Canada's Global Mining Presence

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GLOBAL MARKET FOR MINERAL EXPLORATION

In 2002, the value of exploration programs planned around the world by companies of all sizes for precious metals, base metals and diamonds stood at an estimated $3.0 billion (US$1.9 billion), down by more than 12% from the $3.4 billion (US$2.2 billion) planned the previous year.[1] Compared with 2001, the value of exploration programs planned worldwide for 2002 was lower in roughly two thirds of countries where companies operate. Only in Russia, Mongolia and Finland was there an increase in exploration programs of more than $10 million expected from 2001 to 2002. In contrast, there were seven countries where year-over-year decreases in programs of $30 million or more were expected to occur; in three of these countries, decreases of $50 million or more were likely.

WORLD'S LARGER COMPANIES

Global trends in mineral exploration are based on data for the world's larger mining companies.[2] These companies are defined here as those with annual exploration budgets of more than $4.7 million in 2002 (current US$3 million annually). The larger companies are the only ones for which there are consistent data on worldwide exploration activities spanning a period of 11 years. In 2002, 96 companies based around the world each planned to spend more than $4.7 million on exploration. In 2001, 98 companies had planned to spend an equivalent amount; in 1997, the number stood at a record 279.

During 2002, the world's larger companies were expected to undertake exploration programs with a combined value of $2.1 billion (US$1.4 billion) in 94 countries, 5 countries fewer than in 2001.

The world's larger companies represent only about 15% of the 724 companies of all sizes that were expected to be active in mineral exploration worldwide during 2002. However, these companies account for roughly 80% of the value of all mineral exploration programs carried out around the globe.

On a commodity basis, the larger companies account for over 80% of the value of programs aimed at base metals and diamonds; for more than 75% of those aimed at gold; and for almost 70% of those aimed at platinum group metals (PGMs). On a regional basis, the larger companies account for over 85% of the programs planned for Europe and the former Soviet Union (FSU), and for Latin America; 80% or more of those planned for Africa and the Middle East, and for the United States; and roughly 70% of those planned for Asia-Pacific and for Canada.

LARGER CANADIAN-BASED COMPANIES

There are more mineral exploration companies based in Canada than in any other country (Figure 1). In spite of generally low prices for mineral commodities in recent years and the difficulty for many companies that have no producing mines to raise capital, 37 Canadian-based companies each planned to spend $4.7 million or more on mineral exploration in 2002, up from 32 in 2001.

In 1996, mining companies listed on Canadian stock exchanges raised a record amount of equity capital.[3] As a result, 141 Canadian-based companies had each planned to spend, in 1997, the equivalent of $4.7 million on mineral exploration programs around the world. That year their aggregate budgets for exploration, adjusted for inflation, reached a record value of almost $2.1 billion.

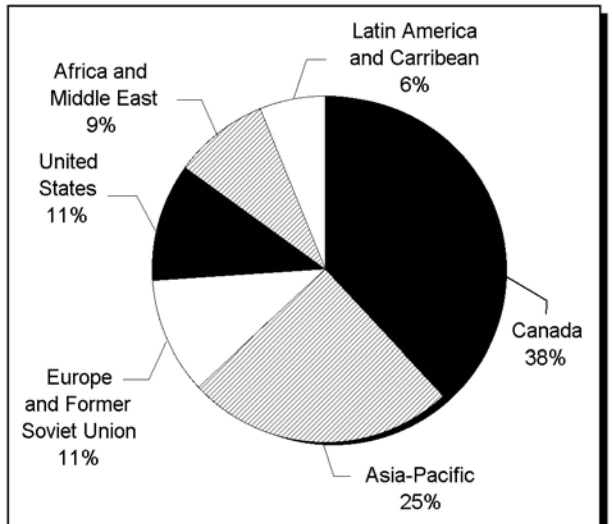
In 2002, the total value of the exploration programs that the larger Canadian-based companies planned to undertake in Canada and elsewhere around the world stood at $670 million (Figure 2), or down by 12% from almost $760 million budgeted in 2001. About two thirds of the decrease in these Canadian exploration budgets from 2001 to 2002 was expected to occur abroad.

The programs that the larger Canadian-based companies planned to undertake during 2002 represent 32% of all larger-company exploration programs for the entire world. These Canadian companies account for the dominant share, by far, of all worldwide mineral exploration activity. Companies based in Africa account for 17% of the larger-company activity worldwide, while companies based in Europe and those based in Australia each account for 16%. In 1997, the exploration programs of the larger Canadian-based companies accounted for a record 35% of the value of all mineral exploration activity planned worldwide.

The larger Canadian-based companies typically budget less individually for exploration programs than the industry average worldwide. In 2002, the exploration budgets of the larger Canadian-based companies had a mean of \$18.2 million and a median of \$7.5 million compared with global averages of \$22.2 million and \$9.1 million, respectively. In 2002, the mean of the budgets of the larger Canadian-based companies decreased by more than \$5 million compared with that of the previous year.

Although, on a company-by-company basis, there can be a significant variation between budgets and expenditures, aggregate exploration budgets generally provide a reliable estimate of the total amount actually spent in the field worldwide. In the case of the larger Canadian-based companies, actual expenditures in 1999 were about 7% lower than budgeted, roughly the same departure as observed in the previous year.[4]

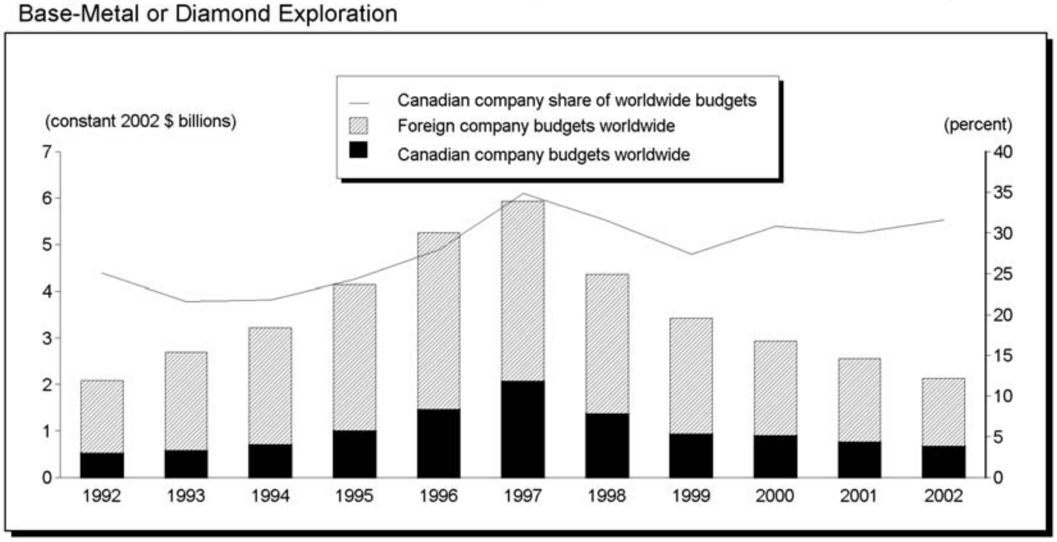
Figure 1
Distribution of the World's Larger Exploration Companies, by Domicile, 2002



Based on 96 companies with budgets of at least \$4.7 million (US\$3 million) for precious-metal, base-metal or diamond exploration.

Source: Natural Resources Canada, based on *Corporate Exploration Strategies: A Worldwide Analysis*, Metals Economics Group, Halifax, Nova Scotia.

Figure 2
Exploration Budgets of the World's Larger Companies, by Origin, 1992-2002
Companies with Worldwide Budgets of at Least \$4.7 Million in 2002 for Precious-Metal, Base-Metal or Diamond Exploration



Source: Natural Resources Canada, based on *Corporate Exploration Strategies: A Worldwide Analysis*, Metals Economics Group, Halifax, Nova Scotia.
Notes: The worldwide exploration budgets of companies that intended to spend less than 4.7 million (US\$3 million) in 2002 are excluded. The worldwide exploration budgets for other commodities such as uranium or industrial minerals are also excluded.

At the end of 2002, companies of all sizes listed on Canadian stock exchanges held interests in a portfolio of more than 6100 mineral properties (Figure 3) located in Canada and in more than 100 other countries around the world.[5] Most of this portfolio consists of properties at the early stages of exploration. The number of properties held worldwide at the end of 2002 increased by about 400, or by more than 7%, compared with the number held at the end of the previous year. This increase occurred mainly in Canada and reflects, in part, the increasing recognition by the mining industry of the diamond and PGM potential in this country.

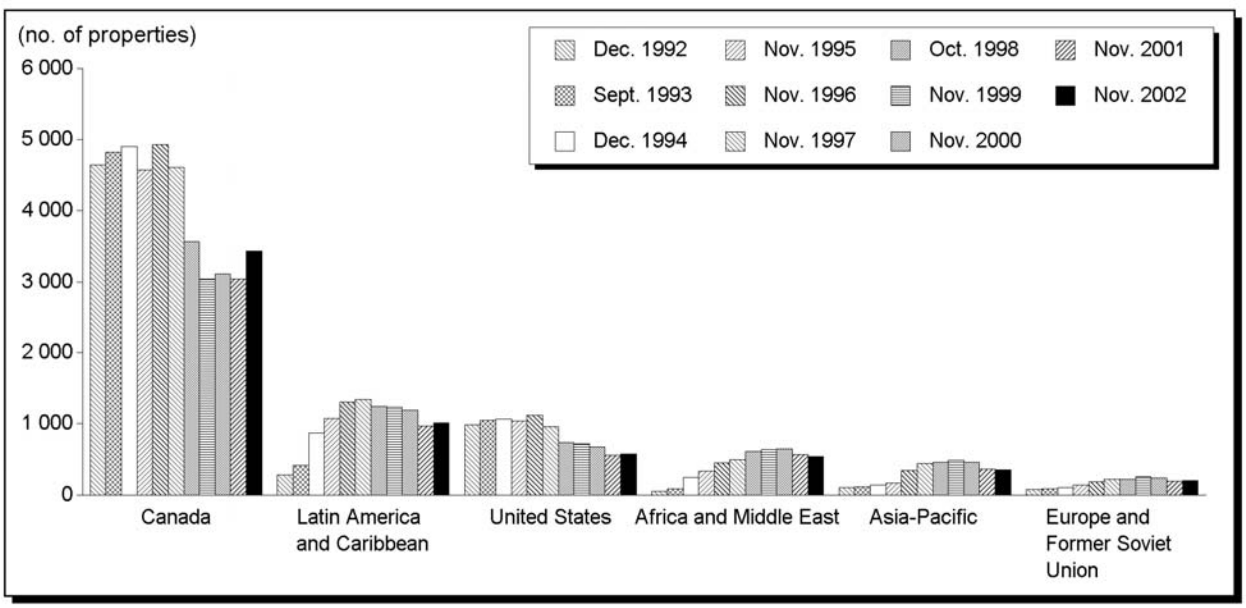
LARGER-COMPANY EXPLORATION MARKET IN CANADA

In 2002, the larger-company mineral exploration market in Canada was valued at $330 million, down by $35 million, or 10%, from roughly $365 million in 2001 (Figure 4). Only in Australia and the United States were aggregate exploration programs expected to experience larger year-over-year reductions. For the first time in a decade, Canada, in 2002, became the country where the global mineral exploration industry is the most active. Australia held that position from 1992 through 2001. The smaller companies are important contributors to mineral development in Canada and elsewhere around the world, but their activities are not addressed specifically here.

In 2002, 42 of the world's larger domestic-based or foreign-based companies planned to explore for minerals in Canada, up from 38 in 2001. More than 15% of the exploration efforts of all of the world's larger companies were expected to take place in Canada in 2002, up from 14% in 2001 (Figure 5). The proportion of all global exploration efforts taking place in Canada stood at about 11% during each of the previous three years. Before the large increase in exploration activity that occurred in developing countries starting in the early 1990s, the proportion of all worldwide mineral exploration activity taking place in Canada stood at 18%.

At the end of 2002, there were more than 3400 mineral properties with recent exploration activity in this country[6] (Figure 3).

Figure 3
Canadian Mineral Property Portfolio Worldwide, by Region, 1992-2002
Companies of All Sizes Listed on Canadian Stock Exchanges



Source: Natural Resources Canada, based on *MIN-MET CANADA* for 1992-97 and InfoMine db for 1998-2002, Robertson Info-Data Inc., Vancouver, British Columbia, and used under licence.
Note: The decrease in properties in Canada after 1997 is due, in part, to the implementation of database features that make it possible to exclude many inactive properties.

Larger Canadian-Based Companies in Canada

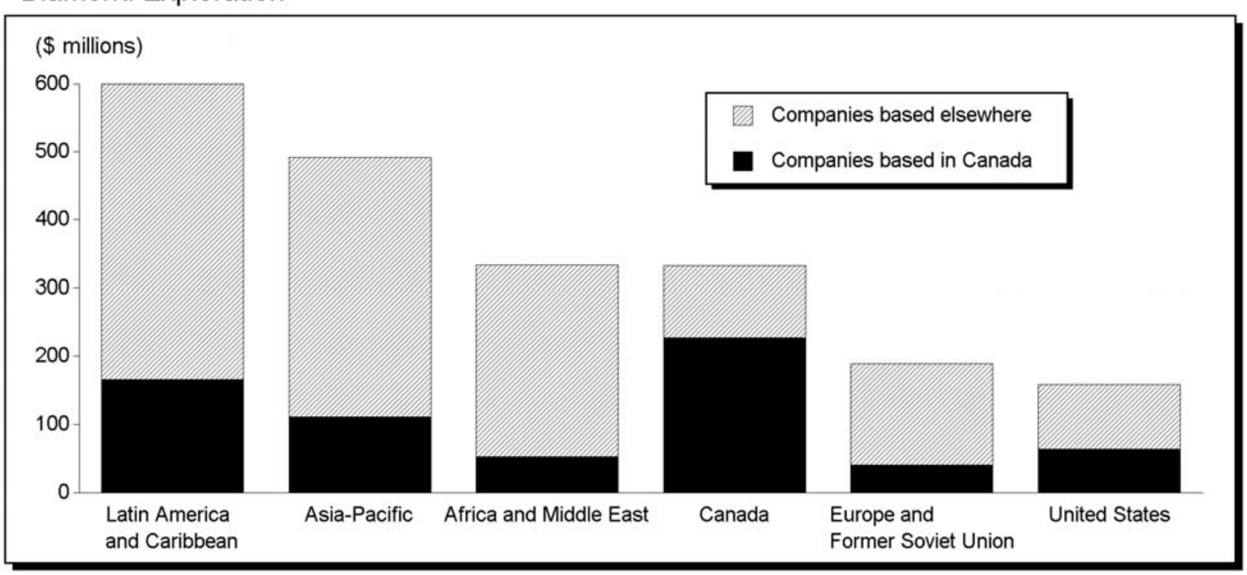
In 2002, 28 of the larger Canadian-based companies allocated, in total, $228 million for mineral exploration in Canada. Their exploration budgets were up by more than $20 million, or 10%, from the $207 million they allocated in 2001.

For the third year in a row, Canadian companies planned to spend more on mineral exploration in Canada than in all of Latin America. From 1995 to 1999, Canadian-based companies had spent more in that region of the world than in this country.

The larger Canadian-based companies control 69% of the larger-company mineral exploration market in Canada. Because mineral exploration is such an international enterprise, the dominance of exploration programs by domestic firms is relatively uncommon. In 2002, there were only six other countries where domestic companies controlled more than half of the larger-company market for mineral exploration: Australia and Sweden (52% each), Brazil (59%), Russia (66%), South Africa (77%), and Japan (100%). Although, during 2002, the larger-company market for mineral exploration was valued at almost $330 million in Australia, at over $140 million in Brazil, and at roughly $80 million in each of South Africa and Russia, it was valued at less than $20 million in Sweden and at less than $5 million in Japan.

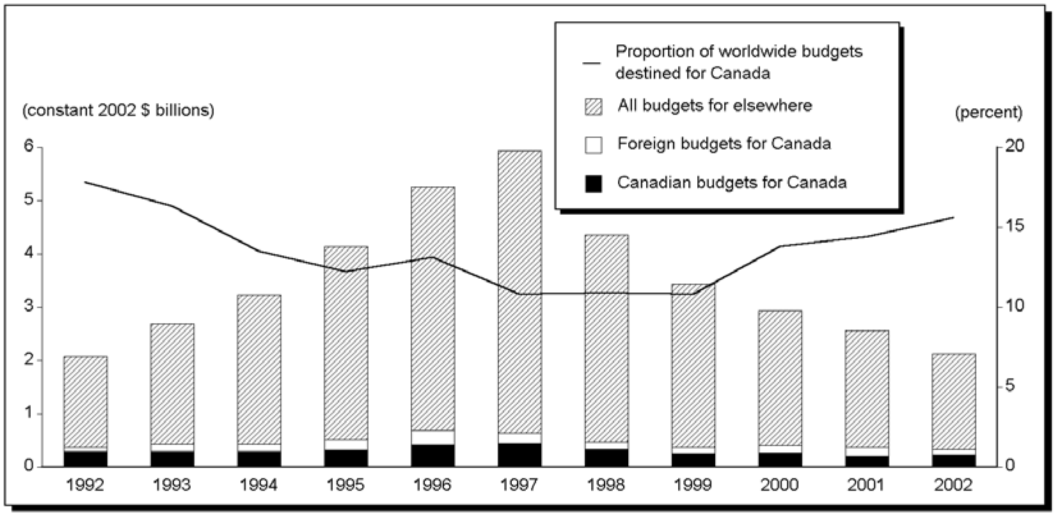
With increasing globalization, the share of the domestic exploration market controlled by Canadian-based companies has fallen gradually as foreign-based companies have increased the amount of activity that they undertake in this country. In 1992, Canadian-based companies controlled 80% of the larger-company mineral exploration market in Canada. However, by 2000, they controlled only two thirds of it. Since the early 1990s, the share of the exploration market controlled by the larger domestic firms has also fallen gradually in the United States and Australia. Although Canadian companies operate all over the world, Canada remains the country where they conduct, by far, the largest proportion of their global mineral exploration programs (Figure 6).

Figure 4
Exploration Budgets of the World's Larger Companies for Selected Regions of the World, 2002
Companies with Worldwide Budgets of at Least $4.7 Million for Precious-Metal, Base-Metal or Diamond Exploration



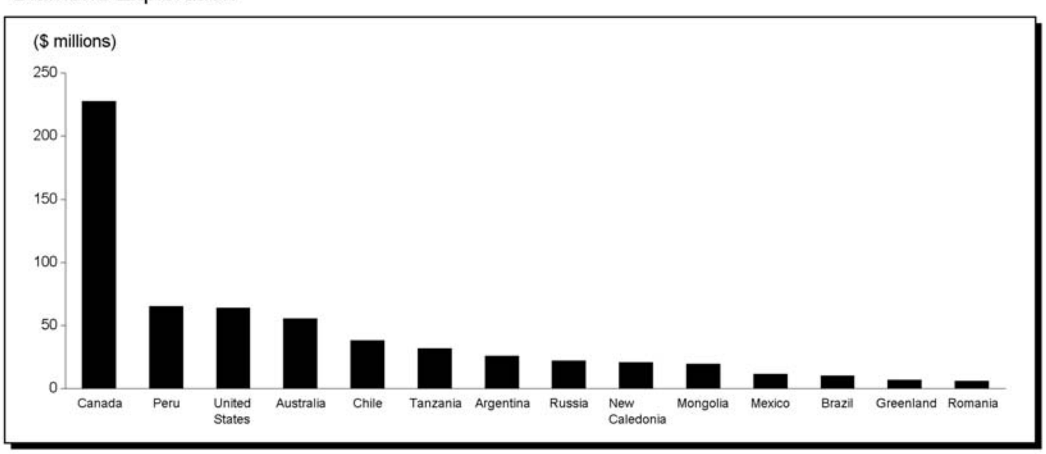
Source: Natural Resources Canada, based on *Corporate Exploration Strategies: A Worldwide Analysis*, Metals Economics Group, Halifax, Nova Scotia.
Notes: The worldwide exploration budgets of companies that intended to spend less than $4.7 million (US$3 million) in 2002 are excluded. The worldwide exploration budgets for other commodities such as uranium or industrial minerals are also excluded.

Figure 5
Exploration Budgets of the World's Larger Companies for Canada and Elsewhere, 1992-2002
Companies with Worldwide Budgets of at Least $4.7 Million in 2002 for Precious-Metal, Base-Metal or Diamond Exploration



Source: Natural Resources Canada, based on *Corporate Exploration Strategies: A Worldwide Analysis*, Metals Economics Group, Halifax, Nova Scotia.
Notes: The worldwide exploration budgets of companies that intended to spend less than $4.7 million (US$3 million) in 2002 are excluded. The worldwide exploration budgets for other commodities such as uranium or industrial minerals are also excluded.

Figure 6
Exploration Budgets of the Larger Canadian-Based Companies, 2002 – Countries Accounting for 90% of Canadian Budgets
Companies with Worldwide Budgets of at Least $4.7 Million for Precious-Metal, Base-Metal or Diamond Exploration



Source: Natural Resources Canada, based on *Corporate Exploration Strategies: A Worldwide Analysis*, Metals Economics Group, Halifax, Nova Scotia.
Notes: The worldwide exploration budgets of companies that intended to spend less than $4.7 million (US$3 million) in 2002 are excluded. The worldwide exploration budgets for other commodities such as uranium or industrial minerals are also excluded.

Foreign-Based Companies in Canada

During 2002, 14 of the larger foreign-based companies planned to spend, in total, almost $105 million on mineral exploration in Canada (Figure 5). This represents more than 30% of all activity planned for this country; however, in 2001, that proportion was 45%. Compared with the previous year, the budgets of foreign-based companies for Canada decreased by more than $55 million in 2002. This reflects, in part, the natural progression of mineral development activity from exploration to capital investment, and to mineral production, particularly in the case of diamonds.

In 2002, the larger foreign-based companies active in mineral exploration in Canada included BHP Billiton Limited-BHP Billiton Plc and WMC Limited, both based in Australia; Echo Bay Mines Ltd., Newmont Mining Corporation, and Phelps Dodge Corporation, all based in the United States; Anglo American plc, Boliden Limited, Lonmin Plc, and Rio Tinto plc, all based in Europe; Anglo American Platinum Corporation Limited, AngloGold Limited, the De Beers group, and Impala Platinum Holdings Limited (IMPLATS), all based in South Africa; and the Mexican mining consortium, Grupo México S.A. de C.V.

In 2002, De Beers reported an exploration budget for Canada of more than $40 million. This represents the largest budget reported by all domestic and foreign companies operating in this country. BHP Billiton, whose budget for Canada was $28 million, had the second largest budget. De Beers' entire exploration budget for Canada is aimed at diamonds, as is 70% of BHP Billiton's. These two companies alone accounted for half of all larger-company budgets for diamond exploration in Canada in 2002.

LARGER CANADIAN-BASED COMPANIES ABROAD

In 2002, the larger Canadian-based companies planned to spend over $445 million on mineral exploration outside of Canada (Figure 4). Their budgets were down by $105 million, or by almost 20%, from the more than $550 million that they had planned to spend in 2001.

Two thirds of the worldwide budgets of the larger Canadian-based companies were allocated to programs abroad in 2002, somewhat less than in 2001. The foreign programs of the larger Canadian-based companies, as a proportion of their domestic and foreign programs combined, peaked at over 78% in 1997. In 1992, that proportion was only about 40%.

At the end of 2002, companies of all sizes listed on Canadian stock exchanges held interests in a portfolio of almost 2700 mineral properties located abroad (Figure 3), about the same as in the previous year. Foreign properties now represent slightly more than 40% of the total mineral property portfolio held by all companies listed in Canada, down from about half in 2001. In 1992, that proportion was only one quarter.

Apart from the United States, where companies of all sizes listed on Canadian stock exchanges have a substantial mining presence, about 30 other nations, spread across the globe, account for most of the balance of their foreign mineral property portfolio (Figure 7).

Canadian companies have interests in over 200 mines, smelters, refineries, plants under construction, or other advanced mineral development projects (Figure 8) in roughly 60 foreign countries.[7] Canadian companies also have hundreds of other projects at the early stages of exploration in these countries and in more than 40 others.

At the beginning of 2003, there was at least US$54 billion worth of new copper, diamond, gold, iron, nickel, PGMs, silver or zinc mining projects, each with a value of at least US$65 million, either at the planning, feasibility, construction or deferred stage of development in Canada or elsewhere around the world[8] (Figure 9). Although only 9% of the total value of those projects was expected to be invested in this country, Canadian companies were expected to participate in roughly 30% of all this current mining investment around the globe.

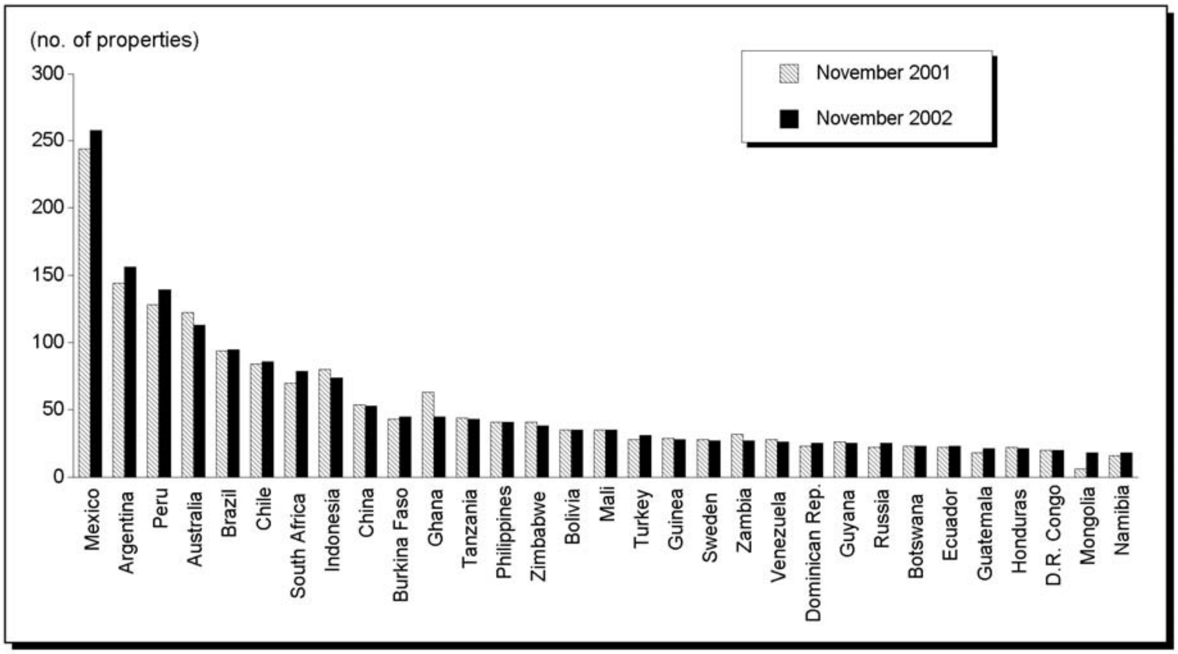
The activities of Canadian mining companies in Canada and abroad have fostered the development in this country of over 2200 suppliers of specialized mining goods and services. Many of these suppliers, such as some drilling companies (Figure 10), export their products all over the world.[9]

United States

In 2002, the larger-company mineral exploration market in the United States was valued at almost $160 million (Figure 4), or roughly 8% of the $2.1 billion larger-company market worldwide. Larger-company budgets for the United States were down by $40 million compared with those of the previous year. Eleven of the larger Canadian-based companies planned to spend, in total, almost $65 million in the United States, down from $110 million in 2001.

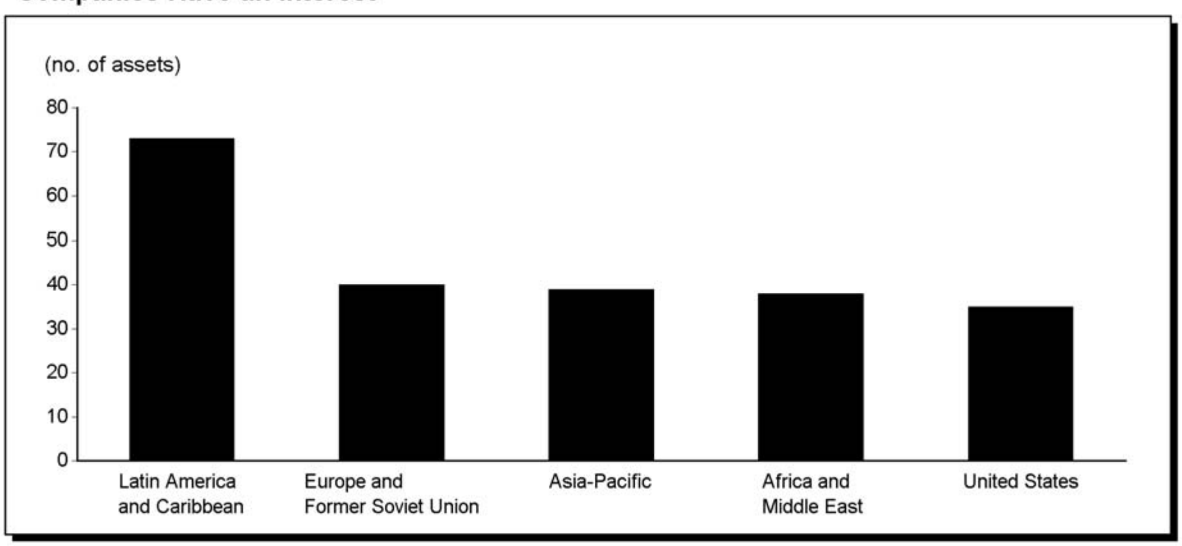
In 2002, the share of the larger-company exploration market held by Canadian-based companies in the United States fell to 45%, down from 55% the previous year. Since the early 1990s, Canadians have increased their share of the exploration market in the United States almost every year. The United States ranks third in terms of countries where Canadian companies are the most active in mineral exploration (Figure 6).

Figure 7
Canadian Mineral Property Portfolio Abroad, 2001 and 2002 – Countries Accounting for 80% of Canadian Holdings Located Outside the United States in 2002
Companies of All Sizes Listed on Canadian Stock Exchanges



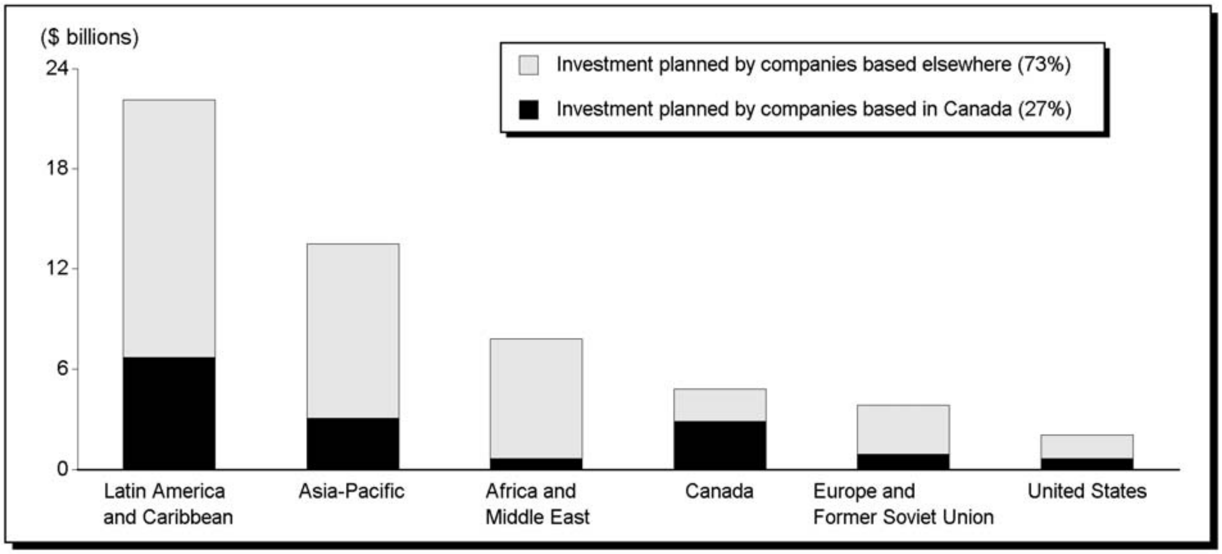
Source: Natural Resources Canada, based on InfoMine db, Robertson Info-Data Inc., Vancouver, British Columbia, and used under licence.

Figure 8
Mines, Refineries, Smelters and Advanced Projects Abroad in Which Canadian Companies Have an Interest



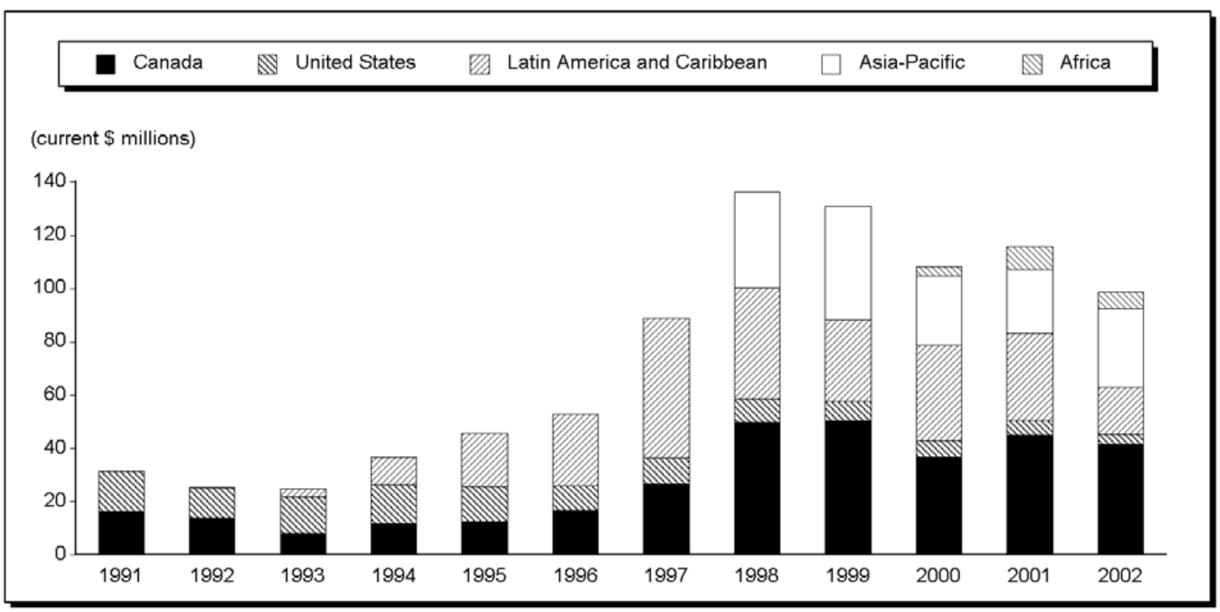
Source: Natural Resources Canada, based on company reports available in June 2000.

Figure 9
New Copper, Diamond, Gold, Iron, Nickel, PGM, Silver and Zinc Mining Projects Each Requiring an Investment of US$65 Million or More, January 2003
Construction, Feasibility, Planned or Deferred Status – Total of US$54 Billion



Source: Natural Resources Canada, based on *Engineering & Mining Journal*, January 2003, after Raw Materials Group, Stockholm.

Figure 10
Major Drilling Group International Inc., Drilling Revenues by Region, 1992-2002
Fiscal Year Ending April 30th



Source: Natural Resources Canada, based on company reports.
Note: The company is based in Moncton, New Brunswick.

During 2002, Canadian companies were expected to spend $20 million more on exploration in the United States than U.S. companies. American companies have budgeted progressively decreasing amounts for mineral exploration in their country most years since the early 1990s. Although U.S. companies accounted for almost 60% of the value of all exploration programs in their country in 1992, their activities represented less than 30% in 2002.

In late 2002, companies of all sizes listed on Canadian stock exchanges held interests in about 575 mineral properties in the United States (Figure 3), roughly the same number that they held at the end of the previous year. In 2000, they had projects located in 22 states, but their efforts were concentrated mainly in the western part of the country in Nevada, Alaska, California, Arizona, Montana, Idaho, Wyoming, Colorado, Washington, Utah and South Dakota in decreasing order.[10] That year, Nevada alone accounted for more than 250 of their mineral properties, or almost 40% of the total Canadian portfolio in the United States.

Although Canadian companies have considerably expanded their activities in Latin America, Africa and Asia since the early 1990s (Figure 3), the United States is likely to remain, for the foreseeable future, the foreign country where they hold their largest portfolio of mineral properties. At the end of 2002, the United States accounted for over 20% of all properties held abroad by companies of all sizes listed on Canadian stock exchanges.

Of all the Canadian-based companies, Placer Dome Inc., NovaGold Resources Inc., Formation Capital Corporation, Barrick Gold Corporation, Kinross Gold Corporation, and Teck Cominco Limited planned the largest mineral exploration programs in the United States during 2002. Together these companies planned to spend over $50 million, equivalent to 90% of the value of all Canadian programs for that country.

In 2002, Placer Dome planned to spend more than $16 million on exploration in the United States, mainly for gold in Nevada. The company planned to spend roughly $9 million at the Cortez (South Pipeline) gold mine and at Getchell (Getchell, Turquoise Ridge and N-Zone gold deposits). It planned to spend the remaining $7 million at the South Carlin gold project, also in Nevada. NovaGold planned to spend more than $12 million, about three quarters of it drilling at the Donlin Creek gold deposit in Alaska. Resources at Donlin Creek are estimated at roughly 120 Mt grading 4.1 g/t gold. Formation Capital planned to spend $9 million to assess the feasibility of bringing into production a cobalt deposit located near Salmon, Idaho. Resources on that property are estimated at roughly 3 Mt grading 0.6% cobalt, 0.45% copper and 0.6 g/t gold.

Barrick planned to spend much of its almost $7 million budget for the United States on further exploration for gold at the Goldstrike operation (Betze-Post and Meikle mines, and Rodeo deposit), the Marigold mine, the Round Mountain mine, the Rossi deposit, and the Dee property, all in Nevada. Kinross planned to spend much of its $6 million budget for the country at or in the vicinity of the Fort Knox open-pit gold mine in Alaska. Teck Cominco planned to spend more than $3 million of its $5 million budget for the United States evaluating the gas-bearing shale of the Kuna Formation as a potential source of fuel for the Red Dog mine, also in Alaska.

Latin America and the Caribbean

In 2002, the larger-company mineral exploration market in Latin America and the Caribbean was valued at $600 million (Figure 4), or 28% of the $2.1 billion larger-company market worldwide. During 2002, the larger Canadian-based companies planned to spend over $154 million in the region, down by $25 million, or 13%, compared with 2001.

Over the 12-year period 1991-2002, the global mining industry invested more than US$7.2 billion (current dollars) in mineral exploration in Latin America and the Caribbean. Companies listed on Canadian stock exchanges accounted for one third of that investment.

After Canada, Latin America has become the region of the world where Canadian companies are the most active in mineral exploration. However, from 1995 to 1999, Canadian companies spent more on mineral exploration in Latin America and the Caribbean than they did in this country.

In 2002, Canadian companies held more than 27% of the larger-company market in Latin America and the Caribbean. The value of Canadian exploration programs stood a close second to those of companies based in the region. The share of the exploration market held by local companies stood at 31% in 2002, roughly the same as in the previous two years; in 1994, local companies held less than 15% of the market in the region.

At the end of 2002, companies of all sizes listed on Canadian stock exchanges held interests in about 1000 mineral properties in Latin America and the Caribbean, about the same as in 2001. Since 1996, the total number of mineral properties held by Canadian companies in the region has exceeded the number held in the United States (Figure 3).

Mexico

In 2002, the larger-company mineral exploration market in Mexico was valued at $68 million, or 3% of the $2.1 billion larger-company market worldwide. Larger-company budgets for Mexico were almost 20% lower than those in the previous year.

Mexico is one of the relatively few countries where domestic companies carry out a significant proportion of mineral exploration programs, even if it is not the dominant share. Together the Mexican companies Industrias Peñoles, S.A. de C.V. and Grupo México were expected to undertake roughly one quarter of the exploration programs planned for the country during 2002.

Mexico ranks fourth in Latin America and eleventh in the world in terms of countries where Canadian companies are the most active in mineral exploration (Figure 6). Five of the larger Canadian-based companies planned exploration programs in Mexico in 2002. These companies were expected to spend, in total, about $7 million there.

Gammon Lake Resources Inc. planned to spend $5 million at the Ocampo gold-silver project in the state of Chihuahua. A preliminary study, completed in April 2002, estimated the cost of building a combined open-pit and underground mine at Ocampo at US$39 million. The mine would produce 120 000 oz of gold and 5.3 million oz of silver annually over a period of more than eight years. Measured and indicated resources at Ocampo are estimated at 21.7 Mt grading 1.44 g/t gold and 57 g/t silver.

In 2002, Teck Cominco budgeted $3.9 million for Mexico. The company planned to spend $0.6 million to further evaluate the San Nicholas polymetallic deposit located in the state of Zacatecas. Towards the end of 2001, the company completed a feasibility study that estimated the capital cost of building a 15 000-t/d open-pit mine at San Nicholas at almost US$246 million. Resources included in the mine plan are estimated at 65 Mt grading 1.32% copper, 2.04% zinc, 0.53 g/t gold and 32.1 g/t silver. However, San Nicholas is unlikely to produce until metal prices improve significantly.

Teck Cominco also planned to spend $0.4 million to further assess the Los Filos deposit located in the state of Guerrero. Los Filos contains measured, indicated and inferred resources estimated at 28 Mt grading 2.02 g/t gold. The company also planned to spend a further $1.7 million on the Morelos North gold project located in proximity to Los Filos.

Mexico is one of the countries where the smaller Canadian companies are spending roughly as much on mineral exploration as their larger Canadian counterparts. At the end of 2002, companies of all sizes listed on Canadian stock exchanges held interests in almost 250 mineral properties in Mexico, about the same as in 2001.[10]

South America

In 2002, the larger-company mineral exploration market in South America was valued at over $475 million, or more than 20% of the $2.1 billion larger-company market worldwide.

Twelve of the larger Canadian-based companies planned to spend, in total, over $150 million in the region, about the same as in the previous year. Their programs accounted for 30% of all mineral exploration activity in South America. Canadian companies held the dominant share of the mineral exploration market in Peru, Chile and Argentina. These countries rank second, fifth and seventh, respectively, in terms of countries where Canadian companies are the most active in mineral exploration (Figure 6).

Barrick is among the largest investors in mineral exploration in South America. In 2002, Barrick was expected to spend almost $58 million in Peru, more than $21 million in Argentina, and more than $18 million in Chile.

Barrick's program for Peru was the largest for the country, accounting for almost 40% of all larger-company exploration programs expected there in 2002. The company planned to spend most of its budget for Peru at the Alto Chicama gold deposit that was discovered in April 2002 and where proven and probable oxide reserves are estimated at 121 Mt grading 0.054 oz/t gold. The capital cost of building a 500 000-oz/y mine at Alto Chicama is estimated in the range of US$300 million to US$350 million. The company planned to complete a feasibility study during 2003. Alta Chicama is expected to start producing gold in 2005.

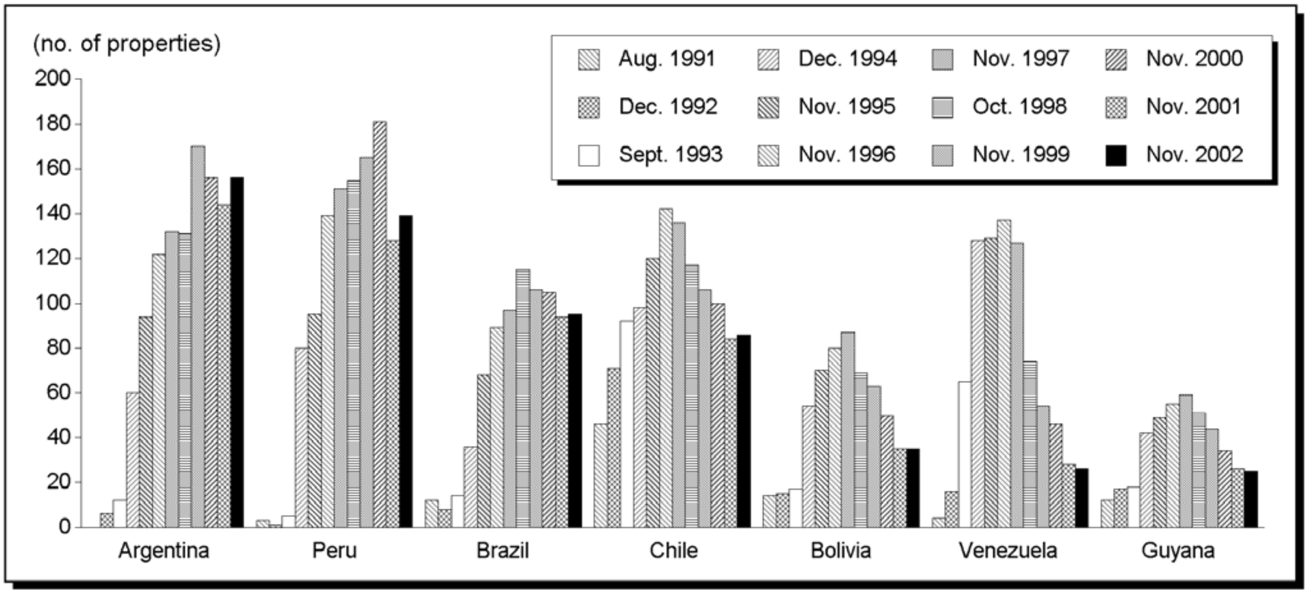
As in the case of Peru, Barrick's program for Argentina was also the largest planned for that country, accounting for almost 40% of all exploration activity expected there in 2002. Barrick's program for Chile was the second largest for that country, representing roughly 20% of all activity planned there during the year. Barrick is spending most of its exploration budget for Argentina and Chile on the Pascua-Lama deposit, which straddles the border of both countries, and at the nearby Veladero deposit in Argentina.

At Pascua-Lama, the capital cost of building an 800 000-oz/y open-pit gold mine has been estimated at roughly US$1.2 billion. Proven and probable resources there are estimated at 296 Mt grading 0.057 oz/t gold. Pascua-Lama is expected to start producing gold in 2008.

At Veladero, a feasibility study completed in the third quarter of 2002 estimated the cost of building a 530 000-oz/y gold mine that would produce for a period of 13 years at US$425 million. Proven and probable resources are estimated at 254 Mt grading 0.037 oz/t gold. Production is expected to start in 2006.

At the end of 2002, companies of all sizes listed on Canadian stock exchanges held interests in over 600 mineral properties throughout South America, about the same as in the previous year. They held more than 150 properties in Argentina, almost 140 in Peru, more than 75 in each of Brazil and Chile, about 30 in Bolivia, and about 25 in each of Venezuela, Guyana and Ecuador (Figure 11).

Figure 11
Canadian Mineral Property Portfolio in South America, 1991-2002 – Countries Accounting for 90% of Canadian Holdings in 2002
Companies of All Sizes Listed on Canadian Stock Exchanges



Source: Natural Resources Canada, based on *MIN-MET CANADA* for 1991-97 and InfoMine db for 1998-2002, Robertson Info-Data Inc., Vancouver, British Columbia, and used under licence.

Central America

In 2002, the larger-company mineral exploration market in Central America was valued at roughly $6 million, or less than 1% of the $2.1 billion larger-company market worldwide. None of the larger Canadian-based companies reported exploration programs in the region.

However, Central America is one of the regions of the world where the smaller companies dominate mineral exploration. In 2002, the smaller Canadian-based companies were expected to undertake more than 80% of the $13 million smaller-company exploration programs planned for the region.

At the end of 2002, companies of all sizes listed on Canadian stock exchanges held interests in about 80 mineral properties throughout Central America. They held 15 or more in each of Guatemala, Honduras and Panama (Figure 12).

Caribbean

In 2002, the larger-company mineral exploration market in the Caribbean was valued at about $0.2 million, or less than 1% of the $2.1 billion larger-company market worldwide.

None of the larger Canadian-based companies reported exploration programs for the Caribbean. However, as was the case in Central America, the smaller Canadian-based companies dominated mineral exploration in the Caribbean during 2002.

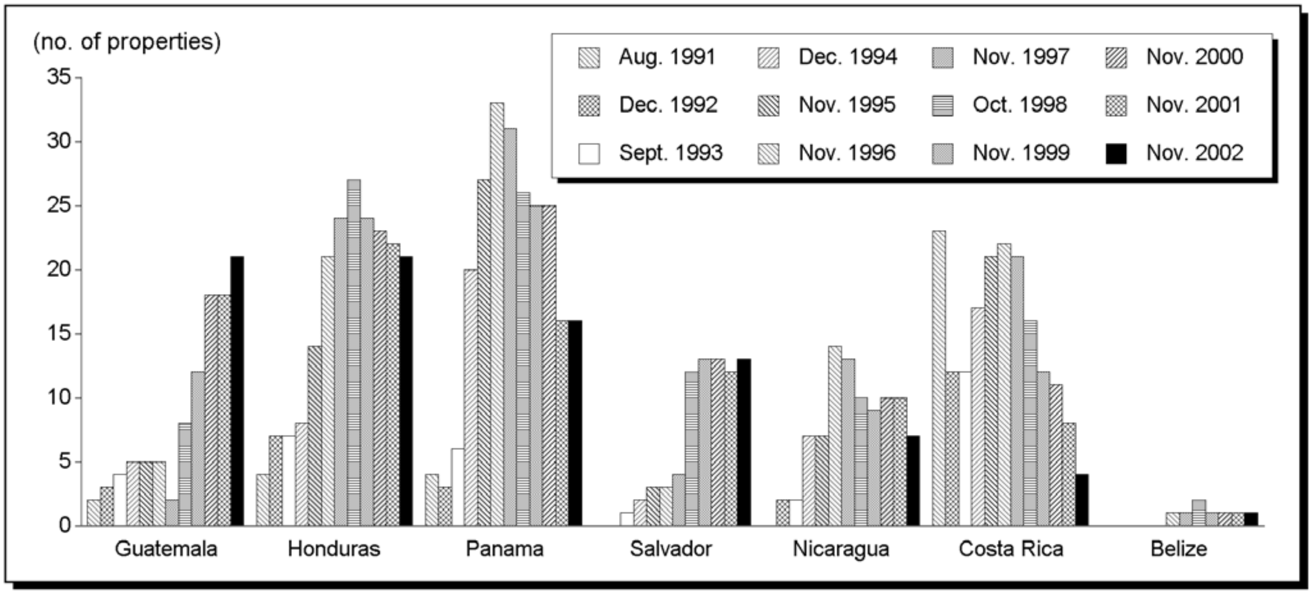
At the end of 2002, companies of all sizes listed on Canadian stock exchanges held interests in roughly 40 mineral properties in the Caribbean, most of them in the Dominican Republic.

Europe and the Former Soviet Union

In 2002, the larger-company mineral exploration market in Europe and the former Soviet Union (FSU) was valued at $190 million (Figure 4), or almost 9% of the $2.1 billion larger-company market worldwide. The market for exploration in the region apparently grew by $55 million compared with 2001, but this was due in large part to information on activity in the region that became available for the first time in 2002.

The larger Canadian-based companies planned to spend $40 million in the region, equivalent to roughly 20% of the market. The value of Canadian programs in 2002 was $10 million less than in 2001.

Figure 12
Canadian Mineral Property Portfolio in Central America, 1991-2002
Companies of All Sizes Listed on Canadian Stock Exchanges



Source: Natural Resources Canada, based on *MIN-MET CANADA* for 1991-97 and InfoMine db for 1998-2002, Robertson Info-Data Inc., Vancouver, British Columbia, and used under licence.

At the end of 2002, companies of all sizes listed on Canadian stock exchanges held interests in 200 mineral properties in Europe and the FSU (Figure 3), about the same as in 2001.

Western Europe

In 2002, the larger-company mineral exploration market in western Europe was valued at almost $80 million, or roughly 4% of the $2.1 billion larger-company market worldwide. The market in the region grew by $15 million compared with the previous year. The larger Canadian-based companies planned to spend almost $18 million in western Europe, equivalent to more than 10% of the market. Canadians were expected to carry out all of the exploration programs planned for Greenland and Norway.

In Greenland, Crew Development Corporation planned to spend $7 million on advanced exploration at the Nalunaq high-grade, narrow-vein gold deposit. A feasibility study, completed in August 2002, estimated the cost of a 94 000-oz/y underground mine that would produce over a period of about four years at US$9.7 million. Measured and indicated resources at Nalunaq are estimated at 483 900 t grading 25.5 g/t gold. Nalunaq will be the first new mine in Greenland in over 30 years and the first-ever gold mine in that country. Construction was scheduled to begin in May 2003.

In Norway, Falconbridge Limited planned to spend about $0.15 million on grass-roots exploration for base metals.

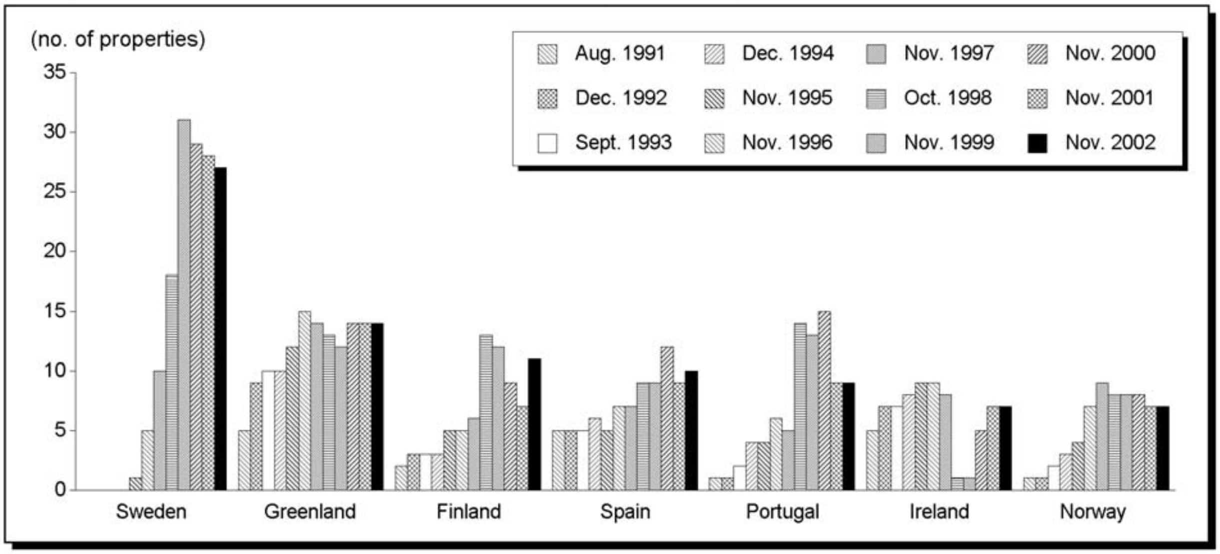
At the end of 2002, companies of all sizes listed on Canadian stock exchanges held interests in more than 90 mineral properties in western Europe. They held roughly 30 in Sweden, 15 in Greenland, and 10 in each of Portugal and Spain (Figure 13).

Eastern Europe

In 2002, the larger-company mineral exploration market in eastern Europe was valued at $21 million, or roughly 1% of the $2.1 billion larger-company market worldwide. The larger Canadian-based companies planned to spend $9 million in eastern Europe, equivalent to about 40% of the market. Canadian-based companies held the dominant share of the market in Romania.

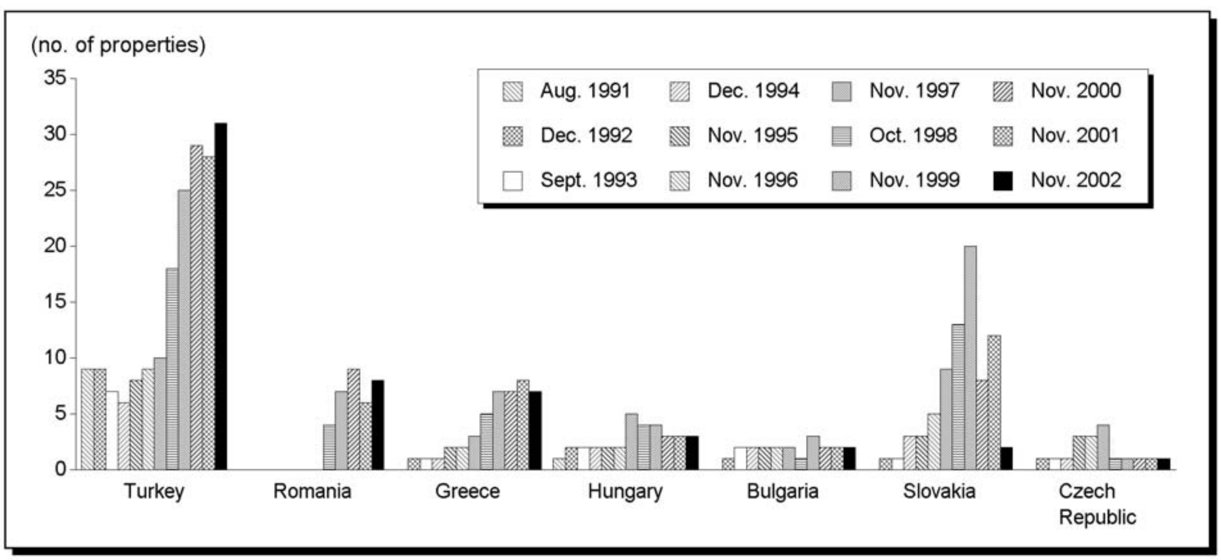
In Romania, Gabriel Resources Limited planned to spend $6 million on grass-roots exploration for gold. In addition, based on previous exploration and other results, Gabriel planned to start construction in late 2004 of a 13-Mt/y conventional open-pit mine at Rosia Montana. The capital cost of that mine, which is expected to produce 533 000 oz of gold annually over a period of some 16 years, is estimated at US$437 million. Proven and

Figure 13
Canadian Mineral Property Portfolio in Western Europe, 1991-2002 – Countries Accounting for 90% of Canadian Holdings in 2002
Companies of All Sizes Listed on Canadian Stock Exchanges



Source: Natural Resources Canada, based on *MIN-MET CANADA* for 1991-97 and InfoMine db for 1998-2002, Robertson Info-Data Inc., Vancouver, British Columbia, and used under licence.

Figure 14
Canadian Mineral Property Portfolio in Eastern Europe, 1991-2002 – Countries with Canadian Holdings in 2002
Companies of All Sizes Listed on Canadian Stock Exchanges



Source: Natural Resources Canada, based on *MIN-MET CANADA* for 1991-97 and InfoMine db for 1998-2002, Robertson Info-Data Inc., Vancouver, British Columbia, and used under licence.

probable reserves at Rosia Montana are estimated at 218 Mt grading 1.52 g/t gold and 7.5 g/t silver. Production is expected to start in mid-2006.

At the end of 2002, companies of all sizes listed on Canadian stock exchanges held interests in 55 mineral properties in eastern Europe. They held more than 30 in Turkey and roughly 10 in each of Romania and Greece (Figure 14).

Former Soviet Union

In 2002, the larger-company mineral exploration market in the countries of the FSU was valued at more than $80 million,[11] or roughly 4% of the $2.1 billion larger-company market worldwide. The larger Canadian-based companies planned to spend $24 million in the FSU, 60% more than in 2001.

The larger-company market for mineral exploration in the FSU apparently grew by more than $40 million in 2002 compared with 2001. This apparent increase occurred largely because Russian-based Alrosa Diamond disclosed its annual exploration budget for the first time in 2002. The exploration budget of this company, all of which was destined for Russia, was estimated at over $50 million.

Russia is the country of the FSU where the larger Canadian-based companies planned to undertake most of their exploration programs in 2002. They were expected to spend $24 million there, equivalent to 30% of the market.

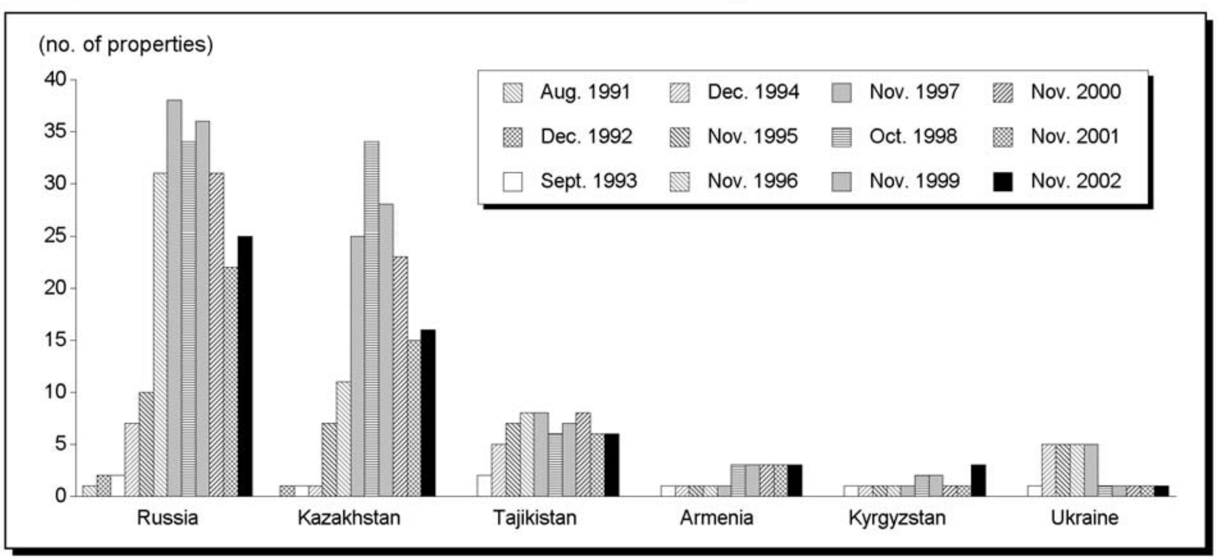
High River Gold Mines Ltd. planned to spend $7 million in Russia, roughly 80% of it to increase reserves at the Zun-Holba and at the Irokinda gold mines in Siberia. Archangel Diamond Corporation planned to spend $4.8 million on advanced exploration at the Grib diamond pipe. Bema Gold Corporation planned to spend $4.4 million on exploration for gold and silver at the Julietta underground mine and at other locations in the country. Kinross planned to spend most of its $3.6 million budget for Russia at the Birkachan gold deposit. That deposit is expected to provide additional ore to the company's processing plant located at the nearby Kubaka open-pit gold-silver mine where reserves are expected to be depleted by year-end 2003.

At the end of 2002, companies of all sizes listed on Canadian stock exchanges held interests in over 50 mineral properties in six countries of the FSU (Figure 15), about the same as in the previous year. The number of properties held in Russia stood at 25.

Africa and the Middle East

In 2002, the larger-company mineral exploration market in Africa and the Middle East was valued at more than

Figure 15
Canadian Mineral Property Portfolio in the Former Soviet Union, 1991-2002 – Countries with Canadian Holdings in 2002
Companies of all Sizes Listed on Canadian Stock Exchanges



Source: Natural Resources Canada, based on *MIN-MET CANADA* for 1991-97 and InfoMine db for 1998-2002, Robertson Info-Data Inc., Vancouver, British Columbia, and used under licence.

$330 million (Figure 4), or more than 15% of the $2.1 billion larger-company market worldwide. Africa accounts for almost all of the mineral exploration market in the region.

Africa

In 2002, the larger-company mineral exploration market in Africa was valued at over $325 million, or more than 15% of the $2.1 billion larger-company market worldwide. The larger Canadian-based companies planned to spend more than $50 million in Africa, equivalent to over 15% of the market on that continent.

In 2002, Barrick was expected to spend $25 million looking for gold in Tanzania. Barrick's exploration program for Tanzania was the largest one in all of Africa. Tanzania ranks sixth in the world in terms of countries where Canadian companies are the most active in mineral exploration (Figure 6).

Barrick planned to spend $14 million of its budget for Tanzania to further assess the economic potential of the Tulawaka gold deposit. At year-end 2002, the company was completing a feasibility study for an open-pit mine there. A production decision for Tulawaka was expected in mid-2003.

At the end of 2002, companies of all sizes listed on Canadian stock exchanges held interests in over 530 mineral properties in 35 countries on the African continent, roughly the same number as at the end of the previous year. Canadian companies held interests in 80 properties in South Africa, more than 40 in each of Burkina Faso, Ghana and Tanzania, and more than 30 in each of Mali and Zimbabwe (Figure 16).

Middle East

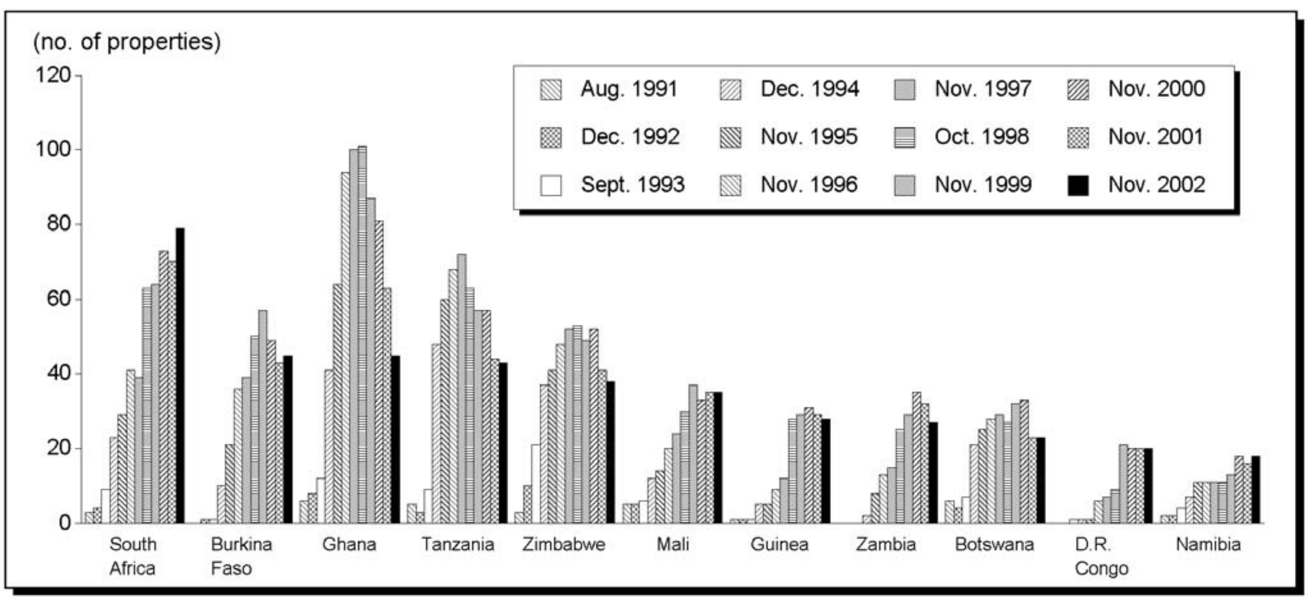
In 2002, the larger-company mineral exploration market in the Middle East was valued at roughly $7 million. The larger Canadian-based companies planned to spend $0.2 million there, equivalent to 2% of the market in the region.

Asia-Pacific

In 2002, the larger-company mineral exploration market in Asia-Pacific was valued at $490 million (Figure 4), or roughly one quarter of the $2.1 billion larger-company market worldwide. The value of exploration programs in the region in 2002 was $130 million less than in 2001.

The larger Canadian-based companies planned to spend $111 million in the Asia-Pacific region, equivalent to over

Figure 16
Canadian Mineral Property Portfolio in Africa, 1991-2002 – Countries Accounting for 75% of Holdings in 2002
Companies of All Sizes Listed on Canadian Stock Exchanges



Source: Natural Resources Canada, based on *MIN-MET CANADA* for 1991-97 and InfoMine db for 1998-2002, Robertson Info-Data Inc., Vancouver, British Columbia, and used under licence.

23% of the market. Even though their budgets for Asia-Pacific in 2002 were maintained at the same level as in 2001, their share of the market increased by about 5%.

At the end of 2002, companies of all sizes listed on Canadian stock exchanges held interests in 350 mineral properties in Asia-Pacific (Figure 3), the same number they held at the end of the previous year.

Southeast Asia

In 2002, the larger-company mineral exploration market in Southeast Asia was valued at almost $70 million, or slightly more than 3% of the $2.1 billion larger-company market worldwide. Exploration budgets for the region were down by $65 million compared with those of the previous year. In Indonesia alone, exploration programs were expected to be reduced by more than $35 million.

The larger Canadian-based companies planned to spend $12 million in the region, equivalent to more than 16% of the market there. Canadian budgets for individual countries were relatively small and no single company planned to spend much more than $4 million in any single country.

In Indonesia, Placer Dome planned to spend $4 million on grass-roots exploration for gold. In Papua New Guinea, the company planned to spend roughly $2 million to increase reserves at the Porgera open-pit gold mine. In Myanmar, Ivanhoe Mines Ltd. planned to spend $0.8 million on grass-roots exploration for gold and copper. In Vietnam, Falconbridge planned to spend $0.9 million at the Ta Khoa nickel-copper-cobalt project, which includes the Ban Phuc nickel-copper deposit, and Tiberon Minerals Ltd. continued to assess the Nui Phoa tungsten-fluorite-copper-gold-bismuth deposit.

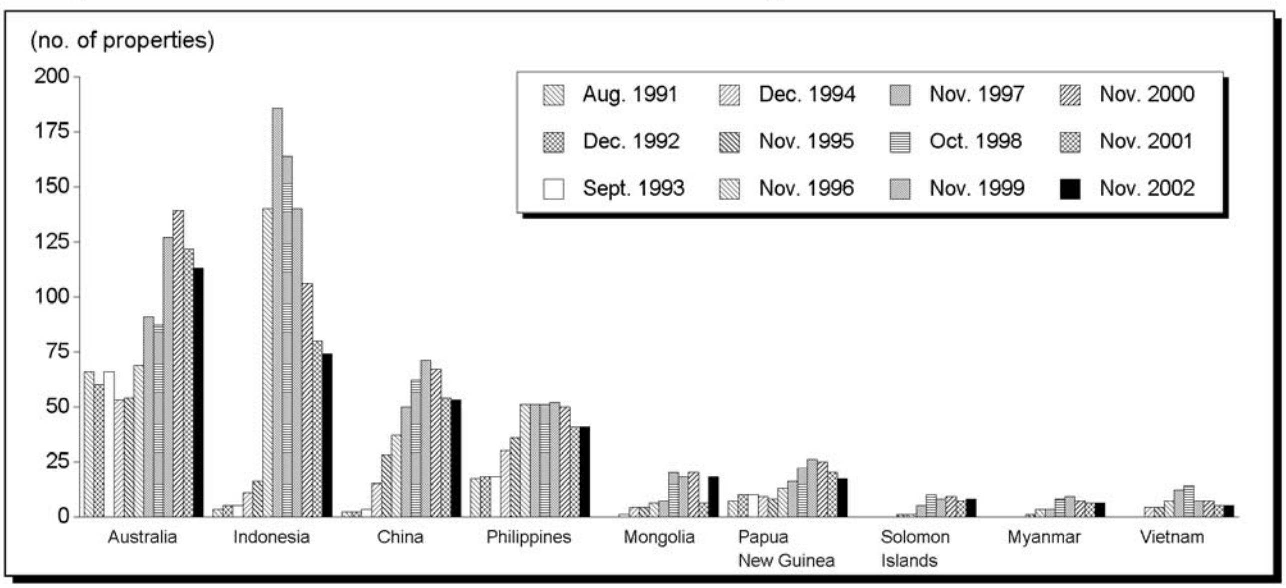
At the end of 2002, companies of all sizes listed on Canadian stock exchanges held interests in almost 150 mineral properties in Southeast Asia, about the same as in the previous year. They held about 70 properties in Indonesia and more than 40 in the Philippines (Figure 17).

East Asia

In 2002, the larger-company mineral exploration market in east Asia, which includes China, Japan, Mongolia and South Korea, was valued at $38 million,[11] or almost 2% of the $2.1 billion larger-company market worldwide. The larger Canadian-based companies planned to spend over $20 million in the region, equivalent to more than 60% of the market.

Since the early 1990s, there has been considerable Canadian interest in the mineral potential of China and in the

Figure 17
Canadian Mineral Property Portfolio in Asia-Pacific, 1991-2002 – Countries Accounting for 95% of Canadian Holdings in 2002
Companies of All Sizes Listed on Canadian Stock Exchanges



Source: Natural Resources Canada, based on *MIN-MET CANADA* for 1991-97 and InfoMine db for 1998-2002, Robertson Info-Data Inc., Vancouver, British Columbia, and used under licence.

significant growth in demand expected to occur there for many mineral commodities.

In 2002, Placer Dome, Falconbridge and Inco Limited planned exploration programs in China. Placer Dome, which reported the largest Canadian exploration budget for China, planned to spend $2 million on grass-roots exploration for gold in that country. In late 2002, companies of all sizes listed on Canadian stock exchanges held interests in over 50 mineral properties in China (Figure 17).

In Mongolia, Ivanhoe planned to spend almost $16 million on exploration for gold and base metals, about 60% of it at the Oyu Tolgoi (Turquoise Hill) deposit. Cameco Corporation planned to spend over $4 million on advanced exploration for gold in Mongolia. Cameco is also building a US$40 million open-pit gold mine at Boroo in that country. In South Korea, Ivanhoe planned to spend about $1.5 million on grass-roots exploration for gold and copper.

South Pacific

In 2002, the larger-company mineral exploration market in the South Pacific was valued at $368 million, or more than 17% of the $2.1 billion larger-company market worldwide. Although there were increases in some countries, budgets for the region were down by $72 million, or by 16% compared with those of the previous year. Activity in Australia alone was expected to decrease by over $80 million, which represents the largest reduction in activity anywhere in the world for a single country from 2001 to 2002.

The larger Canadian-based companies planned to spend $76 million in the South Pacific, equivalent to over 20% of the market in the region. Australia and New Caledonia rank fourth and ninth, respectively, in terms of countries where Canadian companies are the most active in mineral exploration (Figure 6).

In New Caledonia, Falconbridge planned to spend over $20 million for advanced exploration at the Koniambo lateritic nickel deposit. The company's budget for Koniambo in 2002 was among the largest for a single Canadian project abroad. Measured and indicated resources at Koniambo are estimated at 121 Mt grading 2.15% nickel and 0.06% cobalt. A pre-feasibility study for a 60 000-t/y ferronickel plant at Koniambo was completed in the second half of 2002 and a feasibility study was expected to begin in the third quarter of 2003.

In December 2002, Inco announced that it was undertaking a comprehensive review of its Goro project, also in New Caledonia, for which earlier estimates of capital costs were expected to escalate by as much as 45%. The company planned to complete that review in mid-2003. Inco had previously announced that it planned to build a US$1.45 billion open-pit mine and processing plant that would use hydro-metallurgical and solvent-extraction processes. Goro would have a capacity of 55 000 t/y of nickel and 4500 t/y of cobalt. As of the end of 2002, Inco had spent, in total, roughly US$350 million assessing the viability of the Goro project.

During 2002, Placer Dome acquired Australian-based AurionGold Limited.[12] As a result, Placer Dome became not only the second largest gold producer in Australia, but its exploration budget for the country grew to more than $30 million. The combined budgets of Placer Dome and AurionGold represent one of the largest exploration programs for a single country. As a result of its acquisition of AurionGold, Placer Dome added three new gold mining operations to its assets in Australia: Henty, Kanowna Belle and Kalgoorlie West. The latter includes the Kundana and Paddington mills, the Kundana mine, 51% of the East Kundana mine, and 49% of the Mungari West mine. Also as a result of its acquisition of AurionGold, Placer Dome increased its share of the Granny Smith gold mine to 100%.

Also in Australia, Barrick was expected to spend roughly $5.5 million on exploration in the vicinity of the Plutonic gold mine and at other locations in the country.

At the end of 2002, companies of all sizes listed on Canadian stock exchanges held interests in almost 130 properties in the South Pacific, of which roughly 90% were located in Australia (Figure 17).

South Asia

In 2002, the larger-company mineral exploration market in South Asia, which includes India, Pakistan and Sri Lanka, was valued at about $16 million, or less than 1% of the $2.1 billion larger-company market worldwide. The larger Canadian-based companies reported no exploration programs for that region of the world in 2002.

SUMMARY AND OUTLOOK

In 2002, the larger Canadian-based companies planned to conduct mineral exploration programs valued at almost $675 million in Canada and elsewhere around the world. As a result, Canadians were expected to undertake 32% of the $2.1 billion in exploration programs planned that year by all of the world's larger companies. The share of the global mineral exploration market controlled by Canadian companies is the largest, by far; it is about twice as large as the share controlled by companies based in Africa or in Australia.

Almost 16% of the world's larger-company mineral exploration activities was expected to occur in Canada in 2002, somewhat more than in 2001. Canada became, during 2002, the country where the world's companies are the most active in mineral exploration. During the 10-year period from 1992 to 2001, the world's mining companies had spent more on mineral exploration in Australia than in any other country.

During 2002, and for the third year in a row, Canadian exploration programs for Canada were larger than those they planned for all of Latin America. Canadian companies were expected to carry out the largest share of exploration programs, not only in this country, but also in the United States, eastern Europe, and East Asia. They planned to undertake almost as much exploration in South America as all of the companies based in that region of the world combined. Although Canadian companies have diversified their portfolio of mining interests to well over 100 countries, Canada remains the country where they continue to be, by far, the most active in mineral exploration.

Mineral commodity prices have remained relatively low. This affects the amount of profits that producers can reinvest in mineral exploration. Companies with exploration funds are focussing their efforts on their most promising assets. For many of the smaller companies, financing exploration projects continues to be difficult and, as a result, many of them are inactive.

The larger-company exploration market is becoming increasingly concentrated. The number of companies spending the equivalent of US$3 million per year on exploration (C$4.7 million in 2002) has decreased significantly since the late 1990s when financing was readily available. In the case of Canadian companies, the number of larger companies has fallen from an all-time high of 141 in 1997 to fewer than 40 in 2002.

Transnational mergers and acquisitions have become a frequent occurrence in the mining industry. As a result, the industry is becoming increasingly more globalized in its operations. In Canada, the share of the mineral exploration market controlled by foreign companies has grown from 20% in 1992 to slightly more than 30% in 2002.

Although Canadian companies tend, on average, to have smaller exploration budgets than their competitors, they are considerably more numerous than companies based elsewhere. As a result, Canadians are likely to continue, for the near future at least, to dominate mineral exploration worldwide.

REFERENCES

1 All currencies in this review are expressed in Canadian dollars unless indicated otherwise.

2 Most of the statistical data on the larger-company mineral exploration market worldwide are based on *Corporate Exploration Strategies: A Worldwide Analysis*, published annually by Metals Economics Group, Halifax, Nova Scotia (tel. [902] 429-2880). The information on specific projects is based on company reports.

3 Keith Brewer and André Lemieux, *Canada's Global Position in Mining - Canadian Financing of the International Mining Industry*, Metals Finance 4th International Conference, Toronto, May 7-9, 1997, Natural Resources Canada, Ottawa, 53 pp. (tel. [613] 995-4577).

4 For more information on various aspects of the relationship between exploration budgets and exploration expenditures for the larger Canadian-based companies, see André Lemieux, "Canada's Global Mining Presence," in the 1998 edition of the *Canadian Minerals Yearbook*, Natural Resources Canada, Ottawa, pp. 7.1 and 7.2 (www.nrcan.gc.ca/mms/cmy/content/1998/08.pdf).

See also André Lemieux, "Canada's Global Mining Presence," in the 1999 edition of the *Canadian Minerals Yearbook*, Natural Resources Canada, Ottawa, pp. 7.1 and 7.3 (www.nrcan.gc.ca/mms/cmy/content/08.pdf).

5 Most of the data for 1991 through 1997 on the mineral property portfolio of companies of all sizes listed on Canadian stock exchanges are derived from MIN-MET CANADA; for 1998 through 2002, they are derived from InfoMine db. These databases are products of Robertson Info-Data Inc. of Vancouver, British Columbia (tel. [604] 683-2037).

6 For trends in mineral deposit appraisal activity in Canada over the interval 1982-97, and for a list of projects at the deposit appraisal stage in the late 1990s, see André Lemieux, "Canada's Global Mining Presence," in the 1996 edition of the *Canadian Minerals Yearbook*, Natural Resources Canada, Ottawa, pp. 8.9 and 8.11-8.22 (www.nrcan.gc.ca/mms/cmy/content/1996/08.pdf).

7 For a list of mines, smelters, refineries and other advanced mineral development projects in which companies based in Canada had an interest in mid-2001, see André Lemieux, "Canada's Global Mining Presence," in the 2000 edition of the *Canadian Minerals Yearbook*, Natural Resources Canada, Ottawa, pp. 7.16-7.19 (www.nrcan.gc.ca/mms/cmy/content/08.pdf).

8 "Project Investment Survey 2003," *Engineering & Mining Journal*, January 2003, pp. 28-34.

9 For a discussion of the global market for mining goods and services and the role played by Canadian companies, see André Lemieux, *Canadian Suppliers of Mining Goods and Services: Links Between Canadian Mining Companies and Selected Sectors of the Canadian Economy*, Natural Resources Canada, Ottawa, September 2000, 84 pp. (www.nrcan.gc.ca/mms/pdf/minegs_e.pdf).

10 For the geographic distribution of mineral properties in which Canadian companies have an interest in the United States and in Mexico, see André Lemieux, "Canada's Global Mining Presence," in the 2000 edition of the *Canadian Minerals Yearbook*, Natural Resources Canada, Ottawa, pp. 7.5 and 7.7 (www.nrcan.gc.ca/mms/cmy/content/08.pdf).

11 The size of the mineral exploration market in certain regions of the world is underestimated because there are few data available on the extent of exploration programs undertaken by some private enterprises or state agencies.

12 Vancouver-based Placer Dome Inc. acquired Australian-based AurionGold Limited in October, 2002. The exploration budget of Placer Dome discussed in this review refers to the combined budgets of the two merged companies.

Notes: (1) Information in this review was current as at August 2003. (2) This and other reviews, including previous editions, are available on the Internet at www.nrcan.gc.ca/mms/cmy/2002CMY_e.htm.

Note to Readers

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