	16 675

81060090 – Wrought bismuth, articles of bismuth, excluding unwrought bismuth, waste, scrap and powders

		2013	2014	2015	2016	2017
Average import prices	CZK/kg	545	2 688	2 093	1 358	1 137
Average export prices	CZK/kg	750	2 610	2 537	1 751	184

Cadmium

Foreign trade

810720 – Unwrought cadmium, cadmium powders

		2013	2014	2015	2016	2017
Import	kg	58	541	203	159	771
Export	kg	0	1	0	0	0

810720 – Unwrought cadmium, cadmium powders

		2013	2014	2015	2016	2017
Average import prices	CZK/kg	1 069	155	788	899	361
Average export prices	CZK/kg	–	1 000	–	–	–

Chromium

Foreign trade

2610 – Chromium ores and concentrates

		2013	2014	2015	2016	2017
Import	t	6 899	6 974	6 772	5 207	4 502
Export	t	839	548	268	339	569

2610 – Chromium ores and concentrates

		2013	2014	2015	2016	2017
Average import prices	CZK/t	9 750	9 142	8 967	9 224	11 935
Average export prices	CZK/t	7 229	5 771	4 956	3 991	7 542

811221 – Unwrought chromium

		2013	2014	2015	2016	2017
Import	kg	0	0	0	0	0
Export	kg	0	0	0	0	0

811221 – Unwrought chromium

		2013	2014	2015	2016	2017
Average import prices	CZK/kg	–	–	–	–	–
Average export prices	CZK/kg	–	–	–	–	–

Gallium

Foreign trade

81129289 – Unwrought gallium, gallium powders

		2013	2014	2015	2016	2017
Import	kg	3	< 1	< 1	1	8
Export	kg	0	0	0	0	0

81129289 – Unwrought gallium, gallium powders

		2013	2014	2015	2016	2017
Average import prices	CZK/kg	17 667	> 9 000	> 57 000	116 000	12 375
Average export prices	CZK/kg	–	–	–	–	–

Indium

Foreign trade

81129281 – Unwrought indium, indium powders

		2013	2014	2015	2016	2017
Import	kg	13	7	21	8	13
Export	kg	0	0	1	4	2

81129281 – Unwrought indium, indium powders

		2013	2014	2015	2016	2017
Average import prices	CZK/kg	14 077	20 714	14 524	18 625	8 846
Average export prices	CZK/kg	–	–	4 000	3 750	8 500

Magnesium

Foreign trade

810411 – Unwrought magnesium, containing at least 99.8 % by weight of magnesium

		2013	2014	2015	2016	2017
Import	t	2 057	2 688	1 833	1 263	1 612
Export	t	17	0,7	579	13	166

810411 – Unwrought magnesium, containing at least 99.8 % by weight of magnesium

		2013	2014	2015	2016	2017
Average import prices	CZK/t	59 250	57 468	61 478	55 919	57 371
Average export prices	CZK/t	96 039	85 106	58 136	70 469	62 106

810419 – Unwrought magnesium, containing less than 99.8 % by weight of magnesium

		2013	2014	2015	2016	2017
Import	t	719	795	756	2 175	582
Export	t	8 118	9 121	9 330	7 842	7 151

810419 – Unwrought magnesium, containing less than 99.8 % by weight of magnesium

		2013	2014	2015	2016	2017
Average import prices	CZK/t	93 410	91 251	82 312	63 054	38 976
Average export prices	CZK/t	60 199	60 454	67 475	64 425	66 053

Nickel

Foreign trade

2604 – Nickel ores and concentrates

		2013	2014	2015	2016	2017
Import	t	129	860	9	2	0.1
Export	t	151	696	19	4	0.001

2604 – Nickel ores and concentrates

		2013	2014	2015	2016	2017
Average import prices	CZK/t	310 710	348 993	368 014	334 322	527 559
Average export prices	CZK/t	314 198	359 106	4 698	71 801	8 000 000

7502 – Unwrought nickel

		2013	2014	2015	2016	2017
Import	t	2 367	4 493	4 553	3 567	2 831
Export	t	1 667	1 152	1 176	95	35

7502 – Unwrought nickel

		2013	2014	2015	2016	2017
Average import prices	CZK/t	317 657	274 925	328 529	254 666	247 602
Average export prices	CZK/t	284 858	326 017	356 518	262 754	252 781

Thallium

Foreign trade

811251 – Unwrought thallium

		2013	2014	2015	2016	2017
Import	kg	0	0	0	0	0
Export	kg	4	0	0	0	0

811251 – Unwrought thallium

		2013	2014	2015	2016	2017
Average import prices	CZK/kg	–	–	–	–	–
Average export prices	CZK/kg	2 750	–	–	–	–

Thorium

Foreign trade

28443061 – Thorium bars, rods, angles, shapes, sections, wire, sheets, strips

		2013	2014	2015	2016	2017
Import	kg	< 1	< 1	0	0	0
Export	kg	0	< 1	0	0	0

28443061 – Thorium bars, rods, angles, shapes, sections, wire, sheets, strips

		2013	2014	2015	2016	2017
Average import prices	CZK/kg	> 82 000	> 29 000	–	–	–
Average export prices	CZK/kg	–	> 93 000	–	–	–

28443069 – Thorium other, not crude, waste, scrap, bars, rods, shapes, wire, sheets

		2013	2014	2015	2016	2017
Import	kg	< 1	< 1	0	0	0
Export	kg	0	0	0	0	0

28443069 – Thorium other, not crude, waste, scrap, bars, rods, shapes, wire, sheets

		2013	2014	2015	2016	2017
Average import prices	CZK/kg	> 2 000	> 2 000	–	–	–
Average export prices	CZK/kg	–	–	–	–	–

28443099 – Thorium salts

		2013	2014	2015	2016	2017
Import	kg	1	172	0	0	0
Export	kg	0	0	0	0	0

28443099 – Thorium salts

		2013	2014	2015	2016	2017
Average import prices	CZK/kg	3 000	669	–	–	–
Average export prices	CZK/kg	–	–	–	–	–

Titanium

Foreign trade

2614 – Titanium ores and concentrates

		2013	2014	2015	2016	2017
Import	t	100 317	107 926	113 764	107 031	132 791
Export	t	758	813	867	759	796

2614 – Titanium ores and concentrates

		2013	2014	2015	2016	2017
Average import prices	CZK/t	6 467	5 577	5 486	4 643	4 920
Average export prices	CZK/t	48 398	26 567	23 186	23 104	23 018

8108 – Titanium and products of it, including waste and scrap

		2013	2014	2015	2016	2017
Import	t	1 888	1 959	1 985	1 926	2 713
Export	t	369	726	932	973	1 462

8108 – Titanium and products of it, including waste and scrap

		2013	2014	2015	2016	2017
Average import prices	CZK/t	466 266	540 385	562 506	556 584	507 122
Average export prices	CZK/t	255 279	329 037	543 456	676 071	365 200

Vanadium

Foreign trade

81129291 – Unwrought vanadium, vanadium powders, excluding waste and scrap

		2013	2014	2015	2016	2017
Import	kg	1 928	1	40	38	29
Export	kg	0	1	7	9	1

81129291 – Unwrought vanadium, vanadium powders, excluding waste and scrap

		2013	2014	2015	2016	2017
Average import prices	CZK/kg	285	27 000	3 775	2 868	4 724
Average export prices	CZK/kg	–	20 000	13 143	13 000	1 000

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