12. Mineral exploration

Key points:

- Mineral exploration activities are ongoing across the EU, though with significant differences between Member States.
- Compared to the situation depicted in the previous Scoreboard, some mineral exploration projects have progressed towards more advanced exploration stages and some have started production. However, the EU’s mineral potential remains under-explored.
- The budget for exploration activities related to metallic minerals in the EU remains low compared to other regions in the world.

Overview and context

Mineral exploration is essential for ensuring a stable and sustainable supply in the future. As the first step in the mining life cycle, exploration contributes to defining mineral potential areas, the discovery of new deposits or to improving knowledge about existing ones that could in time become new mines. Mineral exploration is therefore an indispensable step in the EU’s strategy for securing raw material supply.

Mineral exploration begins with the identification, characterisation and classification of a resource from large to local scale, followed by streamlined to detailed technical and economic feasibility to determine whether production would be profitable under dynamic socioeconomic and legal constraints. Mineral exploration involves a sequence of activities that, from early to late stages, require progressively higher levels of all of the following: (a) geological knowledge; (b) technological feasibility; (c) social, environmental, political and legal acceptability; and (d) economic profitability. Such a complex process requires time and monetary investment, with an exponentially increasing effort from early to late exploration

Figure 12.1: Mineral exploration activities the EU (2017)\textsuperscript{113}.

\textsuperscript{113} Source: JRC elaboration, based on data from S&P Global Market Intelligence, 2017.
stages. Only a few of the mineral occurrences identified in early stages have the potential to become a mine (see Indicator 11). For instance, out of the circa 400 exploration projects for rare earths that were announced in 2011-2012, fewer than 20 were still active in late 2015 and very few seem to have the potential to become new mines under current market conditions.

The EU’s mineral potential is challenged by factors such as limited geological knowledge, limited access to land, technological and economic feasibility, and high exploration costs. Moreover, interest in exploring mineral potential is highly driven by the price of commodities in the market.

Facts and figures

Mineral exploration activities are ongoing across the EU, though with significant differences between Member States. Figure 12.1 shows where the current exploration activities are located in the EU-28, with reference to 2017 data. Mineral exploration activities remain concentrated in Ireland, Portugal, Finland, and Sweden, which are regarded as attractive countries for investment in exploration (see Indicator 13), with gold, copper and zinc as the main target commodity.

More than 30 exploration projects mapped in the previous edition of the Scoreboard have progressed towards a more advanced exploration stage. In addition, about 10 exploration projects advanced to the feasibility and/or production stage in 2017. Compared to the exploration activities related to selected commodities in the previous version (2014 data), approximately 60 new exploration projects have been identified. More than half are early-stage exploration projects targeting gold and zinc. Other target commodities

also include cobalt, lithium, lanthanide (rare earth elements) and graphite.

The number of exploration projects presented in Figure 12.1 is necessarily smaller than the overall number of mineral deposits, occurrences and showings depicted in Figure 12.2. In fact, the high number of deposits identified during exploration at early stages typically results in a much smaller number of mineral deposits that match the multi-criteria conditions to become a mine. Nevertheless, although mineral exploration activities in the EU have recently shown an increase, a comparison between Figure 12.1 and Figure 12.2 shows that the EU’s mineral potential remains under-explored.

Figure 12.3 presents the global budget allocated for exploration activities for a selection of metals by world region over time. The global and EU-28 exploration budgets decreased by 70% from 2012 to 2016. The highest investment amounts allocated to exploration were seen in Latin America (30% of global total), Canada (14%) and Australia (12%).

The exploration budget share of the EU-28 in 2016 continued to be low compared to other global regions (around 4%). Similar to the 2015 exploration budget (see 2016 Scoreboard), the 2016 exploration budget was mostly allocated to the exploration of gold (43%), followed by copper (30%), zinc (21%) and nickel (6%).

**Conclusion**

Although there are some signs of increasing exploration activity in the EU, investment in metal exploration remains low compared to other regions in the world. Mineral exploration is a complex and dynamic activity that requires time and investment, yet it is a key component of the EU’s strategy for increasing the domestic supply of primary raw materials. Only a few early-stage exploration projects will become a mine, but without exploration the supply of raw materials cannot be sustained in the long run.
Methodological notes

**Figure 12.1**
Compared with the 2016 Scoreboard, the updated map in Figure 2.1 also covers some non-metallic minerals such as graphite, phosphate and potash.

Figure 12.1 is based on S&P Global Market Intelligence data for early and late stage exploration projects. Projects are classified by the main mine product, i.e. primary commodity, and by development stage.

Early-stage projects encompass grassroots, exploration, and target outline stage. Being in the grassroots stage means that claims have been staked on prospects; being in the exploration stage means that preliminary testing is under way, which may include geological mapping and sampling, geophysical and geochemical work and exploration drilling. Being in the target outline stage means that targets have been identified and more detailed surface and/or underground exploration and drilling is under way.

Late stage projects are projects in which an initial reserve/resource has been estimated, and have two sub-types of advanced exploration and pre-feasibility/scoping. Advanced exploration involves drilling activities to add additional reserves/resources. Pre-feasibility/scoping involves working on a preliminary assessment to determine mining and processing methods, and other projected economic metrics such as capital costs, net present value, and internal rate of return, and is described by S&P Global Market Intelligence as a project with a defined resource that has not yet reached a production decision.

As in the case with all statistical data, the data used for Figure 12.1 have certain limitations. For example, survey data are not available for all commodities and all countries involved in the mining business.

**Figure 12.3**
Data on budget exploration for 2016 reflect budgeted expenditure rather than actual spending. The US dollar figures were not corrected for inflation.

The data and the geographical classification follow S&P Global Market Intelligence world mining regions, where ‘Latin America’ includes South America, Central America, Mexico and the Caribbean; and ‘Pacific/Southeast Asia’ includes Myanmar, Cambodia, Fiji, Indonesia, Japan, Laos, Malaysia, New Caledonia, New Zealand, Papua New Guinea, Philippines, Solomon Islands, Thailand and Vietnam. ‘Other areas’ includes non-EU European countries, the former Soviet Union and Middle East countries, and most of mainland Asia. Nineteen countries are covered by ‘EU-28’: Austria, Bulgaria, Cyprus, Czech Republic, Finland, France, Germany, Greece, Hungary, Ireland, Italy, the Netherlands, Poland, Portugal, Romania, Slovakia, Spain, Sweden and the United Kingdom. Regions are listed based on 2017 values.

Other metallic minerals were excluded from this analysis since exploration budget data were aggregated together with data for other minerals; this makes it impossible to identify their specific contribution to metallic mineral exploration.