



# 2011 Minerals Yearbook

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## NEW ZEALAND

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# THE MINERAL INDUSTRY OF NEW ZEALAND

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The economy of New Zealand continued to grow at a modest rate in 2011, and the gross domestic product (GDP) increased by 1.8%. The earthquakes that struck Canterbury in late 2010 and early 2011 had an adverse effect on the country's economy. The earthquakes caused substantial physical damage to the town, and the cost of reconstruction was estimated to be \$20 billion. Reconstruction activities started in late 2011 and would continue during the next several years. New Zealand's trading partners were mainly Australia and other countries in the Asia and the Pacific region. Although the slow economic growth in the European Union had only a limited direct effect on New Zealand's exports, the deteriorating economic conditions in Europe affected the economies of New Zealand's trading partners in the Asia and the Pacific region. New Zealand's economy was expected to grow at a modest pace during the next 2 years (Reserve Bank of New Zealand, 2012, p. 22).

The output of the mineral industry of New Zealand was small compared with that of its neighboring country Australia. New Zealand had metallic mineral occurrences of antimony, bauxite, beryllium, chromium, copper, gallium, gold, iron, lead, lithium, magnesite, manganese, mercury, molybdenum, nickel, platinum-group metals, rare earths, silver, tin, titanium, tungsten, uranium, and zinc. Of these metallic minerals, only gold, iron, and silver were produced. Bentonite, clay, diatomite, dolomite, limestone, perlite, phosphate rock, pumice, salt, silica, building and dimension stone, sulfur, and zeolites had also been discovered in the country (table 1).

New Zealand's total trade increased by 10.4% to NZ\$92.2 billion (US\$73.8 billion) in 2011. Exports were valued at NZ\$47.7 billion (US\$38.2 billion), which was an increase of 9.6% from the value in 2010. Imports were valued at NZ\$44.5 billion (US\$35.6 billion). Australia continued to be New Zealand's leading export destination, accounting for 22.7% of total exports. China replaced the United States as New Zealand's second ranked export market, receiving 12.3% of New Zealand's exports, followed by the United States, 8.4%; Japan, 7.2%; and the Republic of Korea, 3.5%. China replaced Australia as New Zealand's leading source of imports, supplying 15.9% of New Zealand's imports, followed by Australia, 15.7%; the United States, 10.7%; Japan, 6.2%; and Singapore, 4.6%. Crude oil accounted for 4.7% of the country's total export value, and aluminum and its products accounted for 1.8%. Crude oil and oil products were New Zealand's most valuable imported commodities, accounting for 9.6% of the country's total import value. Because it had no alumina refinery, the country imported alumina from Australia for its aluminum production, and alumina imports accounted for 0.7% of the country's total import value (Statistics New Zealand, 2012a, p. 12–22).

## Government Policies and Programs

The New Zealand Government expressed its commitment to combating climate change and reducing greenhouse gas

emissions in the country under the Kyoto Protocol. One recent policy change was the Government's amendment in 2010 of the New Zealand Standard NZS 3122:2009, Specification for Portland and Blended Cements (General and Special Purpose); this amendment increases the allowable mineral additions to 10% from 5%, and thus enables the clinker factor of general purpose cement to be reduced. This change could reduce carbon dioxide emissions from cement production by 15,000 t/yr.

## Minerals in the National Economy

New Zealand's mineral resources were dominated by aggregate and gold, which together accounted for 80% of the total value of New Zealand's mineral resources. Gold, iron sand, and silver were major metallic commodities that made a significant contribution to New Zealand's economy. Production of other metallic minerals, such as bauxite, copper, lead, and zinc, could potentially be economically feasible if technologies and prices become favorable. Excluding the petroleum industry, the value of New Zealand's mining sector accounted for less than 1% of the GDP. The total value of New Zealand's minerals and mineral fuel production accounted for about 2% of the GDP (Statistics New Zealand, 2012b, p. 2).

## Production

New Zealand's economy was constrained as a result of a slowdown in household spending that led to reduced activity in the manufacturing and retail sectors. Manufacturing sales fell by 7.1%, driven largely by the decrease in the price of oil. Activity in the construction sector decreased by about 10% in 2011. Production of such mineral commodities as kaolin and pumice increased by more than 10% compared with that of 2010. Mineral commodities for which production decreased significantly included bentonite, coal, dimension stone, dolomite, perlite, crude petroleum, sand and gravel, and silver. Data on mineral production are in table 1.

## Structure of the Mineral Industry

Table 2 is a list of major mineral industry facilities in New Zealand.

## Commodity Review

### Metals

**Aluminum.**—New Zealand Aluminum Smelters Ltd. was the sole primary aluminum producer in New Zealand. In October, Rio Tinto Ltd. of Australia announced that New Zealand Aluminum had been placed under a newly established company, Pacific Aluminum. Pacific Aluminum held a 79.36% share of New Zealand Aluminum, and Japan's Sumitomo Chemical Co. held the remaining 20.64% share. In 2011, New Zealand

Aluminum completed the replacement of all transformers at its reduction line at the Tiwai Point smelter to increase the power delivery level. Aluminum production increased to 354,029 metric tons (t) in 2011 from 343,335 t in 2010. The smelter emitted a large amount of carbon dioxide—1.87 metric tons per metric ton of aluminum metal produced, which is calculated as carbon consumption (anodes) plus anode production plus fuel usage plus perfluorocarbon generation. In line with the Government's plan to reduce greenhouse gas emissions, the company planned to reduce its carbon dioxide emissions in the future. New Zealand Aluminum exported 90% of its aluminum output, mainly to Japan (Rio Tinto Ltd., 2011).

**Gold.**—New Zealand's gold production was mainly from the Waihi area in the North Island and from the Otago region and along the west coast on the South Island. Hard rock gold mines were mined by Newmont Mining Corp. of the United States on the North Island and OceanaGold Corp. of Australia in the South Island. Newmont Waihi Gold, which was a subsidiary of Newmont Mining, mined the Favona, the Martha, and the Trio Mines in and around Waihi. The mine at Favona was scheduled to be closed later in the year, but mining at the Martha Mine was continuing. The company had received approval from the Government to mine Trio at the end of 2010. The Trio ore bodies were situated between the Martha and the Favona Mines and would be accessed from the Favona portal. Newmont Waihi planned to mine at the deepest level and to work up towards the surface. Mining at Trio was scheduled to begin at the end of 2014. Mined ore from all three mines was being processed at the Martha plant and passed through a series of electrowinning cells where gold and silver were deposited on stainless steel cathode and then put into a furnace. The molten material was poured into a cascade of molds to form dore bullion bars, which were composed of about 10% to 25% gold and 75% to 90% silver. The dore was refined at the Grand Junction refinery (Newmont Mining Corp., 2012, p. 2–10).

OceanaGold's Macraes gold projects in New Zealand included the Macraes open pit mine and the Frasers underground mine on the east coast of the South Island, and the Reefton open pit mine and a 1-million-metric-ton-per-year (Mt/yr) processing plant on the west coast of the South Island. The concentrate from both operations was sent by rail to the Macraes pressure oxidation facility for final processing. The company had estimated that the Macraes and the Reefton operations would be closed in 2019; however, after further exploration at both the Macraes and the Reefton areas, gold resources were increased by 14%, and the company applied to the Otago Regional Council and the Waitaki District Council to extend its mine life permit at Macraes to 2020. In 2011, OceanaGold produced a total of 7.85 t (252,499 troy ounces) of gold from the Macraes and the Reefton Mines (Gold and Minerals Gazette, 2011; OceanaGold Corp., 2012, p. 12).

New Zealand's gold placer mining operations were located mainly on the west coast of the South Island and in the Otago and Southland regions. Waikaia Gold Ltd. received approval from the Government to establish an alluvial gold mining operation on the floodplain of the Waikaia River. The proposed mine path at Waikaia River was about 5 kilometers upstream of the Pyramid Waiparu Road Bridge. The total area of the proposed

mine was 5.6 million cubic meters containing indicated and inferred resources of 4.6 t (148,000 troy ounces) of gold. The company planned to mine up to 622 kg (20,000 troy ounces) for 8 years (Waikaia Gold Ltd., 2011, p. 5–10).

L&M Group started its alluvial mining operation at Bannockburn in Otago. The mining area covered 150 hectares (1.5 square kilometers), and the total gold resource was about 3.1 t (100,000 troy ounces). The company received a permit to mine in July 2004; the permit would expire in 2016 (L&M Group, 2011, p. 5).

**Iron Ore and Iron and Steel.**—New Zealand's iron ore deposits are iron sands, which are placer deposits formed from the erosion of andesitic and rhyolitic volcanic rocks. These iron sands occur in onshore dunes and beaches and in offshore marine sands along the coastline from Kaipara Harbor south to Wanganui on the west coast of the North Island. Iron sand concentrate from Taharoa, which contained about 57% iron, was exported to other countries in the Asia and the Pacific region. Iron sand from the Waikato North Head site was pumped to the Glenbrook steel plant of New Zealand Steel Ltd. (a subsidiary of BlueScope Steel Ltd. of Australia) by way of an 18-km-long underground pipe. The Glenbrook steel plant, which was the sole integrated steel producer in the country, had an output capacity of 650,000 metric tons per year (t/yr).

The Government granted Trans-Tasman Resources Ltd. an exploration license to explore for iron ore deposits off the west coast of the North Island from the Waikato River in the north to the Rangitikei River in the south. Iron sand in the area was vanadium-bearing titanomagnetite. The Government required the company to complete an initial estimate of mineral potential in the exploration area within 48 months (Trans-Tasman Resources Ltd., 2011).

### ***Industrial Minerals***

**Cement.**—New Zealand's cement industry was dominated by two producers—Golden Bay Cement and Holcim New Zealand Ltd., which was a subsidiary of Holcim Ltd. of Switzerland. Owing to the uncertainty of the international financial situation, Holcim postponed a decision on building a new up-to-date technology plant to replace the existing cement plant at Weston (near Oamatu) until 2013. The new \$40 million plant would increase production capacity and reduce emissions. Holcim planned to reduce carbon dioxide emissions by 25% below its 1990 benchmark by 2015 (Holcim New Zealand Ltd., 2012).

The Perry Group planned to invest \$25 million to construct an 80,000-t/yr cement plant at Te Kumi in the Waitomo region. The company submitted a consent application to the Waitomo District Council for approval. It would take about 18 months for the construction of plant after the consents were granted. The company expected that the cement plant would start production in 2013 (Infonews.co.nz, 2011).

### ***Mineral Fuels***

**Coal.**—New Zealand's coal resources were estimated to be 15 billion metric tons (Gt), of which about 8.6 Gt was economically recoverable. Bituminous coal resources

are located in the West Coast region of the South Island; subbituminous coal resources are found mainly in the Waikato region of the North Island, as well as in the Otago, the Southland, and the West Coast regions of the South Island. Lignite resources are found in the Otago and the Southland regions of the South Island. The South Island lignite deposits accounted for 80% of the country's coal resources. Coal accounted for about 4% of the country's total energy consumption.

Although lignite accounted for 80% of the country's coal resources, it accounted for only about 6.5% of the total coal output in 2011, and bituminous and subbituminous coal accounted for 47.1% and 46.4%, respectively. Bituminous coal was produced in the West Coast region of the South Island. Subbituminous coal was mainly from the Waikato region of the North Island. Lignite was from the Southland region of the South Island. State-owned Solid Energy New Zealand Ltd. accounted for about 80% of the country's coal output. There were 22 operating coal mines in New Zealand in 2011, of which 4 were underground mines and 18 were opencast mines. About 59% of the output from the 22 mines was from 2 opencast operations at Rotowaro near Huntly and Stockton in the Buller field. New Zealand's coal production decreased by about 7.3% in 2011 compared with production in 2010. The decrease in coal output was the result of safety problems at Solid Energy's Spring Creek Mine. New Zealand exported nearly all its bituminous coal output from the South Island. In 2011, New Zealand exported 2.2 Mt of bituminous coal; most of the exported coal went mainly to India and Japan, although a small quantity went to Brazil, Chile, China, South Africa, and the United States. New Zealand imported 171,000 t of coal in 2011, most of which was subbituminous coal used for the Huntly powerplant (Ministry of Economic Development, 2012).

**Natural Gas and Oil.**—New Zealand's natural gas and oil were produced from 19 fields, all of which were located in the Taranaki Basin. Natural gas was produced from 13 of these fields. In 2011, New Zealand's natural gas and oil production decreased by more than 7% and 14%, respectively, compared with that of 2010. Natural gas production decreased at the Maari, the Maui, and the Tui fields. The decrease in gas production was caused by shutdowns for maintenance and reductions in seasonal demand. In 2011, New Zealand was a net importer of 22.6 million barrels (Mbbbl) of oil. About 59% of the imported oil was from Middle Eastern countries, and about 28% was from Asian countries, mainly Brunei and Indonesia. The Government extended the tax exemption for exploration

companies until December 31, 2014, to encourage exploration for offshore hydrocarbons in New Zealand territory (Ministry of Economic Development, 2012).

## Outlook

Most mineral production in New Zealand is consumed locally, with the exception of aluminum, coal, gold, and amorphous silica. Coal and gold are the leading exported mineral commodities. The Government proposed to remove some mineral exploration restrictions on public areas where the mineral potential was significant and mineral production could contribute significantly to the economy of New Zealand. The development of the mining sector in New Zealand, however, is constrained by the population's environmental awareness, the ecological sensitivity of the country, and New Zealand's location far from major industrial markets. Consistent with these trends, New Zealand's mineral development is expected to continue to increase only gradually.

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TABLE 1  
NEW ZEALAND: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

(Metric tons unless otherwise specified)

| Commodity                                       | 2007                 | 2008                 | 2009                 | 2010                | 2011      |
|---|----------------------|----------------------|----------------------|---------------------|-----------|
| METALS  |                      |                      |                      |                     |           |
| Aluminum metal, smelter:                        |                      |                      |                      |                     |           |
| Primary   | 351,100              | 315,500              | 271,902              | 343,335             | 354,029   |
| Secondary <sup>c</sup>                          | 22,000               | 22,000               | 22,000               | 22,000              | 22,000    |
| Total <sup>c</sup>                              | 373,000 <sup>r</sup> | 338,000 <sup>r</sup> | 294,000 <sup>r</sup> | 365,000             | 376,000   |
| Gold, mine output, Au content                   | 10,628               | 13,403               | 13,442               | 13,494 <sup>r</sup> | 14,324    |
| Iron and steel:                                 |                      |                      |                      |                     |           |
| Iron sand, titaniferous magnetite, gross weight | 1,723                | 2,020                | 2,092                | 2,439               | 2,357     |
| Pig iron <sup>c</sup>                           | 679                  | 622                  | 608                  | 667                 | 659       |
| Steel, crude <sup>c</sup>                       | 845                  | 799                  | 765                  | 853                 | 844       |
| Lead, refinery output, secondary <sup>c</sup>   | 7,000                | 9,000                | 13,000               | 9,000               | 9,000     |
| Silver, mine output, Ag content                 | 10,568               | 18,269               | 14,264               | 17,136 <sup>r</sup> | 14,324    |
| INDUSTRIAL MINERALS                             |                      |                      |                      |                     |           |
| Cement, hydraulic <sup>c</sup>                  | 1,200                | 1,200                | 1,200                | 1,100               | 1,200     |
| Clays:  |                      |                      |                      |                     |           |
| Bentonite                                       | 6,154                | 753                  | 880                  | 1,216               | --        |
| Kaolin, pottery                                 | 14,130               | 12,761               | 9,016                | 10,700 <sup>e</sup> | 21,545    |
| For brick and tile                              | 55,645               | 34,650               | 40,740               | 30,192              | 10,911    |
| Diatomaceous earth                              | 14                   | 14                   | 10                   | 95                  | --        |
| Lime <sup>c</sup>                               | 20,000               | 20,000               | 20,000               | 19,000              | 19,000    |
| Marble <sup>c</sup>                             | 15,000               | 15,000               | 15,000               | 14,000              | 14,000    |
| Nitrogen, N content of ammonia <sup>c</sup>     | 125,000              | 125,000              | 125,000              | 120,000             | 120,000   |
| Perlite   | 7,873                | --                   | 8,848                | 5,088               | --        |
| Pumice  | 354,903              | 174,729              | 159,357              | 118,249             | 229,268   |
| Salt <sup>c</sup>                               | 100,000              | 100,000              | 100,000              | 95,000              | 95,000    |
| Sand and gravel:                                |                      |                      |                      |                     |           |
| Silica sand, glass sand                         | 86,461               | 48,575               | 43,458               | 113,231             | 109,346   |
| Other industrial sand                           | 1,896,343            | 1,160,543            | 1,453,793            | 1,726,236           | 1,203,103 |
| For roads and ballast                           | 23,782               | 20,889               | 15,471               | 13,257 <sup>r</sup> | 14,757    |
| For building aggregate                          | 9,601                | 9,743                | 8,064                | 7,528 <sup>r</sup>  | 6,000     |
| Stone:  |                      |                      |                      |                     |           |
| Dolomite  | 62,770               | 16,962               | 52,000               | 86,399              | 59,782    |
| Limestone and marl:                             |                      |                      |                      |                     |           |
| For agriculture                                 | 2,180                | 1,918                | 2,020                | 1,686               | 1,373     |
| For cement                                      | 1,965                | 2,018                | 1,888                | 1,686 <sup>r</sup>  | 1,373     |
| For other industrial uses                       | 947                  | 874                  | 664                  | 1,054               | 185       |
| Serpentine                                      | 45,648               | 4,494                | 14,197               | 43                  | 41        |
| Dimension                                       | 22,934               | 16,998               | 17,795               | 18,911              | 140       |
| Zeolite   | 17,039               | 25,800               | 21,750               | --                  | --        |
| MINERAL FUELS AND RELATED MATERIALS             |                      |                      |                      |                     |           |
| Coal, all grades                                | 4,835                | 4,909                | 4,563                | 5,330               | 4,944     |
| Liquefied petroleum gas                         | 1,263                | 979                  | 857                  | 1,200               | 1,200     |
| Natural gas:                                    |                      |                      |                      |                     |           |
| Gross production                                | 4,712                | 4,484                | 4,644                | 5,052               | 4,678     |
| Marketed production                             | 4,310                | 3,994                | 4,097                | 4,432               | 4,003     |
| Petroleum:                                      |                      |                      |                      |                     |           |
| Crude   | 15,011               | 21,436               | 20,026               | 19,302              | 16,591    |
| Refinery products <sup>c</sup>                  | 35,000               | 34,000               | 35,000               | 34,000              | 33,000    |

<sup>c</sup>Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. <sup>r</sup>Revised. do. Ditto. -- Zero.

<sup>1</sup>Table includes data available through August 10, 2012.

TABLE 2  
NEW ZEALAND: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

| Commodity              |                 | Facilities, major operating companies, and<br>major equity owners  | Location of main facilities                            | Annual<br>capacity <sup>c</sup> |
|------------------------|-----------------|--|--|---------------------------------|
| Aluminum               |                 | Tiwai Point smelter [New Zealand Aluminium Smelters Ltd.<br>(Pacific Aluminum, 79.36%, and Sumitomo Chemical Co., 20.64%)] | Southland, Invercargill                                | 350                             |
| Cement                 |                 | Golden Bay Cement (Fletcher Building Ltd.)   | Portland   | 900                             |
| Do.                    |                 | Holcim New Zealand Ltd.  | Cape Foulwind, Westport                                | 500                             |
| Coal                   |                 | Stockton open pit mine (Solid Energy New Zealand Ltd., 51%, and<br>Cargill Inc., 49%)                                      | Buller, 35 kilometers northeast of<br>Westport         | 2,500                           |
| Do.                    |                 | Pike River underground mine (Pike River Coal Ltd.)   | 50 kilometers northeast of Greymouth                   | 1,000                           |
| Do.                    |                 | Spring Creek underground mine (Solid Energy New Zealand Ltd.)  | Greymouth  | 1,000                           |
| Do.                    |                 | Rotowaro open pit mine (Solid Energy New Zealand Ltd.)   | Huntly   | 1,500                           |
| Do.                    |                 | Huntly East underground mine (Solid Energy New Zealand Ltd.)   | do.  | 500                             |
| Do.                    |                 | New Vale open pit mine (Solid Energy New Zealand Ltd.)   | 50 kilometers northeast of Invercargill                | 300                             |
| Do.                    |                 | Ohai open pit mine (Solid Energy New Zealand Ltd.)   | Ohai   | 200                             |
| Do.                    |                 | Terrace underground mine (Solid Energy New Zealand Ltd.)   | Reefton  | 100                             |
| Gold                   | metric tons     | Newmont Waihi Gold (subsidiary of Newmont<br>Mining Corp.)   | Waihi  | 5                               |
| Do.                    | do.             | Macraes gold project (OceanaGold Corp.)  | Otago  | 6                               |
| Do.                    | do.             | Reefton gold project (OceanaGold Corp.)  | Reefton  | 10                              |
| <b>Iron and steel:</b> |                 |  |  |                                 |
| Iron ore               |                 | New Zealand Steel Ltd. (BlueScope Steel Ltd. of Australia)   | Taharoa, 150 kilometers<br>south of Auckland           | 1,300                           |
| Do.                    |                 | do.  | Waikato North Head,<br>30 kilometers south of Auckland | 1,000                           |
| Steel                  |                 | do.  | Glenbrook  | 650                             |
| Do.                    |                 | Otahuhu Mill [Pacific Steel Group (Fletcher Building Ltd.)]  | Auckland   | 300                             |
| Kaolin                 |                 | Imerys Tableware New Zealand Ltd.  | 80 kilometers northwest of Whangarei                   | 25                              |
| Petroleum, refinery    | barrels per day | Marsden Point Oil Refinery (New Zealand Refinery Co., operator)  | Marsden Point  | 95,000                          |
| Salt                   |                 | Dominion Salt Ltd.   | South of Blenheim                                      | 70                              |
| Silver                 | metric tons     | Newmont Waihi Gold (Newmont Mining Corp.)  | Waihi  | 30                              |
| Do.                    | do.             | OceanaGold Corp.   | Otago  | 1                               |

<sup>c</sup>Estimated. Do., do. Ditto.