Exploring the unexplored

Europe is investing in exploration activities and the Nordic countries are the continent’s rising stars

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Despite the economic crisis in 2009, investments into exploration activities in Europe have remained strong and since 2010 almost US$2 billion has been raised for exploration projects across the continent.

In 2012, the figure was US$708 million, which was a 23% increase on the previous year and not far off the 2010 figure. For 2013 the outlook looks less bright, as only US$173 million has been raised during the first four months of the year. This suggests that around US$500 million will be spent on exploration activities over the course of the year.

Over the past three years, iron ore has been a primary focus, cumulatively raising more than US$700 million in equity between January 2010 and May 2013. Gold stands in second place at US$450 million, followed by copper at more or less the same level. As the graph illustrates (see page 18), all other metals are at much lower levels.

In spite of the economic issues affecting Europe, the European Union has continued with the Raw Materials Initiative (RMI) launched in 2008, which set out to follow steps to secure Europe’s future access to resources. One of the keys was to foster the supply of raw materials from European sources, including boosting exploration in the region.

These actions are embedded in the overall proclaimed political goal of reindustrialising Europe by 2020 and achieving an increase of industry’s contribution to Europe’s gross domestic product (GDP) from 13% to 20%.

The EU has embarked on the European Innovation Partnership (EIP) on Raw Materials – a major programme of support for innovation in the raw-materials sector and co-ordination actions to stimulate national mineral policies, with the overarching aim of increasing access to resources within Europe.

The overall objective of the EIP is to ensure a sustainable supply of raw materials to the European economy and society. Specifically, it is to address issues such as:

- Reducing import dependency;
- Improving supply conditions from the EU and other sources;
- Pushing Europe to the forefront in raw-materials sectors;
- Providing alternatives in supply; and,
- Mitigating negative environmental and social effects.

A strategic implementation plan (SIP) is being developed and will include designated priority areas, which are categorised by five work packages (WP):

- WP1 – Exploration, extraction, processing, recycling;
- WP2 – Substitution, alternative functionalities and materials;
- WP3 – Improving Europe’s raw materials regulatory framework conditions, knowledge base and infrastructure;
- WP4 – Improving Europe’s recycling regulatory framework conditions and excellence; and,
- WP5 – International co-operation.

It is expected that the SIP will be implemented by the end of 2013.

For exploration in particular, the EU is looking at implementing a number of measures. These include: deep exploration; finding and defining new, industrially relevant mineral deposits both on the continent and in the sea bed; developing cost-effective exploration technologies; and providing high-resolution 3D geo-data and their interpretation for deposits located as deep as 4000m.

In 2011, European exploration efforts were mostly concentrated in the Nordic countries – Sweden, Finland, Norway and Greenland – and some Balkan countries, such as Serbia. Together with Poland, Scandinavian countries account for around two thirds of total exploration expenditure in Western Europe.

Smaller exploration programmes are also underway in the EU’s remaining mining countries, including Ireland, Portugal, Spain and Bulgaria. Exploration in other countries such as Greece, Austria and Italy, for example, was minimal.

After decades of neglect, the EU is nowrediscovering its own resources and is fostering these in a joint effort between European institutions and its
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Capital ratings by minerals from January 2010 to May 2013

Source: Interactive

member countries. The RMI encourages EU members to either establish new mineral policies or revise their existing ones.

In the meantime, one third of EU members have already amended or are in the process of changing their mineral policies. Spurred on by the EU’s decision to launch the EIP and a surge in activity by European geological surveys and academic institutions, interest in European mineral deposits continues to grow and has the widespread support of both the EU and national political leaders.

The EIP will support innovation in all aspects of the European raw materials sector, including exploration. Policy leaders have recognised that exploration in Europe deserves stronger support since it is both crucial to future regional economic development and is the stepping stone to future raw materials supply for Europe.

The key issues at stake to attract risk capital include encouraging the free availability of pre-competitive geological data, gaining access to land and public and political support.

Research support

In 2012, the European Commission (EC) decided to provide financial support for a co-ordination action between EU members in relation to a minerals research programme aimed at boosting synergies and complementing EU-funded research made available under their EU Seventh Framework Programme (SP7) (2007-2013) and the new programme Horizon 2020 (2013-2020).

This co-ordination programme ERA-MIN (the Network on the Industrial Handling of Raw Materials for European Industries) will develop joint research calls in the future. ERA-MIN hosted a Roadmap Conference from 11-13 March in Lisbon, Portugal, to debate the most significant scientific and technological challenges facing Europe in relation to the sustainable supply of raw materials. The Strategic Research Roadmap was the main outcome of the conference and was adopted in April.

Geological database

In order to boost exploration in Europe, the EU has embarked on a major initiative to develop an updated, high-quality, geologically compatible EU data portal, known as EuroGeoSource (www.EuroGeoSource.eu).

EuroGeoSource is a multilingual web-based geographic information system (GIS) system that brings together a model on energy and mineral resources that complies with the INSPIRE (Infrastructure for Spatial Information in Europe) directive.

This forms part of a data portal that uses these web services and also uses national mapping data from Belgium, Bulgaria, Denmark, Estonia, Hungary, the Netherlands, Poland, Portugal, Romania and Slovenia. The programme may also be extended to encompass other national data sets.

Mapping of European mineral belts

There are regions in Europe that contain world-class or major ore deposits, but apart from in the northern part of the continent, there is a distinct lack of exploration today across the continent.

This is primarily due to problems associated with access to land, complicated legislation, negative general perception and other non-geologically related reasons.

Mineral exploration is getting deeper and is increasingly targeting deep mineralisation. This trend has opened up a huge opportunity for under-explored mineral belts across Europe, where exploration has yet to be undertaken at such depths.

To give some context, the deepest mine in the world is over 4,000m deep, while the deepest mine in Europe, the Pyhä-Häme underground copper-zinc-lead mine in Finland, is around 1,400m deep. Canadian-based Inmet Mining Corp acquired Pyhä-Häme from Outokumpu Oyj in 2002. The mine began exporting to China in 2005 and today Pyhä-Häme exports more than half of its pyrite exports to the China. In April, First Quantum Minerals Ltd acquired the mine when it bought Inmet for C$5 billion (US$4.9 billion).

Most exploration techniques barely detected mineralisation below a few hundred metres and from geological modelling it is now known that mineralisation in most mineral belts in Europe exists at depths that have not previously been targeted.

Therefore, if new exploration techniques were developed and utilised, if new 3D models of the mineral belts were implemented throughout the course of exploration strategies and if legislation and general perception changed to see the opportunities mining can create in many regions across Europe, there is no doubt that we would see huge new discoveries. In turn this would provide job opportunities in the mining regions and provide revenue to both local and national governments.

The data inventory exercises have been complemented by a section of the flagship programme ProMine. It was a FP7 project covering various aspects of mining: exploration, extraction, and manufacturing. It included aspects of research, education and promotion.

It had a total budget of €17 million (US$22 million), including an EU contribution of €11 million, and comprised 30 partners from 11 EU countries and was co-ordinated by the Finnish Geological survey GTK. The project was concluded in April 2013.

It has produced:
16 maps of mineral potential for the 16 main commodities (or deposit types);
Six predictive maps for six main elements (W, Sn, Sb, F, carbonate hosted Zn and Cu), using the weight of evidence quantitative method;
Five predictive maps for five by-products elements (Ge, Ga, In, Ta and Co), using a newly developed database querying method; and,
3D, 4D and predictive modelling have been conducted for the Fennoscandian Shield, located in Norway, Sweden and Finland, the Kupferschiefer belt in Central Europe, the Iberian Pyrite Belt and the Hellenic Belt.

These 27 maps and related material are available on the ProMine web portal. The ProMine databases will provide data for numerous future researches on mineral resources in Europe. In conjunction with the EU's analysis of critical raw materials, ProMine has developed a map of these minerals for the EU.

A knowledge base platform called Minerals4EU will also be created to facilitate future policy-making with regards to fostering exploration. This forms part of the EU's SIP and will receive €2 million in funding. The consortium consists of 31 partners, 26 NGOs and spans 23 countries. The project will begin in September 2013 and will be conducted over a two-year period.

The Intelligent Deep Mine

The research for data and exploration technologies is being developed under a project that will address mineral extraction and processing technologies. Work for the project entitled Innovative Technologies and Concepts for the Intelligent Deep Mine of the Future, or IDMine, started in November 2011 after securing funding from the EC’s FP7.

A consortium, led by Swedish iron-ore miner Luossavaara-KirunaVaara AB (LKAB), comprising 26 companies and academic institutions across 10 European countries, is undertaking IDMine over a four-year period.

The objective of the project is to develop concepts for innovative mining methods for exploring deep deposits – both steep and flat – leading to improved resource efficiency through higher extraction rates (20% or greater), a higher selectivity of extraction (10-20%) together with a 20% higher deposit utilisation as well as increasing productivity and decreasing production costs 20%.

The objectives are:
Tailor-made concepts for underground near-to-face processing to reduce the mass flow to surface 15-25%;
High-resolution 3D-exploration methods for deep deposits;
New concepts for mine management to reduce operational expenditure and new methods for predicting, monitoring and controlling subsidences;
New methods to handle waste rock underground and backfill products with similar characteristics to the original rock;
Health and safety design criteria and guidelines for the new concepts and technologies developed;
Concepts for clean, safe and comfortable climate conditions in the mine’s underground workings;
New concepts and technologies for deep mine rescue and;
Online best practice database for all environmental aspects associated with deep mining projects (including water management, waste management, emissions and subsidy).

Gold opportunities in Romania

Although one of the richest countries in Europe – as far as gold and silver deposits are concerned – over the past six years, gold exploitation in Romania has completely come to a halt. Under the EU’s state aid rules, all state-owned gold mines (which all of them were at that stage) were shut down prior to Romania’s accession to the EU in 2007.

According to a report generated by the Romanian National Agency for Mineral Resources in June 2011, in Romania there are seven active exploration licences: Rom Aur SRL’s projects in Alba and Cluj, Samax Romania SRL’s deposit in Hunedoara, and three of Romatyn Exploration SRL’s mines located in Maramures, as well as another project in Satu Mare.

The same report mentions only two exploitation licences. These are granted to Rojla Montană Gold Corp, for its deposit in Alba, and Deva Gold SA, which is now a subsidiary of Eldorado Gold Corp, for its Certej project, located in the southern part of the Apuseni Mountains in central Romania.

The Rojla Montană project is a large and important project that could restate Romania as Europe’s largest gold producer. The project has reported measured and indicated resources of 14.6 Moz of gold and 64.9 Moz of silver, including

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10.1 Moz proven and probable reserves of gold and 47.6 Moz proven and probable silver reserves at grades of 1.46g/t and 6.88g/t, respectively.

In 1997, Canadian TSX-listed Gabriel Resources Ltd signed a concession agreement for the Rojia Montană project, but the project has been waiting for all related permits for more than a decade. Using a gold price of US$900/oz, the project is anticipated to bring in US$19 billion to Romania as potential direct and indirect contribution to GDP, according to 2010 estimates from UK-based Oxford Policy Management.

The mining project at Rojia Montană could become a trigger for Romania’s economic development and a sign of hope in the latest economic crisis confronting the EU. With state-of-the-art technology, the project aims to build a model mine, while implementing the highest environmental standards. Moreover, the Rojia Montană project will clear up past environmental damage and legacies, which would otherwise just be left.

Regarding the environmental requirements, the project at Rojia Montană complies with all EU legislation currently in force and, in some instances, even beyond existing legislation. The project is in line with the above-mentioned EU strategy on the sustainable use of resources and the Resource Efficiency Flagship Initiative, which are all part of the Europe 2020 strategy.

With the environmental financial guarantees provided, the rigorous protection of cultural patrimony exhibited in light of its current restoration plan for Rojia Montană and the surrounding area and the active involvement in the local community’s social and cultural life, the Rojia Montană project is a solid and responsible investment that is needed by this region, Romania and Europe as a whole.

The project is associated with significant increases in employment opportunities during the life of the mine. Specifically, the mine itself is expected to create 2,390 jobs during the construction phase, with more than 2,300 of these jobs going directly to the Romanian workforce. It is estimated that there will be around 887 people employed directly in the operational phases.

The multiplier effects can be expected to increase these numbers, according to Oxford Policy Management’s calculations, based on a number of Romanian industries that can expect to see a degree of expansion as a result of the new mine.

In the main operational phase, the typical multiplier is more than four, implying additional employment for an extended period for more than 3,600 Romanian workers. Most of these jobs would be located in the local and regional areas in the vicinity of the project, providing some well-paid work and enhancing living standards for households in the area.

Nordic rising

While the EU is encouraging all of its member countries to change the legal framework and conditions for extracting minerals, the Nordic countries are cementing their position as the premier European exploration and mining hub.

As can be seen from the latest analysis by the Fraser Institute, the attractiveness of the Nordic countries for exploration has increased and Sweden and Finland now top the list for global mining investment and exploration.

Mining plays such an important role across the Nordic region that regional mineral strategies have been developed to ensure that the sector is supported and given reasonable conditions to develop. Finland, for example, has developed a new Tekes

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Green Mining Concept in order to strengthen the social licence to operate (SLO). This programme aims to make the country a global forerunner in responsible mining. It is estimated that between 2011 and 2016 £60 million will be spent on over 40 projects.

One of the main projects underway in Finland is the Sakatti copper-nickel-platinum deposit, located 150km north of the Arctic Circle. It was discovered by a team from Anglo American plc in 2009 and from having worked in the area since 2004 and understanding the long-term view needed for Greenfield exploration, the team used a combination of traditional exploration techniques and state-of-the-art In-house geophysical technologies, including LT SQUID (superconducting quantum interference devices) technology, to identify the project area where the deposit is located.

Collaboration with local partners proved another key factor in successfully realising Sakatti’s full potential. Through collaboration with Finnish diamond drilling specialist OY KATI AB, Anglo American developed and implemented a new closed-loop drilling system.

This approach enabled the team to drill, while reducing water use, as well as significantly minimising the environmental footprint of the exploration activities. In November 2011, the team received the 5th Fennoscandian Mining Award for its Sakatti exploration discovery at the Fennoscandian Exploration and Mining (FEM) Conference in Levi, Finland. The award also emphasises the exploration potential across Fennoscandia.

Iron-ore activities

The Nordic countries, and in particular Sweden, have been home to some of the most intensive iron-ore development activities across Europe in recent years.

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Australian miner Northern Iron Ltd is planning an overhaul to solve its capacity problems relating to its mine in Kirkenes in northern Norway. The mine restarted operations in 2010. During 2012, underground operations at Dannemora, located 100km north of Stockholm, were also restarted after a 25-year hiatus. The mine produces lump and fines and its capacity is around 2Mt/y.

Meanwhile, Northland Resources SA is well underway with its Greenfield open-pit in the Pajala shear zone in northern Sweden, on the border with Finland. However, the company has experienced serious financial problems after running out of cash for a brief period earlier this year. The company's shares slumped around 90% over the past year after announcing a US$425 million funding shortfall and scrapping earlier attempts to raise a US$3375 million equity and bond issue.

Nonetheless, at the beginning of May, Northland announced that it had reached financial agreements that it hopes will provide the necessary financing to bring its Kaunisvaara project to full production by the September quarter of 2014. Since then, a planned US$335 million bond offering was completed, which should allow the company to ramp up to full production once again.

Kiruna Iron AB, which is wholly controlled by Australian-based exploration company Hannans Reward, is undertaking a project in the iron-ore region surrounding the town of Kiruna, in northern Sweden.

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This is being run adjacent to LKAB’s Kruuna mine and Beowulf Mining plc’s neighbouring Routevare magnetite project.

In central Sweden, the Bergslagen district, located approximately 250km northwest of Stockholm, hosts two interesting early stage projects: Grängesberg Iron AB was recently granted a mining concession to re-open the historic Grängesberg Iron ore mine; and Nordic Iron, which is developing the Blötberget and Häksberg iron-ore deposits near Ludvika.

Swedish metals producer Bolden AB is gradually developing its more long-term Altik project in Norrbotten, in northern Sweden. The abandoned Laver copper deposit, where Bolden reinitiated operations in 2008, is now at the pre-feasibility stage, and, it is hoped that it will follow the success of the Altik mine.

Finnish gold
In Finland, there is more of a focus on gold mining. Agnico Eagle Mines Ltd’s Kittilä mine further north has become the largest gold mine in Europe. Meanwhile, EndoRami Ab is successfully operating its Pampalo underground deposit since 2011. The mine is located in the eastern-most part of the entire EU.

Finland’s mining industry has been revitalised over following a trough in the late 1990s and early 2000s. Foreign investors have taken over and operate the following mines: Sillilunjärvi phosphate (Norway’s Yara International ASA); Kittilä gold (Canada’s Agnico-Eagle); and Pyhäsalmi base metals and Kevitsa nickel (Canada’s First Quantum).

Although at one point Finland did not have a single junior company operating in the country, now a number of small, but profitable, mines have been opened there. These include Altona Mining Ltd’s copper projects; Belvedere Resources Ltd’s Hitura nickel mine; Dragon Mining Ltd’s focus on gold-based metals; Nordic Mine AB’s gold projects; Outokumpu’s Kemi chromite mine; and Lapland Goldmines AB’s Rahtavaara gold mine.

The Finnish industry has not been entirely without problems, however. Talviivaara Mining Company plc’s Sotkamo nickel mine, for instance, has been plagued by serious environmental issues, resulting in a loss of production. The problems are not yet resolved and illustrate that greenfield mining projects can meet with a host of unexpected challenges.

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