INTRODUCTION

During much of the past two decades, transnational corporations (TNC) in extractive industries have attracted limited attention in analyses and in policy debates on issues relating to development. To some extent, this reflected the declining importance of those industries in the world economy and their shrinking share in global FDI, as well as the increasing emphasis placed on industrialization as a key aspect of the development process. However, the recent and significant revival of commodity prices has led to renewed interest in the exploitation of natural resources and in energy security. Following an extended period of low levels of international investment in extractive industries, significant changes are sweeping the landscape of FDI and TNC activity in these industries. It is therefore an opportune time to take a fresh look at this area, its implications for host-country development, and related policy challenges. Part Two of *WIR07* is devoted to this topic.

The renewed interest in the extractive industries partly reflects the structural shift that is occurring in the relative importance of various markets in the world economy. Rising demand for mineral resources from fast-growing markets in Asia has added to the persistent high levels of demand in developed countries, leading to a surge in mineral prices. In 2006, the price of crude oil reaches a level 10 times higher than its lowest point in 1998. Price increases have also occurred in metals such as aluminium, copper, nickel and zinc, and by June 2007 they were far higher than the levels prevailing in 2003. As a result, corporate profits in the extractive industries have soared and international investments have rebounded.

The boom in mineral prices has brought development issues related to the extraction of natural resources back into focus. The appropriate use of revenues from their exports could enable a number of mineral-rich developing countries to accelerate their development process. At the present juncture, given the shared objective of countries to accelerate the progress towards meeting the Millennium Development Goals set forth by the United Nations, it is timely to consider – once again and with the benefit of experience – how resource endowments can promote development.

Such an assessment needs to take into account the potential implications of involving TNCs in the process. During the past decade, TNC investments in the extractive industries have evolved in several respects, with a change in the distribution of such TNCs among home and host economies. New TNCs have surfaced in traditional as well as emerging market economies. A number of importing countries, anxious to secure continued access to mineral supplies, are encouraging their firms to invest abroad in extractive industries. Today, companies headquartered in developing and transition economies account for a noticeable share of TNC investments, including in the extractive industries (*WIR06*). In some of these, notably oil and gas, privately owned TNCs are now competing directly in overseas markets with State-owned companies from the South.

Mineral-rich developing countries see new economic opportunities and development prospects stemming from higher export revenues, but they are also increasingly aware of the potential adverse effects associated with resource extraction. Countries that allow foreign investment in their extractive industries are seeking to strike the right bargain with the companies involved. This is particularly true for many of the world's poorest economies, for which oil, gas and various metals are by far the largest sources of export and government revenues.

The relationship between TNCs in extractive industries and host States is constantly evolving as countries seek ways of exercising control over their resources and maximizing retained gains, while at the same time drawing on the strengths of the TNCs. In the present decade, the bargaining power of mineral-exporting countries vis-à-vis mining TNCs is growing as a result of the higher mineral prices. Reflecting their improved negotiating position, several governments have recently changed their policies with respect to TNC participation with the aim of increasing their share of the windfall revenues created. At the same time, more and more countries are paying attention to the broader effects of resource extraction, including on the environment, human rights and other social dimensions, with a view to taking the necessary steps for promoting sustainable development.

Although investments in extractive industries account for a small share of global FDI flows, they constitute the bulk of the flows to many low-income economies, particularly in Africa. However, only a few African recipients of significant amounts of such FDI have been able to transform it into broader development gains; instead most of them score low by various measures of development. For example, Angola, Equatorial Guinea, Nigeria and Sudan were among the top five sub-Saharan African host countries of inward FDI stock in 2005 (annex table B.2). They were also the top four sub-Saharan oil exporters. In terms of development, however, their performance has been disappointing. Their rankings out of 171 economies listed according to the Human Development Index of the United Nations Development Programme were: Equatorial Guinea - 121; Sudan - 141; Nigeria - 158; and Angola - 160 (UNDP, 2006).

Owing to the varying experiences of host countries and the failure of many of them to utilize the gains from TNC participation in export-oriented resource extraction for the purpose of accelerating their development, it is necessary to reconsider how foreign investment in the extractive industries can serve as an impetus to development. There are concerns that TNC involvement may not only fail to generate significant economic gains for a host country, but may also have adverse environmental or social effects. On the other hand, many developing countries may not be able to fully exploit their resources without TNCs. The question is what various stakeholders – host countries, home countries, investors, the international community and civil society – can do to facilitate a development-friendly outcome. A range of international initiatives of relevance to the TNC-extractive industries-development nexus have been set in motion in the past decade. Some of them have been initiated by governments, and others by civil society and industry associations.

WIR07 examines the evolving role of TNCs in extractive industries, and revisits the issue of how investment and other relevant policies in this area may bring about greater development gains. The coverage is limited to minerals, more specifically oil, gas, diamonds and metallic minerals, which account for the bulk of FDI in the primary sector.[1] Chapter III defines the scope of the industries and activities covered, and discusses the recent commodity price boom, with particular attention to the interface between extractive industries and development. Chapter IV examines the trends and developments with respect to FDI and other forms of TNC involvement in extractive industries globally. It provides detailed information on the presence of the leading TNCs in key mineral-exporting countries, based on unique sets of data, with a focus on recent developments. It also discusses the main drivers and determinants of foreign investment in extractive industries, noting that these vary between different groups of TNCs. Chapter V analyses the economic, environmental and social impacts of TNC involvement in extractive industries on host countries. The concluding chapter (chapter VI) is devoted to the policy challenge. While recognizing that governments have the primary responsibility for ensuring that TNC involvement in mineral extraction translates into tangible development benefits – particularly in host countries – it explores the options available to various relevant stakeholders for contributing towards the achievement of that goal.

Note

1 Agriculture, forestry and fisheries, which are also part of the primary sector, account for less than 1% of all primary-sector FDI from the EU and the United States, the main sources of such FDI.

CHAPTER III

FEATURES OF THE EXTRACTIVE INDUSTRIES

Access to a variety of minerals is important for all economies, not least for those that are at an early stage of development. The current commodity price boom has generated renewed interest in the links between extractive industries and development. The intertwining roles of markets, enterprises and States in the extractive industries vary with the specific nature of those industries. Global markets for mineral resources tend to be highly volatile, partly due to the often significant time lags in the supply response to changes in demand. Investments in the extractive industries are generally associated with high capital intensity and high risk, and are strongly influenced by political decisions, which in turn are considerably affected by swings in the market. When prices are high, governments have a strong bargaining position vis-à-vis the investors and vice versa. At the same time, there is a significant positive correlation between high prices and global investments in exploration.

For resource-rich countries, the price boom that started in 2004 has generated new development opportunities. However, the relationship between exploitation of mineral resources and the development performance of the exporting countries has varied considerably. Countries have to face several challenges beyond the economic concerns, extending to environmental, social and political dimensions. Such concerns vary, depending on the mineral resources and the countries. Many related challenges are linked to the specific features of the industry itself, independently of TNC involvement.

This chapter sets the stage for the analyses that follow in subsequent chapters of the role and impact of TNCs in extractive industries. Section A examines the evolving role of minerals in the world economy and defines the scope of analysis by identifying the main minerals on which this Report focuses. It points out that the centre of gravity of supply and demand for many minerals has gradually shifted towards developing countries. Section B considers the functioning of mineral markets, highlighting the special characteristics of the most recent commodity price boom and its implications for global investment activities in the extractive industries. Section C outlines some of the main characteristics of investment in these activities and discusses the development opportunities and challenges facing resource-rich countries in the current era.

A. Extractive industries in the world economy

1. Minerals are essential for all economies

Minerals account for a small share of world production and trade.[1] Nonetheless, their supply is essential for the sustainable development of a modern economy. They are basic, essential and strategic raw materials for the production of a wide range of industrial and consumer goods, military equipment, infrastructure, inputs for improving soil productivity, and also for transportation, energy, communications and countless other services (Highley, et al., 2004). No modern economy can function without adequate, affordable and secure access to raw materials. This is easily taken for granted in "normal times". However, when supply is disrupted or prices rise, affected countries are quick to react. Recent events in disrupted gas deliveries between

Box III.1. Definitions of extractive industries and minerals

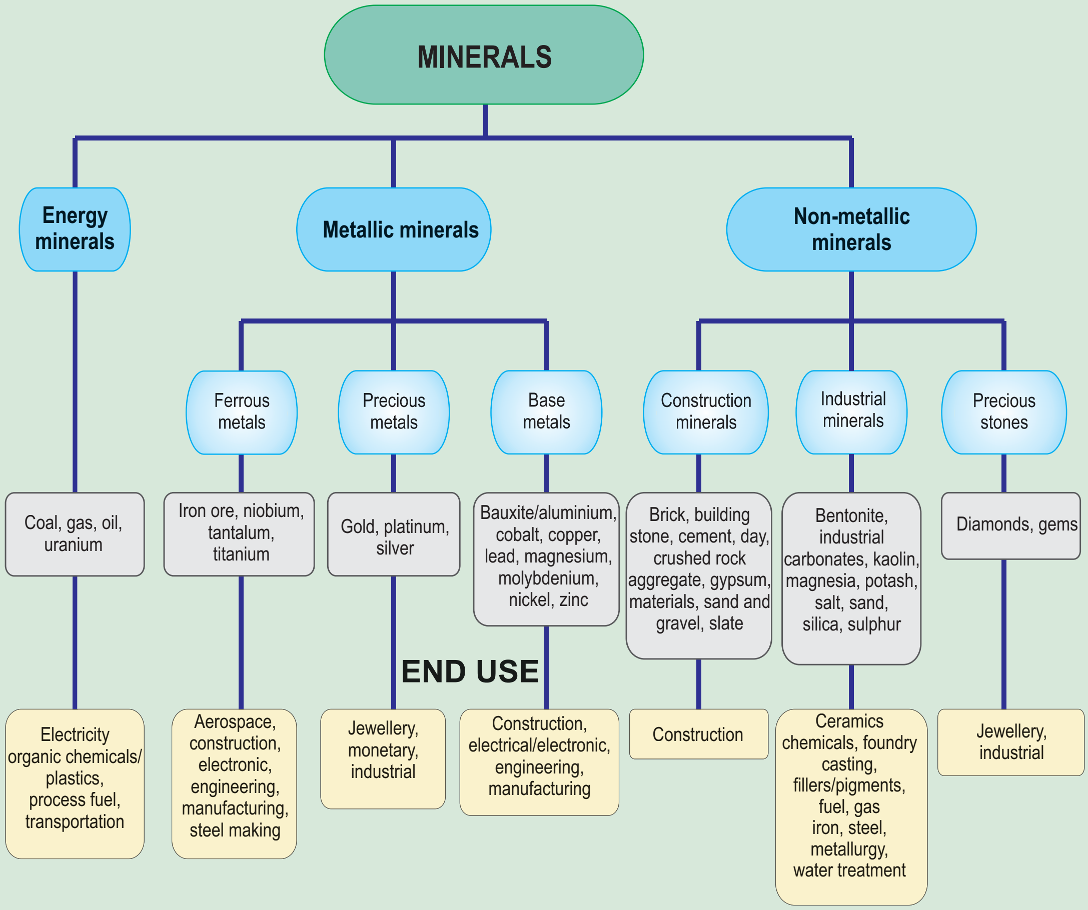
Extractive industries are defined in the *WIR07* as primary activities involved in the extraction of non-renewable resources.[a] Thus they do not include such industries as agriculture, forestry and fisheries. The report also employs an economic definition of minerals.[b] Economic minerals are those that can be marketed for productive purposes. They can be classified into three main categories (box figure III.1):

- o Energy minerals (oil, gas, coal and uranium),
- o Metallic minerals, and
- o Non-metallic minerals (industrial and construction minerals and precious stones).

An important dimension of economic minerals is the way in which they are traded (IIED, 2002). Globally traded minerals have a high enough value per unit weight to be sold in global markets. They include gold, diamonds, copper and aluminium. Oil and gas also belong to this category. Less globally traded minerals have a sufficiently high value per unit weight to be marketed regionally (some grades of coal, limestone and steel), but seldom globally. Locally traded minerals, mainly sand, gravel and stone, have a very low value per unit of weight.

The present report focuses on the most tradable energy and metallic minerals: oil and gas among the energy minerals; and iron ore (ferrous metals), gold (precious metal), and copper, bauxite/aluminium, zinc and nickel (base metals) among the metallic minerals. Metallic minerals account for about 25% of the total value at the mine stage of global mineral production (excluding oil and gas). Given their importance for selected developing countries and their high tradability, diamonds are also included in the analysis.

Box figure III.1.1. Minerals and their use



Source: UNCTAD.

[a] See http://glossary.eea.europa.eu/EEAGlossary/E/extractive_industr. It should be noted that metals are not destructible.

[b] Other definitions of minerals are based on geological, legal or biological-medical considerations.

the Russian Federation and Ukraine as well as concerns over the rising oil and gas prices are vivid illustrations. It is therefore not surprising that energy security has resurfaced to the top of the international political agenda, as witnessed, for example, in the G8-summit in Heiligendamm in June 2007 (G8 Summit, 2007).

This report focuses on extractive industries (box III.1), with special attention to energy minerals, notably oil and gas, and to the following metallic minerals: bauxite/aluminium, copper, iron ore, gold, nickel and zinc, and diamonds. Their selection reflects their importance in global mineral production, the role of TNC involvement in their extraction and their tradability at the global level. Throughout this report, a distinction is made between the oil and gas industry, and the metal mining industry.

These two categories of extractive industries are of quite different magnitude. Global production of crude oil and natural gas amounted to an estimated \$2.3 trillion in 2005.[2] By comparison, global production (at mine site) of metallic minerals was valued at about \$265 billion the same year.[3] Commercially, a few metals dominate the metal mining industry. The three most important ones – iron ore, gold and copper – account for some 50% of the total value of metallic minerals produced, followed by nickel and zinc (which represent only about 8%) (table III.1). Bauxite is low on the list mainly because most of the value added in aluminium is created at the refining (alumina production) and smelting (aluminium production) stages (see below). These six metals are economically the most important. Moreover, in most cases, foreign affiliates play a significant role in their global production, their share being more than 50% in bauxite copper and gold production, 36-37% in zinc and nickel production, and about 20% in iron ore production.

Table III.1. Most important metals in world mining, 2005

Metal	Share in total value of metallic mineral production[a] (%)	Volume of output (metal content in kilotonnes)	Share of foreign affiliates in world production[b] (%)
Iron ore	21.9	800 000	21
Copper	18.0	16 900	56
Gold	13.5	3	50
Nickel	4.9	1 300	36
Zinc	3.4	10 300	37
Bauxite	1.5	31 000	60
Others	36.8	..	..
All metals	100.0	..	..

Source: UNCTAD, based on data from the Raw Materials Group.
[a] Estimates.
[b] Foreign affiliates are considered to be those with at least 10% foreign ownership.

The metallic mineral industry involves five main stages: exploration, development, mining, processing (smelting and refining) and mine closure. The share of the value added at the various stages of extraction depends on the specifics of each process from mine to metal (table III.2). If the smelting and refining steps are complicated and/or very energy-intensive, the costs of these latter stages may be considerable compared to the mining stage, and hence less value is added at the mining stage. For example, in the case of bauxite/aluminium, less than 10% is created at the mining stage. Gold and the platinum group metals represent the other extreme, as the product at the mining stage needs very little further treatment in a specialized refinery. The base metals, copper, lead and zinc are in between, with the product at the mining stage – the concentrate – accounting for most of the value.

Table III.2. Share of value added at the mining stage of selected metals,[a] 2005/2006
(Per cent)

Metal	Share of value added at the mining stage
Gold	100
Platinum group metals	100
Tin	83
Copper	77
Lead	77
Nickel	70
Zinc	63
Cobalt	33
Bauxite/aluminium	9

Source: UNCTAD, based on data from the Raw Materials Group.
[a] Estimates.

In the case of oil and gas, refining applies mainly to oil, but a certain proportion of the natural gas is also used in "gas-to-liquids" plants in which high-quality oil products are produced.

Petroleum refining is the separation and processing of crude oil into three types of products: fuels,[4] finished non-fuel products,[5] and chemical industry feedstocks.[6] The transport part of the value chain is different for oil and gas, respectively. Oil is traded worldwide as it can be easily stored and transported via pipelines, railway, tankers and trucks. Gas, which is more difficult to store and transport, is generally transported between neighbouring countries via pipelines. For long-distance transportation and trade it usually takes the form of liquefied natural gas (LNG). LNG supply involves liquefaction, maritime transportation and re-gasification at the receiving end, where it is connected to the traditional transmission pipelines, storage facilities and distribution networks.[7] The share of LNG in total gas trade, which was 35% in 2005 (BP, 2006), is expected to increase, with total liquefaction capacity worldwide set to double between 2005 and 2010 (IEA, 2006a).

2. Geography of production and consumption of selected minerals

The world mineral market is characterized by an uneven geographical concentration of resources, production and consumption. The major producers are mainly from developing and transition economies and are net exporters, while the major consumers are mainly from developed countries and rely heavily on imports. Since the 1990s, some Asian developing countries have significantly increased their consumption of minerals to help fuel their booming economies, and are now among the leading consumers and importers.

Oil and gas reserves are highly concentrated in West Asia: its share in world total proven and probable reserves was 62% for oil and 40% for gas at the end of 2005. However, in terms of oil and gas production, West Asia's share was only 23% in 2005. In contrast, developed countries that only accounted for 6% and 8% of global reserves of oil and gas respectively, had a significant 25% share in global oil and gas production (table III.3). For natural gas, the Russian Federation has the largest reserves (27% of the world total) and the highest production (22% of the world total).[8] The Persian Gulf region, which accounts for only 10% of world gas production,[9] is set to increase this share as trade in LNG expands.

Developed countries and South, East and South-East Asia are two groups of countries for which the share in world consumption is greater than in world production and reserves. The gap is larger for developed countries, but is growing rapidly for Asian countries (table III.3).[10] This explains why exploration activity is highly concentrated in developed countries where around 70% of new fields are drilled. Among developing countries, exploration activities are mostly concentrated in South, East, and South-East Asia (table III.3).

For metallic minerals, the picture varies by commodity. However, with few exceptions, developed countries and developing Asia consume more metals than they produce, while the converse applies to Africa, Latin America and the Caribbean, as well as to South-East Europe and the Commonwealth of Independent States (CIS). It is interesting to note, however, that the share of developed countries in the consumption of iron ore, copper and zinc fell significantly in 2005 from that of a decade ago. This was compensated by a strong increase in the share of developing Asian countries for these metals. Also worth noting is the strong increase in the participation of developed countries in iron ore production, to the detriment of Latin American countries and economies in transition and of developing Asia in gold, zinc and bauxite production (table III.4).

For many developing countries, minerals are the most important export products. The heavy reliance on minerals is particularly pronounced among oil-producing countries in Africa and West Asia (table III.5). African and Latin American countries are endowed with diverse minerals, ranging from precious minerals to ferrous and industrial minerals. Africa dominates the world's supply of precious metals and stones, such as platinum, diamonds and gold, of which it is the leading producer, while Latin America is the leading producer of such metals as copper and silver (USGS, 2005).

B. The commodity price boom and its impact on investments

Mineral markets are volatile. The most recent commodity price boom has had a major impact on corporate investment behaviour as well as on government policies. It is therefore important to understand the underlying forces behind the recent

Table III.3. Reserves, production, consumption, and exploration of oil and natural gas, by region, 1995 and 2005

(Per cent)

	Oil and gas						Reserves at end 2005[c]	
	Exploration[a]		Production[b]		Consumption[b]			
	1995	2005	1995	2005	1995	2005	Oil[b]	Gas[b]
Economy	Share in total number		Share in total volume					
Developed countries	67	71	31	25	56	52	6	8
Developing countries	29	23	49	54	29	36	84	59
Africa	4	6	8	10	3	3	10	8
Latin America	7	6	10	11	7	7	10	4
Developing Asia	17	11	31	33	20	26	65	47
West Asia	2	3	21	23	7	9	62	40
South, East and South-East Asia	15	8	10	10	13	17	3	7
South-East Europe and CIS	5	6	19	20	14	12	10	31
Russian Federation	3	3	16	16	9	8	6	27
Total world	100	100	100	100	100	100	100	100

Source: UNCTAD based on data from IHS Energy and BP, 2006.

a Shares calculated on the basis of the number of new fields drilled.

b Shares calculated on the basis of volume.

c The reserves are proven and probable ultimate recoverable reserves, i.e. the volume that it is expected will be recovered from the deposit over its entire production lifetime. Proven and probable implies a confidence level of 50%.

Table III.4. Production and consumption of selected metallic minerals, 1995 and 2005
(Per cent)

Metal	Developed countries		Africa		Latin America and the Caribbean		Developing Asia		South-East Europe and the CIS		All regions	
	1995	2005	1995	2005	1995	2005	1995	2005	1995	2005	1995	2005
Iron ore production	17	29	6	4	31	24	27	29	19	14	100	100
Pig iron production[a]	37	29	2	1	8	5	39	52	14	13	100	100
Copper production	41	43	6	9	19	21	12	6	22	21	100	100
Copper consumption[b]	64	46	1	1	5	6	28	42	2	5	100	100
Gold production	34	28	30	21	12	18	14	23	10	10	100	100
Gold consumption	37	39	3	4	2	2	56	53	2	2	100	100
Nickel production	31	30	6	5	12	17	28	26	23	22	100	100
Nickel consumption	52	50	5	3	10	13	10	12	23	22	100	100
Zinc production	45	36	4	4	23	21	22	32	6	7	100	100
Zinc consumption	57	42	2	2	15	8	19	39	7	9	100	100
Bauxite production	39	36	15	10	28	27	12	19	6	8	100	100
Alumina production[c]	40	48	2	1	28	20	14	19	16	12	100	100

Source: UNCTAD, based on data from the Raw Materials Group, Virtual Metals and Bloomsbury Minerals Economics Limited.

[a] Pig iron production (iron content) is used as a proxy for iron ore consumption.

[b] The first column's data for each region are for 1996.

[c] Aluminium production is used as a proxy for bauxite consumption.

Table III.5. Developing and transition economies with highest dependency on exports of minerals
(Per cent of total exports, 5-year average (2000-2004))

Sorted by fuels [a]			Sorted by non fuel minerals [a]		
Economy	Fuels	Product description	Economy	Ores and metals	Product description
Algeria	97.8	Oil and gas	Guinea [bc]	89.8	Bauxite, alumina, gold and diamonds
Nigeria [b]	97.8	Oil	Botswana [d]	87.2	Diamonds, copper, nickel
Libyan Arab Jamahiriya [e]	96.9	Oil	Suriname [b]	70.0	Alumina (aluminium oxide)
Yemen	93.3	Oil and gas	Zambia [b]	61.5	Copper, cobalt
Kuwait [b]	92.9	Oil	Jamaica	60.8	Alumina, bauxite
Angola [f]	92.2	Oil	Niger [b]	46.1	Uranium and gold
Qatar	89.1	Oil, petrochemicals	Chile	45.0	Copper
Saudi Arabia [b]	88.9	Oil	Mozambique [b]	42.3	Aluminium
Brunei Darussalam [b]	88.3	Oil	Papua New Guinea [b]	38.6	Gold, copper
Azerbaijan	86.6	Oil	Congo Republic [g]	34.0	Various metals
Iran, Islamic Rep. of [b]	86.3	Oil and gas	Ghana [h]	33.3	Gold
Venezuela	83.4	Oil	Cuba	33.2	Nickel
Turkmenistan	81.0	Gas	Peru	32.9	Gold, copper, zinc
Oman	80.6	Oil	Rwanda [bi]	32.2	Various metals
Gabon	79.5	Oil	Uzbekistan	30.3	Gold
Sudan [b]	74.2	Oil	Georgia	24.9	Various metals
Syrian Arab Republic	72.8	Oil	South Africa [c]	21.7	Platinium, gold
Bahrain	70.5	Oil	Bolivia	19.1	Zinc, gold
Trinidad and Tobago [b]	61.3	Oil and gas	Kazakhstan	18.0	Various metals
Kazakhstan	56.1	Oil and gas	Bahrain	16.8	Aluminium

Source: UNCTAD, calculation based on COMTRADE database and other sources.

[a] Fuels include SITC 3. Ores and metals include SITC 27+28+68 and, when relevant, diamond ore has been added.

[b] 2 to 4 year average.

[c] The Economist Intelligence Unit.

[d] Bank of Botswana, Financial Statistics.

[e] Derived from OPEC, Annual Statistical Bulletin.

[f] IMF, Staff Reports.

[g] IMF, Direction of Trade Statistics.

[h] IMF, Ghana statistical annex.

[i] IMF, Direction of Trade Statistics.

surge in commodity prices and to examine recent developments from a historical perspective.

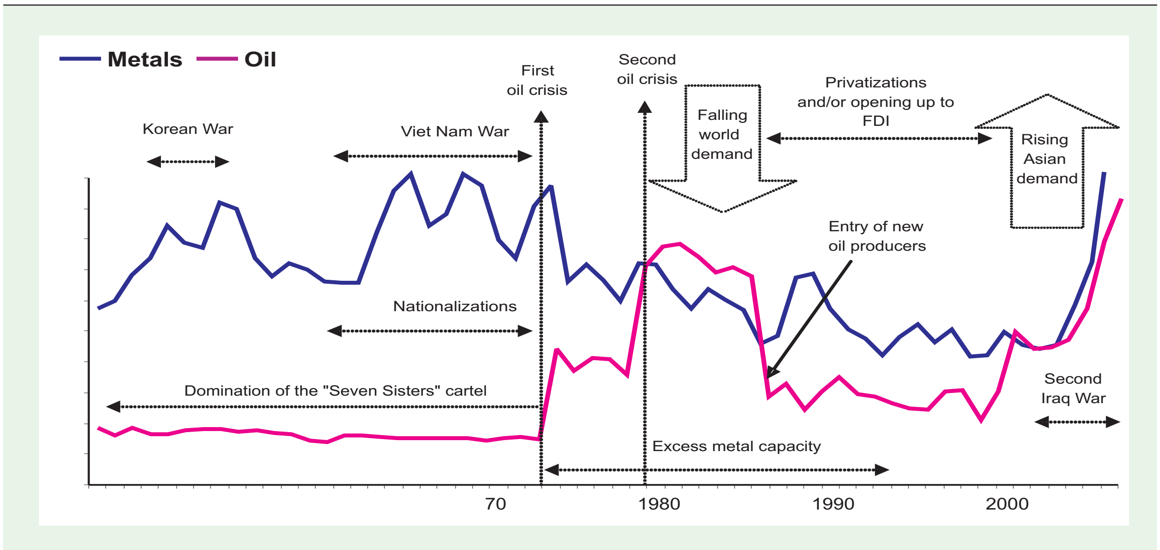
1. Booms and busts of mineral prices

Mineral prices since the Second World War have been very volatile in response to changes in market conditions. 1974 mark the end of the 30-year "golden period" of strong world economic growth, and high demand for minerals that began after the Second World War (figure III.1). During the period 1950–1973, crude oil prices were effectively controlled by the so-called "Seven Sisters" and remained practically constant in real terms.[11] During the same period, metal prices were subject to considerable fluctuations around an upward trend. Positive and increasing long-run growth rates were viewed as a durable feature of mineral markets (Tilton, 1990), and the prevailing preoccupation was the risk of a rapid rise in demand for minerals in developing countries.[12]

From the first oil crisis in 1973–1974 until the early 1980s, oil prices began to climb steeply, largely as a result of increased market control by the Organization of the Petroleum Exporting Countries (OPEC).[13] Metal prices, on the other hand, began a long-term declining trend that reflected several factors, including slower world economic growth, reduced intensity of metal use in many countries (Tilton, 1990), acute competition among producers, and the build-up of huge excess supply capacity.[14] Crude oil prices also began to decline in real terms in 1985, following the discovery of new reserves in non-OPEC countries such as Angola (now an OPEC member), Mexico, Norway, the then Soviet Union and the United Kingdom. These new sources of supply reduced the market control of OPEC, whose share of world crude production dropped from 53% in 1974 to 30% in 1985 (ECLAC, 2002). The depressed mineral prices of the 1980s and 1990s had important consequences: instead of being regarded as strategically important to economic development, oil and metals were increasingly treated as simple commodities. This "commoditization" of both oil and metals influenced governments' policy orientations, and contributed to a trend of privatizations, deregulation and increased openness to FDI in several developing and transition economies, especially in metal mining (see chapters IV and VI).

It is only in recent years that the gradual decline in mineral prices has been reversed. For oil, the turning point came in 1999, when prices increased as a result of an agreement signed in 1998 between the OPEC and non-OPEC producers – Mexico, Norway, Oman and the Russian Federation – to reduce supply.[15] From 2003, the geopolitical instabilities in West Asia contributed to a further surge in the price of crude oil (figure III.1).[16] For metals, the long-lasting decline in prices came to an abrupt end in 2004.

Figure III.1. Real price index of crude oil and metallic minerals, 1948-2006
(Base year 2000 = 100)



Source: UNCTAD and Radetzki, forthcoming.

Note: The metals price index includes the following minerals with their respective weights: copper (38.89%), aluminium (23.93%), iron ore (13.65%), zinc (7.22%), nickel (6.70%), tin (3.62%), phosphate rock (2.67%), lead (2.10%), manganese ore (1.20%), tungsten ore (0.02%). The crude petroleum price index reflects the average of Dubai, United Kingdom Brent and West Texas Intermediate crude prices, with relatively equal consumption of medium, light and heavy crudes worldwide. The deflator used is the unit value index of manufactured goods exports by developed countries.

The price boom took most observers by surprise. It was driven by very strong demand coupled with supply constraints. Unlike earlier boom periods, growth in demand this time came mainly from developing countries. China, in particular, is currently experiencing a resource-intensive growth phase;[17] in addition, the country's economy has been growing more than three times that of the world economy over the past decade (UNCTAD, 2007f). It has therefore become a major engine of world mineral demand growth: in 2005, it accounted for 29%, 66% and 25%, respectively, of the growth of oil, copper and nickel demand, and its share in total world demand for oil, copper and nickel was 8.5%, 22% and 16% respectively (BP, 2006; Goodyear, 2006).[18]

The price rises were also due to slow supply responses. The extended period of low mineral prices had led to reduced investment in human resources, production and refining capacity, resulting in a significant decline in spare supply capacity. Many high-cost production installations were closed in the process.[19] Thus, when demand suddenly surged, there was little idle production capacity left to satisfy the growing consumption.[20] Moreover, shortages and rising costs of inputs caused further delays in the expansion of supply capacity (table III.6). Low levels of stocks, geopolitical instability and unpredictable events, such as strikes and hurricanes, put additional upward pressure on prices.[21]

Table III.6. Supply delays: selected examples
(Month)

Item	Pre-boom lead times (in month)	Lead times, early 2007 (in month)
Grinding mills	20	44
Draglines	18	36
Barges	24	32
Locomotives	12	26
Power generators	12	24
Wagons	12	24
Rope shovels	9	24
Reclaimers	18	24
Tyres	0-6	24
Large haul trucks	0-6	24
Crushers	16	24
Ship loaders	8	22

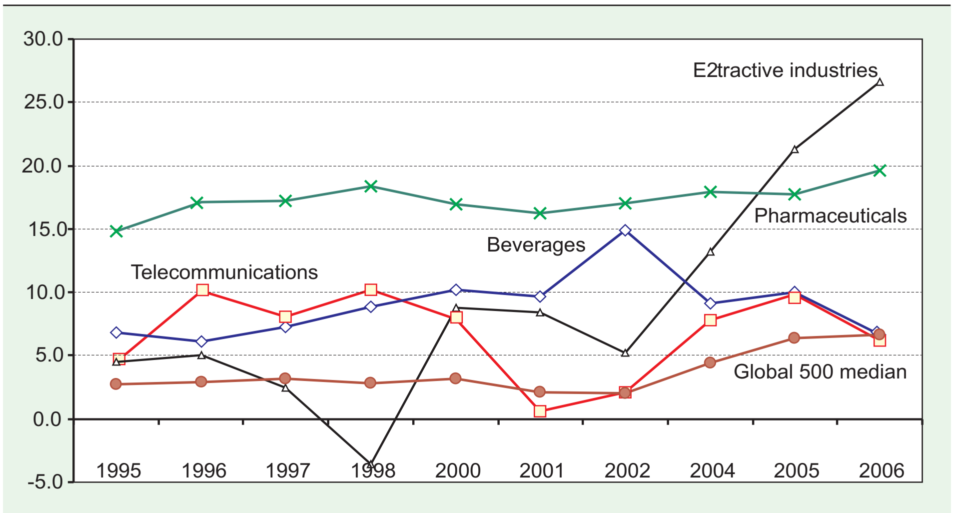
Source: Rio Tinto, 2007.

2. The boom led to rising profits and investments

The recent boom in mineral prices prompted a worldwide investment surge, fed in part by rising profits. Despite cost increases of many inputs, the profitability of mineral producers has risen fast. *Fortune Global 500* companies in extractive industries reached exceptionally high profitability in both 2005 and 2006, compared with large companies in other industries, as well as historically (figure III.2). The net profits of ExxonMobil for 2006 were the highest ever reported by a United States corporation. A study covering some 80% of the world metal mining industry by capitalization found an increase in net profits, from $4.4 billion in 2002 to $67 billion in 2006 (PricewaterhouseCoopers, 2007b).

To take advantage of the high commodity prices, firms were eager to expand their production facilities as fast as possible. The intensity of investment and production activity has taken several tracks. As noted above (table III.6), this may have exhausted a number of immediately available key inputs in mineral resource investments.

Figure III.2. Profitability of Fortune Global 500 companies in extractive industries and other industries, 1995-2006
(Profits in percentage of revenues)



Source: UNCTAD, based on data from the Fortune Global 500 (various years).

Note: Profitability is measured as the ratio of profits to revenues of companies in the Fortune 500 Global, in their respective activity. The common denominator in defining revenues for different industries is income, including sales. Profits are calculated after taxes, and after extraordinary credits or charges that appear in the income statement. For 2006, data for the 1,000 largest corporations in the United States have been used as a proxy.

Oil and gas drilling operations have doubled since 2002, and the number of active rigs has been the highest in 20 years: in mid-2006, the rig utilization rate was estimated at 92%. This intense activity has helped push up costs. For example, drilling day rates have risen by 10–15% per year since 2003 (IEA, 2006b). Companies are scouring the global labour markets for oil and mining engineers, as the dearth of specialized manpower is creating a bottleneck in the execution of investment projects (IMF, 2006).

Supply constraints notwithstanding, the volume of new oil production capacity is expected to grow. According to one study, for the 5-year period 2006–2010, global oil production capacity is projected to increase by 11.7 million barrels per day (mbd), of which no more than 3.8 mbd will be additional oil supplied by the OPEC countries (IEA 2006a). Global demand in the same period is expected to rise by 8.1 mbd, thus relaxing the capacity constraint by 3.6 mbd. Other studies corroborate these findings.[22] However, other observers have warned that supply constraints may result in a further tightening of oil market fundamentals (UBS, 2006; IEA, 2007).[23]

Investments in expansion of capacity are growing in the metallic mineral industries as well. At the downstream level, refined copper capacity is expected to rise substantially faster than demand during the period 2005–2009, and from 2006 increasing surpluses are anticipated in the copper market (CRU, 2006). A similar situation is expected in the case of nickel from 2007 to 2010.[24] In the iron ore market, a turnaround to surplus is expected only in 2009/2010 (UNCTAD, 2007h).

At the upstream level, global private exploration investment in non-ferrous metals rose from $2 billion in 2002 to more than $7 billion in 2006, and it is expected to reach $9 billion in 2007 (figure III.3). Between 2001 and 2005 investment more than doubled in a number of major mineral-rich countries, including Argentina, Canada, Mexico, the Russian Federation, South Africa and the United States (Humphreys, 2005). Among the most important developments in recent years has been the growth of exploration in China, Mongolia and the Russian Federation. Their combined share of global private, non-ferrous exploration expenditures rose from 4% in 2000 to 12% in 2006 (MEG, 2006). However, the level of success in metallic mineral exploration has been low. Indeed, since 1998, only four world class deposits have been discovered by new exploration (figure III.3).[25] While reserves may expand as a result of additional finds in and around already existing mines, it is likely that new metal deposits will be located deeper and in more remote areas, and will be of lower grade. As recently summarized by a mining industry expert (Humphreys, 2006: 5):

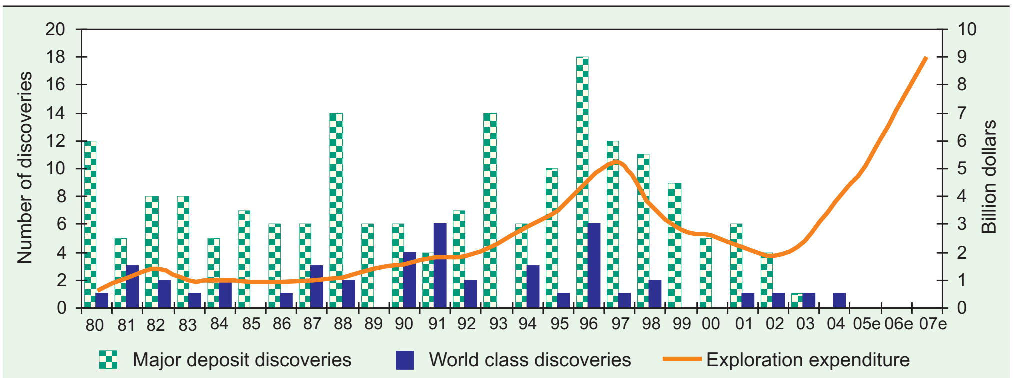
> "The cost of finding economic deposits of base metal minerals appears also to be rising… Moreover, the failure of exploration to turn up new monster deposits of the likes of Carajas, Escondida, Grasberg and Norilsk in recent years has resulted in a growing perception that finding and developing very large projects in the future is going to be much more challenging than in the past. Most of the low hanging fruit appears to have gone."

3. Prices likely to remain high for some time

Some factors suggest that the price boom may reflect a "structural" shift. On the demand side, the economic ascendancy of China, India and other developing countries, along with the resource-

Figure III.3. Number of major discoveries and private non-ferrous mineral exploration expenditure, 1980-2007

(Billion dollars and number of discoveries)



Source: UNCTAD, based on Mineral Economic Group, 2006; and data provided by the Raw Materials Group and BHP Billiton.
e Estimates.

intensive stages of their current development phase could well result in a long-running acceleration of commodity demand growth. This can be seen as a new stage in international commodity markets, with prices remaining at unprecedentedly high levels. [26] Another argument suggesting a structural shift is that depleting natural resources are increasing the cost of new output and, in the case of oil, increasing the dependence on the politically unstable West Asian region, with an unavoidable upward price push (see, for example, Deffeyes, 2005; and Laherrere, 2005), at a time of rising demand from large emerging market economies. Increased State involvement in metal mining and oil extraction may result in political factors having a greater influence on production decisions, and it may limit foreign TNCs' access to mineral deposits.

Other experts question the relevance of such observations and tend to play down the threat of depletion, even in the distant future.[27] Some of them have also cautioned that expectations of future global commodity demand growth may be exaggerated.[28] According to one corporate assessment, expanding output in response to higher prices should mean that prices move back towards marginal costs of production (Rio Tinto, 2007). Still, the period over which this can be expected to happen – which varies from commodity to commodity – is likely to be longer in this current cycle than ever before.[29]

In conclusion, there are contradictory perspectives regarding the evolution of mineral prices. In the short term, although global economic growth may have peaked in 2004 and, in particular, the United States economic expansion slackened during 2006, there are no indications of an impending worldwide recession. On the supply side, the extended gestation period of mining projects due to the shortage and rising costs of inputs may well delay the build-up of a sizeable inventory that could relax the supply constraints. Nevertheless, in the medium term there is the likelihood that most of the ongoing investments will materialize, and that the investment plans may even expand further, if prices remain for some time at the elevated levels of 2006. Thus, unless global economic growth slows down, prices may continue to remain relatively high until there is overcapacity in the oil, gas and mineral industries. This may not happen until the beginning of the next decade.[30] In the longer term, price behaviour will depend upon the demand and depletion rates as well as on new discoveries. However, industry experts seem to be certain that future deposits will be more expensive to develop, which should keep prices relatively high.

C. Extractive industries: opportunities and challenges for development

1. Characteristics of investments in extractive industries

Investments in extractive industries have particular features, relevant for their development impact. The extraction of mineral resources is largely dominated by large-scale, capital-intensive investments, although artisanal and small-scale mining can be important in some countries and for some specific minerals (box III.2). Some projects are technologically challenging, and investments in them are characterized by a high degree of uncertainty and long gestation periods. In most developing countries – except for China and India

Box. III.2. Artisanal mining

There are an undefined number of small- and medium-scale non-fuel mining enterprises all over the world producing mainly gold, but also precious stones, iron ore and other minerals. They include artisanal and small-scale miners such as the Brazilian garimpeiros (illegal gold miners), the West African orpailleurs (artisans that extract gold, mainly by washing alluvia) and the Chinese backyard iron ore mines set up during Mao's "Great Leap" campaign, many of which are still operating. In 2005-2006 alone, several thousand iron ore mines were opened in China and India. Box table III.2.1 provides estimates of gold production by artisanal miners for selected countries in Africa and Latin America.

Source: UNCTAD.

Box table III.2.1. Artisanal gold production,[a] 2005
(Tons)

Country	Artisanal production	Total production
Argentina	0.2	27
Bolivia	3.5	9
Brazil	6.1	35
Colombia	21.6	37
Dem. Rep. of the Congo	2.0	5
Ecuador	3.0	4
Ghana	6.9	65
Kyrgyzstan	1.4	17
Mali	1.8	46
Mexico	7.4	32
Niger	0.5	4
Papua New Guinea	3.2	69
Philippines	1.2	6
United Rep. of Tanzania	5.0	49

Source: UNCTAD, based on data from the Raw Materials Group.
[a] Estimates.

where production is consumed or used domestically – mineral extraction is primarily an export-oriented activity, with significant scope for revenue creation, but limited opportunities for employment creation and local linkages. In addition, mineral extraction poses considerable threats to the local environment and may have adverse social implications. Finally, mineral resources are non-renewable and often of strategic, geopolitical importance. As a result, the level of State involvement tends to be high, especially in the case of oil and gas (see chapter IV).

Mineral extraction is capital-intensive. Building a large base-metals mine can cost over a billion dollars. The magnitude of investments in the oil and gas industry is even greater. Constructing a pipeline, developing an oil deposit or revitalizing an ailing, underinvested mineral industry can run into many billions of dollars.[31] Such kinds of investments in developing countries generally require the involvement of a State-owned enterprise (SOE) that can rely on the financial support of the government, or of TNCs. Not all developing countries, especially among the least developed countries (LDCs), have – or can obtain – the financial resources needed for such investments, either from national SOEs or from national private firms, and have resorted to attracting investments from TNCs. One alternative to TNCs for capital may be to borrow from a lender prepared to accept the high-risk entailed in such investment (e.g. national or regional development banks or the World Bank).[32]

Some projects are more technologically challenging than others. In metal mining, most technology can be acquired in the market, and there are generally few differences in the approaches taken by different mining companies. The challenge is in this case related more to the management of projects with long gestation periods, and the need to give due attention to their environmental and social impacts. In oil and gas extraction, the level of technological complexity is particularly high for offshore, deep-sea extraction, whereas onshore extraction is less technologically challenging.

Special consideration should be given to the long gestation periods often involved in extractive projects. The exploration phase may take up to 10 years, and in many cases such investments eventually turn out to be unsuccessful.[33] On average, the costs associated with failure reduce the expected economic returns of exploration. For the exploration projects that result in discoveries, the potential rewards can, however, be considerable (Land, 2007; Goodyear, 2006).

Even if the exploration is successful and a new mine is developed and brought into production, the investor still faces various technical risks,[34] market risks (related to demand and price forecasts), political risks (e.g. changes in mining laws, nationalizations), and social and environmental risks. In developed countries, it has become increasingly difficult for mining companies to gain legal access to land and maintain that access (Otto, 2006). If undertaken in countries with a weak institutional framework, the political, social and environmental risks can be very costly in terms of delays, negative publicity, risks of losing their operating licence and significant unforeseen expenditures.[35] Indeed, effective management of the social, environmental and other risks is likely to become a source of competitive advantage for firms (Howard, 2006).

When prices are high, companies have a higher propensity for risk. “Certain countries such as Peru, Russia and China, which are generally considered higher risk, are receiving a greater proportion of exploration dollars because of their mineral prospectivity. Companies are willing to accept that risk in the search for reserves, particularly in the current environment of high commodity prices.” (PricewaterhouseCoopers, 2006: 23). In periods of low prices, the profitability of resource extraction projects tends to decline, reducing the bargaining position of a country to attract investment. However, once the investment is made and the mines or wells are successfully working, the high fixed costs, which gave the foreign company bargaining strength at the beginning of the investment, can become a source of vulnerability. If stricter conditions are imposed, for example, the company may have little choice but to accept them, because it cannot easily withdraw.

Another characteristic of extractive industries is the potential for sizeable mineral rents. Metallic mineral and hydrocarbon deposits are heterogeneous, characterized by large differences in production costs depending on their quality and accessibility. The rent is generally higher for oil and gas extraction, partly because OPEC keeps oil prices above the cost of the least productive field. A huge Saudi Arabian oilfield is capable of generating significant volumes of crude oil over a sustained period under its own pressure, resulting in very low extraction costs per barrel of oil. The same barrel of oil is recovered from a deep offshore field at a much higher cost.[36] In the metal mining sector, mineral grade variation, coupled with mineralogical conditions, can also be significant (Land, 2007).[37]

Finally, minerals are often perceived as being of strategic importance both by producer and consumer countries. First, minerals may be strategic for military, industrial or essential civilian needs. Secondly, specifically from a producer point of view, their non-renewable character gives them a strategic dimension. Energy minerals (especially oil and gas) are geographically more concentrated (table III.3), and thus strategically important in terms of energy security. This dimension partly explains the significant role of SOEs in the oil and gas industry (chapter IV).

2. Public policy concerns of mineral-rich countries

Mineral wealth can be a source of income and prosperity and an opportunity for economic development. However, resource abundance does not automatically translate into economic prosperity, and exploitation of non-renewable resources poses serious challenges to long-term sustainable development prospects. As defined by the World Commission on Environment and Development of the United Nations, sustainable development means "development that meets the needs of the present without compromising the ability of the future generations to meet their needs"(United Nations, 1987). Economic and social development, and environmental protection are seen as the three "interdependent and mutually reinforcing pillars" of sustainable development (United Nations, 2005a). Mineral extraction activities can have significant implications for all three pillars.

Although all human activities should, ideally, meet the criteria of sustainable development, this concept is particularly applicable to extractive activities because they concern intensively consumed, non-renewable resources, and their overexploitation can compromise their possible use – or the use of the revenues generated – by future generations.

This section focuses on development opportunities and challenges that mineral wealth represents for resource-rich countries, regardless of which economic agent is exploiting it. Therefore it does not address the specific impacts on host countries of TNCs' involvement in the extractive industry – an issue that is examined more closely in chapter V.

a. Mineral endowments represent development opportunities

Successful mineral-based development, as in developed countries such as Australia, Canada, New Zealand, Norway, Sweden and the United States, has not been merely a matter of geological endowments; rather, it has resulted from the existence and continuous development of human resources and skills, learning and innovation around the extractive activities (Ramos, 1998). For example, natural resource abundance in the United States was more an endogenous, "socially constructed" condition, than a natural endowment alone (David and Wright, 1997). Better scientific understanding and engineering knowledge can contribute to increasing the amount of proved reserves, improve extraction and refining technologies, and widen the scope of end-use and commercial utilization.

A number of today's upper-middle and high-income developing countries (e.g. Botswana, Chile, Indonesia, Kuwait, Malaysia, Saudi Arabia, South Africa, the United Arab Emirates and Venezuela) have managed, in varying degrees, to take advantage of their natural wealth in order to advance at least certain aspects of development (such as increasing per capita income, reducing poverty, and, in some cases, achieving economic diversification).[38] For many other resource-rich developing countries, the impact of mineral wealth on development has been disappointing. Many low-income countries heavily dependent on exporting natural resources "have performed poorly on various measures of economic, social and political development" (Pegg, 2006: 1). This phenomenon is regularly referred to as the "resource curse" (box III.3).

However, the development experience of mineral-rich developed countries is hardly reproducible in the present global context, and resource-rich developing countries may have to find original ways to leverage their natural resources for sustainable development. Developed countries used most of their mineral extraction locally, and local processing as well as inputs were protected by high transportation costs. Today, with relatively low transportation costs and globalized markets, it is more difficult to compete with imported products. Moreover, the intensive exploitation of mineral resources in developing countries has taken place at an earlier stage of their development, to respond to the needs of external, rather than domestic, users. It has thus preceded the development of national human resource capabilities that could help build an integrated mineral activity and create endogenous learning and innovation around it.

This new global context may limit the relative capacity for mineral-rich countries to benefit from their mineral endowments. Therefore they need to devise an overall development strategy for leveraging their non-renewable mineral wealth, not only to improve their present situation but also to ensure sustainable development for the benefit of future generations. In this regard, one important objective should be to build a diversified economy through investment in human capital, infrastructure and productive capacity.

Box III.3. The "resource curse" debate

There is a large body of theoretical and empirical literature that has addressed the role of mineral resources in economic development. Some experts cite evidence to suggest that countries that are rich in minerals have been worse off than less endowed countries in terms of various economic, social and political performance measures. Other experts argue that mineral resources represent a potential source of growth and development if managed well.

In a widely cited study covering a sample of 95 developing countries, a negative relationship was found between natural-resource-based exports (including agricultural products, metallic minerals and energy minerals) and economic growth during the period 1970–1990 (Sachs and Warner, 1997). Other scholars have confirmed that relatively poor per capita growth performance has generally characterized resource-rich developing countries, especially metallic mineral-exporting countries (Auty, 2001a; Mikesell, 1997). Oil exporters have not been immune either to the "resource curse" in terms of low growth (e.g. Gelb, 1988; Shams, 1989; Mikesell, 1997). Many studies also emphasize that countries rich in oil and solid minerals have performed worse in terms of alleviating poverty compared with countries with little or no such mineral wealth (Pedro, 2006).

However, it has also been noted that "there is nothing inherent in resource abundance that condemns countries to either low growth or un-sustainability" (Mikesell, 1997: 191). For example, some studies (Wright and Czelusta, 2003; Davis, 1998; Davis and Tilton, 2002) have questioned the validity of the econometric results and stress that "the reported negative outcomes of mineral economies are case-specific and that economic performance is mixed, heterogeneous and should not be generalized" (Pedro, 2004: 4). Rather than focusing on mineral resources as such, it has been suggested that political underdevelopment may be the root cause of the poor performance of mineral-rich economies (Moore, 2000). Due to weak governance, revenue from mineral extraction has often been wasted, rather than invested in ways that promote sustainable development. Thus governance systems and institutional capacity need to be strengthened, and mineral wealth should be invested in the creation of knowledge for economic innovation, and in human, social and physical capital formation, including infrastructure development. See also chapters V and VI.

Source: UNCTAD.

Mineral wealth represents not only opportunities; it can also, if not adequately managed, hinder development. The ability and capacity of mineral-rich developing countries to address economic, political, social and environmental challenges associated with the extractive industry is a key determinant of their development outcome.

b. The economic challenge

The economic challenge is threefold: how to create value from the mineral deposits; how to capture that value locally; and how to make the best use of revenues created from the extractive activities.

The first part of the challenge is to organize production in an efficient and sustainable way. This may involve different actors, such as artisanal and small-scale miners (see box III.2), large, private or State-owned, domestic or foreign-owned companies. The relative importance of these different players will vary depending on such factors as the nature of the mineral and the level of domestic capabilities.

The value an economy may seek to capture locally from mineral extraction can be direct, through employment, profits and taxes, as well as indirect, through the purchase of goods and services. Again, the scope for local capture of such value depends on how the extraction activity is organized, as well as on the nature of the minerals and the level of domestic capabilities. Large-scale mineral extraction is highly capital-intensive in nature, which limits the potential for employment creation. The magnitude of profits depends on such factors as the quality of the mineral deposit, the cost of extracting the minerals, the productivity of the operations and global price developments. The ownership of the production will influence the extent to which profits are distributed between the State and the private sector and within the country or abroad. The amount of government revenue depends also on the design and implementation of the fiscal system.

The scope for local procurement depends primarily on the availability of inputs, but also on the procurement policies of the extraction companies; whereas the scope for local use depends on the existence of national capabilities and competitive advantages in developing downstream manufacturing activities. In developing countries, local sourcing of the highly specialized inputs used in mineral exploration and extraction is generally difficult; often it is only activities such as catering, cleaning and, in some cases, construction services[39] that are sourced locally (Otto, 2006: 119). Moreover, the downstream capacity of many developing countries barely goes beyond refining activities, and in a number of cases does not even get that far. As a result, fiscal income and profits from the mineral extraction are arguably the most significant value contributions to a local developing economy. Thus, issues related to the ownership, size, distribution and use of revenues are, more than in other industries, the main focus of policy.

The third part of the economic challenge is related to the use of income resulting from mineral extraction, which is of crucial importance from a development perspective. The impact of the income generated will differ depending on its use: that is, whether it is transferred abroad or not, used to service foreign debt, to repatriate profits, for reinvestment, or for importing consumer goods.

There are many risks associated with the use of income from natural resources. First, government revenue from natural resources could lead to a "rentier attitude" that does not promote productive investments in projects conducive to employment creation and economic growth. While some problems may need urgent responses – especially those related to poverty – long-term, durable solutions are important in order to reduce the continued reliance on assistance.

Second, mineral revenue could lead to a shift away from investment in the manufacturing sector, which may cause the sector to shrink and the economy to specialize in the primary sector, a symptom typical of the "Dutch disease".[40] Yet industrialization is crucial for the development of low-income countries. Indeed, a characteristic feature of a successful development path is the growing importance of the manufacturing sector in the early stages of development (Chenery, et al., 1986). Most technical progress is concentrated in manufacturing (Prebisch, 1981), and it is a sector that enables positive externalities and learning opportunities, which play a key role in long-term economic development (Hirschman, 1958). There is a concern that resource-rich countries specialize in products for which demand increases less rapidly than for manufactured goods, leading to a long-term deterioration in their terms of trade (Prebisch, 1949; Singer, 1949). Accordingly, resource-rich countries need to channel the wealth generated in their primary sector into efforts towards greater economic diversification and the upgrading of their manufacturing activities, especially as mineral price volatility may translate into unpredictable government revenues.

c. The environmental, social and political challenges

More than most other industrial activities, mineral extraction tends to leave a strong environmental footprint. It can have profound environmental impacts near a project site and in surrounding areas, as well as at the global level. Effects vary between the different types of minerals and the stages in the production chain. In the case of oil and gas, considerable environmental damage can result from leakages and spills, flaring of excess gas and the creation of access routes to new areas, often involving deforestation. Oil spills are massively polluting, reducing fisheries and tourism and harming bird life, not to mention the severe ecological impact on other ocean life.[41] At the global level, a major concern regarding extractive industries in general, but especially energy minerals, is their impact on climate change (Liebenthal et. al., 2005; Sala-i-Martin and Subramanian, 2003).

Many of the environmental problems associated with metal mining stem from the contamination of surface and groundwater from toxic wastes.[42] The issue of access to and quality of water is especially critical when the mining activity takes place in proximity to agricultural or fishing communities (Otto, 2006). Mining may also be associated with deforestation, soil erosion and mine tailings, and, often, firms or government authorities are unwilling or unable to pay for the clean-up costs of closed and abandoned mines.

Extractive activities can also have profound social and political impacts. They can have a positive effect on development by creating jobs, encouraging businesses and providing vital infrastructure for remote communities, such as roads, electricity, education and health. However, they may also generate new social and economic problems related to the involuntary resettlement of populations, loss of traditional livelihoods, health concerns due to the exposure of workers and populations to chemicals and particles, and workers' safety.[43] As governments obtain sufficient revenues from external sources, they can become less dependent on their inhabitants for revenue, and thus less accountable, transparent and responsive to the societies they govern.[44]

Several studies have furthermore found a strong link between dependence on natural resources and the risk of civil war and other conflicts and their prolongation (e.g. Collier and Hoeffler, 2005; Collier et al., 2003; Ross, 2001; Renner, 2002). Detrimental impacts of natural resource dependence on governance and human rights have been observed, particularly in sub-Saharan Africa. Oil and diamonds in Angola, diamonds in Sierra Leone and Liberia, cobalt and other minerals in the Democratic Republic of the Congo and oil in Sudan have fuelled lengthy civil wars. The instability in West Asia and the Persian Gulf region has been attributed to that region's oil wealth. [45] The "Carter Doctrine", which stated that the United States would use military force, if necessary, to defend its national interests in the Persian Gulf region (Carter, 1980), illustrates that natural resources can also be at the centre of conflicts involving players far beyond the region immediately concerned.

d. The governance challenge

Whether a country can cope successfully with all these important challenges (economic, environmental, social and political) depends in large part on its governance system. The United Nations has defined governance as "the exercise of economic, political and administrative authority to manage a country's affairs at all levels".[46] It defines good governance as:

> "Participatory, transparent and accountable. It is also effective and equitable. And it promotes the rule of law. Good governance ensures that political, social and economic priorities are based on broad consensus in society and that the voices of the poorest and the most vulnerable are heard in decision-making over the allocation of development resources."[47]

Without a well-developed governance-framework, there is an increased risk that benefits from extraction will not materialize, that fiscal systems will lead to uneven sharing of revenues, that lack of a coherent and concerted development strategy will lead to their misuse, that local populations will be left disappointed, and that environmental damage, health risk and conflicts will occur. Thus the quality of institutions prior to the discovery of mineral wealth, and the capacity of a country to regulate, monitor and enforce activities in extractive industries are essential. Resource extraction may not turn well-working institutions into non-performers, but it may make bad governance worse.

The economic, environmental and social challenges noted above underline the importance of governance in ensuring maximum development gains from resource extraction. But structural, long-term beneficial solutions – such as administrative capacity-building, realignment of existing policies, and human capital accumulation – take time to evolve, and provide few immediate rewards. Thus they have often been skirted. As long as the political will is missing, the challenge of governance cannot be resolved. However, there is an urgent need to continue exploring different ways of addressing it.

* * * * * *

Improvement in the terms of trade resulting from the recent commodity price boom represents development opportunities for mineral exporting countries. There are, however, important challenges in harnessing the earnings from extractive industries to boost development. Most of these derive from the specificities of the extractive industry itself, which generally involves large-scale, capital-intensive projects, with low labour intensity, a high environmental footprint, and weak linkages with the local economy of developing countries. While the responsibility for ensuring development gains from mineral exploitation rests first and foremost with governments, the responsibility of other stakeholders in contributing to the development impacts of the activity should not be ignored. And, as shown in the next chapter, TNCs are key players in this context.

Notes

1 In 2005, minerals accounted for 3% of world GDP and 13% of world trade (UN COMTRADE database, SITC Rev. 1 and UN/DESA Statistics Division).

2 Estimated by multiplying global production of oil and gas in 2005, which amounted to 47 billion barrel oil equivalent (data provided to UNCTAD by IHS), by the 2005 Dubai spot crude price ($49.35/barrel) (http://www.bp.com/).

3 Data provided to UNCTAD by the Raw Materials Group.

4 Motor gasoline, diesel and distillate fuel oil, liquefied petroleum gas, jet fuel, residual fuel oil, kerosene and coke.

5 Solvents, lubricating oils, greases, petroleum wax, petroleum jelly, asphalt and coke.

6 Naphtha, ethane, propane, butane, ethylene, propylene, butylenes, butadiene, benzene, toluene and xylene.

7 LNG can constitute an alternative to pipeline transportation in regional neighbouring countries when the extra costs involved match the costs of pipeline transportation.

8 Data on Russian Federation's gas production are from BP, 2006.

9 Data on gas production in the Persian Gulf are from BP, 2006.

10 For oil, the respective shares in production and consumption are: 19% and 54% for developed countries, and 9% and 22% for South, East and South-East Asian countries. The corresponding figures for gas are: 38% and 47% for developed countries, and 12% and 13% for South, East and South-East Asian countries (UNCTAD, based on BP, 2006).

11 The "Seven Sisters" were: Standard Oil of New Jersey (now ExxonMobil), Royal Dutch Shell, Anglo-Persian Oil Company (now BP), Standard Oil of New York (now part of ExxonMobil), Texaco (now Chevron), Standard Oil of California (now Chevron) and Gulf Oil (now part of Chevron, BP and Cumberland Farms).

12 This conviction led to concerns clearly reflected in the argument that "if the present growth trends in world population, industrialization, pollution, food production, and resource depletion continue unchanged, the limits to growth on this planet will be reached some time within the next 100 years" (Meadows et al., 1972: 23–24).

13 OPEC is a permanent, intergovernmental organization, created at the Baghdad Conference on 10–14 September 1960 by Iran, Iraq, Kuwait, Saudi Arabia and Venezuela. The five founding members were later joined by nine other members: Qatar (1961), Indonesia (1962), the Socialist People's Libyan Arab Jamahiriya (1962), the United Arab Emirates (1967), Algeria (1969), Nigeria (1971), Ecuador (1973–1992), Gabon (1975–1994) and Angola (2007) (http://www.opec.org/). Many similar organizations for other commodities, such as for copper (CIPEC), bauxite (IBA) and iron ore (APEF), were set up during the early 1970s but were not particularly successful.

14 Increased competition was the combined result of the emergence of new SOEs in the 1970s, following a wave of nationalizations and the failure of producers in general to anticipate slowdown in the long-run demand growth, which led to excessive investments in new mines and processing facilities and huge surplus production capacity.

15 From 2000 to 2003, a combination of quota cuts and growing oil demand pushed prices back into the vicinity of a price band set by OPEC, of $22–$28 per barrel.

16 Political turmoil in Nigeria and Venezuela, and natural disasters, such as Hurricane Katrina, also contributed to price volatility.

17 In 2005, for example, China consumed 2.1 tons of copper and 180 tons of oil per million dollars of GDP. In comparison, the corresponding figures for Japan were 0.3 tons and 50 tons, and for the United States, 0.2 tons and 80 tons (CRU, 2006; IMF, 2006).

18 On the importance of the Chinese demand in the recent price boom, see, for example, Cyclope, 2007.

19 For oil, for example, this happened especially in the United States and the North Sea, allowing OPEC countries to increase their share in production from 30% in 1985 to 40% in 1999. In addition, low prices were a disincentive for suppliers to maintain spare capacity.

20 Global surplus crude oil production was estimated at 1–1.3 million barrels per day (mbd) in August 2006, down from 5.6 mbd in 2002 (IEA, 2006a). Moreover, the worldwide aggregate stock-to-consumption ratio for all base metals was at a record low in the third quarter of 2006 – down to five days' cover (Barclays Capital, 2006).

21 For example, at the Minera Escondida in Chile, production (of 1.2 million tonnes of copper concentrates a year) was interrupted for most of July 2006 by labour disputes, resulting in an estimated loss of production of around 45,000 tonnes of copper. Production at Codelco's Chuquicamata mine in Chile (54,000 tonnes of copper concentrates a year) was also disrupted in July 2006 after a rock-slide damaged an ore conveyor belt (Abare, 2006).

22 For example, after taking account of reinvestments in existing installations and falling capacity due to field depletion, the net additions in annual capacity from the 100 largest oil projects under development are forecast to average 3% between 2006 and 2008, more than twice the expected demand growth (Goldman Sachs, 2005). See also CERA, 2005; and IHS, 2005.

23 Production forecasts are uncertain, however, a study on long-term projections for non-fuel minerals found very large differences between global projections (made more than 25 years ago) of production and consumption for a selected number of non-fuel minerals and the observed results for the year 2000. Projections critically depend on assumptions relating to such factors as population and income growth, technological and regulatory changes, that are difficult to forecast (Sohn, 2005).

24 Interview with David Humphreys, chief economist, Norilsk Nickel, September 2006.

25 There can be significant lags between the time exploration investments are made and the discovery of a major deposit.

26 See, for example, *The Economist*, 16 September 2006.

27 For the debate between the pessimists and optimists, see Tilton and Coulter, 2001.

28 Some, such as Morgan Stanley's chief economist, Stephen Roach, argue that "commodities are as bubble-prone as any other investment" (*The Telegraph*, 2 October, 2006). Others argue that a significant amount of the impact of demand growth of emerging market economies will be mitigated by weak demand from developed countries, due to the shift of manufacturing from developed to developing countries (Radetzki, forthcoming).

29 For example, historically, it has taken more than five years for iron ore prices to return to trend after reaching a peak, while copper and aluminium prices have taken less than three years. Differences arise mainly due to varying market structures of different commodities.

30 According to one study, the reversal of the upward price trend is likely to result from an adjustment of Chinese economic growth, which is not expected to take place before 2011 (Cyclope, 2007).

31 For example, exploiting oil deposits in the Orinoco Belt in Venezuela cost $17 billion ("In Venezuela, a face-off over the prospect of oil riches", *International Herald Tribune*, 1 June 2006), and in Azerbaijan, the recently opened Baku-Tbilisi-Ceyhan pipeline cost $3.9 billion ("Europe: too much of a good thing; Azerbaijan and oil", *The Economist*, 19 August 2006).

32 In the case of the World Bank, project financing may be conditional on governmental and institutional reform, such as privatization and liberalization of the investment regime (World Bank, 2005).

33 A study of the delay period from discovery to the start of production covering 214 known grassroots gold deposits discovered worldwide in the period 1970–2003 was 6.3 years on average (Schodde, 2004).

34 Technical risks include, for example, the actual amount and grades of ore as compared to forecasts, the actual level of operating costs as compared to forecasts, and the adequacy of mining methods and metallurgical process.

35 See, for example, Otto, 2006, and http://www.ifc.org/ifcext/enviro.nsf/Content/RiskManagement.

36 Production costs of a barrel of petroleum were estimated in 2004 to vary between $1 dollar in the lowest cost zones (West Asia) and $12-$15 dollars in the more difficult or mature zones (e.g. Big North offshore, East Siberia, Texas marginal fields) (Chevalier, 2004).

37 This also applies to diamonds. Different qualities of stone can be present in a single diamond pipe, with rare finds being thousands of times more valuable than the average carat value of diamond production (Land, 2007).

38 See, for example, Stevens, 2002; Sarraf and Jiwanji, 2001; Wright and Czelusta, 2003; and Acemoglu, et al., 2003.

39 Construction service costs are important in the development stage of a mining project.

40 The term "Dutch disease" originated in the Netherlands during the 1960s, when revenues generated by natural gas discovery led to an appreciation of the national currency and to a sharp decline in the competitiveness of the non-booming tradable sector. The revenue windfall served to increase imports to the detriment of national production, provoking a sharp decline in economic growth. This economic paradox has since been recognized as a situation in which a large inflow of foreign currency – whether it originates from a sharp surge in natural resource prices, or from foreign assistance or foreign investment – adversely affects the performance of the non-booming sectors of an economy, and in particular, the non-booming tradable sector (De Silva, 1994).

41 Most spills occur from pipelines and fixed location facilities, usually classified as small spills (less than 7 metric tons), while tankers cause the largest volume of spills (Salim, 2003).

42 For example, gold production involves the use of toxic materials such as cyanide, mercury and arsenic, and their inappropriate handling is frequently a source of health and environmental problems ("Why mining is bad for your river", *World Rivers Review*, Vol. 12, No. 5, October 1997).

43 "Although only accounting for 0.4% of the global workforce, mining is responsible for over 3% of fatal accidents at work (about 11,000 per year)" (see ILO website, http://www.ilo.org/public/english/dialogue/sector/sectors/mining/safety.htm). Note: these estimates are based on official data that only comprises the formal workforce. Thus, workers in informal mining are not covered.

44 Acemoglu et al., 2004; Acemoglu and Robinson, 2006; Keen, 1998; Moore, 2000; Renner, 2002; Tilly, 1975; and Shafer, 1994).

45 See, for example, D'Amato, 2001; Pelletiere, 2004 and Klare, 2002, 2004.

46 See http://mirror.undp.org/magnet/policy/chapter1.htm#b.

47 Ibid.