# Meeting the World's Future Mineral Needs

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## Issue

- World industrialization, increased urbanization, and population growth are driving a sustained demand for minerals, metals and coal. Energy demand is expected to increase significantly in the coming decades – placing even more emphasis on supply, security and environmental impact issues.

- Several countries are taking steps to nationalize their own resources thus safeguarding their supplies and reducing exports of natural resources.

- Understanding the future availability of critical minerals requires a global perspective. It is essential to know where deposits are located, their reserves and resources, the technologies necessary for production, and the costs of producing and transporting the products to consumers.

- As mining companies look to maintain or increase their operating capabilities and increase their mineral resource bases, the search for commodities expands beyond developed terrestrial regions of the world, to include marine resources. (Figure 1) Operating challenges in these locations include finding skilled workers, building infrastructure, improving recovery technologies and practicing sustainable development.

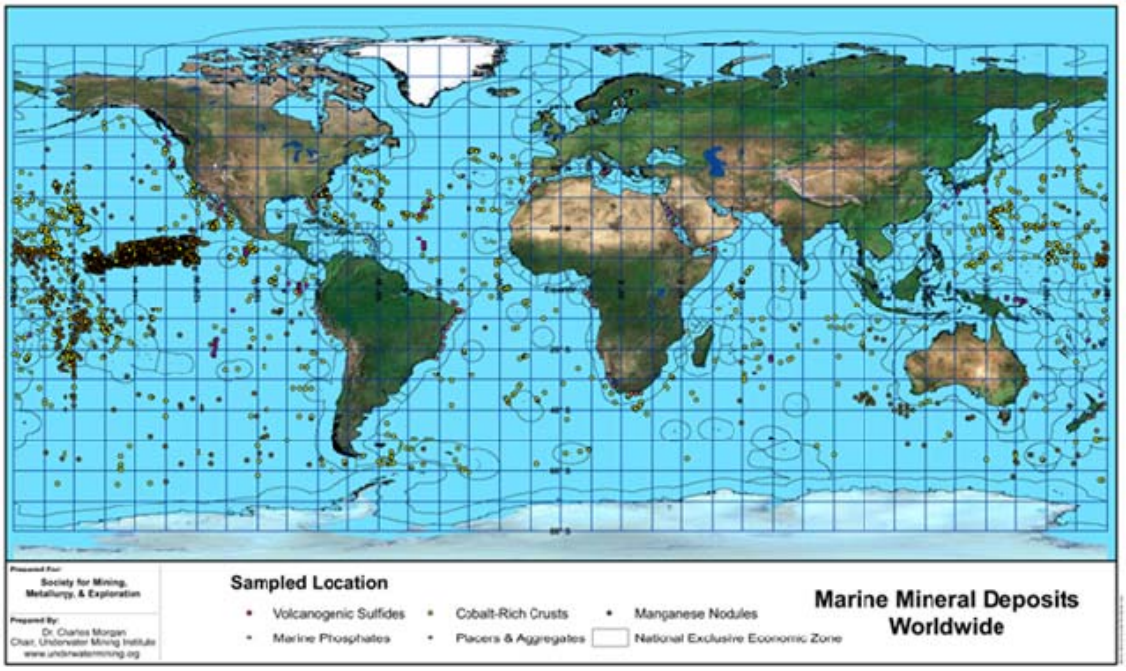


**Figure 1 – Marine Mineral Deposits Worldwide. Source: Underwater Mining Institute**

# Meeting the World's Future Mineral Needs

## Background

The world's population is expected to increase by 40% from 6.8 to 9.5 billion by 2050. Population growth in cities is expected to roughly double to almost 70% of the global population by the same year. As these new urban dwellers seek to improve their standard of living, countries must build infrastructure to serve the growing demand for reliable power, transportation, housing, clean water and sanitation. As these populations consume more resources, the demand for copper, coal, iron ore and other commodities will rise. (Figure 2)

Current annual world consumption of mineral and energy resources is about 32 billion metric tons.

Many countries rely on income from the mining industry, which is a key employer, to support their national economies. In Chile, for example, mining accounts for 15% of GDP, while Australia approaches 10% of its GDP.

Significant international mineral discoveries have been hampered by increasingly competitive exploration costs in sometimes hostile geographic and political environments. Discoveries are often followed by ever increasing costs of environmental regulations, land acquisition, government controls, future reclamation needs and remote area infrastructure development.

Despite reserves of some 78 important mined minerals, the U.S. currently attracts only 8% of worldwide exploration dollars and is increasingly reliant on foreign sources of strategic minerals important to national and economic security. (Figure 3).

Rising prices and terrestrial depletion of many industrial commodities point to a growing interest in locating and developing mineral resources under the ocean, which cover about 70% of the Earth's surface. Half of the global seabed minerals are now controlled by nations within their Exclusive Economic Zones and the other half by the International Seabed Authority as a common heritage of mankind.

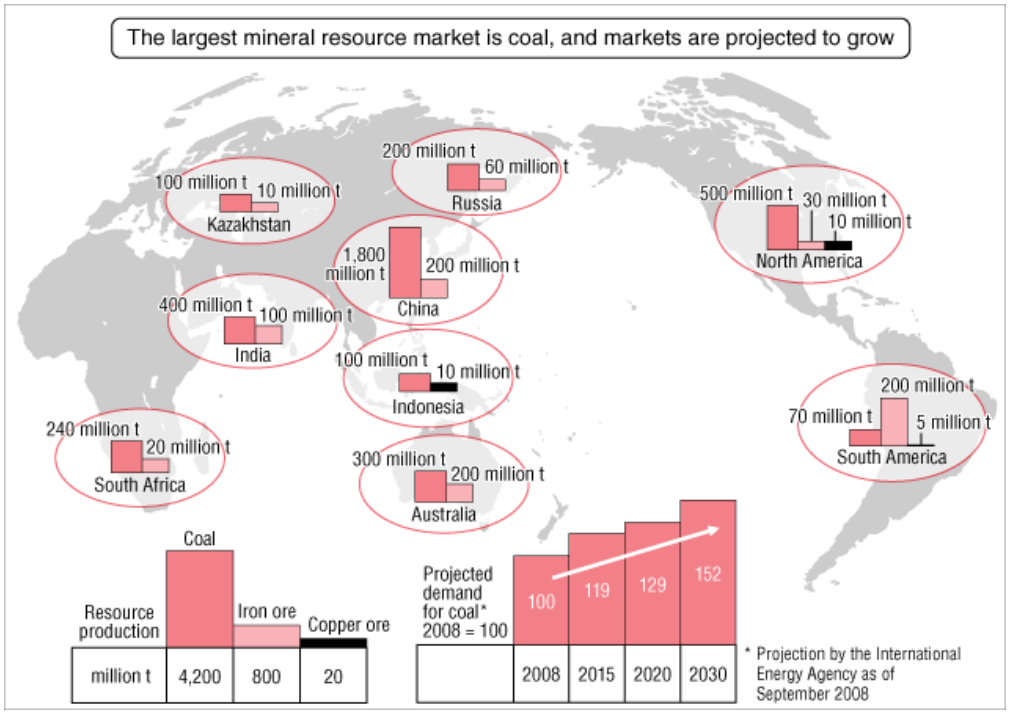


**Figure 2 – World Mineral Resource Markets. Source: International Energy Agency 2008.**

SME
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## 2012 U.S. NET IMPORT RELIANCE[1]

| Commodity | Percent | Major Import Sources (2008–11)[2] |
|---|---|---|
| ARSENIC (trioxide) | 100 | Morocco, China, Belgium |
| ASBESTOS | 100 | Canada, Zimbabwe |
| BAUXITE and ALUMINA | 100 | Jamaica, Brazil, Guinea, Australia |
| CESIUM | 100 | Canada |
| FLUORSPAR | 100 | Mexico, China, South Africa |
| GRAPHITE (natural) | 100 | China, Mexico, Canada, Brazil |
| INDIUM | 100 | China, Canada, Japan, Belgium |
| MANGANESE | 100 | South Africa, Gabon, Australia, China |
| MICA, sheet (natural) | 100 | China, Brazil, Belgium, India |
| NIOBIUM (columbium) | 100 | Brazil, Canada, Germany |
| QUARTZ CRYSTAL (industrial) | 100 | China, Japan, Russia |
| RUBIDIUM | 100 | Canada |
| SCANDIUM | 100 | China |
| STRONTIUM | 100 | Mexico, Germany, China |
| TANTALUM | 100 | China, Estonia, Germany, Kazakhstan |
| THALLIUM | 100 | Germany, Russia |
| THORIUM | 100 | India, France |
| GALLIUM | 99 | Germany, United Kingdom, China, Canada |
| GEMSTONES | 99 | Israel, India, Belgium, South Africa |
| VANADIUM | 96 | Rep. of Korea, Canada, Austria, Czech Republic |
| BISMUTH | 92 | China, Belgium, United Kingdom |
| PLATINUM | 91 | Germany, South Africa, United Kingdom, Canada |
| GERMANIUM | 90 | China, Belgium, Russia, Germany |
| IODINE | 88 | Chile, Japan |
| ANTIMONY | 87 | China, Mexico, Belgium, Bolivia |
| DIAMOND (dust, grit, and powder) | 85 | China, Ireland, Republic of Korea, Russia |
| STONE (dimension) | 85 | China, Brazil, Italy, Turkey |
| POTASH | 81 | Canada, Russia |
| BARITE | 80 | China, India, Morocco |
| COBALT | 78 | China, Norway, Russia, Finland |
| RHENIUM | 78 | Chile, Netherlands, Germany |
| TITANIUM MINERAL CONCENTRATES | 77 | South Africa, Australia, Canada, Mozambique |
| TIN | 75 | Peru, Bolivia, Indonesia, China |
| SILICON CARBIDE (crude) | 73 | China, South Africa, Romania, Netherlands |
| ZINC | 72 | Canada, Mexico, Peru, Spain |
| CHROMIUM | 70 | South Africa, Kazakhstan, Russia, Mexico |
| GARNET (industrial) | 65 | India, Australia, China, Canada |
| TITANIUM (sponge) | 64 | Japan, Kazakhstan, China, Ukraine, |
| PEAT | 62 | Canada |
| SILVER | 57 | Mexico, Canada, Peru, Poland |
| PALLADIUM | 54 | Russia, South Africa, United Kingdom, Norway |
| NICKEL | 49 | Canada, Russia, Australia, Norway |
| MAGNESIUM COMPOUNDS | 46 | China, Canada, Brazil, Australia |
| TUNGSTEN | 42 | China, Bolivia, Canada, Germany |
| SILICON | 36 | Brazil, Russia, China, Canada |
| COPPER | 35 | Chile, Canada, Peru, Mexico |
| NITROGEN (fixed), AMMONIA | 35 | Trinidad and Tobago, Russia, Canada, Ukraine |
| MAGNESIUM METAL | 31 | Israel, Canada, China |
| MICA, scrap and flake (natural) | 31 | Canada, China, India, Finland |
| VERMICULITE | 30 | South Africa, China, Brazil, Australia |
| PERLITE | 24 | Greece |
| ALUMINUM | 20 | Canada, Russia, China, Mexico |
| SALT | 19 | Canada, Chile, Mexico, The Bahamas |
| SULFUR | 19 | Canada, Mexico, Venezuela |
| PUMICE | 15 | Greece, Iceland, Mexico, Montserrat |
| GYPSUM | 12 | Canada, Mexico, Spain |
| IRON and STEEL | 11 | Canada, European Union, Mexico, Rep. of Korea |
| BERYLLIUM | 10 | Russia, Kazakhstan, Japan, Kenya, |
| IRON and STEEL SLAG | 9 | Japan, Canada, Italy, South Africa |
| CEMENT | 7 | Canada, Republic of Korea, China, Mexico |
| PHOSPHATE ROCK | 5 | Morocco, Peru |

[1]Not all mineral commodities covered in this publicaton are listed here. Those not shown include mineral commodities for which the United States is a net exporter (for example, molybdenum) or less than 5% import reliant (for example, talc). For some mineral commodities (for example, rare earths), not enough information is available to calculate the exact percentage of import reliance; for others (for example, lithium), exact percentages may have been roundedto avoid disclosing company proprietary data.
[2]In descending order of import share.

**Figure 3 - Major U.S. Import Sources for Key Strategic Minerals. Source: USGS 2011**

## SME Statement Of Technical Position

- Mining companies must engage their international communities to obtain and maintain their "social license to operate" and build grassroots support in order to be successful.
- In 1995, the U.S. was 100% import dependent for 8 of 47 minerals valued at $51 billion. In 2012, the U.S. was 100% import dependent on 17 of 61 minerals valued at $120.1 billion.
- The U.S. needs the capability to track world-wide terrestrial and seabed mineral exploration, development, production and consumption.
- The potential for commercial minerals per unit area in the oceans and seabed appear to be similar to that of the terrestrial lands. Thus, almost ¾ of the global mineral resources are in, or under, the sea and are virtually untapped.
- Accelerated development of the deep-ocean and continental margin resources may be the ultimate answer to meet rapidly increasing materials demands.
- The U.S. should ratify the 1982 UN Convention on Law of the Sea and be a full member of the Int'l Seabed Authority that controls access to mineral resources in international waters.