Exploration Review

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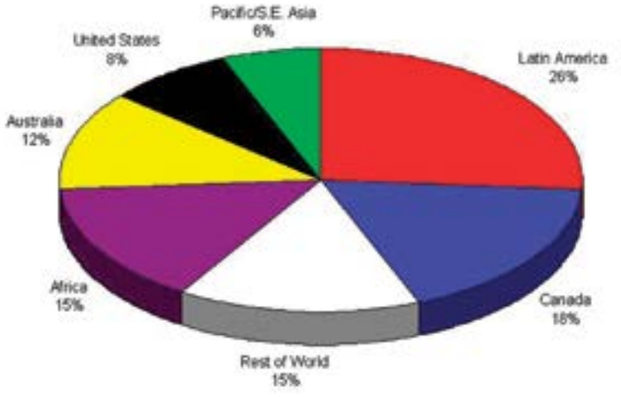
This summary of international mineral exploration activities for the year 2011 draws upon available information from industry sources, published literature and U.S. Geological Survey (USGS) specialists. The summary provides data on exploration budgets by region and mineral commodity, identifies significant mineral discoveries and areas of mineral exploration, discusses government programs affecting the mineral exploration industry and presents analyses of exploration activities performed by the mineral industry.

Figure 1

Planned worldwide exploration budgets for analyzed nonfuel mineral commodities by region for 2011 (2,329 companies' budgets, totaling US$16.31 billion). Source: Metals Economics Group.



Three sources of information are reported and analyzed in this annual review of international exploration: 1) budgetary statistics expressed in U.S. nominal dollars provided by Metals Economics Group (MEG) of Halifax, Nova Scotia; 2) regional and site-specific exploration activities that took place in 2011 as compiled by the USGS and 3) regional events including economic, social and political conditions that affected exploration activities, which were derived from published sources and unpublished discussions with USGS and industry specialists.

The MEG data summarize planned company budgets for worldwide exploration activities in 2011 for 20 mineral commodities, based on surveys returned by companies primarily focused on precious (gold, platinum-group metals and silver) and base (copper, lead, nickel and zinc) metals. Information on uranium exploration activities was included in the MEG overview for the first time in 2007. MEG included data on lithium, niobium, phosphate, potash, rare earth elements and tantalum for the first time in 2010 because of the increased topical significance of these commodities. Since 1999, companies with exploration budgets of $100,000 and greater were included in the MEG compilation. MEG estimates that its post-1999 surveys cover at least 90 percent of world nonferrous nonfuel mineral exploration budgets. The 2011 survey is reported by MEG to cover an estimated 95 percent of these budgets. The remaining 5 percent was composed of companies that chose not to participate in the MEG study, private companies that do not publish their budget data and government-funded exploration activities.

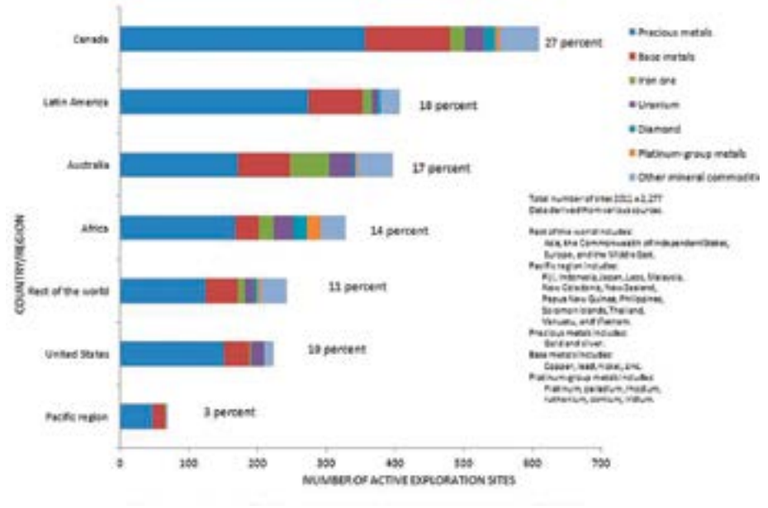
USGS data compilations and analyses are based on information provided by USGS mineral commodity and country specialists and by other USGS scientists, as well as industry contacts and published trade journals. The USGS data summarize exploration site data collected for more than 80 minerals and materials, with a focus on nonfuel minerals including base metals, diamond and precious metals. Iron ore and uranium were included in the USGS analysis after 2007. The USGS analyzed the MEG exploration budget data, the compiled site activity data, and available information on regional conditions and influences to assess the level of exploration activity in 2011 and to report trends in mineral exploration activity for the period 2000 through 2011. This analysis identifies where mineral exploration is occurring by commodity and region, assesses how much activity is taking place in each region for selected mineral commodities, and determines those factors that most affect any changes in this exploration activity.

Certain limitations apply when comparing estimates or evaluating the magnitude of regional changes from year to year, because as worldwide exploration allocations have increased, so too have energy, labor, service and material costs associated with mineral exploration. Consequently, an exploration budget of $1 million allocated in 2011 would yield less exploration activity than a corresponding budget in 2000. Fluctuations in currency exchange rates and the value of trading currencies over time can influence the business pattern of foreign companies conducting business in other countries. Unless otherwise specified, this analysis does not take currency fluctuations into account and expresses worldwide exploration activity in U.S. nominal dollars to simplify comparisons by commodity and region.

Temporal interpretations of the MEG exploration data, such as trend analyses, are also limited by changes in survey parameters, because the sample of exploration and mining companies surveyed by MEG varies with time, companies included in the survey change on a year-to-year basis, and fluctuation of currency exchange rates affects the relative value of budget estimates from year to year. Also, commodity and country coverage may differ from year to year. Post-1999 data reported in this summary differ from prior-year data in that a larger number of companies were included in the more recent survey results. The significant amount of corporate restructuring that took place since 2000 also affected statistical compilations. MEG included 116 more companies in its 2011 survey than it did in 2010.

Figure 2

Number of active exploration sites by region as compiled by the U.S. Geological Survey. The graph shows the contribution of sites in the region as a percent of the total number of world sites.



2011 global mineral exploration activity and trends for 2000 through 2011

According to MEG, the total estimated worldwide budget allocation for nonferrous mineral exploration increased by about 52 percent in 2011 to about $16.3 billion (on the basis of data from about 2,300 companies when uranium in excluded) from the 2010 budget allocation of about $10.7 billion (2,100 companies). MEG annual survey estimates reflect budgeted expenditures rather than actual dollars spent, and reflect an estimated 95 percent of worldwide exploration. Despite increasing volatility, metals prices remained relatively strong in 2011, and industry confidence was sufficiently strong enough to support a variety of active exploration programs. The aggregate 2011 mineral exploration budget reported by MEG was about 30 percent higher than the previous record for nonferrous exploration spending of $12.6 billion reported for 2008 when spending for similar commodities are compared.

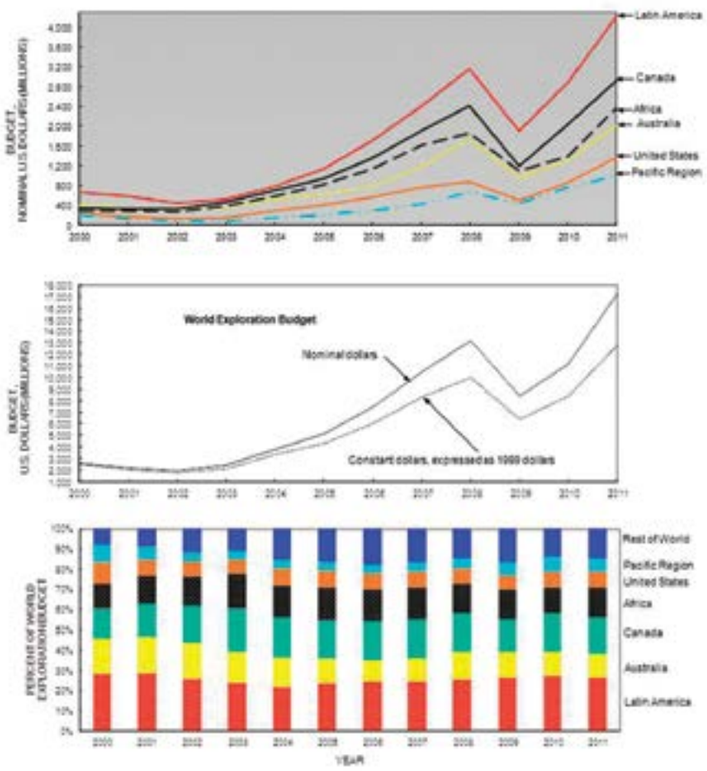
Data compiled by companies surveyed by MEG suggest that most companies planned to conduct more drilling in 2011 than they did in 2010, averaging about 14,000 m (46,000 ft) of drilling during the year. However, this planned increase in drilling lagged behind the increased budget estimates by these same companies, owing to higher drilling costs, increased use of other exploration techniques, as well as other factors. Increased exploration activity and drilling require a greater labor force for the exploration sector. MEG data suggest that the labor force increased about 14 percent on average in 2011 from 2010. Surveys conducted by Ernst & Young and the Fraser Institute suggests that there may be a growing labor shortage of skilled geoscientists in the future.

Higher demand for assaying, drilling and geophysical services, coupled with increasing fuel and labor costs, increased the overall cost of exploration. Consequently, it is likely that cost increases that occurred since 2009 reduced the amount of exploration activity that could be conducted in 2011 from that conducted in 2009, given a similar exploration budget.

Figure 1 shows the 2011 worldwide minerals exploration budgets allocated by region, based on MEG data. MEG "regions" reflect a mixture of individual countries, continents and other groupings, but they are reported consistently on an annual basis and provide a means of assessing the flow of budgeted exploration expenditures from year to year[1]. According to MEG, the top four geographic areas for exploration in 2011 (excluding the rest of the world grouping), in decreasing budget order, were Latin America, Canada, Africa and Australia. Regional budget allocation estimates derived from MEG data for 2011 when uranium is excluded were: Latin

Figure 3

Trends in reported exploration budgets for nonfuel minerals in selected regions, 2000 through 2011. Source: Metals Economics Group.



principal commodity target, based on the number of projects reported for each region. Canada remained the top destination in terms of active exploration sites in 2011, followed by Latin America, Australia and Africa. The number of sites that are actively being explored does not necessarily correlate directly to exploration budget estimates, but it is another indicator of relative interest, reflects market conditions, commodity prices, and local political or social conditions, and shows the effect of recent discoveries on regional exploration activity. When data from Fig. 1 and Fig. 2 are compared, the percentage contribution expressed in terms of exploration sites in Australia, Canada and the United States is higher than the percentage contribution expressed in terms of exploration budget, suggesting that there may be more lower-budget, early-stage sites in these regions. In Latin America, however, the percentage contribution expressed in terms of exploration budget is higher than the contribution expressed in terms of the number of sites. This suggests that there are a greater number of sites at an advanced stage of exploration with a higher exploration budget.

Figure 3 summarizes MEG budget data by region for the period 2000 through 2011 in terms of nominal dollars and percent of the world exploration budget. These data show that the planned exploration budget level (expressed in nominal dollars) for 2011 increased from the 2010 level in all regions of the world. The overall increase in spending since 2003 (as expressed in nominal and constant 1999 dollars) is attributed in large part to higher metals prices, increased spending by junior companies driven by these higher prices and fueled by renewed investor confidence, and increased spending by some major companies with the intent of increasing short-term supply by bringing a number of projects into production over the next several years. In terms of nominal dollars budgeted for exploration, the largest regional budget increase of approximately $1.3 billion from 2010 to 2011 took place in Latin America, followed by an increase of $980 million for Africa. Based on the amount of percentage change, however, the budget for exploration in Africa increased about 69 percent, the budget for exploration in the United States increased 64 percent, and the budget for exploration in Australia and the exploration budget for other regions, including mainland Asia, the Commonwealth of Independent States, Europe and the Middle East, increased 57 percent; the budget for exploration in Latin America increased 47 percent; the budget for exploration in Canada increased 44 percent, and the exploration budget for the Pacific region increased 39 percent.

The 2011 MEG mineral exploration statistics suggest that budgeted expenditures for sites at an advanced stage of exploration accounted for about 41 percent of the total exploration budget for 2011, early-stage sites accounted for about 33 percent and exploration associated with established mine sites accounted for about 26 percent, close to the 2010 percentages of 42, 33 and 25, respectively. Since the mid-1990s, the larger companies have shifted their exploration focus toward advanced stage projects or mine site exploration at the expense of early-stage projects as a less expensive means of replacing or adding mineral reserves. Junior companies have tended to focus on early-stage projects, hoping to attract the interest of a larger company if a project shows potential for further, more expensive exploration or development program. One consequence of the decline in early-stage exploration in the last decade is that the number of viable, large-scale assets considered available for development is unlikely to grow in the near future. This observation coincides with a recent study that suggests that the discovery rate for gold has been declining steadily since 1999 and the observations of some analysts that ore grades of new discoveries have been declining. Additionally, the report found western mining companies are increasingly competing with Chinese and Indian investors for promising new projects. Higher metals prices allow some lower grade material to be classified as ore.

Recent and anticipated commodity prices contribute to exploration budget development and the amount of activity planned by mineral exploration companies. Table 1 shows the average annual prices for selected metals for the years 2001 through 2011. However, because of metal price instability, reporting just the average prices for the year does not provide enough information to assess the effect of price changes on the level of exploration. Figure 4 shows the annual indexed prices in 1999 constant U.S. dollars for selected (a) precious metals, (b) base metals and (c) other selected mineral commodities for 2001 to 2011. Using constant dollar values based on the Consumer Price Index reduces the effects

America, $4.2 billion; Canada, $2.9 billion; Africa, $2.4 billion; Australia, $2 billion; the United States, $1.4 billion and the Pacific region, $1 billion. Exploration taking place in countries included in the rest of the world category totaled $2.4 billion, of which China and Russia accounted for about half of the region's budget total. The largest increase in dollar terms took place in Latin America and Africa; the smallest increase took place in the Pacific region and the United States. In terms of the percentage share of worldwide budget, the largest increase took place in Africa and the largest decrease took place in Canada.

For 2011, information for about 2,300 exploration sites was gathered by USGS specialists from published literature and industry sources. The regional distribution of these exploration targets is represented in Fig. 2 by

[1]As defined by MEG, Latin America includes the Caribbean, Central America, Mexico and South America. The Pacific region includes Fiji, Indonesia, Japan, Laos, Malaysia, New Caledonia, New Zealand, Papua New Guinea, Philippines, Solomon Islands, Thailand, Vanuatu and Vietnam. The rest of the world includes China, Europe, India and Pakistan, the Middle East and republics of the Commonwealth of Independent States. Australia, Canada and the United States are treated separately.

Table 1

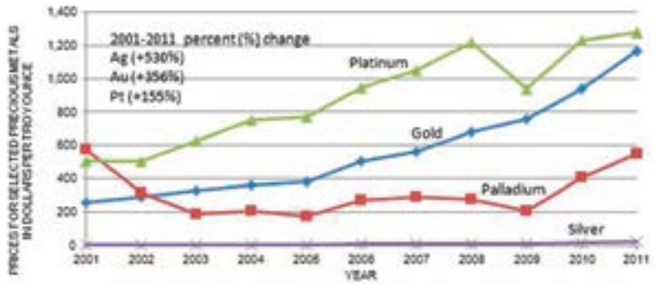
Prices for selected base and precious metals, 2001 to 2011.

Commodity	Average nominal price for specified year, expressed in U.S. currency										
	2001[1]	2002[1]	2003[1]	2004[1]	2005[1]	2006[1]	2007[1]	2008[1]	2009[1]	2010[2]	2011[2]
Copper[3]	0.77	0.76	0.85	1.34	1.73	3.15	3.28	3.19	2.41	3.48	4.06
Gold[4]	272	311	365	411	446	606	699	874	975	1,227	1,572
Lead[5]	0.44	0.44	0.44	0.55	0.61	0.77	1.24	1.20	0.87	1.09	1.22
Nickel[6]	2.70	3.07	4.37	6.27	6.69	11.00	16.88	9.57	6.65	9.89	10.38
Palladium[7]	611	340	203	233	204	323	357	355	266	531	739
Platinum[8]	533	543	694	849	900	1,144	1,308	1,578	1,208	1,616	1,725
Silver[9]	4.39	4.62	4.91	6.69	7.34	11.57	13.41	15.00	14.69	20.20	35.12
Uranium[10]	8.62	9.83	11.24	18.05	27.93	47.68	99.24	64.18	46.67	45.96	56.24
Zinc[11]	0.40	0.35	0.38	0.47	0.63	1.49	1.47	0.85	0.75	0.98	1.01
Neodymium oxide[12]	28.5	28.5	28.5	28.5	28.5	45	60	50	42	63	270

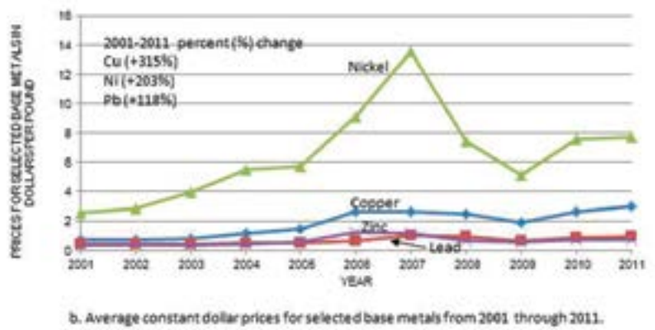
[1] Price reported in U.S. Geological Survey (USGS), Minerals Yearbook series for the years 2001 through 2010.
[2] Price reported in U.S. Geological Survey, Minerals Commodity Summaries series for the year 2011 or updated based on oral and written communications, USGS mineral commodity specialists.
[3] U.S. producer cathode (minimum 99.99% pure), reported in $/lb.
[4] Englehard Corporation industries quotation, reported in $/oz.
[5] North American producer price, delivered (minimum 99.97% pure), in $/lb.
[6] London Metal Exchange cash price for primary nickel (minimum 99.80% pure), in $/lb.
[7] Unfabricated palladium, reported in $/oz.
[8] Unfabricated platinum, reported in $/oz.
[9] Handy and Harmon quotation, reported in $/oz.
[10] Nuexco exchange spot price, reported in $/lb. by the International Monetary Fund.
[11] London Metal Exchange cash price, reported in $/lb.
[12] Rhodia Electronics & Catalysts Inc., reported in $/kg.

Figure 4

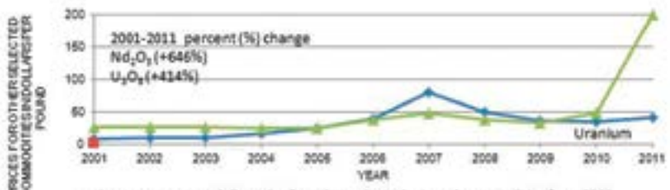
Average constant dollar prices for selected (a) precious metals, (b) base metals and (c) other selected metals from 2001 through 2011. Nominal dollar prices were indexed using the consumer price index with a base year of 1998.



a. Average constant dollar prices for selected precious metals from 2001 through 2011.



b. Average constant dollar prices for selected base metals from 2001 through 2011.



c. Average constant dollar price for other selected mineral commodities from 2001 through 2011.

of inflation on prices of commodities being considered over time. Most 2011 exploration budgets were planned or contracted based on economic considerations at the end of 2010 or early 2011, when metals prices appeared to be recovering to levels not seen since before the global economic downturn of 2008-2009. Junior and intermediate exploration companies, which often rely on credit financing or stock offerings, were able to obtain $12.6 billion in financing for gold and base metal exploration over the first eight months of 2010 and about $11.1 billion in funding throughout the same period in 2011. Major companies, which often use existing reserves as collateral to acquire the credit necessary for exploration or production revenues to supply cash for future exploration and development, planned increased amounts for mineral exploration in 2011, based on their perception of improving corporate and global economic conditions at the beginning of 2011.

As shown in Fig. 4, the average annual constant dollar price of neodymium oxide has increased 646 percent from 2001 through 2011. Much of this increase took place in 2011. In nominal terms, the 2011 gold price was higher than that previously recorded. The average annual constant dollar price of silver increased 530 percent from 2001 through 2011. Similarly, uranium increased 414 percent, the gold price increased 356 percent during this period, the copper price increased 315 percent, the nickel price increased 203 percent and the platinum price increased 155 percent. Figure 4 shows that the constant dollar prices for copper, gold, neodymium oxide, platinum and silver reported for 2011 using a 1999 dollar base are at the highest level since 2000, with gold at the highest price ever in nominal terms. The average constant dollar price for palladium in 2010 is at a level last seen in 2001. Constant dollar prices for base metals generally reflect price levels last reported during the 2007-2008 timeframe.

Sustained higher metals prices throughout 2011 were one factor that stimulated the level of global exploration activity above 2010 levels. Most metals prices increased in 2011 from 2010 levels, although price increases were not as substantial as from 2009 through 2010. On average, precious metal constant dollar prices reported for 2011 increased 33 percent from 2010 to 2011 and base metal prices increased 5 percent. Encouraged by continued high metals prices, companies have targeted gold and polymetallic deposits (often containing copper and other metals) for exploration and have renewed activities at many prospects where activity had been reduced as a result of the 2008-2009 downturn in the global economy.

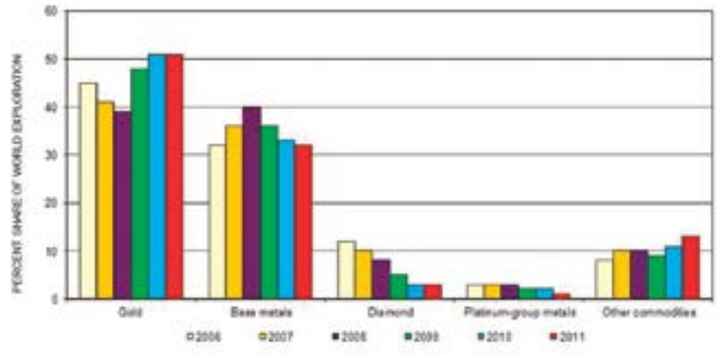
More than 64 percent of the exploration companies responding to the 2011-2012 Fraser Institute mining industry survey published in February 2012 increased their exploration budget in 2011 from their 2010 exploration level, and 68 percent planned to increase their 2012 exploration budget from the 2011 level. Approximately 47 percent of the respondents were exploring for gold, and 18 percent were focusing on copper exploration. Canadian statistics showed the 2011 spending expenditures for Canadian mineral exploration as of October 2011 was 37 percent higher than the corresponding estimate for 2010. There has also been an increase in announced joint venture agreements and announcements of the acquisition of junior exploration companies by major producers.

As governments recover from the recession of 2008-2009 and attempt to deal with growing deficits, higher commodity prices have led some governments to consider the mining and metals sector as a source of revenue. Ernst & Young conducted an assessment that suggests the top risk area for mining and metals in 2011 was resource nationalism, based on the observation that 25 countries have increased or announced their intention to review or change the tax and mineral royalty structure during 2010-2011. Resource nationalism can take many forms, including imposing a resource rent, amending royalty or tax rates, establishing greater controls on foreign participation and encouraging in-country beneficiation and processing. Australia, Brazil, Canada, Chile, China, Colombia, India, Peru, the United States and Venezuela, as well as 10 countries in Africa, all have expressed interest in deriving increased revenue from the mineral sector in some manner.

Higher metals prices, improved corporate profits, and continued strong demand for minerals by China, India and other countries stimulated acquisition and joint venture activity of mining and exploration companies during the first half of 2011 such that the value of deals completed in January-June 2011 was double that of January-June 2010. However, global economic uncertainty and resource nationalism issues reduced acquisition and joint venture activity during the second half of 2011. Based on data reported by MEG, countries that received more than 3 percent of the finances raised for gold exploration from 2008 through mid-2011 include Canada (21 percent), Australia (10 percent), the United States (7 percent), Brazil (5 percent), Argentina, Burkina Faso, Colombia and Mexico (each 4 percent) and Ghana, Indonesia and Peru (each 3 percent). Similarly, countries that received more than 3 percent of the equity raised for silver exploration from 2008 through mid-2011 included Mexico (26 percent), Argentina (19 percent), Peru (16 percent), Canada (13 percent), Australia (10 percent) and Bolivia (5 percent). A 2011 study conducted by PriceWaterhouseCoopers LLP identified 1,379 merger and acquisitions during the first half of 2011.

Figure 5

Worldwide exploration budgets as reported for selected mineral commodity targets, 2005 through 2011. (Source: Metals Economics Group. Other minerals include cobalt, iron ore, molybdenum, silver and tin.)



Data reported by the Raw Materials Group (RMG) suggested that overall investment activity in the minerals sector was higher in 2011 than in 2010. The RMG data suggest that iron ore, copper, gold and nickel were the most important mineral investment targets in 2011, accounting for approximately 84 percent of the total project pipeline. In 2011, 53 new gold development projects were announced, along with 24 copper and 21 iron ore projects. New nickel, silver, uranium, lead/zinc, platinum-group metal (PGM) and rare earth development projects totaled 28 in 2011, according to RMG. The 2011 RMG study ranks the top five countries for mining investment, in descending order of expenditure, as Australia (primarily for iron ore), Canada (base metals, gold and iron ore), Chile, Brazil and Russia. The United States ranked seventh in the RMG survey.

Mining and investment companies from countries with rapidly expanding economies such as Brazil, China and India are now looking outside their borders for mineral sources of supply. Private and state-owned Chinese companies are being encouraged by the Chinese government to seek out commercially viable mining projects and acquire access to their resources in order to ensure that there is sufficient mineral supply for domestic needs. Even with the slowdown in Chinese industrialization as a result of the downturn in the global economy, China continues to look overseas, purchasing companies or taking stakes in mines or projects in Africa, Australia and the Pacific region.

Table 2

Selected noteworthy exploration sites for 2011.

Location	Type[1]	Site	Commodity	Company	Resource[2] notes
Africa					
1 Burkina Faso	E	Bombore	Au	Orezone Gold Corp.	1.59 Moz Au (D)
2 Burkina Faso	P	Essakane	Au	Iamgold Corp.	4.49 Moz Au (R)
3 Burkina Faso	P	Inata	Au	Avocet Mining plc.	1.46 Moz Au (R)
4 Burkina Faso	E	Karma	Au	Riverstone Resources Inc.	1.77 Moz Au (ID)
5 Burkina Faso	E	Kiaka	Au	Volta Resources Inc.	3 Moz Au (D)
6 Burkina Faso	E	Konkera	Au	Ampella Mining Ltd.	1.27 Moz Au (ID)
7 Congo (Brazzaville)	E	Zanaga	Fe	Xstrata plc.	980 Mt Fe (D)
8 Côte d'Ivoire	F	Tengrela	Au	Perseus Mining Ltd.	655,000 oz Au (R)
9 Ghana	E	Enchi	Au	Edgewater Exploration Ltd.	Data not released[3].
10 Ghana	E	Obotan	Au	PMI Gold Corp.	2.26 Moz Au (R)
11 Ghana	F	Wa-Lawra	Au	Azumah Resources Ltd.	646,000 oz Au (ID)
12 Guinea	F	Kalia	Fe	Bellzone Mining plc.	300 Mt Fe (ID)
13 Liberia	E	Putu Range	Fe	OAO Severstal Group	640 Mt Fe (ID)
14 Mali	P	Tabakoto	Au	Avion Gold Corp.	913,000 oz Au (R)
15 Mali	E	Yanfolia/Komana	Au	Gold Fields Ltd.	744,000 oz Au (IF)
16 Mauritania	P	Tasiast	Au	Kinross Gold Corp.	7.55 Moz Au (R)
17 Namibia	F	Husab (Rossing South)	U_3O_8	Extract Resources Ltd.	145 kt U_3O_8
18 Namibia	E	Okjikoto	Au	B2Gold Corp.	1.1 Moz Au (ID)
19 Niger	E	Madaouela	U_3O_8	Cameco Corp.	Data not released3.
20 Senegal	P	Sabodala	Au	Teranga Gold Corp.	1.5 Moz Au (R)
21 South Africa	E	Platreef	PGM	Ivanhoe Nickel & Platinum	Data not released[3].
22 Sudan	P	Hassai	Au	La Mancha Resources Inc.	1.1 Moz Au (R)
23 Tanzania	E	Magambazi	Au	Canaco Resources Inc.	Data not released[3].
Australia					
24 N. Territory	F	Nolans Bore	REE4	Arafura Resources Ltd.	517 kt REO (D)
25 W. Australia	F	Andy Well	Au	Doray Minerals Ltd.	254,000 oz Au (ID)
26 W. Australia	F	Bullabulling	Au	Auzex Resources Ltd.	2.6 Moz Au (IF)
27 W. Australia	E	Lake Giles	Fe	MacArthur Minerals Ltd.	4.7 Mt Fe (ID)
28 W. Australia	F	Pilbara	Fe	Flinders Mines Ltd.	191 Mt Fe (ID)
29 W. Australia	E	Yamarna	Au	Gold Road Resources Ltd.	734,000 oz Au (D)
Canada					
30 British Columbia	E	Aley	Nb	Taseko Mines Ltd.	683,000 t Nb_2O_5
31 British Columbia	E	Blackwater-Davidson	Au, Ag	New Gold Inc.	5.4 Moz Au, 27 Moz Ag (ID)
32 British Columbia	E	Brucejack	Au, Ag	Pretium Resources Inc.	5 Moz Au, 31 Moz Ag (D)
33 British Columbia	E	Caribou	Au	Barker Gold Mines Ltd.	86,000 oz Au (R)
34 British Columbia	E	Dilworth	Au, Ag	Ascot Resources Ltd.	Data not released[3].
35 British Columbia	E	Granduc/Leduc	Cu	Castle Resources Inc.	60 kt Cu (ID)
36 British Columbia	E	Lac la Hache	Cu, Fe	GWR Resources Inc.	Data not released[3].
37 British Columbia	F	Red Chris	Cu, Au	Imperial Metals Corp.	1.1 Mt Cu, 2.6 Moz Au (R)
38 British Columbia	E	Spanish Mountain	Au, Ag	Spanish Mountain Gold Ltd.	2.2 Moz Au, 2.8 Moz Ag (D)
39 British Columbia	F	Tulsequah Chief	Zn, Cu, Au, Ag, Pb	Chieftain Metals Inc.	396 kt Zn, 87 kt Cu, 532,000 oz Au, 532,000 oz Au, 20 Moz Ag, 77 kt Pb (IF)
40 British Columbia	E	Woodjam	Cu, Au	Gold Fields Ltd.	483 kt Cu;283,000 oz Au (IF)
41 NW Territories	E	Nechalacho (Thor Lake)	REE, Nb, Ta, Zr	Avalon Rare Metals Inc.	222 kt REE, 55 kt Nb_2O_5, 5,800 t Ta_2O_5, 422 kt ZrO_2 (PR)
42 Nunavut	E	Back River	Au	Sabina Gold & Silver Corp.	4 Moz Au (ID)
43 Nunavut	E	Meliadine West	Au	Agnico-Eagle Mines Ltd.	2.6 Moz Au (R)
44 Nunavut	E	Three Bluffs	Au	North Country Gold Corp.	508,000 oz Au (ID)
45 Ontario	E	Burns Block (Rainy River)	Au	Bayfield Ventures Corp.	4.4 Moz Au (D)
46 Ontario	D	Detour Lake	Au	Detour Gold Corp.	14.9 Moz Au (R)
47 Ontario	E	Hammond Reef	Au	Osisko Mining Corp.	10.6 Moz Au (IF)
48 Ontario	E	Hardrock	Au	Premier Gold Mines Ltd.	2.5 Moz Au (D)
49 Ontario	E	Kirkland Lake	Au	Queenston Mining Inc.	329,000 oz Au (ID)
50 Ontario	P	Lac des Iles	Pd, Pt, Au, Ni, Cu	N. American Palladium Ltd.	6.4 Moz Pd, 469,000 oz Pt, 394,000 oz Au, 49 kt Ni, 39 kt Cu (D)
51 Ontario	E	Phoenix	Au	Rubicon Minerals Corp.	479,000 oz Au (ID)
52 Ontario	F	Rainy River	Au, Ag	Rainy River Resources Ltd.	4.4 Moz Au, 9.1 Moz Ag (ID)
53 Quebec	E	Eleonore	Au	Goldcorp Inc.	3 Moz Au (R)
Canada continued					
54 Quebec	E	Marban	Au	NioGold Mining Corp.	600,000 oz Au (ID)
55 Quebec	P	Niobec	Nb	Iamgold Corp.	242 kt Nb_2O_5 (R)
56 Quebec	D	Vezza	Au	N. American Palladium Ltd.	320,000 oz Au (D)
57 Quebec	E	Wasamec	Au	Richmont Mines Inc.	556,000 oz Au (ID)
58 Quebec	F	Westwood	Au	Iamgold Corp.	73,000 oz Au (R)
59 Yukon Territory	E	Brewery Creek	Au	Golden Predator Corp.	155,000 oz Au (ID)
60 Yukon Territory	E	Coffee	Cu, Au, Mo, Ag	Western Copper Ltd.	Data not released[3].
Latin America					
61 Argentina	E	Cerro Moro	Au, Ag	Extorre Gold Mines Ltd.	578,000 oz Au, 39 Moz Ag (ID)
62 Argentina	D	Cerro Negro	Au, Ag	Goldcorp Inc,	4.3 Moz Au, 36 Moz Ag (R)
63 Argentina	E	El Tranquilo	Au, Ag	Patagonia Gold plc.	640,000 oz Au, 21 Moz Ag (D)
64 Brazil	E	Cerrado Verde	K_2SO_4	Verde Potash plc.	6.8 Mt K2O (ID)
65 Brazil	D	Pilar	Au	Yamaha Gold Inc.	1.4 Moz Au (PR)
66 Brazil	E	Volta Grande	Au	Belo Sun Mining Corp.	2.2 Moz Au (D)
67 Chile	E	El Espino	Cu, Au	Pucobre S.A.	168 kt Cu, 226,000 oz Au (D)
68 Colombia	E	Buritica	Au, Ag, Zn	Continental Gold Ltd.	635,000 oz Au, 1.5 Moz Ag, 8.9 kt Zn
69 Colombia	E	Gramalote	Au	AngloGold Ashanti Ltd.	925,000 oz Au (ID)
70 Colombia	E	Titiribi	Au, Cu	Sunward Resources Ltd.	2.2 Moz Au, 212 kt Cu (ID)
71 Guyana	E	Aranka/Aurora	Au	Guyana Goldfields Inc.	277,000 oz Au (ID)
72 Mexico	E	Cordero	Ag, Au, Zn, Pb	Levon Resources Ltd.	311 Moz Ag, 839,000 oz Au, 2.4 Mt Zn, 1.9 Mt Pb (ID)
73 Mexico	F	Morelos	Au	Torex Gold Resources Inc.	2.6 Moz Au (ID)
74 Mexico	P	San Francisco	Au	Timmins Gold Corp.	1.3 Moz Au (R)
75 Mexico	E	Sierra Mojada	Ag, Zn	Silver Bull Resources Inc.	47 Moz Ag, 279,000 t Zn (ID)
76 Mexico	E	Tepal	Au, Cu, Ag, Mo	Geologix Explorations Inc.	786,000 oz Au, 145,000 t Cu, 814,000 oz Ag, 790 t Mo (ID)
77 Peru	E	Haquira	Cu, Mo, Au, Ag	First Quantum Minerals	2.2 Mt Cu, 50 kt Mo, 500,000 oz Au, 20 Moz Ag (D)
78 Peru	E	Los Catalos	Cu, Mo	MetMinco Ltd.	9.6 Mt Cu, 339 kt Mo (R)
79 Peru	E	Shahuindo	Au, Ag	Sulliden Gold Corp.	2 Moz Au, 28 Moz Ag (D)
80 Suriname	P	Rosebel	Au	Iamgold Corp.	5.8 Moz Au (R)
Pacific (Including Southeast Asia)					
81 Philippines	P	Masbate	Au	CGA Mining Ltd.	3 Moz Au (R)
82 Philippines	E	Taysan	Cu, Au, Ag	Crazy Horse Resources	1.1 Mt Cu, 1.3 Moz Au, 12 Moz Ag (ID)
United States					
83 Alaska	E	Livengood	Au	Intl. Tower Hill Mines Ltd.	16.5 Moz Au (D)
84 Alaska	E	Whistler	Au, Ag, Cu	Kiska Metals Corp.	1.3 Moz Au, 5 Moz Ag, 135 kt Cu (ID)
85 Arizona	E	Copper Creek	Cu, Mo, Au, Ag	Redhawk Resources Inc.	262 kt Cu, 5.1 kt Mo, 16,000 oz Au, 905,000 oz Ag (ID)
86 Idaho	E	Golden Meadows	Au	Midas Gold Corp.	2 Moz Au (ID)
87 Nevada	P	Cortez	Au	Barrick Gold Corp.	14.5 Moz Au (R)
88 Nevada	P	Hycroft	Au, Ag	Allied Nevada Gold Corp.	10 Moz Au, 390 Moz Ag (R)
89 Nevada	E	Long Canyon	Au	Newmont Mining Corp.	1.4 Moz Au (D)
90 South Carolina	F	Haile	Au	Romarco Minerals Inc.	2 Moz Au (R)
91 Wyoming	E	Bear Lodge	REE	Rare Element Resources	232 kt REO (D)
Rest of the world					
92 Armenia	E	Amulsar	Au	Lydian International Ltd.	1.1 Moz Au (ID)
93 China	E	Beiya North	Au, Ag Pb	Asia Now Resources Corp.	427,000 oz Au, 17 Moz Ag, 357 kt Pb (ID)
94 China	P	CSH	Au	China Gold Int. Resources	3 Moz Au (R)
95 China	P	Jiama	Cu, Au, Ag, Mo, Zn, Pb	China Gold Int. Resources	890 kt Cu, 1 Moz Au, 56 Moz Ag, 41 kt Mo, 53 kt Zn, 85 kt Pb (R)
96 China	P	Ying	Ag, Pb, Zn, Au, Cu	Silvercorp Metals Inc.	58 Moz Ag, 309 kt Pb, 87 kt Zn, 17,000 oz Au, 2 kt Cu (R)
97 Kazakhstan	E	Bakyrchik (Kyzyl)	Au	Altynalmas Gold plc.	6.2 Moz Au (ID)
98 Kyrgyzstan	E	Unkurtash	Au	Highland Gold Mining Ltd.	1.4 Moz Au (R)
99 Mongolia	E	Khul Morit	Au	Voyager Resources Ltd.	Data not released[3].
100 Romania	E	Rovina Valley	Au, Cu	Carpathian Gold Inc.	3 Moz Au, 348 kt Cu (D)

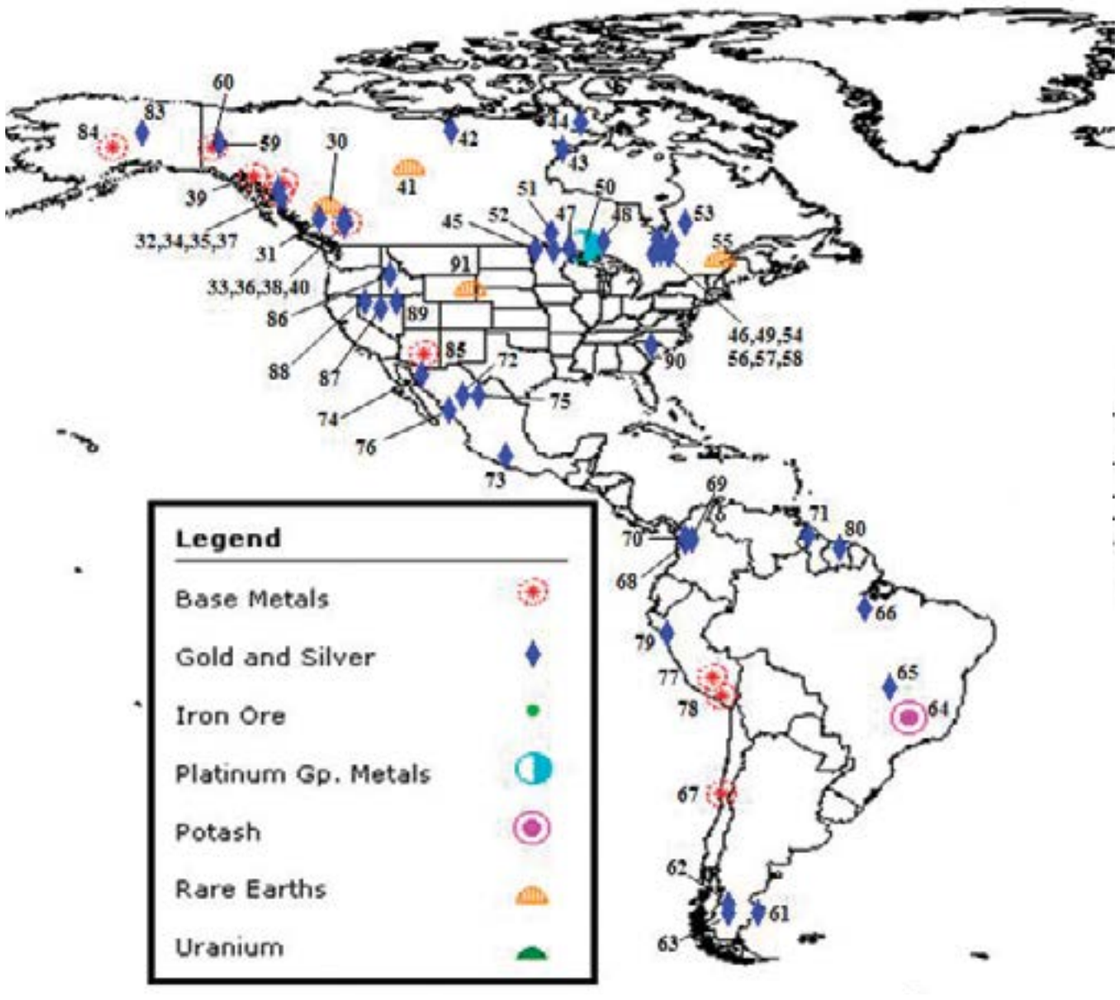
[2] Resource estimate for primary product or coproducts derived from various 2010 sources: D=measured + indicated, ID=indicated, IF=inferred, R=proven + probable, P= proven, PR=probable. Data were not verified by the U.S. Geological Survey. [3] Although resource data have not been released, the site was considered noteworthy by the authors based on the level of exploration activity or regional significance.[4] REE - Rare earth elements.

Even as worldwide exploration allocations have increased, so too have costs associated with mineral exploration. Rising fuel, material, and personnel costs, fluctuating mineral prices and changing rates of exchange have also affected the costs of exploration beyond the level of inflation. The increased demand for services such as drilling and assaying and a lack of qualified personnel have led to equipment shortages and processing delays, affecting exploration schedules and development plans.

Many exploration projects are becoming increasingly more costly and difficult to develop. Important cost drivers include more complex orebodies, deeper lying deposits often with lower grades, and more remote locations. Higher commodity prices in combination with the increasing difficulty of finding significant new resources in traditionally productive areas have encouraged some exploration companies to evaluate mineral resources in more remote areas. The Canadian Arctic and the high mountains of South America are two areas receiving interest by exploration companies.

Figure 6

Map of significant exploration activity sites by principal commodity. Numbers represent sites as shown in Table 2.



In 2007, Nautilus Minerals began exploration for massive sulfides off the coast of Papua New Guinea. A prefeasibility study on the copper/gold Solwara 1 deposit was published in 2010. Other companies are investigating seafloor massive sulfide and epithermal vein deposits near New Zealand, Papua New Guinea and Tonga. The International Seabed Authority approved four applications by interests from China, Nauru, Russia and Tonga to explore for sulfides and iron ore deposits in international areas of the deep-sea floor, but the appropriate legal framework must be in place before work can commence. Eight other groups have laid claim to areas in international waters in both the Indian and Pacific oceans for nickel-bearing nodules. Prospecting of diamond and phosphate occurrences in shallow waters offshore of Namibia was also taking place. Seabed ore deposits are attractive because they generally contain higher concentrations of metals than onshore deposits. However, commercial extraction will likely be expensive.

Exploration activity by mineral commodity

The amount budgeted for gold exploration ($8.3 billion) based on MEG data for 2011 is 52 percent higher than that budgeted for gold in 2010. Figure 5 illustrates the 2006-2011 distribution of reported mineral exploration budget estimates by mineral commodity grouping (excluding uranium). Figure 5 shows that the

Based on MEG data, the estimated 2011 global budget for mineral commodity targets other than gold, base metals, diamond, and PGM was 70 percent higher ($2.1 billion) in 2011 than the $1.2 billion reported for 2010.

amount budgeted for gold exploration targets decreased as a percentage of the total exploration budget for the years 2006 through 2008, but increased as a percentage of the total exploration budget for the years 2008-10 and remained the same from 2010-2011. In terms of percentage of worldwide exploration budget, exploration for gold accounted for 51 percent in 2011, the same as it was in 2010. The budget for gold exploration in Australia, Canada and the United States accounted for more than 40 percent ($3.4 billion) of the gold exploration budget. Exploration for gold in Brazil, Burkina Faso, Chile, China, Colombia, Ghana, Indonesia, Mexico, Peru and Russia accounted for an additional 33 percent ($2.7 billion) of the gold exploration budget.

Exploration budgets for base metal projects increased 50 percent to $5.3 billion in 2011, from $3.5 billion in 2010 based on MEG data. In terms of percentage of total worldwide exploration budget, the estimated base metal exploration budget decreased slightly to 32 percent in 2011 from 33 percent in 2010 and 40 percent in 2008. As shown in Fig. 5, the general trend for base-metal exploration for 2006-2011 was the reciprocal of gold exploration. When expressed in terms of percentage of worldwide budget, base metal exploration increased during 2006-08 and decreased during 2008-2011. Exploration for copper accounted for 69 percent of the base-metal budget for 2011, nickel exploration accounted for 16 percent and zinc exploration accounted for 15 percent.

The budget for diamond exploration estimated by MEG increased 26 percent in nominal dollar terms from 2010-2011. In dollar terms, the diamond exploration budget of about $449 million in 2011 was about 45 percent of the 2008 budget for diamond and represented about 3 percent of the global exploration budget, its lowest value since MEG began compiling data in 1989. Principal locations for diamond exploration in 2011 were Africa and Canada. Decreased diamond sales, increased international concern about illegal diamond mining and energy shortages in South Africa may have contributed to the decrease in diamond exploration.

The amount budgeted for PGM exploration in 2011 based on MEG data of $240 million was up 41 percent from the 2010 budget estimate of $170 million. The MEG estimate for the PGM budget allocation in 2011 was 1.5 percent of the total mineral exploration budget in 2010, its lowest share of global spending since MEG began tracking PGM in 2001. Principal areas for planned PGM exploration in 2011 were South Africa and Zimbabwe (60 percent) and Canada (21 percent).

Based on MEG data, the estimated 2011 global budget for mineral commodity targets other than gold, base metals, diamond and PGM was 70 percent higher ($2.1 billion) in 2011 than the $1.2 billion reported for 2010. The budget estimate for uranium exploration reported by MEG increased from about $826 million in 2010 to about $938 million in 2011. The 2011 budget estimates compiled by MEG for other metals and some industrial minerals (excluding iron ore) increased primarily because of the high level of interest for silver (accounting for about 37 percent of the 'other minerals' total), potash and phosphate (21 percent) and increased exploration for rare earth elements and lithium (accounting for 17 percent of the 'other minerals' total). Exploration for lithium, potash and rare earths has increased as their use in high-technology applications has increased. Concern about reduced exports of China's rare-earth elements to foreign markets has led to increased exploration for these commodities and fast-tracked development of production facilities in other countries. MEG included estimates for the global iron ore exploration budget for the first time in 2011. MEG estimated the 2011 iron ore exploration budget as $1.8 billion.

Based on exploration site data compiled by the USGS, exploration for gold and silver accounted for about 57 percent of the active exploration sites in 2011. Base metal exploration accounted for about 18 percent of the 2011 active exploration sites, iron ore and uranium each accounted for about 6 percent, diamond and PGMs each accounted for about 2 percent, and exploration for other mineral commodities accounted for about 10 percent. Both the MEG and USGS data support the trend that there is increasing interest in exploration for lithium, potash and rare-earth elements because of the increased use of lithium in batteries, potash in fertilizers and biofuels and rare-earth elements in electronics.

2011 exploration highlights

Table 2 presents exploration sites considered most noteworthy by the USGS based on the amount of exploration activity conducted at the sites in 2011. The following criteria were used as a basis for site inclusion:

- The high level of exploration interest at a site, determined either by intensity of drilling activity or level of capital investment. When drilling was used as the principal indicator, a site qualified if a minimum of 20,000 m (65,600 st) of drilling (primarily diamond or reverse-circulation) took place during 2011. Where budget was used as the principal indicator, a site qualified if a 2011 budget of at least $7 million was planned and executed for exploration and drilling activities. These criteria may eliminate early-stage projects (where the level of drilling was below cutoff) or development projects (where planned expenditures include costs for development or infrastructure).
- The magnitude of a resource delineated when compared to prior resource estimates.
- The high potential of near-term development, based upon reported tonnage and grade estimates derived from company announcements.
- The regional significance of an activity.
- The project reflects an emerging source of mineral supply as a result of advances in extraction technology.

Sites where significant exploration activity and expenditures occurred prior to 2011 were not included in Table 2 if the reported level of 2011 activity did not meet the selection criteria. Similar criteria have been applied to previous exploration summaries reported annually in the *USGS Minerals Yearbook* series and in exploration summary articles reported in *Mining Engineering*.

Gold continued to be the commodity generating the greatest exploration activity based on the list of noteworthy exploration sites for 2010 as reported in Table 2. Of the 100 sites selected for Table 2, gold or silver was considered the primary mineral commodity at 73 sites, base metals were considered primary at 12 sites, iron ore was the primary target at five sites, rare earth elements were the primary target at three sites, niobium was the primary target at two sites, PGM were the primary target at two sites, uranium was the primary target at two sites and potash was the primary target at one site. Determination of the primary commodity was based on consideration of commodity value and contained resources at each site.

The estimated resources reported in Table 2 reflect various stages of verification, different methodologies and multiple sources of information. Should these resources be confirmed, however, they would add about 2.1 Gt (2.3 billion st) of iron, 15 Mt (16.5 million st) of copper, about 7 Mt (7.7 million st) of potash, about 6 Mt (6.6 million st) of lead and zinc, 980 kt (1.1 million st) of niobium oxide (Nb_2O_3), 970 kt (1 million st) of rare-earth oxide (REO), 440 kt (485,000 st) of molybdenum, 420 kt (463,000 st) of zirconium oxide (ZrO_2), 145 kt (160,000 st) of uranium, 24 kt (780 million oz) of silver, 6 kt (195 million oz) of gold, 5.8 kt (6,400 st) of tantalum oxide (Ta_2O_5), and 210 t (7 million oz) of PGM to the identified world resources for these mineral commodities estimated by the USGS.

Figure 6 plots the locations of those sites included in Table 2. Site numbers shown in Table 2 are reflected in Fig. 6 to allow the reader to identify each site. Sites have been classified by their primary commodity target.

Table 3 shows the number of noteworthy sites by region for the years 2001 through 2011. In terms of noteworthy projects identified for 2011, the number of projects in Africa and the United States increased relative to the number reported for 2010 in those regions, and the number of noteworthy projects in Canada and Latin America decreased. There was limited change in the number of significant projects reported for Australia, the Pacific region (excluding Australia) and the rest of the world.

Table 3

Noteworthy exploration projects[1] by region for the years 2001-2011.

Region	2001	2002[2]	2003	2004	2005	2006	2007	2008	2009	2010	2011
Africa	11	16	16	20	18	21	19	24	22	13	23
Australia	21	20	10	4	10	6	6	10	13	5	6
Canada	17	19	31	28	22	24	25	26	26	33	31
Latin America[3]	17	15	19	21	29	25	25	17	16	29	20
Pacific[4]	12	4	4	4	4	4	3	3	7	1	2
United States	10	6	12	12	4	6	8	8	7	9	9
Rest of the world[5]	12	10	8	14	13	14	14	12	9	10	9

[1] Based on data developed by the USGS and appearing in Table 2 of the exploration summary discussion published in the May issue of *Mining Engineering* for the years 2001–2011.
[2] Only 90 noteworthy exploration projects met the selection criteria for 2002.
[3] Including Central America, Mexico and South America.
[4] Including Southeast Asia and islands in the Pacific Ocean.
[5] Including China, the Commonwealth of Independent States, Europe, India, the Middle East, Mongolia and Pakistan.

According to the Fraser Institute February 2012 survey, the top 10 destinations for mineral exploration based on favorable mineral policies in 2011, listed in descending order, were New Brunswick (Canada), Finland, Alberta (Canada), Wyoming (United States), Quebec (Canada), Saskatchewan (Canada), Sweden, Nevada (United States), Ireland and Yukon Territory (Canada).

In an economic climate of high metals prices but increasingly limited government revenues, some countries, states or municipalities have expressed interest in obtaining greater revenue from minerals and mining by increasing taxes and/or royalty rates or by imposing additional controls on foreign investment within their jurisdictions. Other areas were in the midst of ongoing social unrest or increased environmental pressures to regulate or restrict mining and mineral exploration. As a result, the perceived "risk" profiles of many jurisdictions changed from 2010 to 2011. The Fraser Institute of British Columbia, Canada, annually publishes a survey assessing the effects of perceived "mineral potential" and public policy on exploration investment around the world. The 2011-2012 survey (published February 2012) includes data from 802 respondent companies, representing 37 percent of the total global nonferrous exploration budget (when uranium is excluded) as reported by MEG.

According to the February 2012 survey, the top 10 destinations for mineral exploration based on favorable mineral policies in 2011, listed in descending order, were New Brunswick (Canada), Finland, Alberta (Canada), Wyoming (United States), Quebec (Canada), Saskatchewan (Canada), Sweden, Nevada (United States), Ireland and Yukon Territory (Canada). The top 10 destinations for mineral exploration based on their prospecting potential, assuming 2011 regulations and land use restrictions and listed in descending order, were Botswana, Greenland, Yukon Territory (Canada), Saskatchewan (Canada), Chile, Alaska (United States), Nevada (United States), Newfoundland and Labrador (Canada), Quebec (Canada) and Western Australia (Australia), according to the Fraser Institute survey.

Exploration activity by region

Exploration-related activities and events within each region are summarized in the following sections. The order of regional and country discussions is based on the amount budgeted for exploration in 2011 from highest to lowest. Areas not included in the regions discussed have been aggregated as "Rest of the World" and are discussed separately at the end of this section.

Latin America. Latin America continued its leading position as a destination for exploration activity based on MEG budget data. However, it was listed second after Canada by the USGS when the number of active sites was considered. MEG estimated that the 2011 exploration budget for Latin America increased 47 percent to about $4.2 billion from the $2.9 billion estimated for 2010. Recent discoveries high in the Andes Mountains of Argentina and Chile have focused exploration in an area where exploration costs are relatively high due to the remoteness of the area. Brazil, Chile, Colombia, Mexico and Peru were ranked in MEG's top 10 country list for anticipated exploration spending in 2011. On the basis of data compiled for this review by the USGS, Latin American countries with the greatest exploration activity, in descending order by number of sites for which data were compiled, were Mexico, Peru, Brazil, Argentina, Chile and Colombia. Gold and silver attracted about 67 percent of total exploration activity in Latin America, and interest in base metals achieved 19 percent of the total exploration activity based on the number of active sites. Activity in 2011 was primarily used to further define early-stage resources (75 percent), conduct exploration at a producing site (14 percent), conduct feasibility studies of promising discoveries (7 percent) and further explore for resources of deposits under development (4 percent).

Figure 7 illustrates exploration activity in terms of budget allocation and the number of active exploration sites. Data in Fig. 7 are expressed as a percentage of world activity based on budget allocation share reported by MEG and the number of sites as compiled by the USGS from various sources. Exploration activity in Latin America during 2011 continued a trend of sustained or increasing exploration activity as measured by global share of budget allocation and number of active sites. Latin America was a leading region for mineral exploration owing to its promising geology, the perception of its mineral policies, and its successful historical record of mineral production and development. As mineral properties reach a more advanced stage leading to development, exploration costs tend to increase. Consequently, a region such as Latin America that hosts many properties at an advanced stage of development would likely have a high regional exploration budget, although the number of sites actively being explored in such a region may not be as high as in a region where most of the sites are at an early stage of exploration. The Latin American region has generally been able to maintain its global share of exploration sites for the past decade, suggesting that exploration companies have continued to favor this region even during lean economic conditions or when nationalism of resources in some countries has led to increased risk of resource development.

A law was passed in 2011 that required mining and oil companies operating in Argentina to repatriate all of their future export revenues to Argentina. The Argentinian government also repealed laws banning the use of cyanide in gold mining and processing.

In order to comply with a new constitution that took effect in Bolivia in 2009, mining and energy legislation is being revised to increase government revenues generated by mineral exploration and mining. Plans call for an increase in average royalty rates based on the international commodity price up to 7 percent for gold, 6 percent for silver and 5 percent for lead, tin and zinc.

Brazil is reported to have issued about 28,000 exploration permits in 2011, an increase from the 20,000 permits issued in 2010. The greatest number of permits were for iron ore and gold deposits. Other minerals receiving a sizable amount of exploration activity in Brazil were bauxite, copper, manganese, nickel, potash, silver, tantalum, tin and tungsten.

Colombia is also restructuring its mining law to generate greater revenue for the state and improve safety of mining projects in the country. Colombia had received almost $10 billion in foreign direct investment in the oil and mining sectors by the end of 2010. In 2010, the National Mining Registry reported that 1,717 companies had submitted requests for mineral exploration and extraction, in addition to 7,200 licenses held by individuals. The Colombian government suspended new request applications in 2011 for at least six months until measures could be implemented to handle these requests and monitor this growing sector.

The government of Panama passed an amendment to the country's mining law that allowed foreign governments to invest in mining projects. The regulation generated widespread protests and was subsequently repealed.

During 2011, Peru's congress passed three bills into law that would change the country's mining royalty structure. Mine royalties would now be based on operating income instead of sales and would be set on a sliding scale from 1 to 12 percent of operating profits. A windfall profits tax ranging from 2 to 8.4 percent of net profits would also be assessed, aimed at increasing tax revenues in years, such as 2011, when metal prices are high. Companies that have existing tax stability agreements must pay a special contribution tax between 4 and 13.2 percent of operating income in lieu of the windfall profits tax. A law was also passed that required mining and oil companies to consult with indigenous communities before developing a project.

Nationalization of the Venezuelan gold mining industry was formalized in 2011 with a decree prohibiting export of gold and giving the state 55 percent interest in all exploration and mining ventures. Private companies will still be allowed to participate but as minority partners. A second provision of the 2011 decree required that future legal disputes must be resolved in Venezuelan courts. This action is likely in response to the filing for international arbitration by three mineral exploration companies (Vanessa Ventures, Gold Reserve Inc. and Crystallex International Corp.) that claim they are entitled to financial reimbursement for assets that were expropriated. The 2011 decree requiring all gold produced in Venezuela to be sold to the Central Bank of Venezuela will likely increase the effect of currency controls on company profitability, particularly if the gold price set by the bank is different than the international market price for gold.

Exploration activity data for Venezuela suggest that there has been a recent shift in exploration activity from predominantly Australian, Canadian and U.S. companies to companies with ties to Brazil, China and Russia. Rusoro Mining Ltd. is exploring 10 sites in Venezuela by means of joint venture agreements with Venezuelan state mining company CVG. Other companies currently conducting gold exploration include ValGold Resources Ltd. (Canada) and Shandong Gold Mining Co. Ltd. (China).

Canada. Statistics as of December 2010, released by the Canadian government, show 2011 exploration spending expenditures as of October 2011 through the feasibility level at C$3.8 billion (US$3.9 billion), up 45 percent from an expenditure of C$2.8 billion (US$2.88 billion) for 2010. MEG reported budgeted exploration spending in Canada for 2011 at US$2.9 billion, or about 18 percent of the estimated overall worldwide exploration budget. Canadian

Figure 7

Exploration activity and budget for Latin America, 2001 through 2011. Sources: Metals Economics Group; U.S. Geological Survey.

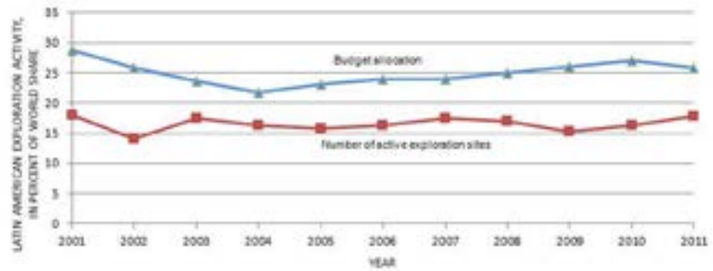
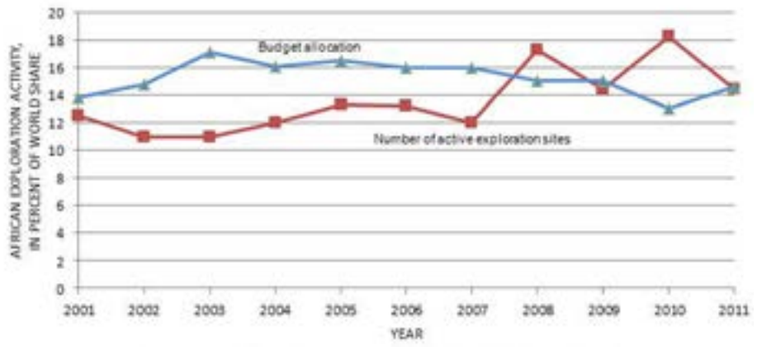


Figure 8

Exploration activity and budget for Africa, 2001 through 2011.
Sources: Metals Economics Group; U.S. Geological Survey.



government statistics include planned exploration expenditures for a wider variety of minerals and materials than are included in the MEG estimates. It is also important to note that the total of revised spending intentions for Canada reported by Natural Resources Canada as of October was 27 percent higher than its February 2011 estimate of C$3.2 billion (US$3.29 billion), although these adjusted figures may reflect increased exploration costs rather than a greater amount of exploration activity. In 2011, precious metals (gold and silver) accounted for C$1.9 billion (US$1.96 billion); base metals, C$760 million (US$780 million); uranium, C$185 million (US$190 million) and diamond, C$93 million (US$96 million) of the C$3.8 billion exploration total. When the Canadian exploration statistics are reconfigured to make them comparable with MEG statistics, the reported exploration expenditures as of October 2011 by Natural Resources Canada would be C$2.9 billion (US$3 billion), essentially equivalent to the MEG estimate.

Company exploration spending for 2011, as reported by the Canadian government as of February 2012, was greatest in Ontario (27 percent of the total exploration and deposit appraisal expenditures for Canada), Quebec (19 percent), British Columbia (15 percent), Nunavut (10 percent), Saskatchewan (8.6 percent) and Yukon Territory (8.2 percent). Canadian provinces or territories with a 50-percent or more increase in exploration activity in 2011 from 2010 based on reported expenditures were Yukon Territory (97 percent increase, primarily a result of precious and base metals), Alberta (94 percent increase, primarily for coal, industrial minerals and iron ore), New Brunswick (85 percent increase, primarily a result of increased exploration for base and precious metals and rare earths), British Columbia (54 percent increase, a result of increased exploration for precious and base metals, as well as other metals and nonmetals) and Nunavut (54 percent increase, primarily a result of increased exploration for base and precious metals and iron ore). Junior exploration companies accounted for about 57 percent of total expenditures in 2011. In terms of mineral commodities sought country-wide, precious metals received the largest exploration expenditure (50 percent), followed by base metals (20 percent), uranium (5 percent) and diamond (2.5 percent). Coal, iron ore and other minerals comprised the remaining 22.5 percent.

Canadian provinces or territories with the greatest exploration activity, in descending order by number of sites in 2011 as compiled by the USGS, were British Columbia, Ontario, Quebec, Yukon Territory, Saskatchewan, Manitoba, Newfoundland and Labrador, Nunavut, New Brunswick, Northwest Territories, Nova Scotia and Alberta.

Based on the site data, exploration for gold and silver accounted for approximately 59 percent of 2011 Canadian exploration, base metals accounted for about 20 percent, uranium accounted for about 5 percent, iron ore accounted for about 3 percent, diamond accounted for about 3 percent, PGM accounted for 1 percent and other minerals accounted for 9 percent. There was a significant increase in exploration for graphite, lithium, potash and rare-earth elements in 2011. Approximately 87 percent of all reported exploration sites were considered early-stage sites.

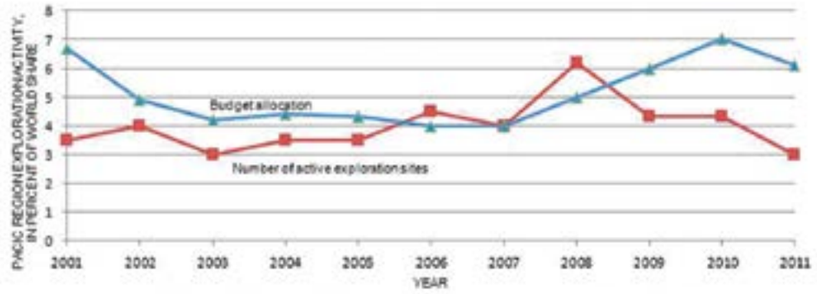
Gold exploration in Canada, based on the number of active sites reporting activity in 2011, focused on British Columbia, Ontario, Quebec and Yukon Territory, where recent gold discoveries have generated much interest. Base metal exploration in Canada based on the number of active sites focused primarily on British Columbia, Ontario, Manitoba, Yukon Territory and Quebec. Uranium exploration took place primarily in Saskatchewan. Exploration for rare-earth elements in 2011 took place in British Columbia, New Brunswick, Newfoundland, Northwest Territories, Nunavut, Ontario, Quebec and Yukon Territory. Potash exploration in 2011 took place in Saskatchewan and Alberta. Exploration for lithium deposits in 2011 took place in Nova Scotia, Ontario and Quebec.

In 2011, much of Canada's legislation was aimed at stimulating the country's economy. The 2011 federal budget as amended June 6, 2011, extended the temporary 15 percent Mineral Exploration Tax Credit for another year to March 2012 as a means of maintaining revenues generated by the high level of mineral exploration investment in the country. The program applies to preliminary exploration activities conducted at or above the ground surface. The Canadian government allocated C$25 million over a five-year period to renew the Targeted Geoscience Initiative, with a focus on developing new methods for exploring deeper mineral deposits, and the five-year, C$100 million Geo-mapping for Energy and Minerals (GEM) program. The Canadian Northern Economic Development Agency plans to invest C$3.275 million over three years (2012 through 2014) to support geoscience research and data analysis in the Northwest Territories.

At the provincial level, phase 1 of the Ontario Mining Act was implemented in 2011 to amend certain staking procedures and withdrawal provisions and provide exemption conditions from the mining land tax for surface rights landowners. The Quebec government implemented a 25-year plan to stimulate investment in northern Quebec. Under the plan, called "Plan Nord," the Quebec government will spend $2.1 billion during the next five years to make areas of Quebec north of the 49th parallel more accessible for mineral exploration and development.

Figure 9

Exploration activity and budget for the Pacific Region, 2001 through 2011.
Sources: Metals Economics Group; U.S. Geological Survey.



Africa. According to MEG, African exploration budgets increased to about $2.4 billion in 2011 from about $1.4 billion in 2010, a 69 percent increase. Based on site data compiled by the USGS, active gold and silver projects in 2011 accounted for approximately 51 percent of the reported African exploration projects, base metal projects accounted for about 10 percent, uranium projects accounted for about 9 percent, iron ore projects accounted for about 7 percent, diamond and PGM each made up about 6 percent and other minerals accounted for the remaining 11 percent. Early-stage projects comprised about 70 percent of the 2011 activity, while producing projects accounted for about 17 percent, feasibility stage projects represented about 8 percent and developing projects accounted for about 5 percent. Exploration was focused primarily in South Africa, Burkina Faso, Ghana, Namibia, Mali, Tanzania, Congo (Kinshasa) and Guinea, in descending order based on the number of sites, but activity also took place in a number of other countries.

African exploration activity, as shown in Fig. 8, expressed in terms of percent of world share of budget and number of active sites, has been quite variable since 2007. Prior to 2007, the percent share of active sites, was low when compared to the African budget allocation, suggesting that much of the activity was focused on advanced sites where exploration tends to be more expensive. After 2007, however, the number of early-stage sites increased, likely a result of increased interest by Chinese and Indian companies in the region.

The decrease in site activity in 2008 is likely a result of the global economic recession that took place in 2008-2009. The decrease in site activity in 2011 is possibly tied to increasing resource nationalism in some African countries, which has the potential to make foreign investment in such countries more expensive. African exploration budgets were less susceptible to these changes as Chinese interests tend to be less affected by global economic conditions than their western counterparts and so are continuing to develop long-term resource and trade agreements with African countries. When compared to such areas as Latin America and the United States, much of Africa is at a comparatively early stage of development, and much of African exploration is focused on identifying new areas rather than expanding the resources of previously identified areas.

Exploration activity in Africa in 2011 varied as improving commodity prices and renewed investor interest stimulated activity in some areas while mineral supply concerns related to electricity shortages and regional unrest have

Africa has not been immune to the growing trend of resource nationalism in light of higher metals prices. The 2012 budget proposal in Ghana includes provisions that would increase the corporate tax rate for mining companies from 25 percent to 35 percent and implement a 10 percent windfall profit on miners.

limited activity in other areas. Power costs remain a concern in South Africa and Zambia. Electricity prices in South Africa have doubled from 2008 through 2011 in nominal terms and the South African utility Escom has asked the top 500 electricity users, including mining companies, to reduce usage by 10 percent to avoid power blackouts. Zambia has raised the price of electricity for mining companies by 30 percent.

Interest in exploring for African mineral resources continues to increase. Australian companies are involved with nearly 650 mines and exploration projects in 43 African countries. The International Finance Corporation intends to invest $300 million in mining companies operating in Africa over the next three years. Both China and India are investing in natural resource projects in Africa. Chinese investment in the minerals resources of Africa in 2011 is expected to reach $110 billion, primarily through billion-dollar infrastructure for resources deals in Angola (2004), the Democratic Republic of the Congo (2007), Gabon (2006), Guinea (2009), Zimbabwe (2009) and South Africa (2011). Another indication of growing Chinese activity in Africa is reflected in the increasing number of prospecting licenses held by Chinese companies in Botswana. In 2010, three Chinese companies collectively held 143 prospecting licenses in Botswana, compared to a very small number in 2008. Indian investment has increased from about $1 billion in 1991 to about $35 billion in 2008. A survey of institutional investors conducted by the Economist Intelligence Unit found that two-thirds of the respondents listed Africa as having the greatest opportunity for investment of global frontier markets in spite of its macroeconomic and political risk.

Exploration activity has increased in Guinea and Sudan. In Guinea, Rio Tinto formed a joint venture with the Aluminum Corp. of China Limited to explore and develop mineral properties. Vale SA has formed a joint venture with BSG Resources Ltd. to explore for iron ore in the Simandou Range of southeastern Guinea. Mineral exploration in northern Sudan was strengthened with the signing of 47 separate multiple agreements in 2010 for copper, gold, lead, iron ore and zinc, in order to diversify the nation's crude-oil-dependent economy. Sudan's economy has relied heavily on revenues from oil resources in southern Sudan but, with the impending succession of this region, the country's economy will likely become more reliant on mineral resources located in northern Sudan.

Africa has not been immune to the growing trend of resource nationalism in light of higher metals prices. The 2012 budget proposal in Ghana includes provisions that would increase the corporate tax rate for mining companies from 25 percent to 35 percent and implement a 10-percent windfall profit on miners. The government of Guinea has adopted a new mining code that gives the state an option to increase its current 15 percent share of mining projects to 35 percent and changes mine permitting procedures to include feasibility and social impact studies before a company can apply for a mining permit.

In Namibia, a proposal to increase the corporate tax rate from 37.5 to 44 percent was withdrawn. But plans to issue new exploration and mining licenses for coal, copper, diamond, gold, rare earth elements and uranium only to the state-owned mining company Epangelo moved forward. In South Africa, the government approved the development of a beneficiation strategy for 10 mineral commodities that would strengthen the value-added component of the minerals industry. The minerals to be included in this plan are chromium, coal and uranium, diamond, gold, iron ore, manganese, nickel, platinum, titanium and vanadium. Presently, up to 89 percent of the potential value of South Africa's raw minerals is reported lost through premature exports.

Zambia has suspended issuing mining licenses in preparation for an audit of the existing licenses and reviewing the mining tax structure in Zambia. In its 2012 budget, Zambia has proposed doubling the royalty rate for base metals to 6 percent and increasing the rate for precious metals to 5 percent to pay for budgeted social programs.

In Zimbabwe, the government is proceeding with plans to set up a sovereign wealth fund that will own a 51-percent share of all foreign-owned mining companies, increase mining royalties for gold from 4.5 percent to 7 percent and royalties for platinum from 5 percent to 10 percent in 2012, and increase exploration fees for coal to $100,000 and diamond to $1 million.

The temporary ban imposed in 2010 on mining in the eastern provinces in the Democratic Republic of the Congo (DRC) was removed in March because of the government-backed efforts to improve oversight of illegal mining in this region and improvements in the traceability of local supplies. "Conflict minerals" legislation such as the Dodd-Frank Act of 2010 (United States) has specified that minerals exported from DRC and its neighboring countries be certified as conflict free. The region was reported to be at least two years away from having an effective certification and traceability process in place.

Australia. Exploration budget allocations reported by MEG for Australia showed an increase to about $2 billion in 2011 from $1.3 billion in 2010. The Australian Bureau of Statistics reported mineral exploration expenditures (excluding coal and petroleum) for fiscal year 2010-2011 of about A$2.4 billion (US$2.4 billion), a 40 percent increase from the Australian expenditure for fiscal year 2009-2010. The Western Australia Department of Mines and Petroleum reported that the number of prospecting licenses in Western Australia increased about 1 percent from fiscal year 2009-2010 to fiscal year 2010-2011, and the number of exploration licenses increased 14 percent from fiscal year 2009-2010 to fiscal year 2010-2011. The Australian statistics include expenditures for a greater number of mineral commodities than do the MEG statistics.

The estimated expenditures for iron ore exploration in Australia accounted for 27 percent of the total Australian expenditure for metals and minerals for fiscal year 2010-2011 (excluding coal and petroleum). Gold exploration accounted for about 27 percent of the total Australian expenditure for metals and minerals for fiscal year 2010-2011. In nominal terms, gold exploration increased about 13 percent in fiscal year 2010-2011 to A$652 million (US$657 million). The estimated expenditure for copper exploration increased 60 percent to A$323 million (US$326 million) in fiscal year 2010-2011; exploration expenditures for nickel and cobalt increased 33 percent to A$271 million (US$273 million); exploration expenditures for lead, silver, and zinc increased 46 percent to A$76 million (US$77 million). Western Australia's share of the Australian mineral exploration expenditure accounted for 54 percent; Queensland accounted for about 22 percent; South Australia accounted for about 9 percent; Northern Territory accounted for 7 percent; New South Wales accounted for 5 percent; Victoria accounted for 2 percent and Tasmania accounted for 1 percent.

Of the 182 nonfuel mineral exploration and development projects considered by the Australian Bureau of Agricultural and Resource Economics and Sciences between October 2010 and April 2011, 35 projects (19 percent) were considered as being under construction or committed for development, and 147 projects (81 percent) were at an earlier stage of activity and listed as uncommitted for development. Of these latter projects, 34 were being considered for gold projects, 31 were being considered for iron ore, 17 were being considered for nickel, 16 were being considered for lead-zinc-silver, 14 were being considered for copper, seven were being considered for mineral sands and five were being considered for bauxite. The remaining 23 uncommitted projects considered in this Australian government assessment were for rare-earth elements, tin, vanadium and other mineral commodities. About 50 percent of these projects were in Western Australia, 19 percent in Queensland, 12 percent in New South Wales, 8 percent in Northern Territory, 7 percent in South Australia, 3 percent in Tasmania and 1 percent in Victoria. Australian states and territories experiencing the highest levels of exploration activity in 2011, in descending order based on the number of sites compiled for this annual review, were Western Australia (52 percent), Queensland (13 percent), New South Wales (10 percent), South Australia (10 percent), Northern Territory (9 percent), Tasmania (3 percent) and Victoria (3 percent).

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A number of laws were enacted by the Australian Parliament during 2011. Effective July 2012, a carbon tax of A$23/t ($21/st) of carbon will be imposed on 500 companies having the largest carbon emission rates. Legislation will be enacted in July 2012 that will expand the definition for minerals exploration to include geothermal energy sources and will provide a tax deduction for these minerals that is available for other minerals under current law. A proposal for a 30-percent minerals resource rent tax passed the lower house of Parliament but had not passed the upper house as of December 2011.

New South Wales and Western Australia have proposed to increase mineral royalty rates in order to compensate for tax losses anticipated when the federal carbon tax is enacted. Under the proposed mineral resources rent tax, the federal government would refund state royalties to the mining companies. The Queensland government drafted interim legislation that restricts mineral exploration activities within a 2-km (1.2-mile) buffer area surrounding urban areas with a population of 1,000 or more but provided local jurisdictions the option to exempt themselves from this legislation. The South Australian government amended provisions of the Mining Act of 1971 that changed the mineral exploration application and assessment process, implemented programs for environmental protection, compliance and enforcement, and modified landowner related rights and obligations. The South Australian government enacted legislation that would prohibit mining in the Arkaroola region but would open the Woomera area to development.

Western Australia continued its A$80 million federal exploration drilling program in 2011, providing exploration funding for a variety of

There was also significant exploration activity in Alaska during 2011, but compiled data were not yet available. Based on a 2011 report released by the Alaska Department of Natural Resources, exploration expenditures (excluding development projects) in Alaska increased from about $180 million in 2009 to about $264 million in 2010.

mineral commodities, primarily gold, copper, nickel and uranium. Funding was provided for a limited number of diamond, lead, manganese, PGM and zinc projects.

United States. The U.S. nonfuel mineral exploration budget was anticipated to increase by about 64 percent to about $1.4 billion in 2011 from $850 million in 2010, according to MEG data. Much of this increase is a result of increased copper and gold exploration budgets in Alaska and gold exploration budgets in Nevada. The U.S. percentage of the world exploration budget remained at 8 percent in 2011. The increase in the U.S. minerals exploration budget in 2011 is likely tied to an improved economy and higher commodity prices in 2011, which provided incentive for higher exploration budgets during the year.

In 2011, data on 223 U.S. exploration projects were collected and reviewed by the USGS; 38 percent were located in Nevada, 19 percent were located in Alaska, 9 percent were located in Arizona, 5 percent were located in Idaho, 4 percent were located in Wyoming, 4 percent were located in Colorado and 3 percent each were located in Minnesota, New Mexico and Utah. Exploration also took place in California, Michigan, Montana, North Carolina, Oregon, South Carolina, Texas, Washington and Wisconsin. Most of these sites had prior exploration activity, suggesting that economic conditions were such that exploration companies were reevaluating prospects in light of perceived improvement in economic conditions in 2011, technological advancements that would improve recovery, or their proximity or geologic similarity to recent discoveries.

The USGS conducted a review of the U.S. properties included on the tables of significant sites (Table 2) published in its annual summaries of nonfuel mineral exploration from 1995 through 2010. The study noted that higher metals prices and new discoveries since 1995 have stimulated re-exploration of Nevada's established mineral belts and new areas, while much of the exploration activity in Alaska is focused on greenfield prospects in areas with a less mature history of production. Based on this review, the number of years from initial ore deposit exploration to initial production was up to 70 years. The average exploration and development timeframes were eight years for sites located in active mineral belts and 36 years for greenfield sites in the United States. The average timeframe required for permitting of these U.S. sites was determined to be four years for sites located in active mining areas and 10 years for greenfield sites from the time the operating permit application was received, although there was often an extensive period of time prior to formal permit application submission for permit planning and community input activities, which were not included in these estimates. There is a considerable range in permitting timeframes from site to site, based on numerous factors such as economic, environmental and geologic factors, land ownership issues and governmental legislation. Study data suggest that the United States has been able to maintain its gold and silver mine production rates since 2005 while maintaining gold and silver reserve levels primarily because of high metals prices and delineation of additional reserves by means of continued exploration.

A relatively high gold price has sustained interest in Nevada exploration. Based upon a 2011 survey conducted by the Nevada Division of Minerals, mineral exploration expenditures in Nevada were reported as $214.1 million in 2010 and expected to be $295.5 million in 2011. About 74 percent of the reported 2010 spending was for actual exploration activities, with the remainder used for land holding, permitting, compliance and corporate overhead. Based on U.S. Bureau of Land Management statistics as of October 2010, 175,000 active claims were reported for Nevada in 2010, compared to 177,000 in 2009. Based upon survey results, more than 99 percent of the respondents to the 2011 Nevada survey came from exploration entities with annual exploration budgets greater than $1 million. The principal exploration objective in Nevada continued to be gold, although exploration for copper, lithium, magnesium, molybdenum, potash, uranium and zinc occurred in Nevada during 2010, based on USGS site data.

There was also significant exploration activity in Alaska during 2011, but compiled data were not yet available. Based on a 2011 report released by the Alaska Department of Natural Resources, exploration expenditures (excluding development projects) in Alaska increased from about $180 million in 2009 to about $264 million in 2010. About 47.4 percent of this expenditure was for precious metals, 46.5 percent for polymetallic deposits, 2.5 percent for coal and peat, 2.4 percent for base metals, and 1.2 percent for diamond, heavy mineral sands, tantalum, tin and uranium and other industrial minerals. About 49 percent of the total estimated expenditure was to be spent in southwestern Alaska, 21 percent in the eastern interior, 10 percent in the south-central region, 9 percent in the southeastern region, 7 percent in the western region, 3 percent in northern Alaska and 1 percent on the Alaskan Peninsula. In 2010, there were 20,389 state claims and 8,413 federal claims active in Alaska, of which 6,132 state claims and 332 federal claims were new.

Exploration activities at the Donlin Creek and Pebble gold projects accounted for more than 43 percent of the Alaskan exploration expenditures in 2010 and in the first half of 2011. However, citizens voted in 2011 to ban large-scale resource extraction at the Pebble property because of its perceived effect on local salmon fishing. The state of Alaska is appealing this referendum. Exploration and development activity at Pebble in 2011 was not significantly affected. The Alaska state budget for 2011 included $500,000 for a strategic assessment of rare earth elements in Alaska.

In the United States, the U.S. Secretary of Interior, Ken Salazar, withdrew about 405,000 ha (1 million acres) of federal land near the Grand Canyon in Arizona from mineral leasing for the next 20 years. The decision does not prohibit previously approved uranium mining or new projects that could be approved on claims and sites with valid existing rights.

The Arizona legislature approved a bill that allows mineral exploration permits on state trust lands that have been closed by the State Land Commissioner. In Colorado, the issuance of new mineral leases in the Uravan mineral belt have been suspended by court ruling until environmental reviews of 31 existing leases are completed. In Nevada, legislation was passed in 2011 to reform the Net Proceeds of Minerals Tax by 2013 and create the Mining Oversight and Accountability Committee, charged with reviewing existing mining regulation and taxation in Nevada.

Pacific region. Based on MEG data, the 2011 exploration budget allocation for the Pacific region and Southeast Asia (excluding Australia) was about $1 billion, up 39 percent from the 2010 level of $750 million. Indonesia, Papua New Guinea and the Philippines together accounted for about 80 percent of the total mineral exploration budget for the region when Australia is excluded. The increase in this region can be attributed to continued interest by Chinese and South Korean companies to expand sources of supply for strategic minerals such as gold, base metals and rare-earth elements and by Japanese companies to develop regional copper and nickel deposits to supply Japan's smelting industry. There is increased interest in exploring for undersea minerals in the Pacific Ocean. Based on the data on active exploration sites compiled by the USGS, the three countries included in this region with the largest number of exploration sites were Papua New Guinea, the Philippines, and Indonesia, together accounting for 68 percent of the active exploration sites in the region. Other countries with active exploration in 2011 include Fiji, Java, the Republic of Korea, Laos, Malaysia, New Caledonia, New Zealand and the Solomon Islands. Gold and silver exploration accounted for approximately 68 percent of all exploration interest in the Pacific region, base metals accounted for about 27 percent, iron ore and PGM each accounted for about 1 percent, and other minerals accounted for 3 percent of the reported activity in 2011. Two-thirds of the sites in this region were conducting early-stage exploration, and one-third of the sites were conducting advanced exploration or were exploring for minerals adjacent to producing mines.

Figure 9 shows exploration activity in the Pacific region (excluding Australia) in terms of the percent of world share of exploration budget and number of active sites. Since 2008, the region's share of the world exploration budget has generally increased, while its share in terms of the number of active exploration sites has decreased. This trend is perhaps reflective of the increased interest by neighboring China in exploring for resources in the region. Unlike Africa, where Chinese interests have been working at the state level to secure an adequate supply of resources primarily through trade agreements, Chinese interests are working in the Pacific to secure access to future resources by establishing joint venture agreements to develop selected advanced deposits. Thus, a greater amount of the regional exploration budget is funding the development of a small number of deposits.

Cambodia issued 24 mineral resource exploration licenses to local and foreign companies in 2011. Indonesia is conducting a review of more than 8,000 existing mining permits to ensure compliance with new environmental legislation. The presidential order sets a December 2012 deadline for completion of this review.

Rest of the world. Exploration budget allocations for the rest of the world (including mainland Asia, the countries of the Commonwealth of Independent States, Europe and the Middle East) increased by about 57 percent in the MEG 2011 survey to about $2.4 billion from the $1.5 billion budget reported in its 2010 survey. The percent share increased slightly to 15 percent in 2011 from 14 percent in 2010. The exploration budget for Russia was reported to have decreased and accounted for about 3 percent of the world's exploration budget in 2011, down from 4 percent in 2010. China maintained its 4 percent share of

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the total exploration budget in 2011 (excluding exploration activity conducted by government-controlled entities).

In terms of the number of exploration sites, the greatest amount of exploration occurred in China, Turkey, Central Eurasia (primarily Kazakhstan and Russia) and Scandinavia (particularly Finland and Sweden). On the basis of exploration site data collected by the USGS for this summary, Turkey accounted for about 12 percent of the exploration sites in this group, Russia accounted for about 11 percent, China accounted for about 10 percent, Sweden accounted for 8 percent, Kazakhstan accounted for about 7 percent and Finland accounted for about 6 percent. The remaining 46 percent occurred in 32 other countries in Asia, the Commonwealth of Independent States, Europe and the Middle East.

Exploration activity in Asia in 2011 primarily focused on gold (40 percent of all sites in this group had gold as the primary commodity), copper (13 percent), uranium (10 percent), rare earths (8 percent), and diamond, iron ore and silver (each 6 percent) and other mineral commodities 11 percent. Exploration activity in the Commonwealth of Independent States primarily focused on gold (69 percent), copper (8 percent, iron ore, PGM, rare-earth elements and silver (each 4 percent). European mineral exploration primarily focused on gold (39 percent), base metals (26 percent), iron ore and uranium (each 7 percent), with the remaining 21 percent exploring for nine other mineral commodities. Middle Eastern exploration (including Turkey) primarily focused on gold (56 percent) and base metals (38 percent).

In an effort to supply its growing industry with raw materials, China opened its mining sector to foreign investment during the 1990s, extended its search for minerals by investing in foreign exploration and development projects during the last decade, and received approval to conduct deep-sea mineral exploration activities in the Indian Ocean in 2011. Domestically, the Chinese government has announced plans to consolidate and modernize its mining operations. In 2004, China had 25,000 operating mines; plans call for reducing the number of mines to 4,000 by 2013, while increasing individual mine production such that a minimum production of 300 kt/a (330,000 stpy) would be required. The Chinese mining industry is dominated by state-owned enterprises and regional governments issue most exploration and development licenses. In 2011, 23 private foreign companies were conducting mineral exploration in China

Chinese interests continued to explore outside of China for raw materials. MDM Engineering, an African-focused mine exploration and development company, reported that 40 percent of its 2011 projects are Chinese funded in some form.

India's Forest and Environment Ministry has implemented regulations requiring all Government-owned mining companies to immediately adopt a Corporate Environment Policy. Similar regulations would later be applied to companies operating in the private sector.

In 2011, the Mongolian Parliament extended a ban on issuance of new mining exploration licenses, and a Mongolian court ordered the government to enforce a ban on mining in forest and river areas. A new two-tier royalty plan was passed by the Parliament in 2010 and went into effect on Jan. 1, 2011. Under this plan, exported minerals are assessed a surtax royalty in addition to a flat 5 percent royalty rate. For minerals other than copper, the surtax varies from 1 to 5 percent, depending on metal prices. The surtax on copper ranges between 22 and 30 percent for ore, 11 and 15 percent for concentrates, and 1 and 5 percent for final products.

Amendments to the mining law in Turkey enacted in 2010 include a royalty increase to 4 percent for gold, platinum, and silver, and a royalty decrease to 1 percent for dimension and natural stone. A 50-percent reduction of this royalty is applied if future production comes from an underground mine or if metal production of these minerals takes place in Turkey. The legislation introduces a three-step exploration period. Since this legislation was enacted, 26 companies have applied for gold mining permits.

The United Kingdom enacted a new anti-bribery law, the United Kingdom Bribery Act, which holds mining and mineral exploration companies accountable for any action that might be considered bribery.

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For more information

The USGS collects and analyzes data on more than 100 mineral commodities in the United States and worldwide. This article draws from public and private sector sources and the knowledge and expertise of USGS mineral commodity, country and mineral-resource specialists. More detailed information on the material covered in this article may be obtained from the author, David Wilburn, U.S. Geological Survey, P. O. Box 25046, MS 750, Denver Federal Center, Denver, CO 80225-0046; telephone 303-236-5213; fax 303-236-4208 or wilburn@usgs.gov. For additional USGS information on mineral commodities and international mining activities, inquiries may be directed to Lauryn Norman, U.S. Geological Survey, 988 National Center, Reston, VA 20192; telephone 703-648-4961 or lnorman@usgs.gov. ■