## Section 2　Resource problems and Japan's action

As stated in Chapter 1, the recent rise in resource prices has become a focus of attention. While higher resource prices promote economic growth through increased exports in resource producing countries (resource countries), including newly emerging and developing countries, rising resource prices may also restrict sustainable global economic development, including for newly emerging and developing countries, since it also generally results in increased commodity prices.

In the previous section, it was stated that Japan, which is dependent on foreign countries for its energy resources, has been committed as a nation of energy conservation ever since the first Oil Crisis and its real GDP has doubled over the past 30 years[1] without increasing energy consumption of the industry sector. This experience includes fostering energy efficient and energy distribution-type industrial technologies while providing highly energy efficient social systems, such as urban infrastructure. Japan, which is also highly dependent on overseas for mineral resources other than energy, has taken the initiative in recycling and reducing use of those resources and in use and development of technologies for the development of alternatives. Altogether, Japan has taken various steps aimed at promoting recycling social systems.

In past oil crises, it was a supply shock that lead to higher resource prices, while current high resource prices are more demand driven in that economic growth in newly emerging countries such as China and India has pushed up the demand. This section deals with the factors behind the appearance of resource restrictions, including supply side factors, and provides evidence of the leading measures taken by Japan, as a high-degree user of resources, aimed at sustainable development of the global economy. More specifically, while discussing the aim of expanded resource supply and active resource development[2] both in Japan and abroad using Japan's economic might, we confirm the importance of spreading the technology and social systems in which Japan has taken the lead, and foresee Japan as a leading model country for resolving resource restrictions in order to achieve sustainable development.

### 1. Rising resource prices and resource problems
### (Higher resource prices accompanied by rising economic growth in Asia)

As stated in Chapter 1, prices for energy resources such as oil and coal, and mineral resources such as iron ore and copper have continued to rise recently.

Other than energy resources, a comparison of resources used as the main materials in Japan's industry over the past five years (January 2003 to January 2008) reveals uranium used in nuclear power plants, for example, has risen 8.62x, and the price for many other resources has risen by over 2x (see Table 3-2-1).

The factors behind the higher prices are not necessarily the same for all resources but factors include:

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[1] Statement by Prime Minister Fukuda at Davos Conference.

[2] Including development of new alternative resources and social system infrastructure that lead to a higher level of usage of resources and the voluntary development of past resources.

1) expansion of demand in newly emerging countries starting with China, and
2) the inflow of investment and speculative funds into the commodity markets, are combined with supply side factors such as
3) uneven distribution of supply to some resource countries
4) changes in resource policies in resource countries
5) corporate oligopolization through internationalization, and
6) insufficient infrastructure in some resource countries

Table 3-2-1 Prices of main resources

| | | January-03 | January-06 | Comparison with Jan-03 (x) | January-08 | Comparison with Jan-03 (x) | Note |
|---|---|---|---|---|---|---|---|
| **Oil (WTI)** | ($/t) | 32.9 | 65.5 | 1.99 | 93.0 | ***2.82*** | |
| **Coal (Aus. ordinary coal)** | ($/t) | 26.7 | 46.3 | 1.73 | 98.3 | ***3.68*** | |
| **Natural gas (Rus)** | ($/m$^2$) | 113.4 | 275.8 | ***2.43*** | 369.7 | ***3.26*** | |
| **Uranium** | ($/lb) | 10.2 | 36.8 | ***3.62*** | 87.6 | ***8.62*** | |
| **Iron ore** | (cent/t) | 32.0 | 77.4 | ***2.42*** | 140.6 | ***4.40*** | |
| **Aluminum** | ($/t) | 1,379.3 | 2,383.3 | 1.73 | 2,456.1 | 1.78 | |
| **Copper** | ($/t) | 1,650.3 | 4,743.9 | ***2.87*** | 7,078.9 | ***4.29*** | |
| **Lead** | ($/t) | 444.8 | 1,258.1 | ***2.83*** | 2,621.8 | ***5.89*** | |
| **Zinc** | ($/t) | 782.3 | 2,091.8 | ***2.67*** | 2,364.4 | ***3.02*** | |
| **Nickel** | ($/t) | 8,032.9 | 14,660.8 | 1.83 | 27,774.8 | ***3.46*** | |
| **Tin** | ($/t) | 4,445.3 | 7,067.4 | 1.59 | 16,310.9 | ***3.67*** | |
| **Rare earth: neodium** | ($/kg) | 7.0 | 13.9 | 1.99 | 43.0 | ***6.14*** | |
| **Rare earth: dysprosium** | ($/kg) | 25.0 | 72.0 | ***2.88*** | 142.0 | ***5.68*** | |
| **Indium** | ($/kg) | 99.2 | 910.3 | ***9.18*** | 527.8 | ***5.32*** | Transparent electrodes in LCD panels |
| **Platinum** | ($/troy oz) | 630.2 | 1,038.0 | 1.65 | 1,599.1 | ***2.54*** | Car catalytic converters,electronic components |
| **Tungsten ore** | ($/t) | 39.7 | 145.0 | ***3.65*** | 165.0 | ***4.16*** | Carbide tools, high-speed steel |
| **Cobalt** | ($/kg) | 16.6 | 30.6 | 1.84 | 100.6 | ***6.06*** | Heat resistant allowy (gas turbines), secondary batteries (lithium batteries, etc) |
| **Ferro-vandadium** | ($/kg) | 10.1 | 38.4 | ***3.80*** | 40.9 | ***4.05*** | High tensile steel (pipelines, etc) |

Note: Prices that more than doubled since Jan-03 are shaded.
Source: IMF Primary Commodity Prices、Metal Bulletin.

**(Resource self sufficiency in Asian nations declines)**

Chapter 1 pointed to the expansion in resource demand in new emerging countries, starting with China, as economies grew. As a result of this expansion Asia accounted for 32%[3] of global energy consumption as of 2005 but as a part of this trend self sufficiency in resources in Asia declined (see Table 3-2-2).

[3] In this case Asia refers to ASEAN+6 (for statistical constraints, excluding rise). IEA (2007), "$CO_2$ EMISSIONS FROM FUEL COMBUSTION"

China, the biggest consumer of coal, a main resource in new emerging countries in Asia, is forecasted to become the net importer of coal in the near future[4].

In regards to self sufficiency in oil, China's self sufficiency declined sharply from 73.7% to 57.05% between 2000 and 2005, while India declined from 32.6% to 28.9%. Indonesia[5], an oil producer as well as a member of OPEC, was a net exporter of oil in 2000 but became a net importer in 2005, and now has a self sufficiency ratio of 74.8%. In mineral resources there is a similar downward trend in self sufficiency among Asian nations. Self sufficiency in iron ore in China, the largest consumer of iron ore in Asia, went from 60.1% in 2000 to 45.9% in 2006. Self sufficiency in copper ore, similarly, has declined in both China and India, and the same trend can be seen in bauxite, the raw material for aluminum.

Asian nations are expected to further expand their consumption of energy and mineral resources as they maintain their economic growth in the future, and the decline in self sufficiency is expected to continue. Therefore, the rise in international resource prices is believed will have a strong impact on economic growth in Asia.

Figure 3-2-2 Main Asian resource consumer country and self sufficiency ratio

Energy resources

<Coal>

| | 2000 | | | 2005 | | |
|---|---|---|---|---|---|---|
| | Production (Mtoe) | Supply (Mtoe) | Self sufficiency | Production (Mtoe) | Supply (Mtoe) | Self sufficiency |
| China | 649.4 | 625.6 | 103.8% | 1,145.4 | 1,087.6 | 105.3% |
| India | 146.2 | 164.3 | 89.0% | 186.3 | 208.0 | 89.6% |
| Japan | 1.6 | 98.0 | 1.6% | - | 112.1 | - |
| Australia | 164.6 | 48.2 | 341.8% | 204.7 | 54.3 | 376.8% |
| Republic of Korea | 1.8 | 36.5 | 4.9% | 1.2 | 49.5 | 2.4% |

<Petroleum>

| | 2000 | | | 2005 | | |
|---|---|---|---|---|---|---|
| | Production (Mtoe) | Supply (Mtoe) | Self sufficiency | Production (Mtoe) | Supply (Mtoe) | Self sufficiency |
| China | 163.1 | 221.4 | 73.7% | 181.4 | 318.4 | 57.0% |
| Japan | 0.8 | 262.8 | 0.3% | 0.8 | 251.7 | 0.3% |
| India | 37.2 | 114.4 | 32.6% | 37.1 | 128.6 | 28.9% |
| Republic of Korea | 0.7 | 103.5 | 0.6% | 0.5 | 96.2 | 0.6% |
| Indonesia | 71.3 | 54.5 | 130.7% | 49.2 | 65.8 | 74.8% |

<Natural gas>

| | 2000 | | | 2005 | | |
|---|---|---|---|---|---|---|
| | Production (Mtoe) | Supply (Mtoe) | Self sufficiency | Production (Mtoe) | Supply (Mtoe) | Self sufficiency |
| Japan | 2.3 | 65.7 | 3.5% | 2.9 | 70.5 | 4.1% |
| China | 22.8 | 20.8 | 109.7% | 42.6 | 40.1 | 106.2% |
| Indonesia | 63.0 | 31.3 | 201.5% | 62.7 | 30.6 | 204.8% |
| India | 21.0 | 21.0 | 100.0% | 23.8 | 28.8 | 82.7% |
| Republic of Korea | - | 17.0 | - | 0.4 | 27.4 | 1.6% |

Mineral resources

<Iron ore>

| | 2000 | | | 2006 | | |
|---|---|---|---|---|---|---|
| | Production (1000/t) | Consumptio (1000/t) | Self sufficiency | Production (1000/t) | Consumptio (1000/t) | Self sufficiency |
| China | 105,257 | 175,228 | 60.1% | 276,441 | 602,744 | 45.9% |
| Japn | 0 | 131,733 | 0.0% | 0 | 134,251 | 0.0% |
| India | 74,946 | 40,538 | 184.9% | 165,000 | 79,021 | 208.8% |
| Republic of Korea | 332 | 39,312 | 0.8% | 430 | 43,237 | 1.0% |
| Australia | 176,300 | 20,826 | 846.5% | 275,091 | 30,088 | 914.3% |

<Bauxite>

| | 2000 | | | 2006 | | |
|---|---|---|---|---|---|---|
| | Production (1000/t) | Consumptio (1000/t) | Self sufficiency | Production (1000/t) | Consumptio (1000/t) | Self sufficiency |
| China | 7,900 | 3,499 | 225.8% | 18,000 | 8,648 | 208.1% |
| Japan | - | 2,112 | - | - | 2,323 | - |
| Republic of Korea | - | 823 | - | - | 1,153 | - |
| India | 7,562 | 570 | 1327.8% | 12,444 | 1,080 | 1152.8% |
| Thailand | - | 195 | - | - | 407 | - |

<Copper ore>

| | 2000 | | | 2006 | | |
|---|---|---|---|---|---|---|
| | Production (1000/t) | Consumptio (1000/t) | Self sufficiency | Production (1000/t) | Consumptio (1000/t) | Self sufficiency |
| China | 593 | 1,928 | 30.7% | 755 | 3,610 | 20.9% |
| Japan | 1 | 1,349 | 0.1% | - | 1,282 | - |
| Republic of Korea | - | 862 | - | - | 828 | - |
| India | 32 | 240 | 13.3% | 27 | 435 | 6.2% |
| Thailand | - | 151 | - | - | 254 | - |

Notes: 1. Within ASEAN+6 countries, top 5 countrris in 2005 in supply of energy resources, and top 6 countries in 2006 in consumption of mineral resources

2. Self sufficiency calculations are as follows.
Energy self sufficiency ratio=production volume of each energy resource/primary energy resource supply volume of each energy resource
Iron ore self sufficiency ratio=iron ore production volume/(iron ore proudction volume + iron ore imports-iron ore exports),
Bauxite self sufficiency ratio=bauxite production volume/aluminum metal consumption volume
Copper ore self sufficiency ratio=copper ore production/copper metal consumption.

3. Because bauxite and copper metal consumption include recycled consumption volume, the self sufficiency ratio may be understated.

4. Countries where the 2005 self sufficiency ratio is under the 2000 level are shaded.

Source: IEA (2007), "ENERGY BALANCES OF OECD COUNTRIES"; IEA (2007), "ENERGY BALANCES OF NON-OECD COUNTRIES", International Iron and Steel Institute (2007), "Steel Statistics Yearbook 2007"; World Bureau of Metal Statistics (2007), "World Metal Statistics Yearbook 2007."

[4] As stated in Chapter 1, China's coal imports in 2007 are net exports seen for one while but net imports from Jan-Sep.

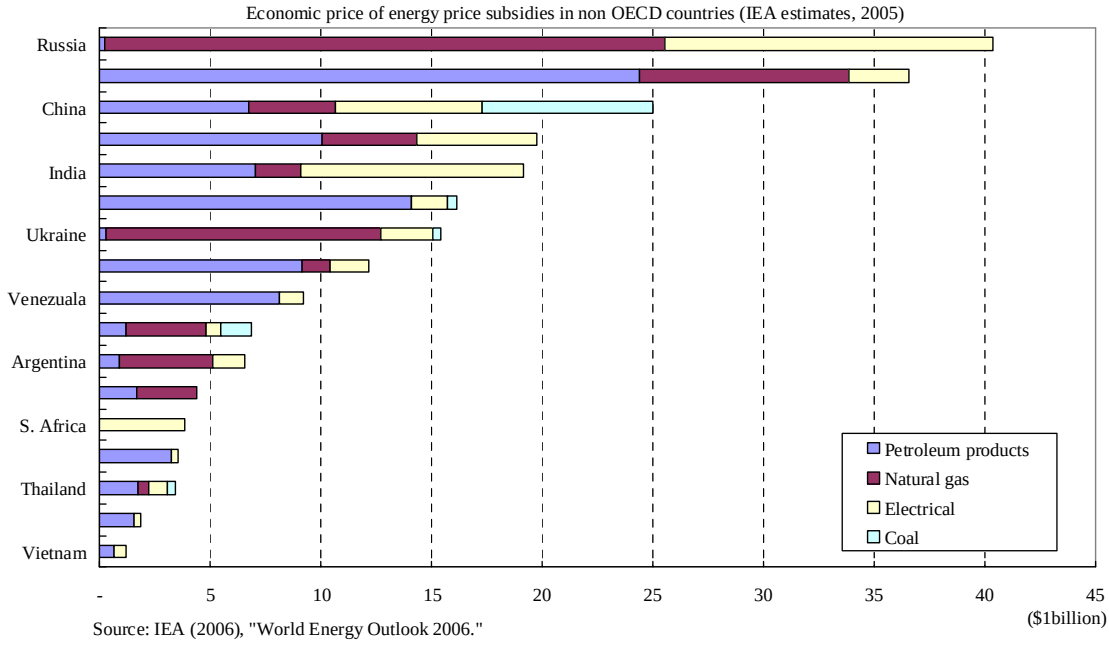
[5] Indonesia recently announced withdrawal from OPEC.

**(Newly emerging country economies and high resource prices)**

Economic growth in newly emerging countries is one of the factors behind the rise in international resource prices. One the other hand, the rise in prices creates inflationary pressures in these countries, which could restrict economic growth in those countries and restrict sustainable development in the global economy.

As the IEA has pointed out[6], China, India and some Middle East countries have adopted price measures such as price controls on individual items and price subsidies via fiscal expenditures to deal with the recent rise in international prices (see Figure 3-2-3). The analysis by the IMF[7] of a quantitative international comparison of the degree of shift in international price increase to domestic prices revealed that net oil exporters passed on higher international prices to domestic prices at a lower rate than countries that are net oil importers (see Figure 3-2-4).

Figure 3-2-3 Energy price subsidies by country

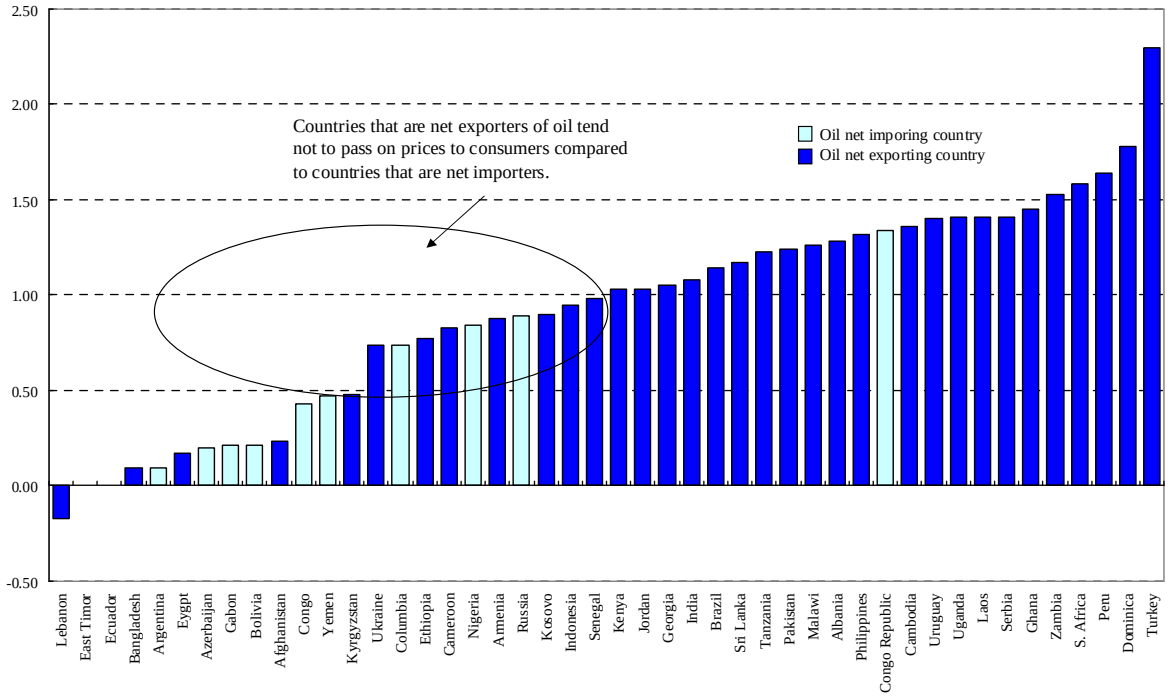



Source: IEA (2006), "World Energy Outlook 2006."

[6] IEA (2006), "World Energy Outlook 2006"

[7] Taimur Baig, Amine Mati, David Coady, and Joseph Ntamatungiro（2007）, "Domestic Petroleum Product Prices and Subsidies: Recent Developments and Reform Strategies", *IMF Working Paper* WP/07/71.

Figure 3-2-4 Rato of higher international prices passed on to domestic prices (gasoline)




Note: (2006 domestic price-2003 domestic price)/(2006 international price-2003 international price), Passing on entire rise in international price to domestic price equals 1. However, foreign exchange impact has to be taken into consideration.
Source: Taimur Baig, Amine Mati, David Coady, and Joseph Ntamatungiro (2007), "Domestic Petroleum Product Prices and Subsidies: Recent Developments and Reform Strategies", *IMF Working Paper WP/07/71*.

When resource prices are kept constant through domestic pricing measures, the supply-demand adjustment mechanism via higher international prices fails to function, and there will be no progress in the effective utilization of resources. As a result, price subsidies increase the fiscal burden, possibly leading to deterioration in fiscal revenues and expenditures and, in an inflationary phase, leading to an increase in inflexible imports in these new emerging countries, which could result in an accelerated rise in international prices. The IMF[8] has also pointed out this problem.

As was pointed out in Chapter 1, Section 1, speculative funds have recently moved into the international commodity markets, such as in oil market. There is a possibility some of these speculative funds funded by the foreign currency reserves of newly emerging countries. Part of the foreign reserves accumulated through the export of resources may have flowed to the international commodity markets, including the sovereign fund route, and become a factor in resource price fluctuations[9]. Adding

[8] David Coady, Moataz El-said, Robert Gillingham, Kangni Kpodar, Paulo Medas, and David Newhouse (2006), "The Magnitude and Distribution of Fuel Subsidies : Evidence from Bolivia, Ghana, Jordan, Mali, and Sri Lanka", IMF Working Paper WP/06/247.

[9] For example, sovereign wealth funds such as the Stabilization Fund of the Russian Federation, the Abu Dhabi Investment Authority, the Kuwait Investment Authority, and the Qatar Investment Authority are able to include commodities in their portfolios and also include hedge funds (Kenichi Takayasu (2008), Sovereign Wealth Funds of Resource Exporting Countries (Pacific rim business information, RIM, 2008, Vol.8 No. 29 JRI).

to this demand factors and financial factors, supply factors including the movements of newly emerging countries are increasing influence.

**(Uneven distribution of supply)**

The top three producers by volume of the world's main resources have over 50% share of many of the resources (see Table 3-2-5). Notably in non ferrous metals such as rare metals, there is a strong tendency toward uneven distribution, and production is concentrated in certain countries; e.g., China accounts for 97% of the world's production of rare earth metals required in the manufacture of advanced magnets used in hybrid car motors, for example, and for 85% of the production of the tungsten used in carbide tools, also South Africa produces 71% of the platinum used in fuel cells and as an automobile exhaust catalyst.

Table 3-2-5 Top resource production countries

| | | Top 3 resource production countries (only iron ore 2005, others 2006) | | | | | | Top 3 total share |
|---|---|---|---|---|---|---|---|---|
| 10 | Rare earths | (1) China | 97% | (2) India | 2% | (3) Malyasia | 0.2% | 99% |
| 11 | Vanadium | (1) S Africa | 40% | (2) Russia | 30% | (3) China | 28% | 98% |
| 12 | Tungsten | (1) China | 85% | (2) Russia | 6% | (3) Canada | 3% | 94% |
| 13 | Platinum | (1) S. Africa | 71% | (2) Russia | 14% | (3) Canada | 3% | 88% |
| 14 | Indium | (1) China | 63% | (2) Japan | 11% | (3) Canada | 10% | 84% |
| 15 | Molybdenum | (1) US | 34% | (2) China | 23% | (3) Chile | 22% | 79% |
| 9 | Lead | (1) China | 31% | (2) Australia | 23% | (3) US | 13% | 67% |
| 2 | Coal | (1) China | 39% | (2) US | 19% | (3) India | 7% | 65% |
| 16 | Cobalt | (1) Congo Republis | 38% | (2) Zambia | 15% | (3) Australia | 10% | 63% |
| 5 | Iron ore | (1) Brazil | 22% | (2) Australia | 20% | (3) China | 17% | 59% |
| 4 | Uranium | (1) Canada | 25% | (2) Australia | 19% | (3) Kazakhstan | 13% | 57% |
| 8 | Zinz | (1) China | 25% | (2) Australia | 14% | (3) Peru | 12% | 51% |
| 7 | Copper | (1) Chile | 35% | (2) US | 8% | (3) Peru | 7% | 50% |
| 17 | Manganese | (1) S. Africa | 20% | (2) Brazil | 15% | (3) Gabon | 14% | 49% |
| 18 | Nickel | (1) Russia | 21% | (2) Canada | 15% | (3) Australia | 12% | 48% |
| 6 | Aluminum | (1) China | 26% | (2) Russia | 11% | (3) Canada | 9% | 47% |
| 3 | Natural gas | (1) Russia | 21% | (2) US | 19% | (3) Canada | 7% | 46% |
| 1 | Oil | (1) Saudi Arabia | 13% | (2) Russia | 12% | (3) US | 8% | 33% |

Note: Countries with more than 30% of global market share are shaded.。

Source: BP "BP Statistical Review of World Energy", World Nuclear Association Web site,
U.S.Geological Survey "Mineral Commdity Summaries 2007", "Minerals Yearbook."

**(Resource development environment becomes more severe)**

The environment for resource development is becoming increasingly tough due to the heightened awareness of resource country rights.

National oil companies own the rights to 80% of the world's oil reserve. There is believed to be little possibility that Middle Eastern countries, which are the main oil producers, will open those rights to foreign investment.

Rising resource nationalism, such as the appearance of foreign capital restrictions on domestic resource development, is making resource development by private firms difficult.

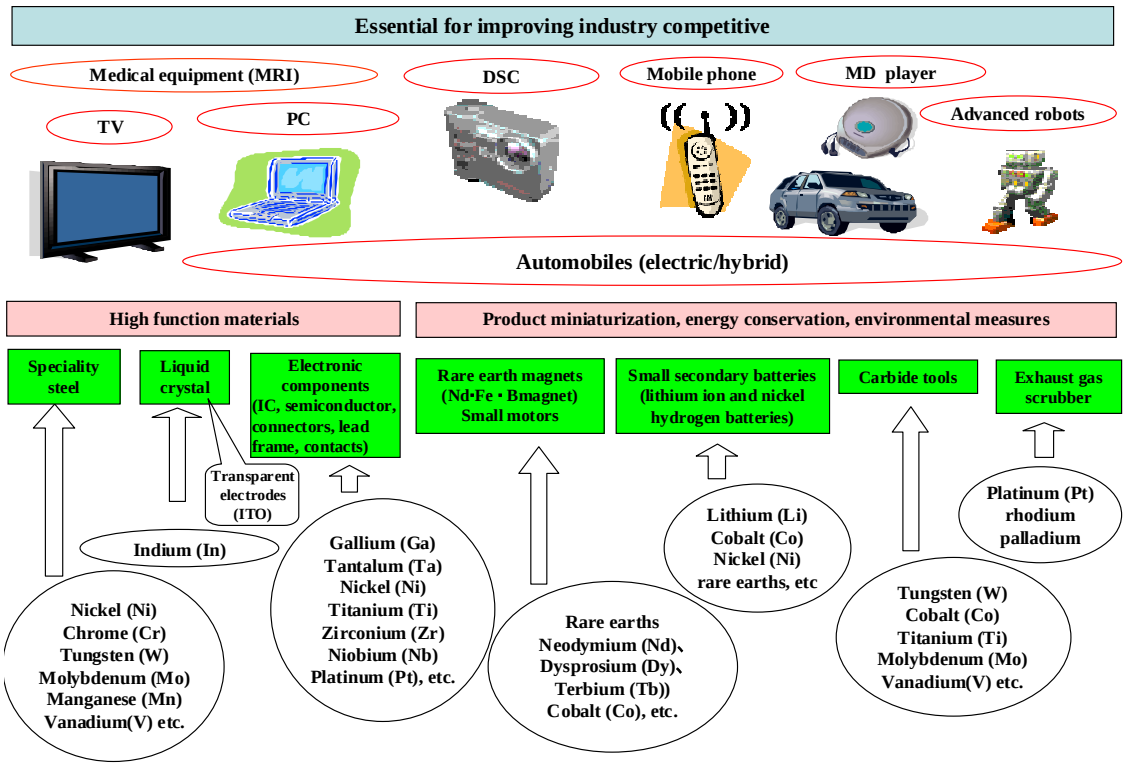
Also, aggressive resource development in Africa and Central Asia by new emerging country companies such as from China and India and the trend toward oligopolization through mergers of resource development related companies is increasing international competition in resource

development.

**[Column 27]** Rare metals impact competitiveness of Japanese industry

Rare metals are a material essential in the manufacture of high value-added/high function products. Although there is no accepted international definition of what constitutes a rare metal, the word is generally used to denote minerals that are rare on earth or that are technically or economically difficult to extract. The Mining Industry Council defines 31 minerals (17 rare earth minerals are combined as one mineral) limited to minerals with industrial demand, demand that is expected to continue into the future, and that are forecast to have new industrial demand based on technical innovation. Based on the various characteristics of rare metals such as tungsten, indium, cobalt, platinum and the rare earths, these mineral though included in wide range of products in small quantities have extremely important functions, and are used in a wide range of industries such as IT and automobile, thus supporting the competitiveness of Japanese industry (see Column 27 Figure 1).

Column Figure 27-1 Importance of rare metals



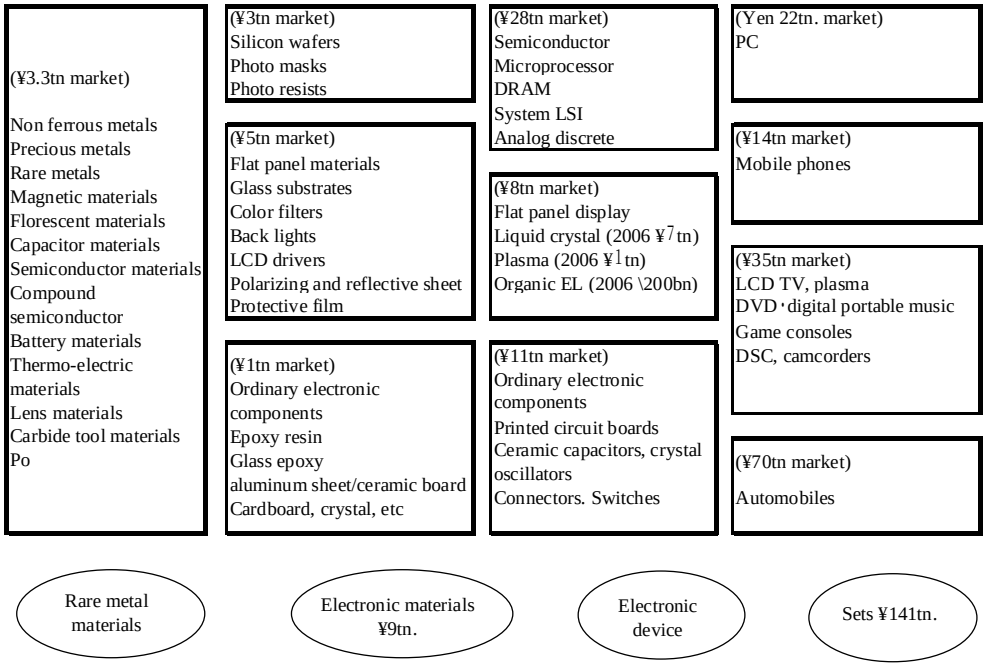

Source: Complied byMETI

For example, the high performance motors essential in hybrid cars use rare earth magnets (neodymium/iron/, boron magnets), and the secondary batteries use cobalt, manganese, and nickel. ITO (indium tin oxide) is used in the transparent electrodes of LCD panels. Carbide tools, which include tungsten and other minerals, are used in processing, cerium, a rare earth, is used as an LCD glass grinding material, and zirconium is used as in electronic materials. In the environment/energy sectors,

platinum, palladium, and rhodium are used as automobile exhaust gas catalysts. Platinum is finding use as a catalyst in fuel cells, which are expected to be introduced for use in low pollution vehicles. In the steel industry, various rare metals are added to specialty steels, starting with stainless steel, that have heat and corrosion resistance characteristics.

As there is no one accepted definition for rare metal, there is also no single definition of market scale, however, according to a report[10] compiled from import customs statistics on the market scale of rare metal materials in distribution in Japan, the rare metal material market in 2007 is estimated at ¥3.3 trillion[11] (see Column 27 Figure 2).

Column Figure 27-2 Digital industry market scale




Source: Shigeo Nakamura (2008) "Rare Metal Resource Supply-demand Structure and prices" (Japan Center for Economic Research (foundation) (2008) "Resouce problems and global economic paradigm shift" Chapter 3)
Source: Import customs statistics, Wataru Izumiya "Electronic material kingdom of Japan counter attach" etc.

## 2. Measures in countries and regions in the world

### (1) Rising resource nationalism

There are signs of rising resource nationalism in resource rich countries in the form of recent changes to the country's tax code restricting resource development by foreign companies and resource

[10] Shigeo Nakamura (2008), "Demand-supply Structure and Price Trend for Rare Metal Resources—present and outlook for rare metal market" Japan Center for Economic Research, 2008 "Resource Problem and Global Economic Paradigm Shift" Chapter 3.

[11] ¥3.3tn includes scrap ¥25bn and precious metals (¥844.6bn), not in line with Mining Industry Council rare metal definition. This estimate only one analysis example extrapolated from import custom statistics, and may not include recycled rare metals within Japan.

exports.

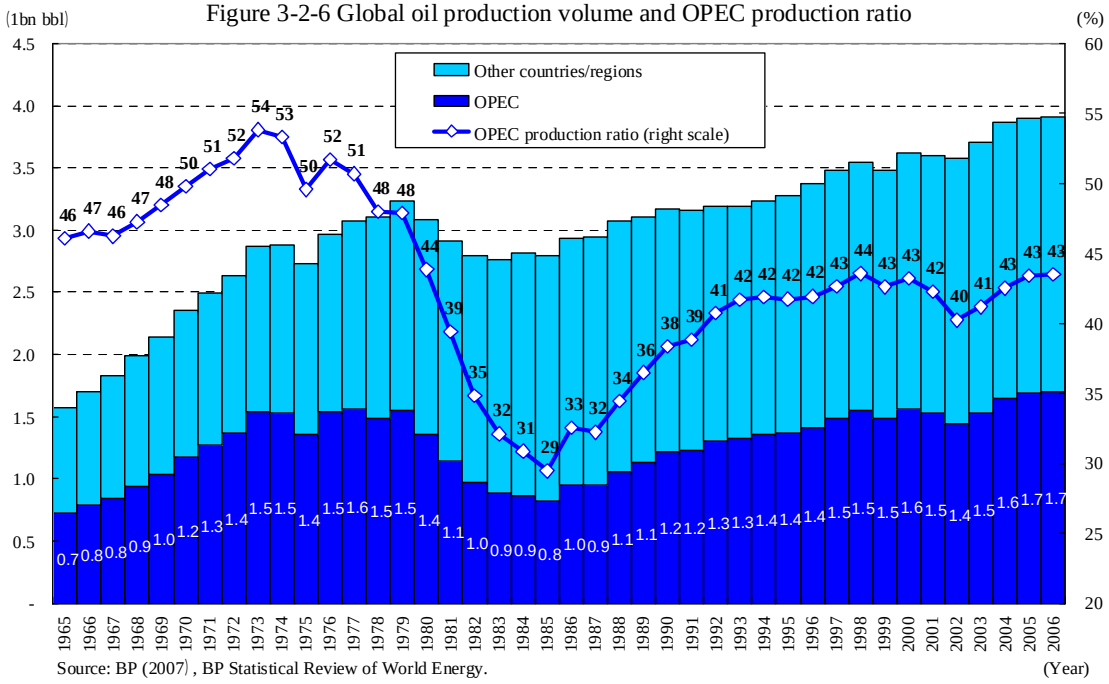
**(International trend of cartel)**

**○ Organization of Petroleum Exporting Countries (OPEC)**

The Organization of Petroleum Exporting Countries (OPEC)[12] accounts for more than half of the world oil production[13] and OPEC countries has been able to influence oil prices throughout the world (see Figure 3-2-6). However, since the second oil shock, more oil is being produced outside of OPEC and OPEC's share of global oil production fell to less than 30% by 1985, which weakened OPEC's international influence for some period.

But after the 1990's, OPEC maintained the share of is roughly 40%, and since 2003, when oil prices rose dramatically, the share has showed a further increasing trend. Due to the recent rise in prices, the WTI price, an international price index for oil, has tended to reflect the movement in OPEC oil production, and one possible outlook is that OPEC production trends will further impact global oil prices.

Figure 3-2-6 Global oil production volume and OPEC production ratio




Source: BP (2007), BP Statistical Review of World Energy.

[12] OPEC was established in 1960 by the five countries of Iran, Iraq, Kuwait, Saudi Arabia, and Venezuela for the purpose of 1) adjustment and unification of member country oil policies and deciding on the best means for protecting the individual and overall profit of member countries, 2) establishing measures aimed at stable price preservation in the international oil market, and 3) securing steady income for the benefit of producer countries, efficient, economic and stable supply of oil to consumer countries, and securing a fair return on capital in regard to investment in the petroleum industry. Indonesia, which became a net oil importer, announced withdrawal from OPEC.

[13] Calculated from production of 12 of the 13 current members, excluding Ecuador, which resigned in 1993 but again became a member in November 2007.

○ **Possibility of applying the concept of "OPEC" in the field of natural gas**

There are recent signs of establishment of a cartel for natural gas.

On 28 January 2007, Iran announced that it was prepared to cooperate with Russia in establishing a cartel regarding natural gas[14]. In response, then President Putin indicated interest[15] in a meeting with journalists on 1 February 2007, which drew attention to the trend toward establishing a natural gas version of OPEC. Since the beginning of 2008, there have been negotiations aimed to setting up a natural gas cartel and attention has been drawn to the next meeting of the Gas Exporting Countries Forum (scheduled for Moscow), which has been held six times since 2001.

However, even if a natural gas version of OPEC is established, the ability to dominate the global market is likely to be limited because:

1) 74% of natural gas is consumed within the producer nation, leaving only 26% for the international market, which makes it difficult to establish an international market, and
2) the market structure is different from that of oil in that most contracts are long term and have pricing formulae geared to each specific customer, which make production changes and pricing flexibility difficult[16].

**(China moving rapidly to protect resources)**

In the 11th 5-year plan for 2006 to 2010, China has revealed a plan to reinforce the protection of resources such as rare earth minerals, tungsten, antimony in order to develop the domestic metallurgy industry and to promote applications in rare earth high technology. Based on this policy, China is developing measures aimed at strengthening restrictions on the export of mineral resources, starting with rare metals.

China, starting on 1 January 2004, abolished the refund of extra taxes on nonferrous ores such as many of the rare earth minerals. On 1 November 2006, China started to levy an export tax of a maximum 15% on 110 items that included metals such as nickel and manganese, and on 1 January 2008, raised both the range of items to be taxed and the tax rate on rare earth minerals from 10% to a maximum of 25%, and from 5% to 10% on items such as tungsten.

China is also restricting export volume through the use of an export permit system. In June 2007, molybdenum, indium, rare earth minerals, tungsten, and antimony were newly added to the list of mineral resources in the trend to reducing the export framework.

There is also an export permit system and an export customs regime for coal and cokes. In 2004, China announced a "coal export allocation management law" in response to the domestic coal supply-demand balance, and the law implemented on 1 July of the same year. The total permitted amount of coal exports for both ordinary coal and raw material coal was reduced from 8,000t in 2004 to 5,300t in 2008. A 5% export tax was applied to raw material coal from 1 November 2006 and the

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[14] Iran's supreme leader, Ali Khamenei, proposed that Russia and Iran establish a cooperative structure regarding gas because the two countries have half of the world's gas reserves.

[15] Announced at a 1 February 2007 press conference that a gas version of OPEC was of deep interest.

[16] Akira Ishii, Takayuki Nokami (2007), (Natural Gas Market: Gas version of OPEC concept—Effectiveness of global natural gas domination?

refunds for added taxes on export coal have been abolished.

**(South Africa seeks to foster national industry)**

South Africa, as well, is implementing a value-added policy in the country through the promotion of employment opportunity creation in the mining industry downstream sector and in 2006 announced a law aimed at promoting value-added in diamonds and precious metals (gold, platinum). The country is also drawing up a law proposal on taxing certain royalty payments with regard to the sales of mining and petroleum resources.

**(Changes in resource policies in other countries and regions)**

In recent years, there have been changes in resource policies among many resource rich countries, including the strengthening of control over national resources and tightening control over trade in resources.

Khazakhstan, in November 2007, revised its underground resource utilization law. With this revision, the activities of business users of underground resource deposits deemed strategically important by the Khazakstan government can bring about fundamental changes in Khazakstan's economic profit, and, when national safety is threatened, the government can apply for contract changes and additions in order to recovery economic profit. Furthermore, should the user of underground resources not respond to such contract changes and additions, the authorities may unilaterally terminate such contract, check whether the execution of the contract is suitable in terms of national interest and security and, if not, refuse to allow future execution of the contract.

Based on revisions to the hydrocarbon law in 2006, the Ecuador government acquired 50% of excess income generated when the price of oil rise above the $24/bbl agreed upon by the government and the petroleum companies, but in October 2007 a presidential decree was signed raising this to 99%, changing the content of the contracts with the petroleum companies.

Indonesia, in January 2007, prescribed a permit system for tin exports and set technical standards for exportable tin metal (tin purity 99.85%)[17].

**(2) Moves of international companies on resources**

**(insufficient investment on the supply side could affect resource prices)**

Insufficient investment on the supply side is also having an effect on resource prices. Insufficient investment is thought to be due to the loss of incentives for both the resource countries and the resource related companies. First, the recent rise in resource prices raises short-term income for these countries. As any aggressive development would lower the price of resources, resource rich countries have declining incentive to seek new development, and with rising resource nationalism the release of mining concession is suppressed and favorable projects are not released to overseas companies, which include multinational oil and gas companies (the so-called majors). The result is a difficult environment for development using foreign capital. In this way, it is possible for there to be insufficient resource

[17] "Commerce ministry regulation regarding tin export restriction No. 04/M-DAG/PER/1/2007"

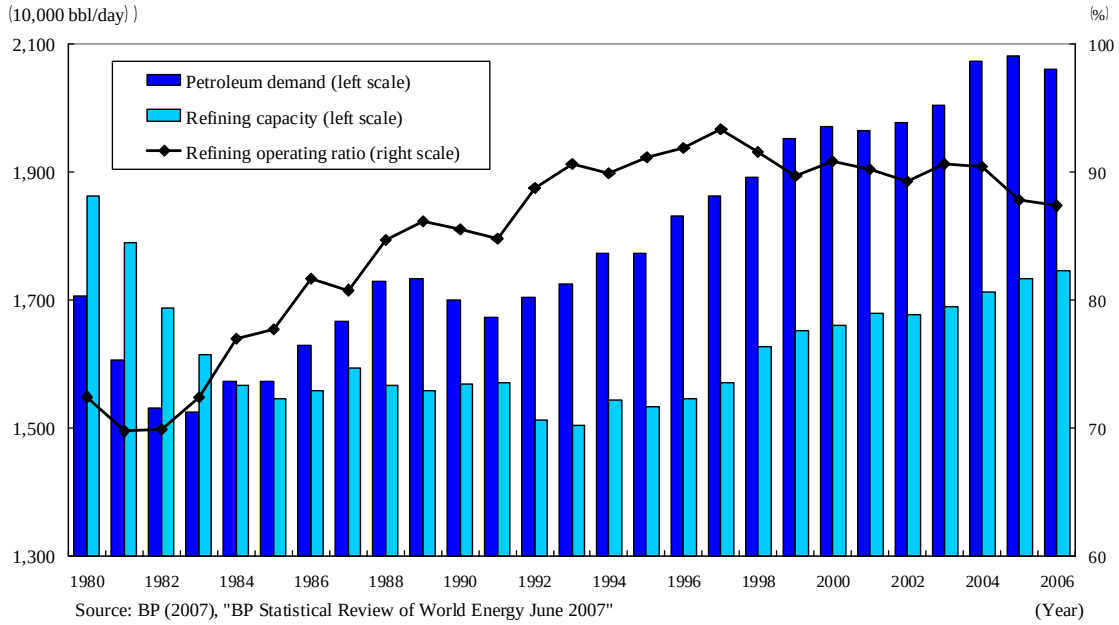
investment even though resource prices are high.

Resource related companies also face the problems of difficult access to quality resources and insufficient workers. Thus, there is a tendency for resource companies to direct investment funds to non development related investments such as business other than new energy development and the M&A of other companies with insufficient investment in resource development as the result.

These factors suggest there may not be sufficient investment in resource development even if rapidly rising demand in new emerging countries drives up resource prices, and supply insufficiency may continue.

As a matter of fact, in the US in the 1990's, when oil prices slumped, the decline of investment in oil fields and the decline of inflow of new workers into the resource sector is said to be one factor in the current slump in new oil field development. Since 1984, US refining capacity has been less than the demand, but in recent years, refiner operating capacity has generally been at 90%, and refining spare capacity has continued to be dearth (see Figure 3-2-7).

Figure 3-2-7 U.S. petroleum refining spare capacity



Source: BP (2007), "BP Statistical Review of World Energy June 2007"

**(Increase in resource development in new regions)**

There are companies that are carrying out new resource development as recent prices rise, including the companies in newly emerging countries (see Table 3-2-8).

The overseas countries and regions that multinational oil and gas companies are being expanded to areas that were not under development before as Africa. Further, in recent years not only companies from developed countries but also Chinese and Malaysian companies, as well as the resource companies from newly emerging countries are moving into Africa.

Chinese companies, in particular, are expanding their oil, gas and mining explorations across the world, including Africa and Central America (see Figure 3-2-9 and 3-2-10). This indicates that the

world’s resource related companies are aggressively developing new resources having rise inhigh prices.

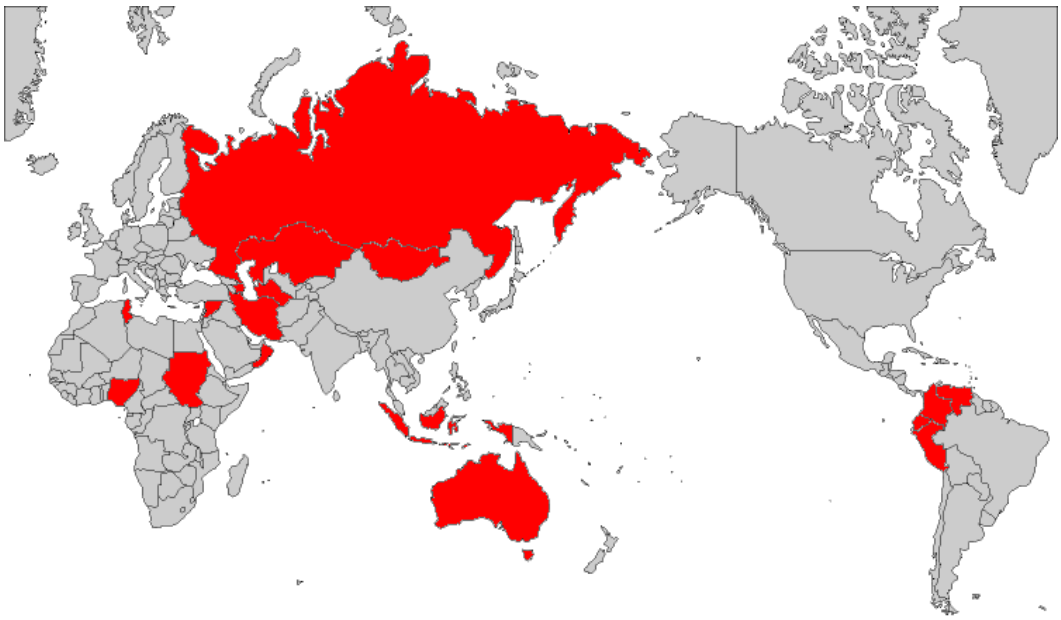
Table 3-2-8 Development of main mineral resources since January 2008 (new reports)

Main large-scale projects in progress of mining devleopment

| Country | Project | Production start | Content |
|---|---|---|---|
| **Mongol** | Oyu Tolgoi | 2010 | Development by Ivanhoe Mines、RioRinto. Resource volume approx. 1.3bn/t (copper1.13%, gold 0.24g/t). Difficulties in concluding development agreement with Mongol government and delays expected. |
| **Pakistan** | RekoDiq | 2011 | Development by Antofagata、Barrick Gold, reserves 730mn/t(copper 0.64%, gold 0.39g/t). |
| **Philippines** | Tampakan | 2012 | Copper mine being promoted by Xstrata, reserves 2bn/t (copper 0.57%, gold 0.23g/t) |
| **Chile** | El Morro | 2008 | Large scale project in which Xstrata has 70% stake, FS completed. Reserves 380mn/t (copper 0.65%, gold 0.58 g/t). |
| | GabrielMistral (former Gaby) | 2008 | China's Minmetals negotiating entry at copper mine being developd by CODELCO. Reserves approx. 600mn/t (copper 0.41%). |
| | Esperanza | 2010 | Copper mine being developed by Antofagasta with capital particpation from Marubeni. Recoverable volume 480mn/t, copper concentrate annual production 700,000t. |
| | Caserones | 2011 | Copper mine being developed by Pan Pacific Copper, FS including pilot tests, underway. |
| **Chile/Argentina** | PascuaLama | 2010 | Gold deposts crossing national borders, being developed by BarrickGold. |
| **Argentina** | El Pachon | 2009 | Copper mine being developed by Xstrata. Reserves approx. 200mn/t (copper 0.65%, molybdenum 0.02%), annual production 100,000t. |
| | AguaRica | 2011 | Copper mine being developed by NorthernOrion. Reserves 1bn/t (copper 0.58%, gold 0.23g/t) |
| **Peru** | Rio Blanco | 2011 | Copper mine purchased by China's Zijing Group for development. Reserves 1.3bn/t (copper0.57%, molybdenum 0.02%). |
| | Totomocho | 2011 | Copper mine being developed by China Aluminum Co. Reserves 1.3bn/t (copper 0.53%, molybdenum 0.02%). |
| | Michiquillay | undecided | Anglo American bought at auction for $400mn. Reserves 544mn/t (copper 0.69%, gold 0.1 - 0.5g/t). |
| **Brazil** | SantaRita | 2009 | Nickel mine being developed by MirabelaNickel, annual production 18,500t, expanding to 25,000t/ by 2010 |
| | OncaPuma | 2009 | Nickel mine being developed by VALE, construction cost $1.2bn, annual production 58,000t |
| | BarroAlto | 2010 | Nickel mine being developed by AngloAmerican, construction cost $1bn, annual production 36,000t. |
| | Salobo | 2010 | Copper mine being developed by VALE., reserves 700mn/t (copper 0.86%, gold 0.52g/t). |
| | Cristalino | 2011 | Copper mine being developed by VALE., reserves 250mn/t (copper 0.7%, gold 0.15g/t). |
| **Canada** | GaloreCreek | 2009 | Copper mine being developed by TeckCominco、NovaGold, continued development under study. Increase in environment costs could be above development cost of $5bn. |
| **U.S.** | Resolution Copper | 2012 | Copper mine being developed by Rio Tinto, reserves 1.3bn/t (copper 1.5%). |
| **Madagascar** | Ambatovy | 2010 | Nickel mine being developed by Canada, Korean companies and Sumitomo Corp, sceheduled annual nickel production 60,000t, cobalt 5,000t. |
| **New Caledonia** | Goro | 2009 | Nickel mine under construction by VALE and Sumitomo Metal & Mining, annual nickel production 60,000t |
| **Australia** | Ravensthorpe | 2009 | Nickel mine being developed by BHP Billiton, construction cost $2.2bn, full annual production of 50,000t/ by 2010. |

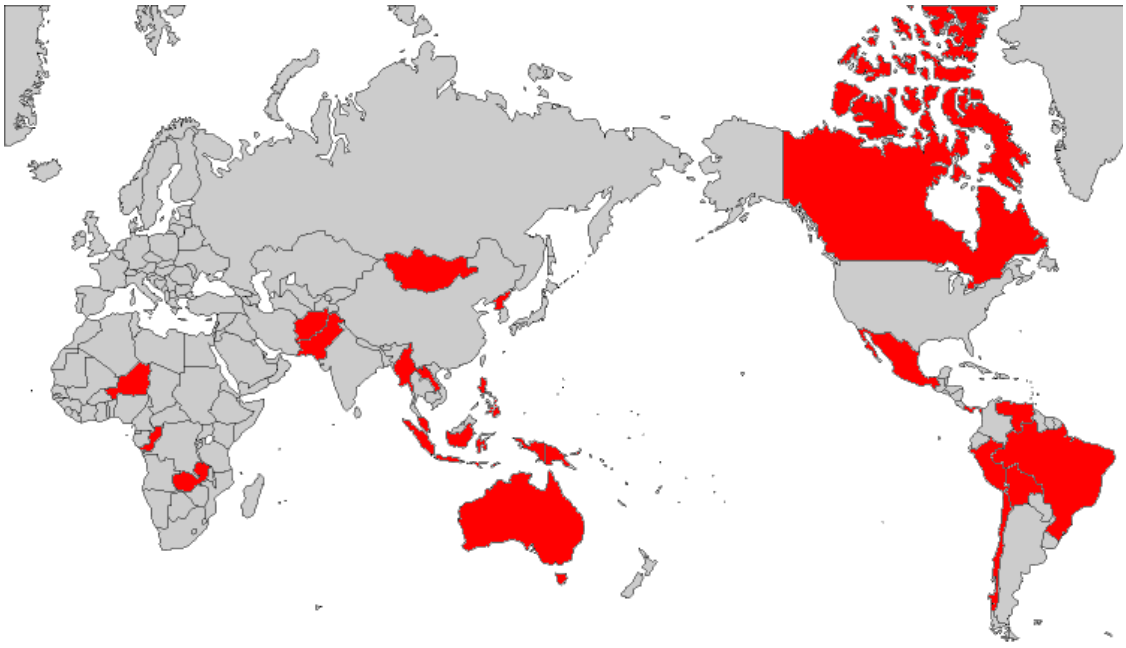
Source: JOGMEC Web site, "Metal Mining Information News Flash."

Figure 3-2-9 Overseas operations of Chinese Oil and Gas Companies (2005)



Note: UNCTAD in "WIR2007" shows the countries where the top 3 Chinese oil and gas companies have overseas operations
Source: UNCTAD (2007) "WIR2007. "

Figure 3-2-10 Main areas of activities by the main Chinese mineral exploration companies (2005)



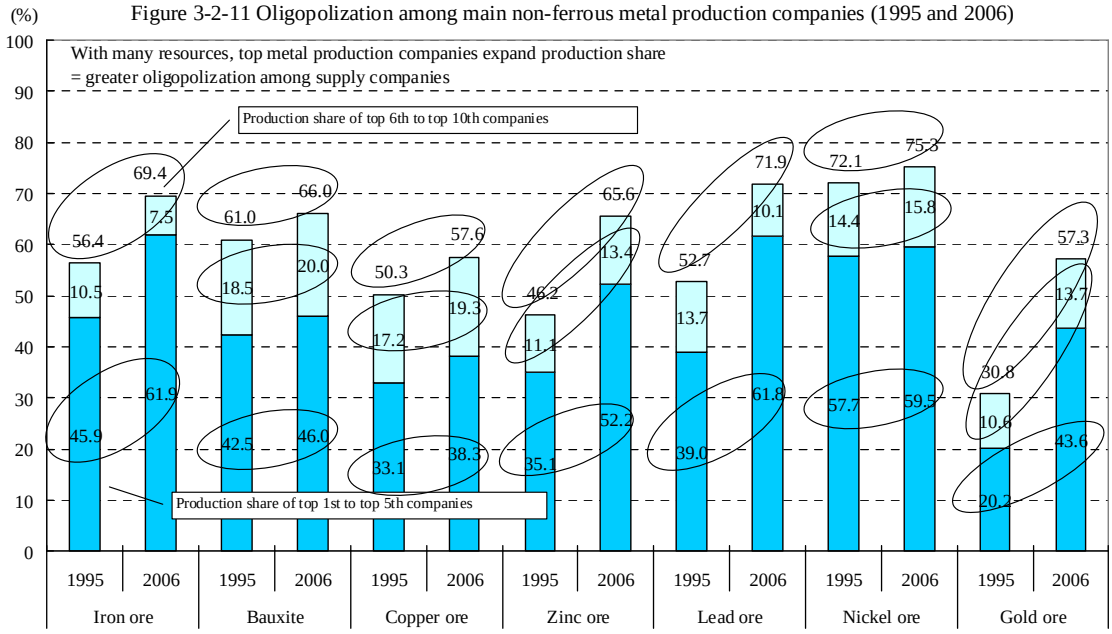
Source: Natsumi Kamiya (2007), "China's Resource Strategy"

**(Oligopolization in the mineral resource market)**

The top mining companies in the world are expanding their share of production in many metal

resources and the trend toward oligopolization is gaining strength (see Figure 3-2-11)[18].

Figure 3-2-11 Oligopolization among main non-ferrous metal production companies (1995 and 2006)




Source: JOGMEC (2008), "Trend in resource majors 2007."

**(Reorganization of companies)**

The mineral resource market in recent years has been characterized by reorganization amongst mining related companies.

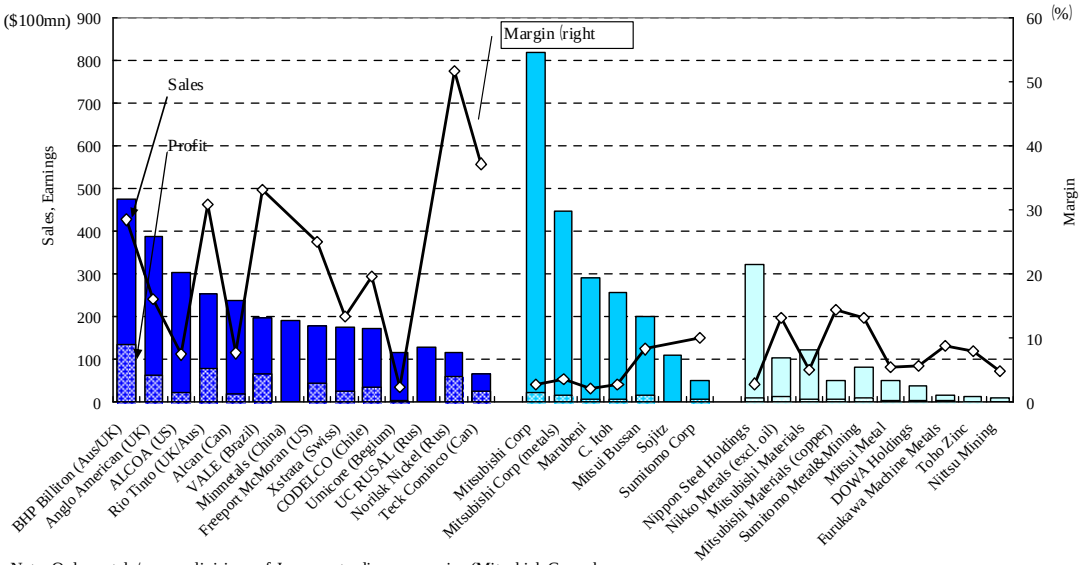
Since 2000, mergers and acquisitions between the main mining companies has pushed the scale of these companies in terms of sales, profits, and market capitalization well above Japan's own mining companies (see Figure 3-2-12 and 3-2-13). On 22 January, it was reported that Vale was studying the possibility of buying Xstrata, and BHP Billiton delivered an official buy out proposal on 6 February to Rio Tinto[19]. If BHP Billiton succeeds in the buyout, the company will have 14% of the world's iron ore production (marine shipment basis 39%), 13% of the copper ore production, and 22% of bauxite production, making BHP Billiton a massive company by sales, well ahead of the number 2 and other companies.

Oligopolization of mineral resource development companies, which are upstream in the resource value chain, is likely to increase price negotiation power over downstream companies in a market of expanding consumption. This trend requires careful monitoring as Japan is a resource importer and concentration in upstream companies could put pressure on the earnings of Japanese companies.

[18] In iron ore, in particular, the top three companies account for roughly 70% of marine shipment volume with CVRD (name changes to VALE in November 2007) at 33%, Rio Tinto at 23%, and BHP Billiton at 16% .

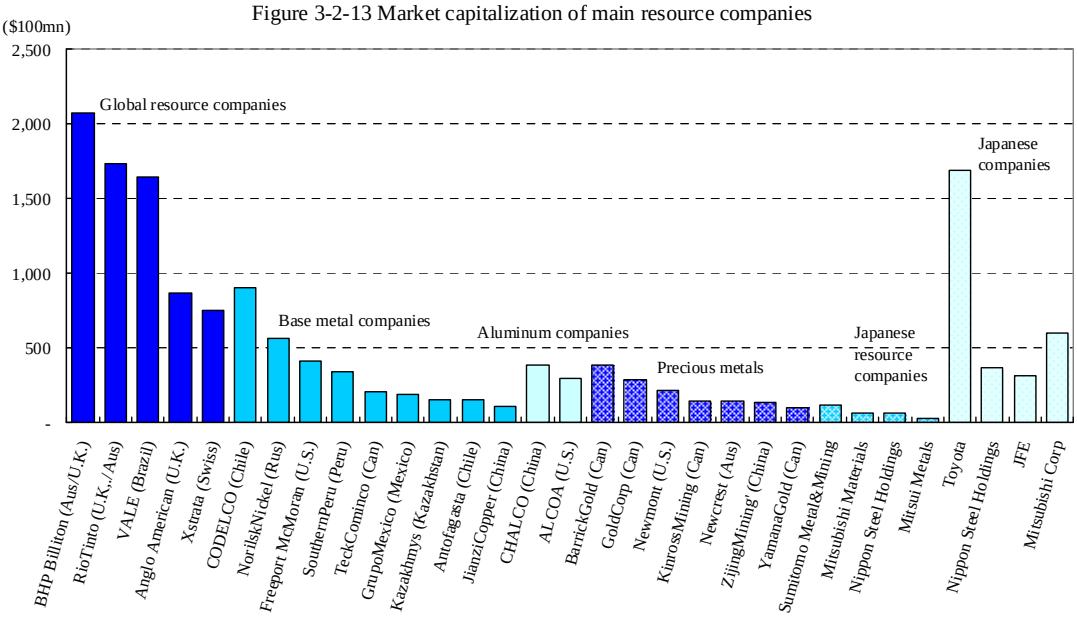
[19] The buyout scale is believed to be massive with Vale paying $90bn for Xstrata and BHP Billiton paying $150bn for Rio Tinto. Attention has be directed toward CHINALCO, a China state company, and ALCOA (UD+S) acquiring a 12% stake in the London market in Rio Tinto.

Figure 3-2-12 Domestic/overseas ratio of main resource companies (sales, earnings, margin (2006))




Note: Only metals/energy divisions of Japanese trading companies (Mitsubish Corp shows metal resoures separately). Minmetals, UC, RUSAL, Sojitz, do not disclose profits.
Source: JOGMEC data.
Original source: JOGMEC (2008), "Trend of resource majors 2007", company data.

Figure 3-2-13 Market capitalization of main resource companies




Note: $1=\100. CODELCO (Chile) are estimate values.
Source: JOGMEC data. Original source: *Mining Journal*, April 11. Japanese companies from *Yahoo Finance*, April 16 2008 data.

**(3) Insufficient transportation infrastructure in some resource countries becoming apparent**

In recent years, insufficient transportation infrastructure, such as railroads and port facilities, has suppressed international resource distribution volume, affecting resource prices.

Australia, which provides Japan with roughly 60% of its coal, is facing demurrage problems as ships line up to load coal in the main harbors of coal producers and exporters New South Wales (NSW) and

Queensland. This is tightening the supply-demand balance as Asian countries, such as China and India, increase their coal consumption, and Australia, a country with relative production spare capacity is flooded with orders, leading to the signing of export contracts above infrastructure transportation capacity. The New Castle Harbor in NSW, a representative coal exporting harbor, had as many as 70 ships in demurrage in mid 2007 (demurrage period around one month). Although the number of ships in demurrage declined to roughly half after six months, the fluctuation in ships in demurrage continues, indicating that transportation infrastructure is in no way sufficient.

The impact on Japan has been an increase in additional costs as a result of buying higher priced spot contracts for coal from other countries to compensate for insufficient coal stocks due to the delayed arrival of Australian coal attributable to its delayed departure. Other increases in the cost of coal procurement, placing pressure on company operations, include rising marine freight rates due to a decline in the number of ships actually operating around the world, and users being burdened with demurrage costs.

The Australian federal government and the related state governments are aware of the seriousness of the problem and are pouring efforts into improving infrastructure, but reinforcement to establish sufficient infrastructure will take time and will require monitoring.

**3. Measures taken by Japan regarding the resource problem**

**(1) Measures to stabilize the oil market**

As was stated earlier, the rise in oil prices is starting to make serious effect on the global economy and the non-oil producing developed countries, demanding a response from the international society. Japan has taken a leading role regarding this problem, and Economic, Trade and Industry Minister Amari has spoken of the necessity of joint action regarding high oil prices at the bilateral meeting with oil producing countries and at various international energy meetings, such as in the January 2008 Davos Conference and the Rome meeting of the International Energy Forum (IEF) in April. Measures on the financial side include steps such as proofing funds from Japan to the IEA and steps aimed at improving the transparency of markets, such as establishing a place for discussions between finance and energy specialists. There have been concrete steps taken to improve transparency such as the end May US the Commodity Futures Trading Committee (CFTC) announcement of reinforced monitoring aimed at improving energy market transparency.

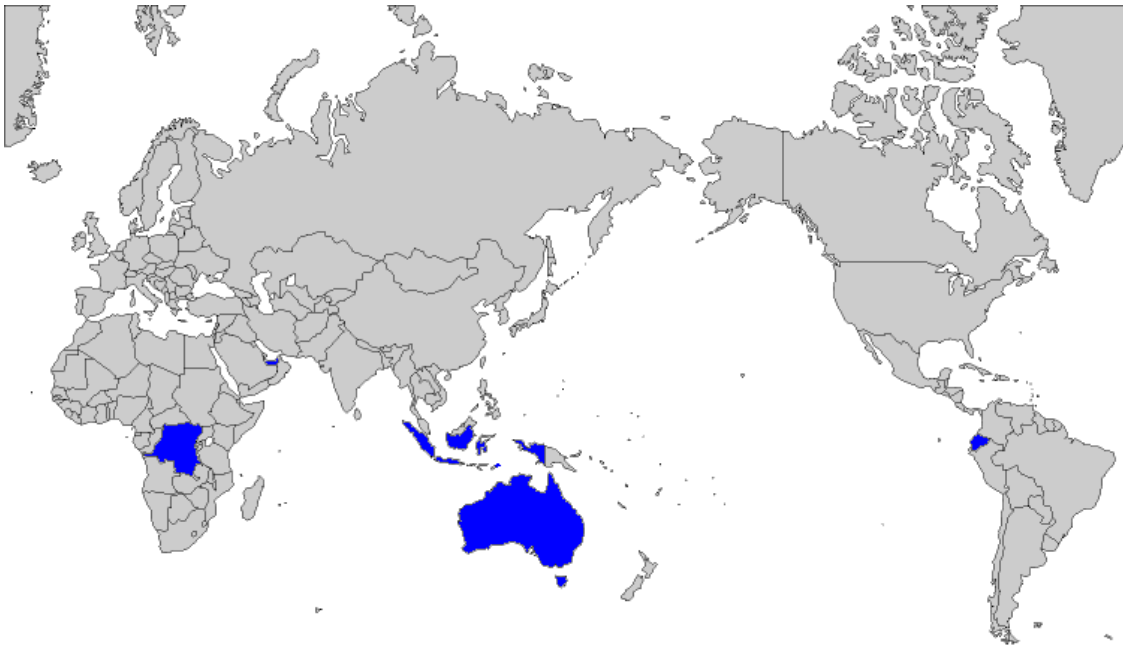
In June, the 5 energy ministers' meeting and the G8+China, India and Korean energy ministers' meeting were held in Aomori, Japan. As well as sharing a feeling of crisis regarding high oil prices, the countries agreed on measures aimed at improving market transparency, strengthening production by promoting development investment in order to stabilize the oil market, and improving fundamentals by promoting the spread of energy conservation and new energy. At the Toyako summit in July, it was agreed to push international cooperation aimed at these measures and strive to stabilize the oil market.

**(2) Japanese companies must aggressively develop resources both domestically and internationally and secure resource intrests**

As stated earlier, amidst the rising tendency toward supply reduction[20], the utilization of Japan's technical skills and financial power in active development investment is positively contributing to increasing demand.

Recently, Japanese companies have been aggressively developing resources overseas as seen in the series of acquisition between end 2007 and 2008 by Nippon Oil Exploration Ltd. S.E. in Asian countries such as Thailand and Malaysia. While there is some development in African countries such as Madagascar by Japanese companies, most of the activity is concentrated in the Pacific rim region (see Figure 3-2-14 and 3-2-15).

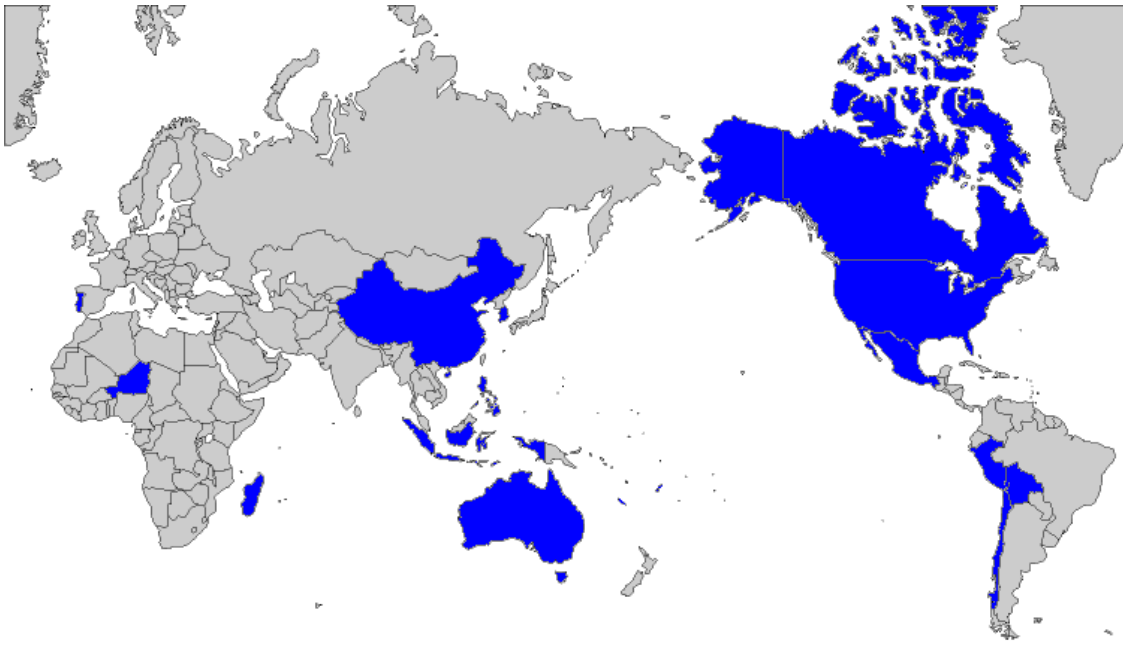
Figure 3-2-14 Overseas operations of Japanese oil and gas companies (2005)



Note: UNCTAD in "WIR2007" shows the countries where the 1 Japanese oil and gas company have overseas operations
Source: UNCTAD (2007), "WIR2007. "

[20] Reduced investment and rising resource nationalism, and oligopolization amongst resource development companies amidst rising prices.

Figure 3-2-15 Main areas of activities by the main Japanese mineral exploration companies (March 2005)



Source: JOGMEC data.

With resource demands in newly emerging countries, as China, are forecasted to rise, it is important to support Japanese resource companies' active resource development activities in a variety of regions, including Africa, in order to secure stable supply.

Deposits of methane hydrate[21], which is expected to become a next generation fuel, have been confirmed under the deep waters in areas near Japan[22]. Excavation technologies for methane hydrate have been the bottle neck, but in March 2008, JOGMEC was successful in consecutively produce methane gas from methane hydratefirst in the world, using a reduced pressure method[23] in tests conducted in Canada. If methane hydrate can be made commercially viable, Japan, which has limited rechargeable resources, should be able to improve its resource self sufficiency. It is important for Japanese companies to develop these kinds of alternative resources.

**(3) Government support aimed at encouraging Japanese companies to advance overseas**

However, in many cases, overseas resource acquisition requires more money than in other businesses, and because resources are located in regions of high geopolitical risk[24] and involve excavation risk, the risks are higher than other businesses.

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[21] Methane hydrate is a solid material that ties methane gas with water, and is difficult to make flow as can be done with oil.
[22] For example, it is estimated the volume of primitive resource volume located in the eastern part of the South Sea trough in the Pacific Ocean is around 40tn cubic feet.
[23] By reducing shaft pressure, solid methane hydrate is broken down, generating methane gas.
[24] Acquiring exploration rights does not guarantee resources can be obtained.

Thus, the government is supporting resource development by Japanese companies through active diplomacy with resource rich countries, through steps to building a favorable cooperative relationship, and through tie ups with various organizations such as JOGMEC, NEDO, JBIC, and NEXI.

**(Building a multifaceted cooperative relationship based on strategic resource diplomacy)**

It is important in supporting companies to build a favorable cooperative relationship with resource countries in order to reduce the investment risk of Japanese companies. The cooperative relationships established between Japan and these resource countries consisted of development cooperation centered on the value chain in resources such as oil and gas, as oil development cooperation, fostering of petrochemical related industries, and plant construction. However, due to recent high resource prices, the resource rich countries, which have acquired large funds, have developed not only the ability to develop resources without funding from Japan, but started to seek sustainable growth without being dependent on resources to advance from a monoculture economy.

Thus, in building a cooperative relationship with these resource countries, Japan is seeking not only to simply secure resources centered on resource development but also to establish a multifaceted cooperative relationship that includes favorable cooperative relationship through industry-government support in response to the needs of those countries, industrial cooperation including bilateral investment, and cooperation in energy conservation and new energy technologies.

Japan is aiming at strengthening a comprehensive relationship through the EPA and FTA and through bilateral investment agreements to promote smooth economic activity and cooperation in a wide range of fields that include energy, and to improve the business environment in a way that promotes investment by Japanese companies.

However, there are differences amongst the resource countries and there can be little prospect of success if the steps taken are not in response to that country's characteristics and situation. It is important to respond in a manner that matches the development stage of that country.

**(Building a cooperative relationship with African countries)**

Many countries in Africa lack the finance and technology required to develop resources and, in this case, Japan is called upon for the plant and equipment investment required to carry out exploration, development and production. The following shows Japan's resource diplomacy with the African countries, South Africa and Botswana as examples of cooperative relationships[25].

○ **Multifaceted cooperative relationship with South Africa and Botswana**

South Africa is the world's richest resource and resource producer country in rare metals, such as platinum and manganese, while China, which has an extremely uneven distribution of rare earths having roughly 90% of the world's supply, are expected to become a new supply source. Countries such as Botswana in the southern region of Africa are expected to have rechargeable resources such as rare metals but exploration is still insufficient. Through strategic mutually beneficial relationships with

[25] The South Africa Development Community is headquartered in Botswana.

countries that have resources but have not sufficiently explored these resources, it is possible for Japan, which has advanced resource utilization technology, to contribute to the economic development of these African countries and to secure a stable resource supply for Japan. In November 2007, Economy, Trade and Industry Minister Amari visited South Africa and Botswana. Japan is building a multifaceted cooperative relationship with South Africa, in particular, through cooperation in the mining of rare metals as well as through cooperation in the energy conservation[26] and nuclear power sectors.

**(Building cooperative relationships in Central Asia)**

Compared to Africa, the economies in the Central Asia region are expanding and geopolitical risks are relatively low. Resources also bring an inflow of foreign funds and the countries are financially wealthy compared to Africa. It is important in the relation with these countries not only to the supply technology for mine development butto cooperate to utilize their resources. Also, the central Asia region is rich in deposits of the uranium, required for nuclear power generation and with global nuclear power generation expanding and with the growing demand for uranium, it is important for Japan to form strong relationships in the region. The following shows Japan's resource diplomacy with the Central Asian countries of Kazakhstan and Uzbekistan as examples of cooperative relationships.

○ **Cooperative relationship with Kazakhstan**

Kazakhstan has the second largest uranium reserves in the world. Then Prime Minister Koizumi visited Kazakhstan in August 2006 and reached a broad agreement on nuclear power cooperation at a meeting with the Kazakhstan head of state.

In April 2007, upon the conclusion of an additional protocol with Kazakhstan, then Foreign Affairs Minister also announced the start of Nippon-Kazakhstan nuclear power cooperation negotiations. Also in April of the same year, Economy, Trade and Industry Minister Amari led a large-scale mission totaling 150 members including the heads of government organizations such as NEXI, and the nuclear power industry (trading houses, power companies, nuclear power manufacturers) to Kazakhstan. On this occasion, agreement was reached and signed on 24 detailed cooperation projects in uranium resource development, nuclear fuel processing and nuclear reactor support. With this series of agreements Japan secured the rights of 30-40% of Japan's total uranium needs. This is one example of resource diplomacy in which Japan's advanced technology in nuclear fuel processing and nuclear reactor plant was used.

○ **Cooperative agreements with Uzbekistan**

Uzbekistan ranks 10$^{th}$ in global uranium reserves. Then Prime Minister Koizumi visited Uzbekistan in August 2006 and reached an agreement in a head of state meeting on the prospects for uranium trade and development.

In April 2007, Economy, Trade and Industry Minister Amari visited Uzbekistan and reached an agreement on cooperation in mineral resources, as uranium, and in the oil and natural gas sectors. Based on a memorandum between JOGMEC and the Uzbekistan Geological Mine National Resource

[26] Experts from the Energy Conservation Center (foundation) are being seconded to South Africa.

Committee, cooperation was agreed upon in various sectors such as mutual cooperation in the four areas of joint exploration of Uzbeki mineral resources which are study of participation by Japanese companies in exploration and development, exchange of information on resources and exploration technology and training of personnel. Also, exploration in Uzbekistan and production cooperation, technical cooperation regarding oil and natural gas industries, and acceptance by Japan of trainees through JOGMEC were agreedbased on a memorandum between Uzbekistan and JOGMEC.

**(Building cooperative relationship in GCC region)**

With countries that have achieved a certain level of economic growth through the acquisition of foreign currency based by natural resources and have expanded national wealth, it is more important to build a multifaceted cooperative relationship, rather than a single-layer foreign diplomacy centered on resource development cooperation through measures such as industrial policy support in response to the needs of resource countries, industrial cooperation involving bilateral investment and energy cooperation based on energy conservation and new energy technology. The following are examples of Japan's resource diplomacy with Saudi Arabia and the United Arab Emirates (UAE).

○ **Cooperative relationship with Saudi Arabia**

Saudi Arabia with a population of over 23 million of which 50% is under the age of 24 has a relatively high unemployment rate of 9.1%, which calls for fostering industries that will increase employment. In visits to Saudi Arabia in April and May of 2007, then Prime Minister Abe and Economic, Trade and Industry Minister Amari agreed on establishing an industrial cooperation framework between the two countries and on cooperation in promoting a national industry cluster concept for the purpose of fostering manufacturing industries in automobiles and components, consumer goods, metal processing, construction materials and packaging. As well as holding multiple meetings between the taskforces of the two countries and the establishment of a framework for promoting investment in Saudi Arabia by Japanese manufacturing companies, a multi-layer relationship has been built for providing policy know how based on the request of Saudi Arabia regarding the fostering of small and medium companies, the continuation of industrial personnel cooperation in the fields of cars and plastics, and new industrial personnel cooperation in fields of electronics and home appliances.

○ **Building a multifaceted cooperating relations with United Arab Emirates**

Strengthening the relationship with the UAE has clearly been important in view of the upstream oil rights Japan has had in the UAE from in the past. At the time of the official visit to Japan by the Abu Dhabi prince in November 2007 a total of eight cooperative agreements were drawn up and announced in a broad range of economic fields including not only energy but also in the fields of small and medium enterprises and finance. At the time of Economic, Trade and Industry Minister Amari's visit in January 2008, a memorandum was concluded for specifying joint investment projects in Asia between NEXI and Mubadala Development. By the request of Abu Dhabi side, broad ranging proposals were made such as cooperation between universities of the two countries, medical cooperation including the training of Abu Dhabi doctors and the holding of seminars on the promotion of bilateral investment.

○ **Economic tie ups with GCC countries**

In order to strengthen the economic ties with GCC countries, Japan is negotiating a FTA with the GCCC overall and a bilateral investment agreement with Saudi Arabia. Preparations are being made for negotiating a bilateral investment agreement with Qatar.

On the requests of both Japanese industry and the GCC, the FTA negotiations had begun with the announcement of a joint communiqué by then Prime Minister Koizumi and Saudi Arabia Prince Sultan in April 2006. Negotiations have been ongoing since September 2006 and are aimed at strengthening a broad range of economic relationships in both countries such as liberalization of trade in goods and services. In order to expand the investment by Japanese companies that the GCC countries requests, negotiations with Saudi Arabia on a bilateral investment agreement were advanced and preparations for such negotiations were made with Qatar.

**(Exploration and development support through private sector tie ups)**

As was stated earlier, there are geopolitical risks and exploration risks inherent in resource development, making business risk higher than in other businesses.

In regard to providing surveys, analysis and results of relatively high risk geological structures, the Japanese government has contributed to reducing the exploration risk through ODA activities and joint implementation with JOGMEC and NEDO.

Also, the government has taken steps aimed at economic support and geopolitical risk reduction though JBIC and NEXI[27].

**(4) Contribution through recycling and alternative technologies**

**(Recycling of mineral resources)**

Mineral resources are recoverable and reusable resources. Recycling of mineral resources is also important from the standpoint of stable supply of resources that supply restrictions. Japan is recycling gold, silver, copper and palladium using existing refining facilities and technologies. Also, For rare metals, the process waste generated in the manufacture of products that use rare metals is being recycled.

Used products that incorporate rare resources like rare metals can be considered as a valuable domestic resource. However, even if there are resources within the country, if a system for the stable collection and recovery of the resource does not exist, there will be no progress in recycling. For this reason, in order to encourage recycling, it is important to first develop the recycling technology and to establish the systems for greater stabilization in obtaining the recycling raw material. In the four years between 2007 and 2010, The Ministry of Economy, Trade and Industry is developing rare metal recovery technologies at private companies and universities by way of aid to JOGMEC.

Further, in order to secure a stable supply of the whole world's resources, it is necessary for the

[27] Trade insurance, undertaken by NEXI, covers risks such as wars and foreign exchange restrictions that private sector insurance companies are unable to cover.

mineral resource recycling measures to be taken globally. Japan has top level metal recycling technology. There are also companies in Japan that are recycling resources overseas, and such moves are expected to expand.

**(Contribution from other reduction in mineral resources, development of alternative materials, and other measures)**

Measures aimed at dealing with the supply risk of rare metals include the use of the latest technology such as nanotechnology to reduce the volume of metal used and the development of new materials with similar, or even more advanced functions. The Ministry of Economy, Trade and Industry began a project, using subsidies to NEDO, as a part of a five-year plan between 2007 and 2011 that aimed to reduce the quantity of rare metals used and to develop alternative materials through tie ups with universities and independent government corporations, such as the National Institute of Advanced Industrial Science and Technology, and private companies. The purpose of the project is to develop the standard of technology to a commercially viable level within five year for three minerals, indium, which is used in transparent electrodes for LCD panels, dysprosium, an additive in rare earth magnet manufacturing, and tungsten, used in carbide tools. Japan is also developing innovative technology such as the use of hydrogen as a partial alternative to cokes in steel making. This technology is a part of the technical development in Cool Earth 50 discussed in Section 1 of this chapter. This technology is expected to reduce carbon dioxide emissions and the volume of cokes used in steel manufacturing.

It is important for the efficient use of the whole world's rare metals and for easing global supply restrictions to develop these kinds of technology and to spread the effective use of the world's resources.

**(5) Social systems for resource conservation**

As stated earlier, in order to create a resource conservation society, it is important to develop and spread advanced technology as well as to build social systems to realize this. Japan has built up such systems based on past experience and is called on to demonstrate global leadership in seeking further advancement in the 3Rs (reduce, reuse, recycle) from a lifecycle point of view.

In recent years, foreign countries, such as China, have been following Japan's footsteps in studying and building recycling systems. It is also important for these countries to support the construction of recycling systems by building the kind of used product recovery systems found in Japan, and through cooperation in the know how involved in setting up the facilities and recycling plant, the separation of waste goods, and the technology involved in breaking down used products.

The Ministry of Economy, Trade and Industry is advancing an environment control accounting system known as "material flow cost accounting" for the efficient use of resources in the product manufacturing stage. Material flow cost accounting is a method for measuring the flow and stock of raw materials and energy in physical units (weight, capacity and volume) within an organization and appraising their manufacturing cost (in currency), and by making the cost of waste visible, to simultaneously suppress the quantity of resources used and improve productivity. In November 2007, Japan proposed making this accounting method a new work category for the TC207 (environment management) of the International Standard Organization (ISO), and in March 2008 the ISO officially

began drawing up an international standard. Japan, in this way, contributed internationally to the spread of this accounting method and the more effective use of resources.

In order to maximize the impact of these measures, it will be effective to gain greater familiarity with suppressing resource consumption not only at the company level but also in the many companies that make up a supply chain from product design companies to component supply. Thus, it is important promote tie ups between supply chain companies.

**(6) Consumer nation tie ups in resource stockpiling**

For a country such as Japan, which is almost entirely dependent on the supply of resources from overseas, the stockpiling of resources is important due to the possibility of supply reductions and cut offs due to geopolitical risks. Japan currently is stockpiling oil, natural gas, and rare metals in the event of short-term supply disruptions.

With the expected expansion in resource consumption in Asia, it will become important for Japan to cooperate and support steps aimed at reinforcing petroleum stockpiling in the other countries in the Asia region to ensure the safety of energy supply.