International Raw Materials Markets:
Rising Prices and Growing Conflict Potential

Raimund Bleischwitz

The current record price levels for raw materials are not a temporary phenomenon. Over the coming years, the situation on the raw materials markets is likely to remain tense as large countries such as China, India and Brazil press ahead with infrastructural development and industrialization.

The closer economic ties now developing between newly industrializing countries (emerging economies) are a novel feature of the global economic landscape. A number of countries in Latin America (notably Brazil, Peru and Chile) and Africa (South Africa, Zambia and the Democratic Republic of Congo) possess some of the world’s largest reserves of mineral resources and are increasingly emerging as major suppliers. The high demand for these products in Asia (especially in China, India, Indonesia and Malaysia) is a driver of growth in the supplier countries.

As a result of this dynamic, a new geography of the raw materials trade is being created, with major industrializing countries emerging as growth motors. As part of this trend, the industrialized countries are losing influence, and weaker developing countries are becoming even more marginalized. Resource conflicts are erupting along these lines: highly developed countries are determined to safeguard their access to raw materials, while growth is slowing in the less developed countries and internal conflicts are increasing. To resolve these conflicts, new forms of governance are required, based on international cooperation, greater resource productivity and sustainable resource management in a process which must involve companies and NGOs alike.

Figure 1: The increasing importance of developing countries in raw materials supply

![Production of mineral resources by country/country group 1900 – 2030](source: Personal Communication from Magnus Ericsson, Raw Materials Data 2005)
The raw materials situation worldwide

Mineral resources are unprocessed raw materials that are obtained by means of primary production. For many years, the debate about these products was dominated by geostrategic concerns. This aspect is re-emerging in the current discourse as well, along with other key issues such as the environmental impacts of resource extraction/use and the socio-economic role of these products in development processes.

The call for security of supply: availability and geostrategic risks

There are two key indicators of raw materials availability: “reserves” and “resources”. “Reserves” mean the stocks at known sites that are technically and economically extractable, i.e. presently being mined or likely to be. The term “resources” is used to denote stocks which may become technically and economically recoverable in the future. A further indicator is “availability”; “static availability” relates current reserves to total annual consumption, while “dynamic availability” presupposes specific growth and adaptation processes. The lower the availability, the more urgent the problem of raw materials availability appears to be.

Defining these indicators precisely still is a challenging task, as the terminology varies around the world. From a geological perspective, it is essential to bear in mind that the concentration of raw material deposits and thus their extractability can vary over time: the correlation between the concentration and the amount of the raw material is often non-inverse. Key criteria, in this context, are the thickness, porosity, saturation, filling level and yield of the deposit. When it comes to assessing “availability”, it is essential to consider the probable production trends and the anticipated level of demand for the commodity in question. The use of different criteria means that estimates of raw materials availability vary accordingly.

A general and absolute scarcity due to exhaustion of deposits is unlikely to be a serious concern for the foreseeable future. However, estimates of availability indicate relative scarcity for some raw materials such as lead, copper, tin and zinc [see Table 1]. Besides the familiar scarcity of products such as oil, there is a need for monitoring and action in relation to specific metals for which Germany and the European Union

Table 1: Production, reserves, resources and availability of selected raw materials

<table>
<thead>
<tr>
<th>Material</th>
<th>Production 2004</th>
<th>Production 2005</th>
<th>Reserves</th>
<th>Resources</th>
<th>Static availability (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead</td>
<td>3,150</td>
<td>3,880</td>
<td>67,000</td>
<td>140,000</td>
<td>19</td>
</tr>
<tr>
<td>Copper</td>
<td>14,600</td>
<td>14,900</td>
<td>470,000</td>
<td>940,000</td>
<td>32</td>
</tr>
<tr>
<td>Nickel</td>
<td>1,400,000</td>
<td>1,500,000</td>
<td>62,000,000</td>
<td>140,000,000</td>
<td>41</td>
</tr>
<tr>
<td>Tantalum</td>
<td>1,540</td>
<td>1,910</td>
<td>43,000</td>
<td>150,000</td>
<td>25</td>
</tr>
<tr>
<td>Tin</td>
<td>264,000</td>
<td>280,000</td>
<td>6,100,000</td>
<td>11,000,000</td>
<td>22</td>
</tr>
<tr>
<td>Zinc</td>
<td>9,600</td>
<td>10,100</td>
<td>220,000</td>
<td>460,000</td>
<td>22</td>
</tr>
<tr>
<td>Zircon</td>
<td>830,000</td>
<td>890,000</td>
<td>38,000,000</td>
<td>72,000,000</td>
<td>43</td>
</tr>
</tbody>
</table>

Data in 1000 tonnes
Author’s own calculations based on USDI/USGS 2006
are almost entirely reliant on imports. The situation is especially critical in relation to certain strategic metals which will continue to be essential for key growth technologies in the foreseeable future; here, steep price hikes are a sign of economic scarcity [see Table 2].

**High prices: short-term rises and long-term fluctuations**

Prices on the international raw materials markets reached their highest levels for many years in 2005. Very high prices were recorded for nickel in particular, which is used in the production of high-grade steel, and for steel scrap; above-average price increases also occurred in the markets for tin, copper and lead. For iron ore, producers successfully enforced a 70% price increase in 2005. By comparison, the highest price increase previously reported (in 2003) was 18%. These are record prices for industrial raw materials. In all, the raw materials price index based on the US dollar (2000 = 100) rose from 90.1 (2001/2 average) to around 145 for mineral resources and 190 for energy resources in 2005.

When a longer period is observed, the real price increase looks less dramatic. At the beginning of the 1980s, similar high prices for industrial raw materials were recorded, but prices fell in the interim. Time series analyses from 1900 to 2000 collected by the US Geological Survey and measured in constant US dollars actually show falling real prices of many different raw materials in the long run. By contrast, an analysis by Citigroup points to 30-year growth cycles with prices rising somewhat during the second half of the nineteenth century and again after the Second World War until around 1980 (Heap 2005). This puts statements on falling price levels for the period 1990–2000 into question. Rising prices can be observed for some strategic commodities used in growth industries, for which there is no prospect of a short-term substitute [see Table 2].

Were a general threat of resource scarcity to exist, prices would increase over a longer period of time. At present, such a scenario – at least as a longer-term global trend – is not borne out by empirical observations. Nonetheless, it would be irresponsible to predict future developments on the basis of past trends. A report to the US research community (Gordon et al. 2006) stresses that no substitute is likely to be identified for various metals used in the industrialization process in industrializing

<table>
<thead>
<tr>
<th>Raw material</th>
<th>Field of use</th>
<th>Price 2001</th>
<th>Price 2005</th>
<th>Price rise in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indium</td>
<td>LCD screens, semiconductors</td>
<td>120.00</td>
<td>810.00</td>
<td>575</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>Steel production</td>
<td>5.00</td>
<td>72.00</td>
<td>1,340</td>
</tr>
<tr>
<td>Platinum</td>
<td>Catalytic converters</td>
<td>533.00</td>
<td>890.00</td>
<td>66</td>
</tr>
<tr>
<td>Selenium</td>
<td>Glass, chemicals, electronics</td>
<td>3.80</td>
<td>52.00</td>
<td>1,268</td>
</tr>
<tr>
<td>Tellurium</td>
<td>Steel production</td>
<td>7.00</td>
<td>96.00</td>
<td>1,271</td>
</tr>
<tr>
<td>Tungsten</td>
<td>Electronics</td>
<td>64.00</td>
<td>140.00</td>
<td>118</td>
</tr>
<tr>
<td>Vanadium</td>
<td>Petrochemicals, metal industry</td>
<td>1.37</td>
<td>17.50</td>
<td>1,177</td>
</tr>
<tr>
<td>Zircon</td>
<td>Ceramics, chemicals</td>
<td>340.00</td>
<td>662.00</td>
<td>95</td>
</tr>
</tbody>
</table>

*Price data in US$ related to specifically relevant amounts.*

*Author’s own calculations based on: USDI/USGS 2006*
countries or for the information society’s high-tech needs for the foreseeable future. Bottlenecks are predicted for platinum if the mass production of fuel cells – seen as a building block in a renewable energy supply – commences. The high price of steel is likely to remain an obstacle to the expansion of wind power which is widely considered to be desirable. For any prospective analysis, then, it is essential to identify the driving forces of price and other current trends.

“Hungry dragons”:
China and other emerging economies as driving forces

There is general consensus among experts that the growing demand from emerging economies, particularly China, has been a crucial factor for the price increases since 2000. *The Economist* titled one of its articles on this issue *The Hungry Dragon*. A few figures illustrate the Chinese hunger for raw materials: during the last 12 years China has attained an average growth rate of more than 10% per annum. China accounts for nearly 30% of the world’s GDP growth since 1992. Despite some successful strategies to decouple the demand for raw materials from GDP growth, and despite increasing domestic mining activities, China is now the world’s largest importer of raw materials, including steel, copper, coal and cement, and the second largest importer of crude oil after the USA.

Even if growth rates were to tail off, Chinese demand is likely to remain high in the coming years. Key factors here are the demand for capital goods, the urbanization trend, industrialization and the development of consumer demand. Raw material and energy shortages, the food supply, environmental and health problems and social conflicts could all exert a dampening effect. Predictions about the extent of the Chinese growth dynamic therefore vary. Nonetheless, analysts forecast that demand for raw materials will double by 2020 (Heap 2005).

The demand from other emerging economies with high growth rates, such as India and Brazil, is also important. Unlike the situation in the 1980s when the East and South-East Asian “Tigers” were achieving
high rates of growth, the current demand for raw materials comes from populous countries with a high level of purchasing power which are investing in industries and infrastructure. The demand from the Asian industrializing countries is stimulating additional growth in the extracting countries. Forecasts show that these countries have good prospects of development with above-average rates of growth. Assuming that international demand remains constant at a high level, with relatively low price elasticity over the medium term, high raw materials prices are likely to persist for the coming years. Comparisons with other countries show that although the reliance on natural resources subsides to some extent as countries become more developed, it does not decrease in absolute terms, so the tensions in the international raw materials markets are likely to continue. Figure 3 depicts raw materials consumption in relation to gross domestic product (GDP) for various countries in the 1990s; at present, there is no empirical evidence to support the hypothesis that improved economic performance is accompanied by a reduction in raw materials consumption [see Figure 3].

Long-term contracts, short-term speculation and a new trade geography

The elasticity and flexibility on raw materials markets are crucially influenced by inter-company contracts and shareholding structures. Despite the existence of stock exchanges such as the London Metal Exchange (LME), the competition on markets for raw materials is imperfect; instead, the real prices are determined by inter-company contracts. Stock markets and spot markets merely facilitate supply when short-term bottlenecks occur and are also a starting point for price negotiations. In raw materials con-

Figure 3: Raw materials consumption in relation to gross domestic product (GDP)

GDP in US$ in constant prices and exchange rates, baseline year 1990; resource consumption measured as direct material input (DMI)

Source: Steger (2006, personal communication) based on Bringezu et al. 2004
tracts, delivery quantities are fixed in the medium and long term, whereas prices are fixed in the short and medium term (usually for one year). The background to this practice is the need for asset-specific investments for capital goods in the extraction and processing of raw materials. Contracts provide certainty and are therefore in the interest of both the extracting and the processing industry. A key feature of the current raw materials markets is the emergence of benchmarking systems where single contracts act as indicators for the subsequent negotiations. In some cases, the running time for the delivery quantities is as much as 20 or 30 years! For SMEs in the processing industry in particular, high prices concluded by other enterprises abroad entail considerable price risks.

It is noticeable that during the course of the long-lasting low price phase since the beginning of the 1980s, many companies have divested their shares in extractive projects and mining enterprises (BMWA 2005). Raw materials projects were also regarded as less profitable by investors; the reason is that due to comparatively protracted payback periods, the return on investment (RoI) comes late. As a result of the increased and expected continuing high prices, the payback periods of raw material projects will shorten. This is currently leading to a renaissance of an upstream integration from the raw material processing to the raw material extracting industry.

It must be pointed out that raw material processing companies in emerging countries are also pursuing this strategy and that the concentration in the mining sector, combined with higher profit margins, makes a downstream integration, i.e. shareholdings by mining companies in processing companies, a rational choice as well. In this context, in contrast to the competition in a market-based economy, a centrally-planned economy like China provides security benefits for domestic companies. China is increasing its engagement in direct investments and shareholdings in raw materials-producing countries.

Overall, the market position of the raw materials companies and of the emerging economies is improving. This will create a new geography in the raw materials trade, with strong enterprises from emerging and developing countries starting to cooperate and increasingly dominating this sector.

Outcomes and risks: environmental damage and resource wars

Overall, the environmental impacts of resource use must be considered (MMSD 2002). An expert report by the World Bank proposes that in view of the gravity of these impacts, no new funding for developing countries should be approved for the time being. Resource extraction is not only linked to major intervention in the ecosystem, producing toxic substances and using large quantities of water and energy. The transport of raw materials from remote areas also requires a transport infrastructure which is linked to further intervention. Wuppertal Institute for Climate, Environment and Energy has introduced the “ecological rucksack” concept to describe these environmental stresses (Bringezu 2004). Later stages in the raw materials lifecycle cause further environmental damage. The “ecological footprint” is a comparative indicator of a country’s natural resource consumption. Current market developments also harbour serious risks: raw materials exploration and extraction are increasingly being carried out in areas which are highly sensitive in geo-ecological terms, such as nature protection areas, deep sea or continental shelves.

Geostrategic risks are caused by a reliance on politically unstable regions. Almost 70 percent of the world’s known oil and gas reserves fall inside a “strategic ellipse” extending from the southern tip of
the Arabian Peninsula across the Caspian region into northern Russia and up to the Jamal Peninsula. Similar dependencies exist with metals. Euromines – the European Association of Mining Industries – forecasts an increase in metal import rates from six developing and newly industrializing countries: Brazil, Chile, Peru, South Africa, Congo (DRC) and Zambia [see Figure 1]; the latter can hardly be regarded as secure supplier countries. Construction minerals, the dominant group in raw materials consumption [see Figure 4], are mainly extracted in the country in which they are used. So overall, the reliance on imports of metals, oil and gas from politically unstable regions is likely to increase, as their reserves of these commodities are far greater than other countries. The United States is more than 80% import-reliant for more than 30 mineral commodities (USDI/USGS 2006).

These dependencies give rise to distribution conflicts and are possible causes of war (Brock 2004; Klare 2002):

- within the mining countries, over the use of revenue from the extraction of raw materials. Several civil wars are being bankrolled from this source. High prices have knock-on effects, creating incentives to undermine environmental and labour standards, for example. Unstable countries are especially susceptible to corruption. A correlation between high indebtedness and increased raw materials exports has not yet been demonstrated empirically, however (Neumeyer 2005).
- Import-dependent developing countries have to pay higher prices for imports of raw materials. This reduces their scope to undertake other investments and weakens their foreign trade and capital balance sheets.
- Industrialized countries face growing competition from strong newly industrializing countries. Within the industrialized countries, industrial sectors which process raw materials and can only pass on high costs to purchasers to a limited extent are in a difficult position. The military option to safeguard access to raw materials cannot be ruled out.

Overall, the socio-economic impacts vary. Distribution conflicts and potential causes of war are a possible but by no means probable global trend. Indeed, high raw materials prices offer development opportunities for exporting countries and trigger savings and substitution effects in technologically developed countries. Despite these opportunities, the current situation and the global trends in the international raw materials markets cannot be described as sustainable. Relative scarcities, socio-economic impacts and environmental damage appear to be manageable when viewed in isolation. The need for action becomes apparent, however, when the interaction of these factors is considered.

The political economy of international raw materials markets

International raw materials markets display a number of specific characteristics. Deposits are distributed unequally and considerable financial and technological investment is required to extract them. This gives rise to various distortions of the market and is used to justify political intervention.

Subsidies

Subsidies are a dominant factor in market distortions. They are quite common in the raw materials sector because mining companies contribute to the security of supply and catch-up development processes. Subsidies also facilitate lower prices for customers, i.e. for industry and final consumers. The OECD (2003) estimates that
the annual subsidy for energy and raw material extraction across the world is approximately $270 billion. Subsidies by OECD countries to the mining sector alone amount to 83% of total global subsidies – well above the global average. Subsidies to agriculture are also high. In developing and industrializing countries, energy, water and forestry receive proportionately higher subsidies.

In China, the government is refunding import tariffs to domestic firms. These financial resources are being reinvested in resource funds through which Chinese firms acquire shareholdings in mining companies all over the world. Thus a threefold benefit is obtained: China’s domestic raw materials production is promoted through import tariffs. Thanks to the refunds, key domestic industries receive a cost advantage vis-à-vis their international competitors (“Hoover effect”). In addition, the financial capacity of the Chinese enterprises – whose foreign direct investment, shareholdings and negotiations on supply contracts are aided by government guarantees – is being increased (BDI 2005, p. 30, 60). There is a lack of reliable data showing the extent to which this practice is being pursued by other newly industrializing countries as well.

**Geo-economic aspects of resource extraction**

Resource extraction has improved technically over time. A significant proportion of the earlier long-term price reductions in raw materials markets can be attributed to better extraction technologies (Reynolds 1999; Tilton 2003). Improved extraction technologies, work processes and logistics have cut supplier costs in the past and resulted in price cuts. This sends out a misleading message to users: falling prices appear to signal a better supply, so when real scarcity of supply occurs at a later date, the ensuing price rise comes as a shock. Steadily falling prices over a longer period of time also have the disadvantage of delaying new investment.

In the case of raw materials, hardly any new investment was undertaken after the early 1980s, i.e. since the last boom (BMWA 2005, p. 3). As a result, the high demand that has been observed for some years is stretching current capacity to its limits.

Geo-economic analysis of raw material availabilities indicates that exploration activities take place on a cyclical basis. The same applies to new capital investments in production capacities. Enterprises usually wait for high price phases before they undertake new exploration and investments. In
terms of the above discussion, successful exploration acts as a price corrective. The discovery of new deposits signals future extraction capabilities and therefore moderates the current price level.

Due to the high price level, large-scale exploration projects are currently being initiated and conducted worldwide; spending on new exploration projects around the world is estimated to have almost doubled since 2001 (USDI/USGS 2006, p. 14). It would be premature, however, to draw an optimistic conclusion. For scientific and technical reasons, and in some cases for political or economic reasons, not all reserves detected are successfully developed at a later stage. Mining concessions, licensing procedures and unforeseeable technical or political difficulties increase the extraction costs. The extraction of certain types of reserves, e.g. oil shale for energy use or deep-sea mineral deposits, must wait until extraction technologies are market-ready and appropriate risk assessments have been carried out.

Institutional deficits

Raw material reserves in which several companies purchase property rights have the characteristics of common-pool resources: someone has to take on the risks associated with their initial development. Once the initial risks are overcome, a rapid extraction pathway is embarked upon in order to pre-empt free-rider attitudes among other shareholders. This applies especially to liquid and gaseous raw materials. Overall, the extraction pathway is suboptimal.

Another price distortion results from the “moral hazard” phenomenon. A number of cases in the oil industry have come to the public’s attention. Companies paid bonuses to managers who were able to show increasing reserves within their field of activity. As a result, the companies overestimated the oil reserves in their internal data; in some cases, the figures were deliberately manipulated. These incorrect statistics only became apparent when external analysts challenged the data. This has resulted in an overestimate of extractable future resources and in some cases to lower current prices and increased incentives for consumption. The phenomenon does not only affect companies. The OECD’s extraction rates are also ascertained on the basis of the reserves calculated by the Member States. Here too, there is an incentive to overestimate the reserves. There have been fewer cases of this kind in the mineral resource industry, however.

Oligopolistic structures

International raw material markets can be characterized as oligopolistic structures. In recent years, the concentration on the supply side has been increasing. The market share of the ten largest producers of several raw materials is above 40%; this concentration is particularly high for oil, iron ore, platinum, nickel and aluminium. For example, three suppliers dominate up to 75% of the world market for iron ore (CVRD, Rio Tinto, BHP Billiton).

There are various reasons for this concentration. As these industries involve capital-intensive production whose revenue is strongly dependent on the size and quality of the deposit, the entry barriers to the market are high. This trend is exacerbated by purchasers’ stringent requirements as regards quality of the materials and delivery reliability, which are regulated on a contractual basis.

In the absence of competition policies, oligopolistic supply structures help to set price levels, the consequence being excessively high prices. It could be argued, on this basis, that monopolistic structures for raw materials should be established in the inter-
ests of sustainable resource management! In practice, this is offset by the purchasing practices of major companies, with demand traditionally being linked to market power (e.g. in the automobile industry). However, due to the growing competition on the demand side, the market power of raw materials suppliers has increased. The new geography of the raw materials trade could lead to cartel-like conditions, resulting in strategic control of information and agreements on prices and delivery quantities. An internationally coordinated competition policy embedded at institutional level could counteract this market power.

Abundant raw materials – a curse or a blessing for developing countries?

The increasing cooperation between emerging economies and developing countries raises the question of their economic policy and resource interests. Contrasting with the conventional assumption that successful development processes are based on the utilization of available natural resources, Jeffrey Sachs (with Warner, 2001) has developed the “resource curse” hypothesis.

The assumption that the availability of raw material sources has beneficial effects is easy to justify. Countries rich in raw materials can use their natural resources to develop their industry and infrastructure. They can use their export revenues to build up a capital stock, thus accelerating growth. Indebted countries may liquidate foreign debts. For example, Russia is currently liquidating part of its debts from its increased oil and gas revenues.

However, the economic development of countries rich in raw materials is reflected in highly divergent growth rates. Whereas Norway and some minor oil-extracting countries are operating quite successfully, growth rates in resource-rich countries in Africa and Central Asia are sluggish. From 1980 to 2002, even the OPEC states showed lower growth rates than the average being achieved in other developing, newly industrializing and transition countries.

Thus the availability and utilization of natural resource reserves do not seem to guarantee successful development processes. There are two main explanations for this empirically observed phenomenon:

- Macroeconomic deficits (“Dutch Disease”): in the 1960s, the discovery of natural gas in the North Sea resulted in a

Table 4: Growth performance of resource-exporting countries

<table>
<thead>
<tr>
<th>Countries</th>
<th>Share of resource exports/GDP</th>
<th>GDP growth /a (average)</th>
<th>GDP per capita 2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bahrain</td>
<td>71.9</td>
<td>4.3</td>
<td>16,300</td>
</tr>
<tr>
<td>Surinam</td>
<td>68.1</td>
<td>0.0</td>
<td>5,200</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>36.9</td>
<td>1.6</td>
<td>11,500</td>
</tr>
<tr>
<td>Nigeria</td>
<td>35.2</td>
<td>2.3</td>
<td>870</td>
</tr>
<tr>
<td>Algeria</td>
<td>23.7</td>
<td>2.0</td>
<td>5,800</td>
</tr>
<tr>
<td>Venezuela</td>
<td>21.4</td>
<td>0.9</td>
<td>5,260</td>
</tr>
<tr>
<td>Norway</td>
<td>17.2</td>
<td>3.1</td>
<td>37,850</td>
</tr>
<tr>
<td>Indonesia</td>
<td>11.9</td>
<td>4.8</td>
<td>3,224</td>
</tr>
</tbody>
</table>

Source: Bardt 2005, based on IMF, WTO
decline of exports of industrial goods and services for a time. In this scenario, negative economic impacts are caused by an upward revaluation of the currency, worsening the export prospects of other goods. The situation is exacerbated by a shift of investments and a wage differential because the booming sector is able to pay higher wages than other sectors, leading to migration of productive labour.

- Political and institutional deficits: economic success or failure has political and institutional causes. Successful countries use their revenues from raw material extraction for investments in physical and human capital. They also invest in improving their social welfare and legal systems. Some of their revenues from the extraction of non-renewable resources is invested in renewable alternatives. By contrast, in less successful countries, corruption and lobby groups exert considerable influence.

By way of illustration, two resource-rich countries – Nigeria and Norway – can be compared. While concentrating on the oil sector, Nigeria has neglected to develop associated sectors; for example, Nigeria’s refineries are inadequate, so petrol has to be imported. Agriculture has also been neglected, causing hunger and poverty among large sections of the population. Per capita GDP has fallen, also as a result of high population growth. A high level of corruption and legal instability are obstructing development, and there have been frequent military coups.

Norway, on the other hand, is undoubtedly one of the most economically successful countries in the world. Norway invests its oil export revenue in a designated fund which it uses to purchase foreign securities and undertake investment. It is free from debt, has stable social and legal systems and emerges as one of the world’s leading countries in all the international comparisons of innovation and growth.

The challenge for governance strategies: elements of sustainable resource management

The above-mentioned deficits and their impacts have resulted in a greater need for international management and control. The options can be summed up as a “3-M strategy”: material productivity, market transparency and multilateral cooperation.

In every country, material productivity in companies and along the value chain can be systematically improved. According to figures from Germany’s Federal Statis-

Table 5: Material input and reduction potentials within the next 7 to 10 years in four selected sectors

<table>
<thead>
<tr>
<th>Sector</th>
<th>Material input (€ bn)</th>
<th>Estimated reduction potential (€ bn)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing of metal products</td>
<td>18.6</td>
<td>0.8 – 1.5</td>
</tr>
<tr>
<td>Manufacturing of plant for electricity generation, distribution, etc.</td>
<td>10.2</td>
<td>1.5 – 3.0</td>
</tr>
<tr>
<td>Chemical industry (without primary industry)</td>
<td>11.1</td>
<td>1.8 – 3.4</td>
</tr>
<tr>
<td>Manufacturing of synthetic products</td>
<td>10.8</td>
<td>1.0 – 2.0</td>
</tr>
</tbody>
</table>

Source: ADL et al. 2005, p. 7
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Figure 4: Information society or stone age?

Construction minerals dominate resource consumption in the European Union

<table>
<thead>
<tr>
<th>Domestic material consumption (DMC) in million tonnes</th>
<th>kg (DMC) per EURO (GDP at 1995 price)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9000</td>
<td>8000</td>
</tr>
</tbody>
</table>

Source: Wuppertal Institut 2005

There is medium-term potential to improve material productivity in resource-intensive consumer-oriented industries, also in relation to their inputs. These industries include construction, food and automobile production. Greater product responsibility, e.g. recyclable materials, material balances and integrated product policy are important building blocks in harnessing this potential.

In view of industrialized countries’ well-developed infrastructure and the decline of towns and cities in some regions, there is also scope to explore a new direction in raw materials development: are cities the mines of the future? The potential to increase the productivity of raw materials inputs could amount to as much as 20–30% by 2010, and in the long term, resource productivity could increase by a factor of four or more – as occurred with labour productivity in the past (Bleischwitz/Hennicke 2004). Newly industrializing and developing countries are already able to exploit this potential in the development of their industrial base and infrastructures.

The second element of governance strategies is to increase market transparency in the raw materials markets. Better decision-making must be based on better information. Initiatives such as Publish what you
pay and the Extractive Industries Transparency Initiative aim to uncover corruption and promote sustainable management in the extractive industries (Culverwell et al. 2003; Global Witness 2005). But market transparency must be based on other information as well, such as data on subsidies, shareholdings, delivery contracts, the properties of materials, etc. Reliable information on the environmental impact of certain inputs and product lines is also required, as are industry forecasts. Drawing on the findings of research, a public-access database should gradually be established, offering economically relevant geo-information and including current price information and market trends. The existing databases and information providers do not supply this service to an adequate extent at present.

The European Commission (2005) proposes the establishment of an international panel on the sustainable use of natural resources. As with the Intergovernmental Panel on Climate Change (IPCC), this body would collate current knowledge and present it to decision-makers. It would provide transparent and comparable data and develop scenarios on current and future resource consumption trends. It would also provide a forum for discussion of benchmarks and actions and promote best practice in the field of sustainable resource management. As in other policy fields, the experts’ reports should flow into an institutionalized learning process that produces reliable practice-relevant information.

A third element of governance strategies is to develop legally binding multilateral agreements combined with economic incentives. These agreements would, firstly, establish legal safeguards for individual cooperation between companies and NGOs and set it on a broader footing. Secondly, they would promote learning processes and international cooperation, e.g. between the EU and the raw materials exporting countries. They would link supply agreements with technology transfer and capacity-building. Experience gained with the EU-Russia Energy Dialogue and the launch of international emissions trading and other Kyoto mechanisms in the climate field could be useful in this context. Assuming a high level of consensus, a multilateral agreement is also a way of promoting sustainability principles in resource extraction and processing and providing support to developing countries.

It remains to be seen whether this type of strategy can be implemented in practice at international level. At present, raw materials policy is dominated by strategies which involve far greater risks and conflict potential. Overall, it seems likely that the international raw materials markets will continue to feature on the political agenda in the coming years, linking foreign, environmental economic and development policy.

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