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# Main challenges of mineral resources policy of Poland

Marek Nieć [a], Krzysztof Galos [a,*], Krzysztof Szamałek [b]

[a] Mineral and Energy Economy Research Institute of the Polish Academy of Sciences, Wybickiego 7, 31261 Kraków, Poland
[b] Warsaw University, Faculty of Geology, Żwirki i Wigury 93, 02089 Warszawa, Poland

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ABSTRACT

Meeting the demand for mineral commodities is crucial for sustainable development and social welfare. Prospecting and exploration in Poland in the second half of 20th century allowed to discover and demonstrate important resources of various minerals. National economic security regarding the domestic mineral commodities supply is estimated by the mineral static sufficiency coefficient expressed in years. Mineral resources of active mines are estimated to satisfy the demand in the coming years. The estimations vary depending on the resource – lignite resources from currently operating mines will be depleted in 14 years, sand and gravel natural aggregates in 12 years, industrial dolomite in 15 years, ball clays in only 4 years. Zn–Pb ores in active mines are expected to be completely exhausted during the next 3 years. Considerable resources have been identified but are not currently extracted. The minerals may suffice for longer if the yet untapped resources will be exploited. The Polish demand for mineral commodities is only partly satisfied by the domestic supply. Numerous minerals which are not extracted in Poland need to be imported. Extraction of many mineral deposits in Poland is restrained by the actual or planned land use, land property ownership, environment protection exigencies, social opposition and the NIMBY syndrome. Legal regulations can help to solve the conflicts which limit the accessibility of mineral deposits for exploration and exploitation. Legal protection of the areas of known and expected mineral deposits occurrence is necessary.



## Introduction

The sufficient supply of mineral commodities, recently and in the future, is the basic factor of sustainable development and welfare of society. Free access to their domestic sources in the framework of land use planning and their availability on international market are crucial elements of contemporary resources geopolitics (Anderson, Anderson 1998, Tiess 2010). Mineral security is considered one of the key issues of the 21st century, both internationally (Kooroshy et al., 2010; Tiess 2010, 2011a, 2011b; Vaughn 2007, 2011) and in the Polish context (Galos et al., 2012a, 2012b, 2012c; Galos and Szamałek 2011; Szamałek 2011, Nieć, Radwanek-Bąk 2009, 2010). Mineral security should be analyzed on a few different levels. First and foremost, it is necessary to consider the key question for how long the known deposits are likely to satisfy the demand. Secondly, one must identify the limits on mineral supply and consider how to minimize their impact. According to Tiess (2010) risks in mineral supply "*are caused by the concentration of reserves in particular, often politically unstable countries, by price volatilities, by growing domestic demand of mineral-rich countries (such as China or India) in connection with export restrictions, export duties and other trade distorting measures*". Therefore, in order to avoid/minimize these problems, a few years ago the EU started to work on creating a coherent and comprehensive common minerals policy (Critical Raw Material, 2010, EU Resolution 2011). It should be "*based on creation basic conditions for public raw materials awareness as well as implementation a national minerals policy/strategy in each Member State. Such national policy should include a mineral statement, appropriate mineral planning policies (based on land use planning) and a coherent regulatory framework*" (Tiess 2011a). Several European countries have prepared and adopted their own mineral security strategies in the field of non-energy raw materials, e.g. Austria, Finland, France, Germany, Greece, the Netherlands, Portugal, Sweden, and the UK (EC Enterprise and Industry, 2014). Poland's mineral security policy is currently being developed (Assumptions for the Action Plan…, 2014) by the Ministry of Economy, with the participation of Ministries of Environment, of Regional Development and of Foreign Affairs, as well as of other institutions.

There are new directions in mineral sector activity aimed at securing the supply of resources, such as discoveries and

* Corresponding author. Tel.: +48 502689382; fax: +48 126322068.
*E-mail addresses:* mark@min-pan.krakow.pl (M. Nieć), krzysztof.galos@min-pan.krakow.pl (K. Galos), krzysztof.szamalek@uw.edu.pl (K. Szamałek).

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production of new mineral commodities, introduction of new mineral extraction and processing technologies, and an increase in exploration programs. In order to meet the demand for mineral commodities, it is necessary to ensure:

- in-depth knowledge of domestic mineral deposits,
- free access to domestic mineral resources,
- reasonable exploitation and use of domestic mineral deposits,
- continuous supply of mineral raw materials from abroad.

Mineral policy of Poland should be based on:

- domestic mineral deposits with sufficient resources and mineral quality suitable for exploitation,
- possibility for identifying new resources to replace the exhausted ones,
- access to mineral deposits in foreseeable future,
- lack of barriers that preclude or substantially restrain mining,

as well as:

- forecast of possible scenarios of economic development and demand for mineral commodities,
- disclosure of barriers limiting expected economic development and utilization of mineral deposits (Galos et al., 2012a, 2012b, 2012c).

The key issue in national mineral policy should be also to ensure energy supply by the means of:

- securing fossil fuels used directly for energy production,
- securing mineral commodities used for production of equipment necessary for energy production (also renewable energy).

In the paper, authors attempted to analyze the significance of mineral security, taking into account the extent of Polish mineral resources, their sufficiency for domestic demand, dependence of the Polish economy on imported mineral raw materials, legal framework for mineral exploration and extraction, as well as protection for future development. Finally they present recommendations and suggestions for mineral security improvement in Poland.

## Main features of mineral and fossil fuels resource base and production in Poland

Poland has large minerals and fossil fuels deposits (Fig. 1). They have played an important role in history and economy of the Polish territory since prehistoric times, as evidenced by numerous sites of silex opencast and underground mining and remote distribution of produced objects. Iron ore production in ancient times, as well as lead, silver, gold and salt production in the Middle Ages were important sources of economic growth. Iron ore, lead–zinc, sulfur, coal and crude oil were the basis for Poland's industrialization in the 19th and 20th centuries. The importance of these resources changed over time due to:

- discovery of new deposits and exhaustion of known resources,
- changing demand,
- change in costs and prices of mineral commodities, as well as availability of cheaper resources from foreign sources,
- political reasons (fiscal, military, social etc.) (Galos et al., 2010).

Extensive prospecting and exploration conducted in Poland in the second half of 20th century allowed identifying important resources of lead–zinc and copper–silver ores, native sulfur, bituminous coal, lignite as well as numerous industrial rocks, and relatively small deposits of natural gas and oil (Tables 1 and 2). Poland appeared rich in sulfur and copper ores and became one of the world's key sources of these mineral commodities (Nieć and Przeniosło 2004).

The demand for just a few mineral commodities is met domestically; most have to be imported (Table 3). Only few mineral commodities are produced domestically in sufficient quantities to allow exportation (Smakowski et al., 2013). The most important among them are: silver, rhenium, cadmium, helium (almost 100% exported). Large share of exports in total sales is also important in case of: zinc (78%), coke (72%), selenium (66%), copper (59%), sulfur (57%), calcined soda (36%) and lead (34%).

Among the EU countries, Poland is the only producer of rhenium and leading producer of copper, silver and cadmium. It is also one of main producers of zinc, lead, and dolomite. It provides over 5% of EU's selenium, rock salt, cement, gypsum and anhydrite production. Poland plays a key role in sulfur production as the only country exploiting native sulfur deposits by underground melting (Frasch method). It is the 5th world producer of rhenium. Poland also holds a high position (6th–10th) among the producers of Ag, Cu, Cd, Se, Zn, Pb, rock salt, gypsum and anhydrite and dimension stones (Smakowski et al., 2013).

Poland's share in EU's production of refractory clay, magnesite, and diatomite is very small. Poland has no domestic sources of several minerals, most importantly iron and aluminum ores, phosphates and critical metals, excluding rhenium (Galos, Smakowski 2008, Galos, Szamałek 2011).

## Supply–demand relationship and mineral commodities sufficiency

### *Mineral resources in Poland – basic data*

The deposits resources of which can are supposed to be profitably mineable in Poland (named “balance resources” in the Polish resources classification system) are listed in geological reports prepared in a standardized manner, defined by the Ministry of the Environment. The resources qualified for exploitation in already operating mines named “industrial” are listed in the “Mining development plan” (“*Projekt zagospodarowania złoża*” – *PZZ*), and updated annually to reflect the ongoing exploitation, as well as additional exploration within the mining field. Reserves consist recoverable part of these resources. The resources are categorized using original Polish classification, according to geological assurance, as: inferred (in Polish classification – Category D and $C_2$), indicated (category $C_1$) or measured (category B or A) (Nieć, Przeniosło 2004). Polish resources/reserves classification system is comparable with JORC Code or PRMS systems (for hydrocarbons), through United Nations Framework Classification (Nieć, 2010, Nieć, Sobczyk 2013).

These data are listed in the Register of mineral resources of Poland (“*Bilans zasobów złóż kopalin w Polsce*” - *BZZK*) published by the Polish Geological Survey and updated annually (Szuflicki et al. 2013). The data on additional prognostic resources (hypothetical or speculative) are periodically presented in the “Register of perspective mineral resources in Poland”, most recent published in 2011 (Wołkowicz et al., 2011).

Within metallic ore deposits, besides the principal metallic components, the resources of accompanying constituents are evaluated. These are, however, only rough estimates, since the data regarding their presence in ore are insufficient due to limited sampling (Table 2).

The total quantity of reported resources varies in time. It decreases when known deposits are depleted (in Poland e.g. Zn–Pb ore deposits), or when further exploitation of known deposits becomes impossible (in Poland e.g. majority of native sulfur deposits due to competitiveness of sulfur from other