S&P Global
Market Intelligence

PDAC Special Edition:

World Exploration Trends 2018

March 2019

In a world of "darkening skies," according to the World Bank, uncertainty over future economic growth and trade disputes, and therefore the health of commodity demand and metal prices, it would be easy to forget some of the more positive outcomes of 2018. S&P Global Market Intelligence's 29th annual Corporate Exploration Strategies[1] study found that the global exploration budget for nonferrous metals increased to an estimated US$10.1 billion in 2018 from US$8.5 billion in 2017. This was the second consecutive year of growth, following four years of shrinking commitment to exploration.

The industry ended 2017 on a high note: metals prices were trending upward, exploration activity levels were at multiyear highs and company market capitalization had recovered from the doldrums of late 2015. These positive indicators raised our Pipeline Activity Index, or PAI, to 88 in the December 2017 quarter, its highest level since mid-2013.

While this strength continued into early 2018 as metal prices continued to rise, the exploration sector experienced some weakness in mid-year. Financing activity declined and our Exploration Price Index pulled back as many metals saw first-half gains undone, although, importantly, both indicators remained well above their levels seen in 2015 and 2016. Despite the appearance of adverse signs, companies continued to report exploration results at an elevated rate. The close of 2018 saw a return to upward momentum for most metrics, although company market caps continued on a downward trend. The PAI ended the year at just under 86[2].

Turning to 2019, uncertainty still abounds over the sustainability of economic growth in the world's two largest economies. We therefore expect some volatility to persist in the exploration metrics, but with a generally upward trend as the positive underlying fundamentals for most metals encourage increased activity. We expect the global exploration budget to increase again in 2019, although by a smaller amount — likely emphasizing late-stage exploration as the industry remains risk averse.

There will be some headwinds. With M&A expected to rise by double-digit percentages, consolidation will result in lower total budgets, as merged companies usually have budgets lower than the sum of the two merged companies' previous budgets. Global political tensions continue to dampen sentiment and investment into the sector. The industry does, however, remain short of critical new discoveries, and some metals, such as copper, will see widening deficits without additional investment in exploration for the mines of the future.

We feel that not only must the industry continue to invest in exploration, but the concerning trends that persist, such as grassroots' share of exploration and the share of miners' revenue directed to exploration at historical lows, will need to turn around if the thinning project pipeline is to be effectively addressed.

US$10.1 billion
nonferrous exploration budget for 2018[1]

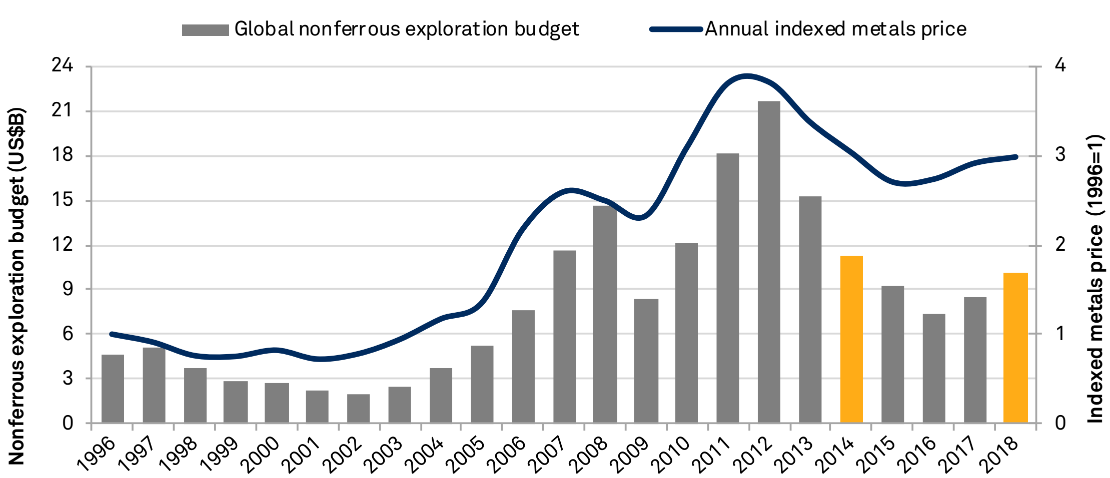
3,300+
companies surveyed for 2018 exploration budgets[1]

4%
difference between year-end 2017 and 2018 PAI[2]

"Recent pessimism in the industry is mostly divorced from the positive underlying commodity fundamentals"

-Mark Ferguson, Associate Director, S&P Global Market Intelligence

Global exploration budget still below 2014 levels



Data as of Jan. 18, 2019.
Source: S&P Global Market Intelligence

World Exploration Trends 2018

In Numbers

S&P Global Market Intelligence obtains the data used in its Corporate Exploration Strategies (CES) studies through the participation of the surveyed companies. The individual nonferrous exploration budgets covered by the study include planned spending for gold and silver, base metals, platinum group metals, diamonds, uranium, rare earths and potash. They specifically exclude exploration budgets for iron ore, coal, aluminum, oil and gas, and many industrial minerals.

Note that all historical exploration budget amounts throughout this report represent dollars of the day and have not been adjusted for inflation.

1,651
companies with budgets

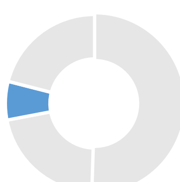
US$10.1
billion budget total; growth of 19%

5%-10%
forecast increase in 2019; a third consecutive year

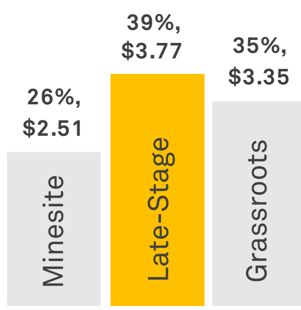
50%
targeting gold

22%
targeting copper

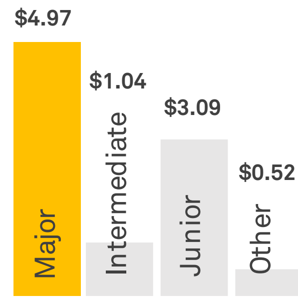
7%
targeting lead/zinc



Grassroots lags late stage still (US$B)



Majors still dominate exploration spend (US$B)



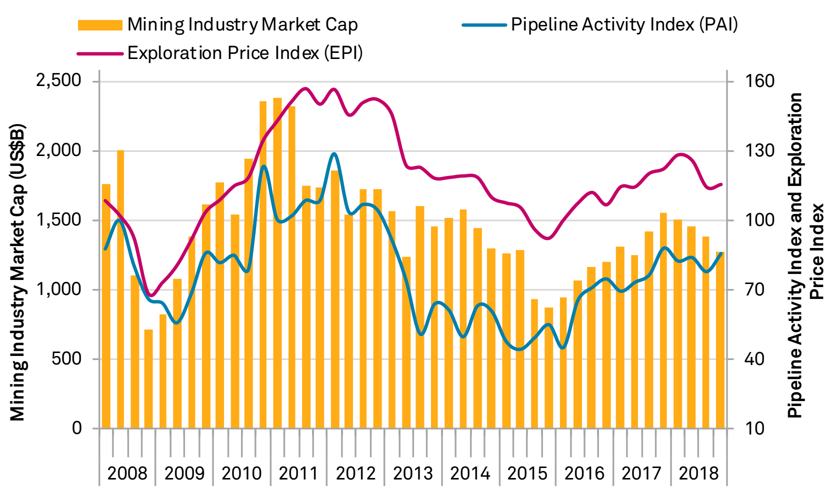
0.5%
revenue reinvested into grassroots exploration

US$2.9 billion
raised primarily for exploration in 2018

	HQ Location	US$B	Change
1	Canada	3.52	34%
2	Australia	1.71	20%
3	Rest of World	4.39	10%
	Total	9.62	20%

Exploration budget globally for companies aggregated by country of headquarters domicile. Change is versus 2017 budget. Aggregate budgets of US$9,624.7 million recorded among 1,651 companies. Total exploration budget of US$10.1 billion includes estimates for companies budgeting less than US$100,000 and private companies.

Pipeline activity index, 2008-18



Data as of Jan. 18, 2019.
The quarterly PAI is calibrated so that the June quarter 2008 = 100.
The quarterly EPI is the average of the monthly EPI, which is calibrated so that May 2008 = 100.
Source: S&P Global Market Intelligence

Macroeconomic uncertainty

The metals and mining industry had a year of two halves in 2018. The beginning of the year continued 2017's discernible improvement in key industrial metal prices. However, policy uncertainty in China, the evolution of the U.S.-China trade war and economic growth fears caused most metal prices to pull back throughout the year before stabilizing near year-end.

Looking at the year ahead, the environment for the global economic outlook certainly appears to be less healthy than it was a year ago. The World Bank recently released a cautionary Global Economic Prospects publication titled "Darkening Skies[3]." The report warns that "financing conditions have tightened, industrial production has moderated and trade tensions remain elevated" and that "downside risks have become more acute and include the possibility of disorderly financial market movements." In recent months, both the WTO[5] and the IMF[6] have downgraded expectations for global trade and economic growth.

S&P Global Economics[4] is forecasting that global GDP growth will fall to 3.6% in 2019 from a six-year high of 3.8% in 2018, due to declines in the two largest economies, the U.S. and China. U.S. growth will fall because of waning fiscal stimulus from personal and corporate tax cuts. As recession fears spread through Wall Street, however, Goldman Sachs Research's chief economist Jan Hatzius has been reported saying in a Nov. 18 note to clients that "neither overheating risks nor financial imbalances — the classic causes of U.S. recessions — look worrisome" and "as a result, the expansion is on course to become the longest in U.S. history next year."

Meanwhile, we are less pessimistic regarding China, as the government lowering the reserve requirement for smaller banks and enacting fiscal stimulus through infrastructure spending will cushion the decline in growth to 6.2% in 2019 from 6.5% in 2018. Financial Times reported that Chinese vice-president Wang Qishan even told the World Economic Forum in Davos in January that despite China's growth rate falling in 2018 to the lowest level in three decades, the figure was a "pretty significant number, not low at all". He also added that "there will be a lot of uncertainties in 2019, but one certainty is that China's growth will continue and be sustainable".

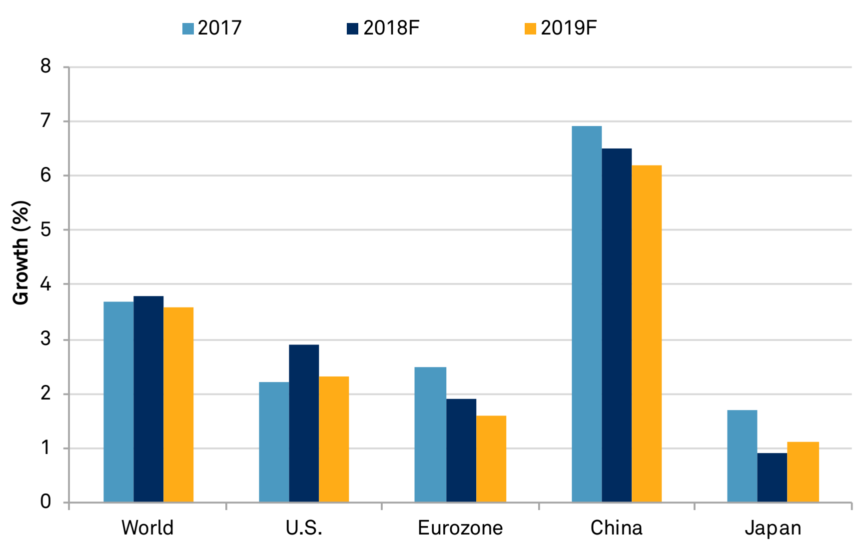
Elsewhere India's GDP growth is expected to fall to 7.4% as it heads into an election year. In addition, European growth will be weighed down by Brexit, Italy's budget and Germany's new leadership and its economy contracting in the third quarter of 2018 due to reduced automobile production. However, a global slowdown in 2019 is both necessary and healthy and will not be the beginning of another global financial crisis. The biggest risk to the global economic outlook is the U.S.-China trade war, however its direct net effect on both countries is likely to be less than 1% of GDP.

3.6%
global GDP predicted for 2019[5]

"Metal prices will be driven largely in 2019 by policy announcements. For industrial metals, notably Chinese announcements to support the economy"

-Matthew Piggott, Research Director, S&P Global Market Intelligence

Growth forecasts: December 2018 CCC Round



Data as of Dec. 11 2018.
CCC = S&P Ratings Credit Conditions Committee; F = forecast
Source: S&P Global Economics

Metals prices tumbled in the last half of 2018 due to a strong U.S. dollar, a weak renminbi and uncertainty in the macroeconomic environment. The S&P GSCI fell to an 18-month low on Dec. 24 and was down 15% over the year. Mining equities shared a similar fate, with the S&P/TSX Global Mining Index falling to 67.77 on Dec. 31 from 73.76 on Jan. 5.

The trade-weighted dollar index increased by 5% to 96.17 on Dec. 31 from 91.87 on Jan. 2. Gold was hindered by the dollar's success, falling to US$1,283/oz at year-end from US$1,318/oz at the start of the year. The precious metal also fell to a 20-month low of US$1,175/oz on Aug.16. Gold did however benefit from a late-December rally, helped by comments from Chair Jerome Powell in a Dec. 19 press conference that the Fed now expects two rate hikes in 2019, down from its September forecast of three. On Jan. 30 the FOMC made further dovish remarks, changing language away from "further gradual increases" and stating that it will be "patient" as it determines what future adjustments may be appropriate to the funds rate target range.

Copper, the next most important exploration target, had reasonable increases in 2018. The London Metal Exchange, or LME, cash copper price averaged US$6,527/t for the year, up from an average of US$6,173/t in 2017 due to economic growth and supply tightness. However, the copper price fell to a 14-month low of US$5,759/t on Aug. 15 from a four-year high of US$7,331/t on Jun. 7, as the macroeconomic environment began to turn. We estimate that the LME cash price will increase to average US$6,824/t in 2019.

Iron ore prices are sensitive to changes in the macroeconomic environment and disruptions to supply. Despite macroeconomic uncertainty, iron ore prices will increase in 2019 due to a 40 Mt reduction to higher-grade production volumes at Vale's southern system in response to a dam burst at its Feijão mine on Jan. 25.

Average LME nickel cash prices rose to US$13,122/t for the year from US$10,411/t in 2017 on the back of robust demand. We estimate the 2019 average price to fall to US$12,240/t as supply increases. Primary output is expected to increase by 2.8%, to an estimated 2.21 Mt in 2019 from 2.15 Mt in 2018.

The average LME cash zinc price increased modestly, to US$2,919/t from US$2,893/t in 2017. However, the weaker macroeconomic environment caused it to follow a similar trend to copper, rising to US$3,606/t on Feb. 1, the highest level since 2007, before falling to a 22-month low of US$2,284 on Aug. 15. The consensus forecast for the average LME zinc cash price for 2019 is US$2,668/t.

15%

decrease in the S&P GSCI during 2018

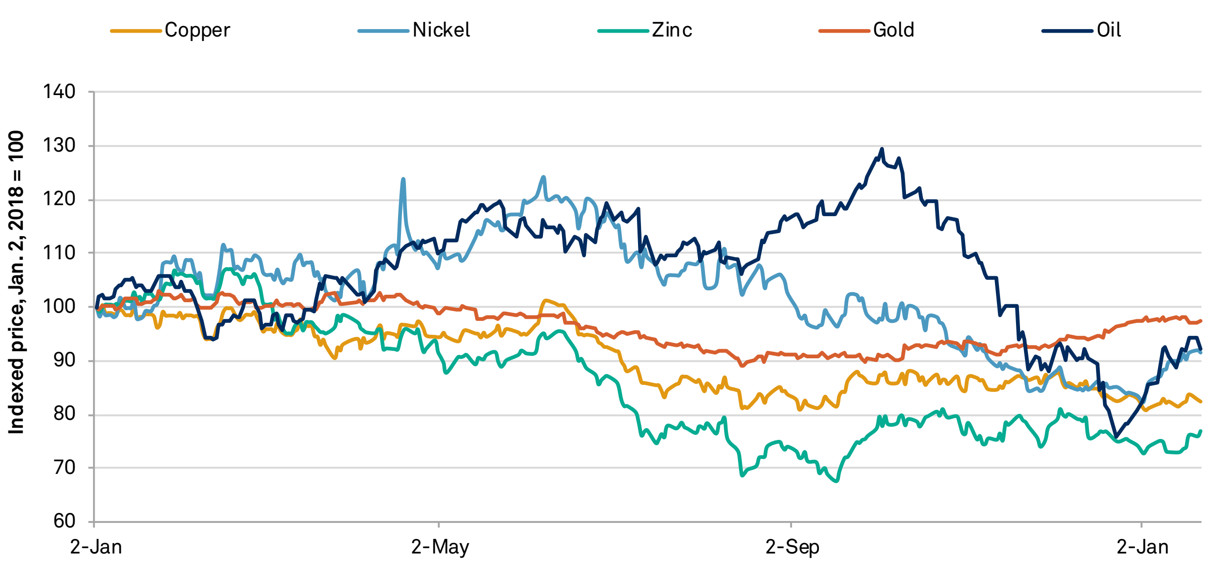
599bp

drop in S&P/TSX Global Mining Index by end-2018

"Metal prices should trend upward during 2019, although volatility is likely"

-Thomas Rutland, Research Analyst, S&P Global Market Intelligence

Indexed key commodity prices from Jan. 2, 2018



Data as of Jan. 18, 2019.
Source: S&P Global Market Intelligence

The rebound in exploration continues

The recovery in exploration that began in late 2016 continued through the first part of 2018, with planned spending on nonferrous exploration rising for a second consecutive year. S&P Global Market Intelligence's survey of more than 3,300 public and private companies in 2018 resulted in the global aggregate nonferrous budget increasing by 20% year over year to US$9.62 billion.

For the first time since 2012, the number of companies planning expenditures increased year over year; the 1,651 companies actively exploring in 2018 were 8% more than in 2017 but still one-third fewer than the 2012 peak. Exploration allocations were buoyed by broad-based increases in planned exploration, with the average budget increasing to US$5.8 million and the median budget increasing to US$1.3 million. While up year over year, both the average and median budgets remained well below the levels seen from 2011 to 2013.

Junior and intermediate companies have more consistently been able to raise funds for their exploration efforts since March 2016, a marked improvement over the preceding three-year period. Although financings are moving in the right direction, the US$9.60 billion raised in 2017 and US$9.44 billion raised in 2018 remain well below the US$19.41 billion raised in 2011.

Capital offerings targeted primarily for exploration purposes in 2018 were down slightly compared with 2017 and 2016, with the totals for all three years returning to 2012 levels, when equity markets were just beginning to shun the industry.

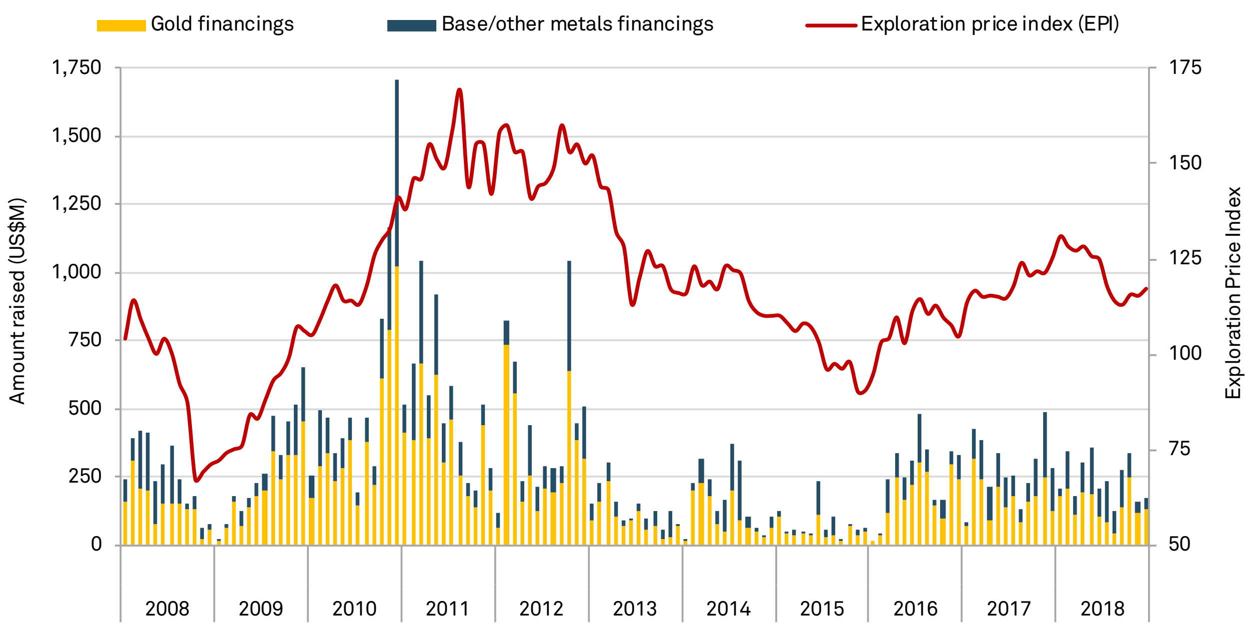
20%
increase in nonferrous budgets in 2018[1]

US$2.9 billion
raised primarily for exploration in 2018[2]

"While 2017 saw active companies increase their budgets, 2018 had dormant companies reactivating along with an increase in the average budget"

-Kevin Murphy, Senior Analyst, S&P Global Market Intelligence

Significant exploration-related financings by junior and intermediate companies

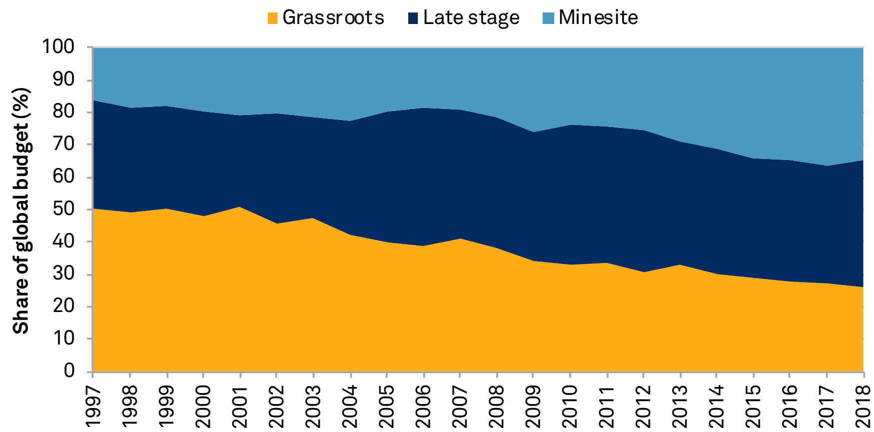


Data as of Jan. 18, 2019.
The monthly EPI is calibrated so that May 2008 = 100.
Source: S&P Global Market Intelligence

Industry remains risk averse

Our research has long shown that the mining industry is allocating an increasing proportion of its exploration spending to advanced projects and mines. This tends to become more pronounced during downturns, as juniors opt to spend scarce funding on proven assets rather than on riskier early-stage exploration. Despite improved market conditions in 2017 and 2018, the proportion of budgets directed to grassroots exploration fell to an all-time low of 26% in 2018[7]. This shows that while conditions have improved, companies remain risk averse.

Grassroots budget share of exploration at record low



Data as of Jan. 18, 2019.
Source: S&P Global Market Intelligence

Revenue share directed to exploration in 2017 at new low

Although the mining industry widely accepts that exploration is key to guaranteeing companies' future, the top earners (revenues of at least US$1 billion) continue to allocate only a small proportion of their revenues to exploring for new reserves and resources. In 2017, the average adjusted revenues for these top earners increased 6% to US$3.44 billion. The amount they spent on exploration in 2017 increased only 1% to US$49.8 million. This pushed the ratio of exploration spending to adjusted revenue down to 1.4%, an all-time low. While this ratio is currently forecast to return to 1.6% in 2018 — using 2017 revenues and 2018 exploration budgets — it remains near historically low levels[8].

It seems unlikely that the ratio will improve going forward, as consolidation at the top of the industry generally results in lower exploration — revenue streams will be combined, but with lesser compounding of exploration budgets and spending. We saw this in 2001 with the merger of BHP Ltd. and Billiton PLC, and in 2002 with Newmont Mining Corp.'s acquisition of Normandy Mining Ltd. The recent Barrick M&A and the proposed Newmont-Goldcorp transaction will likely affect the ratio over the coming years as the merged companies rationalize their combined portfolios.

The smaller proportion of major miners' revenue being directed to grassroots exploration reinforces our concerns about the shift away from early-stage exploration.

The majors allocated 0.4% of their revenue to grassroots exploration in 2017, an all-time low and well off the peak of 2% allocated in 1997. We estimate that the share has improved slightly to 0.5% in 2018. This is not to say that the top earners have abandoned generative exploration; while junior budgets increased by the largest percentage year over year, the majors still outspend the juniors on grassroots exploration. Yet our data indicates that most large producers are focused on late-stage and minesite exploration to replace depleted reserves and increase production[8].

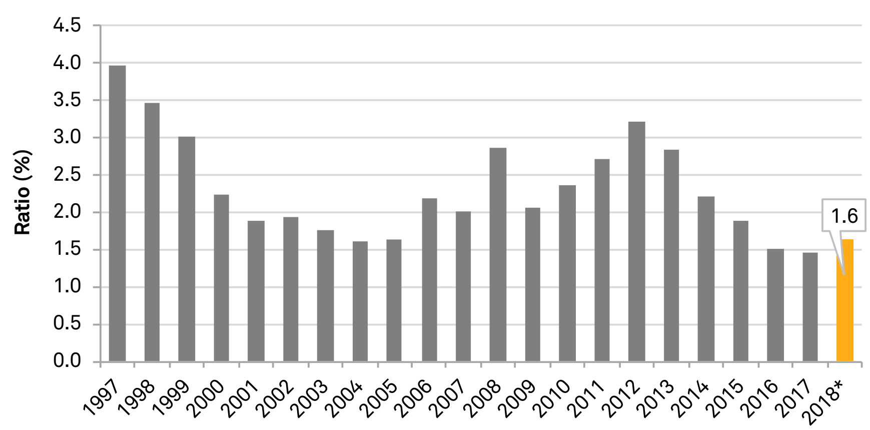
1.4%

of 2017 major miners' revenues spent on exploration; minor improvement expected in 2018[7]

14%

2018 budget increase over 2017 spending[1]

Top earners ratio of exploration spend to adjusted revenue increasing once again



Data as of Jan. 18, 2019.
* 2018 ratio forecast using 2017 revenues.
Source: S&P Global Market Intelligence

Exploration budgets rebound in most regions

All global regions but one had higher exploration budget allocations in 2018. The United States had the largest increase year over year, jumping more than one-third to US$852 million, and only in Pacific/Southeast Asia did allocations continue to decrease, dropping to US$305 million from US$332 million the year before and lowering the region's share of the global budget to 3% from 4%.

Although Latin America's global budget share slipped to 28% from a record 30% in 2017, the region remained the most popular exploration destination. Six countries, Peru, Mexico, Chile, Brazil, Argentina and Ecuador, together accounted for the lion's share (90%) of the region's total budget. For the first time since 2014, base metals matched gold as the top Latin American exploration target, with each garnering 42% of planned spending.

Our Rest of World region, covering Europe and most of mainland Asia, had the second-largest budget, accounting for 17% of the global budget, led by allocations of US$487 million and US$452 million for China and Russia respectively. For the eighth time in the past nine years, China held the region's top position with 29% of total allocations. Four other countries, Kazakhstan, Sweden, Finland and India, each attracted more than US$50 million.

Canada rose to third place from fourth in 2017 with 15% of the global budget. The province of Ontario accounted for 28% of Canadian allocations, followed by Quebec with 24%. With planned spending for gold up an impressive 37%, the precious metal's share of the total Canadian budget rose to 64% from 62% year over year. An even higher 43% increase in planned spending for base metals increased that category's share of Canada's budget to 16% from 15% in 2017.

Australia edged past Africa to take fourth place with 14% of the global budget, after languishing in fifth place since 2004. Western Australia was again by far Australia's most popular exploration destination with 63% of the country's total. Gold remained the top exploration target, although a relatively weak 14% year-over-year increase in allocations lowered the metal's share of the Australian budget to 56% from 61%. A notable 58% increase in the base metals budget raised its share to 27% from 21% in 2017.

Africa dropped to fifth place from third with 13% of the global budget; however, only US$51 million separated the region from fourth-place Australia. The most significant African exploration destinations included Democratic Republic of Congo, or DRC, Burkina Faso, Ghana and Cote d'Ivoire. A continued focus by explorers on West Africa (Burkina Faso and Cote d'Ivoire in particular) gave gold the largest allocation again in 2018,

29%

of 2018 budgets allocated to Canada and Australia[1]

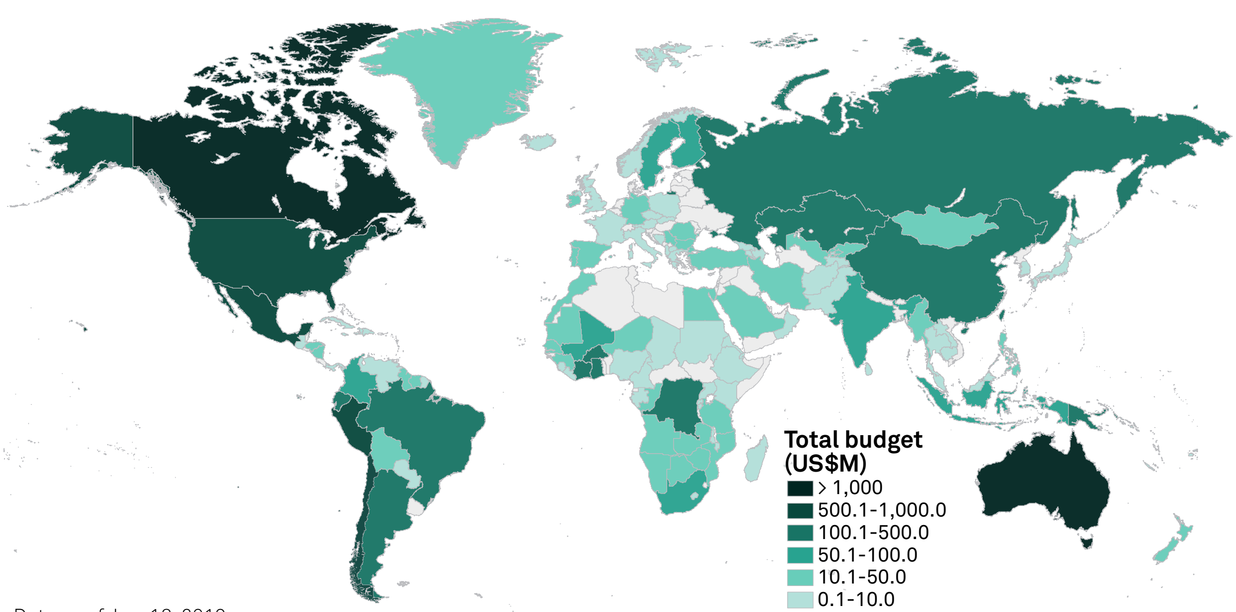
8%

decrease in allocations to Pacific-SE Asia, the only region to decrease[1]

"Australia and Canada are seeing the largest benefit from the recovery in budgets due to the number of smaller companies investing in their backyard"

-Kevin Murphy, Senior Analyst, S&P Global Market Intelligence

Nonferrous exploration budgets - Canada has largest budget of any country in 2018



Data as of Jan. 18, 2019.
Source: S&P Global Market Intelligence

although the metal's share of the overall African budget fell to 54% from 59% in 2017. Led by copper allocations for DRC, budgets for base metals were up 42%, increasing the category's share of the region's budget to 24% from 19% in 2017.

Gold and copper exploration in the United States kept the region in sixth place with a 9% share (up from 8% in 2017), ahead of Pacific/Southeast Asia with 3% (down from 4%). Nevada had the largest share (40%) of the region's 2018 budget, and three states, Nevada, Arizona and Alaska, together accounted for 73% of the total. Gold remained the top United States exploration target, and although gold allocations were up 28% in 2018, the metal's share of the region's budget declined to 57% from 59% in 2017. Base metals' share of the total increased to 32% from 30% in the previous year, due to an impressive 40% increase in planned spending.

In Pacific/Southeast Asia, exploration allocations for Papua New Guinea, Indonesia and the Philippines accounted for the bulk of the region's 3% of the global budget, split mainly between gold (51%) and base metals (46%). Remaining in last place regionally, Pacific/Southeast Asia showed the only decrease in allocations (8%) among the regions in 2018.

Gold dominates but base metals show life

Gold led the way to a higher global budget in 2018 with an increase of 18%, or US$756.6 million, year over year to US$4.85 billion. The precious metal, which made up half of the global budget, accounted for 48% of the year-over-year increase.

The aggregate base metals budget also made a significant move upward in 2018 after a fairly tepid 2017, increasing by US$606 million to US$3.04 billion. Copper allocations increased the most in dollar terms, by US$369.3 million to US$2.07 billion, while zinc allocations increased the most in percentage terms, by 37% to US$671.8 million.

Our Other Targets category accounted for 13% of the global budget, while uranium and diamonds each accounted for around 2% and platinum group metals accounted for 1%.

Battery metals outperform again

In recent years, exploration efforts have been spurred by relatively robust prices for many commodities used as essential components of batteries. With demand expected to grow for these materials in the coming years and attention focused on supply, many explorers have launched campaigns to find new projects or expand known deposits, focusing particularly on commodities previously not considered core to the exploration sector.

In 2018, lithium exploration budgets reached a new high of US$247.1 million — a 58% increase year over year. Despite lithium attracting more investment, the number of active explorers remained flat, with 137 companies active in 2018 compared with 136 in 2017.

For a second consecutive year, cobalt registered the largest year-over-year percentage increase in planned exploration spending among the nonferrous metals covered by our study. Ninety-five companies allocated a total of US$110.8 million for cobalt exploration in 2018, more than triple the US$35.9 million budgeted by 52 companies in 2017.

50%

of global budget allocated to gold exploration[1]

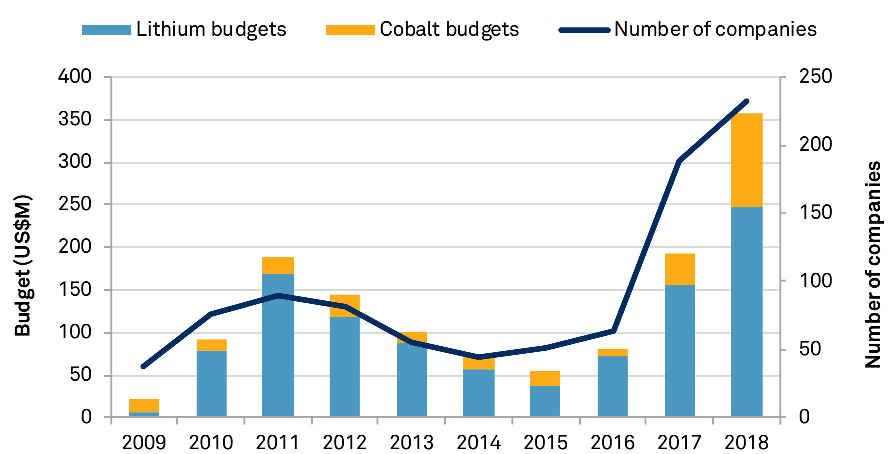
59%

increase in battery metals budgets[1]

"The exploration industry remains overly concentrated on gold despite recent increases to other commodities"

-Sean DeCoff, Associate Analyst, S&P Global Market Intelligence

Lithium and cobalt exploration budgets, 2009-18



Data as of Jan. 18, 2019.
Source: S&P Global Market Intelligence

Drilling activity robust[9]

Drilling activity increased in 2018 on the back of strong growth in exploration budgeting by the industry in 2017 and 2018. In 2017, explorers reported results from 43,312 drillholes at 1,132 projects worldwide. In 2018, both metrics increased considerably — 49,239 holes were reported at 1,261 projects, representing increases of 14% and 11% respectively.

Primary gold projects made up the majority of projects reporting drilling in 2018. While the number of gold projects drilling increased 8% over 2017, the proportion of gold projects relative to projects reporting on other commodities was the lowest since 2014. When explorers turned to gold as an investor safe haven in 2015, as much as 68% of all reporting was from gold projects. Through 2018, the gold project share declined in each successive quarter, indicating that industry players have been diversifying to other targets. Base metals projects benefited the most from the diversification, with nickel up 73%, copper up 20%, lead-zinc up 17% and cobalt up 83%.

Significant drill results have also been steadily increasing. While the number of projects drilling increased 11% in 2018, those with significant results increased by 10%, implying that industry players are willing to take more risks in choosing locations to drill. Grassroots drilling jumped nearly 13% globally year over year in 2018, with Mexico, the U.S. and Canada the largest contributors to the increase.

While levels of drilling activity and encouraging results have been increasing since 2016, exploration-focused financing levels have not kept pace. Significant (> US$2 million) financings for gold and base metals exploration fell to US$2.91 billion in 2018 from US$3.39 billion in 2017. In addition, 46 fewer significant exploration-focused financings were completed in 2018 than in 2017.

14%

YOY increase in drillholes reported[9]

26%

increase in actively drilled base metals projects[9]

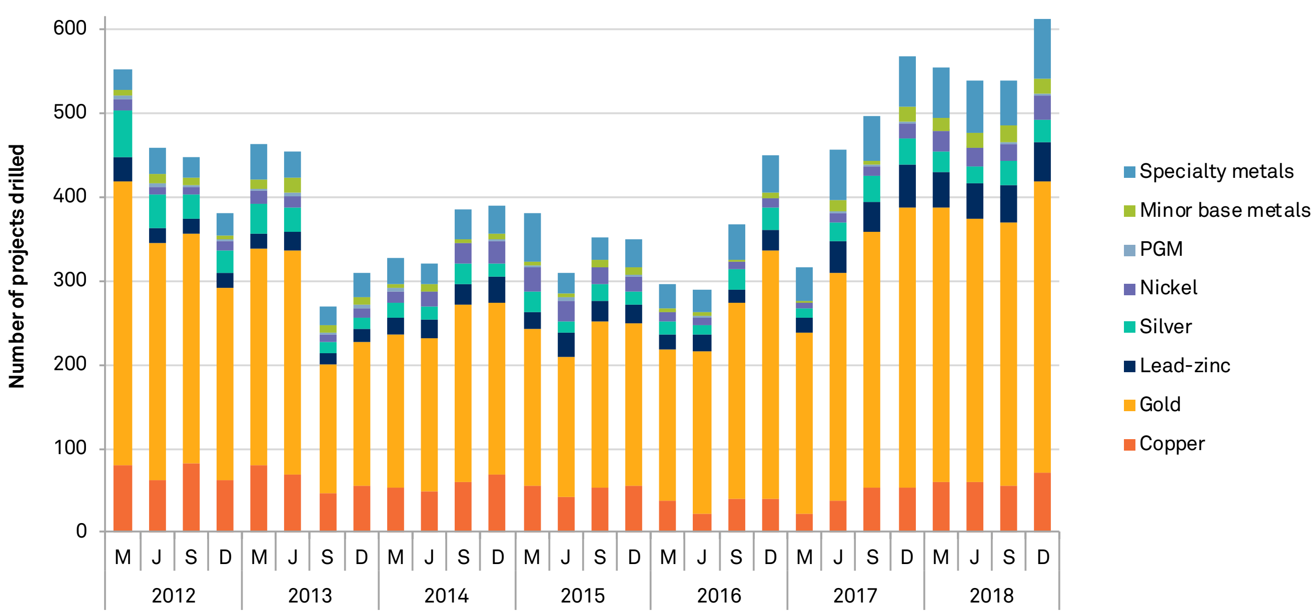
8%

increase in actively drilled gold projects[9]

"Although financings lie below the highs of 2012, exploration results during 2018 are well above the 2012 level"

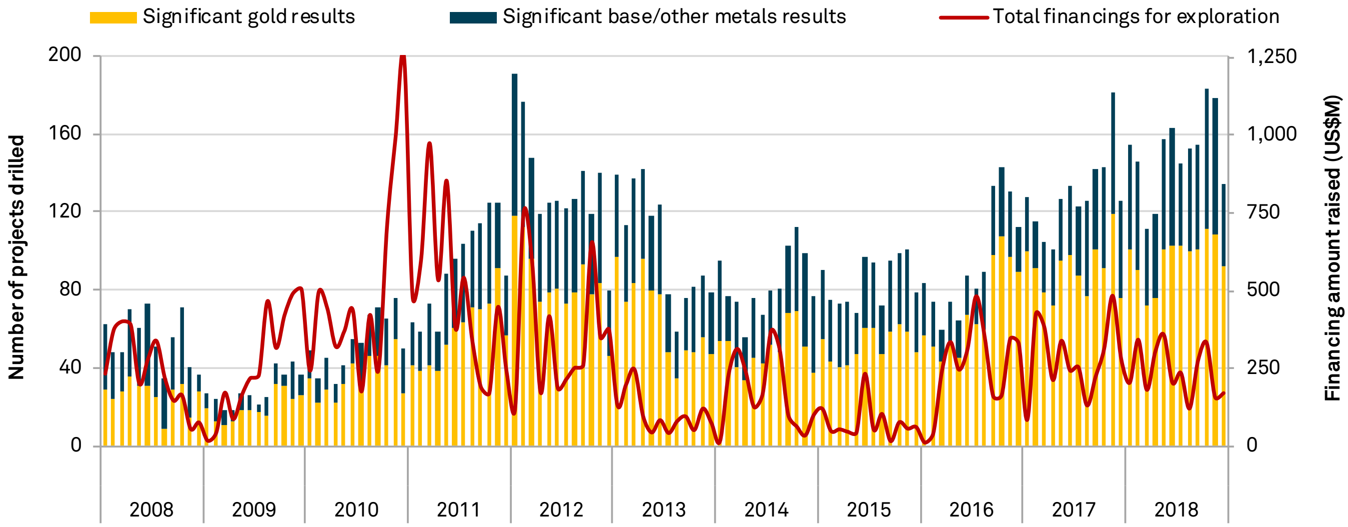
-Christopher Galbraith, Research Analyst, S&P Global Market Intelligence

Global drilling activity surpassing 2012 exploration budget peak



Data as of Jan. 18, 2019.
PGM = platinum group metals
Source: S&P Global Market Intelligence

Financings lag 2012, drilling activity highest since 2007



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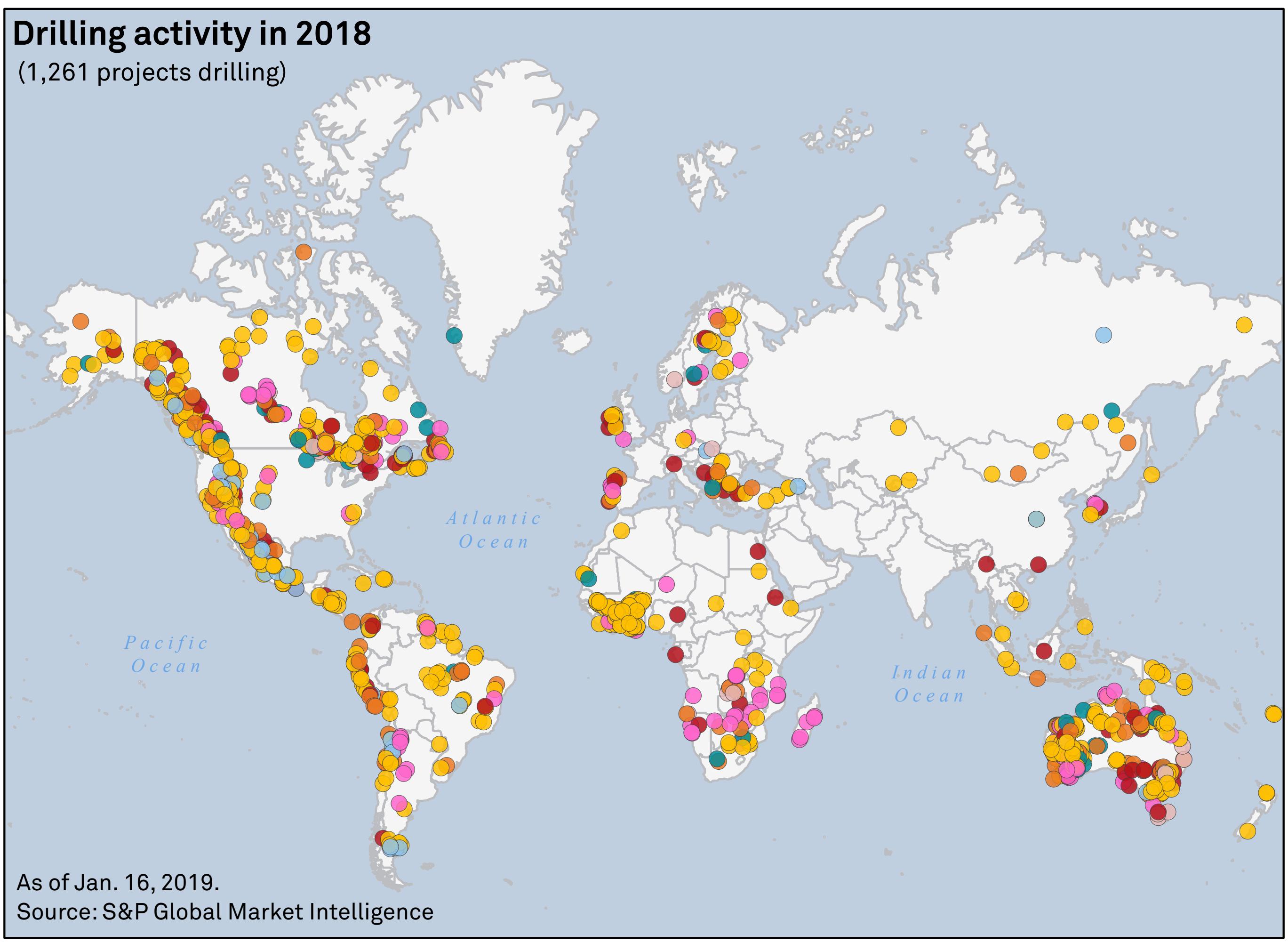

Primary commodity

Copper · Gold · Lead-zinc · Minor base metals · Nickel · Platinum group metals · Silver · Specialty metals

About S&P Global Market Intelligence

S&P Global Market Intelligence integrates financial and industry data, research, and news into tools that help track performance, generate alpha, identify investment ideas, understand competitive and industry dynamics, perform valuation, and assess risk. Our metals & mining solution provides a comprehensive source of global exploration budgets, reserves replacement analysis and in-depth asset level metrics for mining properties, projects, companies and mines worldwide. From worldwide exploration, development, production and mine-cost analysis, our unbiased research provides insightful perspectives to act with conviction. Get the essential insights you need for acquisitions, commodity market forecasts, and credit risk assessments for well-informed mining investment decisions.

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Sources:

[1] *Corporate Exploration Strategies, Overview of Exploration Trends,* S&P Global Market Intelligence, Nov. 6 2018
[2] *Quarterly Industry Monitor: December Quarter2018,* S&P Global Market Intelligence, Feb. 2 2019
[3] *Global Economic Prospects : Darkening Skies,* World Bank, Jan. 8 2019
[4] *Global Economic Outlook 2019: Autumn Is Coming,* S&P Global Ratings, Dec. 11 2018
[5] *World Trade Outlook Indicator,* World Trade Organization, Nov. 26 2018
[6] *World Economic Outlook (international Monetary Fund),* International Monetary Fund, Oct. 2018
[7] *CES 2018 – Grassroots' share of global budget at all-time low,* S&P Global Market Intelligence, Nov. 22 2018
[8] *CES 2018 — Exploration spending in 2017 hit new low as share of mining revenue,* S&P Global Market Intelligence, Nov. 29 2018
[9] *Drilling activity up 14% YOY in 2018 to 7-year high,* S&P Global Market Intelligence, Jan. 24 2019

Unless otherwise stated, all data is as retrieved on Feb. 5 2019.