The Lure of Gold - How Golden is the Future?

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Introduction

GOLD HAS NEVER lost its lustre or power of attraction. Global demand has now reached a record high: last year 85% of newly mined gold was beaten into jewellery. In search of today's gold are transnational corporations and an aggressive new breed of 'junior' mining companies, which are now jostling, in a headlong rush to stake their claims in many developing countries.

And they are being made welcome as never before. In all, 70 countries, including 31 in Africa, have changed their mining laws to attract foreign companies. Countries such as the Philippines and Ghana are holding out a raft of incentives, from the lifting of foreign ownership restrictions to reduced taxes. Weighing up the costs and benefits is a tricky task for Southern countries striving for sustainable development.
For some, these changes have boosted production and export earnings. This may be no bad thing when international creditors are banging on your door. On the ground, it creates jobs for under-employed and unemployed hands and can help build schools, roads and power plants. In Peru, companies estimate that one mining job creates 10 additional jobs in the area.

But weighed against these benefits are the costs. Extracting gold involves excavating billions of tonnes of ore. Trees, topsoil and vegetation are removed, and only very careful closure and repair work ensures the damage is not lasting. During operations, chemical treatments present further risks to the health of the miners and the surrounding environment and communities.

In Africa it is estimated that small-scale miners produce up to 20% of the gold. Small-scale mining has the potential to support local communities throughout the developing world, but environmental protection measures are vital. So, too, is the regulation of a largely illegal industry. Some countries have made important strides in supporting miners' rights over their mining plots. But further developments, including opening credit lines, the adoption of non-polluting technology, as well as training and government backing, are badly needed to support the small-scale sector.

Whether the costs are social, health or environmental, they certainly bump up the 'price' of gold. If developing countries are to benefit from gold mining, then economic and environmental safeguards are imperative. The use and development of non-polluting technologies and better environmental monitoring are needed to help reduce the risks. The rights and safety of miners and their communities also need protection.

Source: Mining Journal and Gold Fields Mineral Service

Amid predictions that in 20 years about half of global production will come from territories used or claimed by Indigenous Peoples - many of whom have successfully protested against mining activities - further action will be needed. Without new safeguards, the lustre of gold may well turn out to be as illusory for developing countries as the fabled El Dorado.

Key Facts

- Global demand for gold is now higher than ever before - 3,642 tonnes in 1995, as against the previous record of 3,573 tonnes in 1992.
- Gold is uniquely malleable and ductile; one ounce can be drawn into 50 miles of thin gold wire.
- More than 70 countries, including 31 in Africa, have changed their laws to attract foreign companies.
- In 20 years or so, about half of global gold production will come from territory used or claimed by Indigenous Peoples.
- South Africa is the world's leading producer; in 1995 it produced 523 tonnes. But production is falling.
- By 1991, just over 20 companies delivered more than two-thirds of official global gold production (outside of China); the world's two biggest mining companies - RTZ-CRA and Anglo American - controlled nearly one-half of this amount.
- It is estimated that small mines account for more than 10% of world gold output.
- Brazil is the biggest single small-scale gold producer, with annual production of 80 tonnes. Some 500,000 miners work in the Amazon region.
- It is estimated that small-scale miners produce up to 20% of Africa's gold. In the sub-Saharan region, more than 1.5 million people work in the informal mining sector, while in Zimbabwe the figure is put at 100,000.
- In South Africa, each tonne of gold mined in the country costs one life and 12 serious injuries.
- Tests from several mining communities in Brazil found that more than 30% of miners examined had mercury levels above the World Health Organization's tolerable limit.
- In Peru, companies estimate that one mining job creates 10 additional jobs in the area.
1 THE SECOND GOLD RUSH

The increasing lustre

Gold is currently the most lucrative investment sector of the mining industry, which is the world's fifth largest industry (including oil, gas and coal) in terms of capital deployed. Global demand for the metal is now higher than ever before - 3,642 tonnes in 1995, as against the previous record of 3,573 tonnes in 1992 [1]. And although more attention has shifted to diamonds and copper of late, gold exploration dominates mining investment portfolios across the world [2].

With buoyant gold prices, many of the world's gold mining companies - like the more broad-based mining groups - are leading South. Anxious for investment, many countries, including the Philippines and Indonesia, have held out a raft of incentives to foreign corporations. They have lifted foreign ownership restrictions, reduced taxes, and helped boost the repatriation of profits. And in a sale of state assets to the private sector, mining companies are being courted for their bids.

More than 70 countries have changed their mining laws to attract foreign companies. "The mining industry is suddenly confronted with a wide arena of opportunities that have not been available for several decades," Bob Wilson, chief executive of London-based RTZ (Rio Tinto Zinc) recently told the UK newspaper, The Financial Times.

Since the early 1980s, when bullion prices soared, a considerable tonnage of the new world output is being mined by small-scale miners in the informal sector. And the big strikes are largely in the South.

Countries such as Brazil, Guyana and Zimbabwe have witnessed a marked increase in artisanal mining. Although it is notoriously difficult to come up with precise figures, it is estimated that small mines account for at least 10% of world gold output.

The ultimate security

The biggest single use of refined gold is as jewellery, perceived by millions of people in cultures across the world as a "store of value" - a failsafe currency against bad times. Last year, 85% of newly mined gold was beaten into jewellery. In Britain the trend is for high-quality, designer jewellery. "It's an adornment that makes you beautiful," says the London-based World Gold Council. For many, it is a personal statement of wealth.

Demand is strongest in Asia and the so-called tiger economies of the south-east. Gold sales have also been booming in India, where the opening up of the economy has spurred economic growth and a huge middle class is prospering. Here brides are expected to bring at least part of their dowries in gold. Middle
Eastern, Indonesian and Latin American workshops are increasing in importance, while those in North America and Europe are static or only slightly increasing.

About 600 tonnes of "scrap" gold is recycled annually and 90% of all gold mined is available for re-use. This is because gold is almost indestructible. Its resistance to oxidisation is often cited as a reason it was so popular in classical times with the Romans. It is also uniquely malleable and ductile; one ounce can be drawn into 50 miles of thin gold wire.

The metal is an unrivalled conductor of electricity - hence the market in telecommunications, computers and automobiles is modestly expanding. Industry and medicine account for about 12% of annual gold demand.

The mystery of the gold market

Bad news of wars and coups is good news for market prices. When currencies are weak, the market price of gold tends to become stronger ("bullish"). When international tension increases, demand tends to rise. When interest rates rise, and inflation seems under control, then the gold market tends to "bottom out" (goes "bearish").

Nonetheless, the market works in mysterious ways with largely inexplicable price swings in the absence of any obvious major buying or selling on the world market. Recent price movements have been put down to "rogue" private investors, central bank buying, and forward sales cunningly structured to avoid early selling which could depress the gold price.

2 FROM GIANT CORPORATIONS TO WILDCATS

Mining the globe

South Africa continues to be the world's leading producer of mined (or "new") gold. Last year it produced 523 tonnes, although this was the lowest output for 40 years [3]. In terms of regions, most gold is mined in the North, particularly in the USA, Australia and Canada, followed by Russia and China. Each of these countries produces more than 100 tonnes a year - though China's official production hovers around that mark [4].

Yet exploration targets suggest that in 20 years time, around half of global gold production will derive from territory used or claimed by Indigenous Peoples. These regions include Amazonia, the high Andes, parts of northern Canada and the CIS, Indonesia, Papua New Guinea, the Solomons, Cambodia, Thailand, Laos, and northern Samiland in Scandinavia ("Lappland"). If Africa's estimated reserves of gold are included as "Indigenous", as some would argue, then the
proportion rises even further. According to the Commodity Research Bureau, the continent has nearly one-third (31%) of the world's known sources of the yellow metal.

Jerry Ellis, chief executive of BHP Minerals, Australia's biggest conglomerate, says that the next century could see the world's mining industry dominated by a handful of large companies [5]. Already by 1991, just over 20 companies delivered more than two-thirds of official global gold production (outside of China) - while the world's two biggest mining companies (RTZ/CRA and Anglo American) controlled nearly half of this amount [6]. The trend is toward big takeovers and mergers as corporations seek to exploit the world market.

The new junior breed

The giant corporations that dominate the industry, such as RTZ and Anglo American, are currently being upstaged by a new breed of aggressive, junior companies financed by "smart money" on the stock exchanges of Canada and Australia.

A Canadian government working group in 1992 identified some 200 Canadian mining companies operating outside their home country - holding around 420 separate mineral "properties". By 1995 that figure had trebled. Such companies are mobile, relatively inconspicuous, and ready to take risks. They are opening up new fields of exploitation, in countries like Peru, Ecuador and Ethiopia, and regions like the Guiana Shield (Guyana, Suriname and "French" Guiana), Vietnam and Laos, and Central Asia.

Few of these junior companies will actually mine an ounce of gold on their own, since they lack the expertise and long-term investment capital to do so. On locating a promising deposit, they generally enter partnership with bigger companies. In this way, the big corporations still continue to hold some sway.

Critics say the junior companies often go where environmental standards are lax or non-existent. In a survey carried out by the London-based pressure group Minewatch in 1995, of all Canadian companies operating in Latin America, virtually none of the "juniors" had any cogent policy for environmental protection, site rehabilitation or social responsibility [7].

On the other hand, some experts say that such companies go where the deposits are richest, follow strict environmental guidelines and use the best technology available in order to raise the vast amounts of money needed for major mining projects.

Southern-based and-owned mining companies are also growing: for example, the penetration of Cambodia's northeast region is being carried out largely by the Malaysian gold mining company, Delcom Services Sdn Bhd [8].
"Wildcat" and artisanal mining

In most gold-producing countries, there are vibrant small-scale mining operations, many of which are illegal and unregulated.

Statistics are hard to come by and should be treated with caution. Nevertheless, it is estimated that in Africa, small-scale miners produce up to 20% of gold. In the sub-Saharan region, more than 1.5 million people work in the informal mining sector, while in Zimbabwe the figure is put at 100,000. In Tanzania, the Central African Republic and Sierra Leone, the total gold output currently comes from small-scale mines. The World Bank estimates that small-scale mining in Brazil produces 50% of total gold output (though Brazilian government sources put a lower figure), employing perhaps 500,000 miners or garimpeiros at any time. Elsewhere, the Philippines also has a big small-scale mining sector.

The composition of mining communities and the technology used varies from country to country. Individual prospectors assiduously pan or mine their own individual plots, some work together as families, in small groups or co-operatives using semi- or fully mechanised technology, and others work for small companies which can employ tens and even hundreds of miners. In Brazil, a small number of professional miners employ temporary, seasonal workers who are predominantly smallholders.

But whatever the size of the informal sector, the bulk of all primary gold is mined by private corporations. And with the shift inexorably continuing away from state-controlled mining to foreign operators, the dependence on these companies is likely to increase. Many gold fields currently exploited by tens of thousands of small-scale miners in Tanzania, Venezuela, Central African Republic and Indonesia, for example, have been licensed to foreign concerns.

3 RIGHTS, SAFEGUARDS AND MINING CODES

Ensuring the benefits

If developing countries are to benefit from gold mining, then economic and environmental safeguards are imperative. This may involve a recognition of mining as a national strategic industry and developing mining policies which ensure that a fair share of the vast profits go towards local communities and sustainable development practices.

Small-scale mining also has the potential to support local communities throughout the developing world. Environmental safeguards are paramount, but so too is the regulation of a largely illegal industry. Some countries have made important strides in giving miners rights over their mining plots. But further
developments, including opening credit lines, the adoption of non-polluting technology, as well as training and government backing, are needed if the sector is to emerge from its old ways.

**The need for regulation**

Clearly, the informal gold-mining sector has the capacity to further contribute to the economies of many developing countries. By its nature it is labour intensive and technology can be manufactured locally. And, unlike the formal sector, it is less influenced by the up-and-down movement of bullion prices. But regulation, credit, training, and improving miners’ rights are paramount if the industry is to move towards sustainability.

In the late 1980s, Ghana introduced a law on small-scale mining, which requires the registration and licensing of miners as individuals, small groups or co-operative societies. Penalties are also set down for the illegal purchase of gold. Another law regulates the use of mercury in gold production. The mining code and its "satisfactory results" won praise from the World Bank and other parties, including non-government organisations, at a meeting last year which discussed a small-scale mining strategy.

Despite their importance, many codes remain virtually unworkable. In the Philippines, for example, only duly established claim-holders are permitted to mine for gold. A proposed small-scale mining bill, critics claimed, would take away Indigenous People's land rights. But what action can be taken when tens of thousands of people mine illegally? Precious little. Most governments do not have the resources to police the codes. In the Philippines, poorly paid soldiers protect illegal workings for a cut of the ore produced. And illegality breeds dismal working conditions, leaving miners vulnerable to extortion. With the pressure on to make a living, health and safety measures may often be ignored.

Nevertheless, regulation can bring tangible benefits. Zimbabwe’s Ministry of Mines, which legalised gold panning in the early 1990s, has shown what can be done. The Ministry provides detailed information on mineral resources, prospecting and mining exploration and ore processing. In another move, the Ministry is working with a local miners' association and development agencies, including the UK-based Intermediate Technology (IT) group. The association and IT have helped to build a mining centre which provides processing services to other miners in the area. The centre has a qualified mining engineer giving advice and training. "The centre demonstrates that by improving productivity through sharing resources and appropriate technology, more responsible mining can be achieved," says John Twigg of IT.
Competing for favours

Attracting foreign direct investment (FDI) for mining projects - particularly gold ones - is a key priority for many indebted developing countries which are liberalising their economies, often as part of Structural Adjustment Programmes. Since deregulation began in the mid-1980s, many countries which expelled mining corporations in the first flush of independence in the 1950s and 1960s are now rewriting mining laws and reopening their doors, in some cases to the very same corporations.

Dr Jim Otto, an international expert on mineral policy, cites 31 countries in Africa alone that have made changes to their mining legislation in recent years [9]. The rewriting of mining codes is much the same worldwide: allowing tax-free imports, deferring royalties and similar payments, and permitting the expatriation of up to 100% of profits, and even the export of all gold mined.

The Philippines races for gold

The Philippines was once known as the "Isles of Gold". In the early 1980s, the country was the eighth-largest producer in the world. But it then slid to 14th place. In a bid to kickstart an indebted economy and match gold exports to a 1980 peak, the government, with the help of international donors and foreign mining companies, allegedly rewrote the mining laws.

"I have never seen so many mining company chief executives as I have in the last four months," said the secretary of state for the environment and natural resources, soon after the laws came into effect in March last year. Among the new prospectors are corporations like RTZ/CRA and newer companies like the London Fiduciary Trust. Most companies are in the rush for Financial or Technical Assistance Agreements (FTAAs) which give licence to explore vast areas of up to 81,000 hectares of land for a limited time [10].

Critics say the government has abandoned mining as a national strategic industry and sold out to foreign companies. Local companies, for example, are restricted to exploring blocks of land up to 16,000 hectares. The country has also changed its longstanding 60/40 mining code, which stipulated a minimum of 60% investment by Philippine companies, and hence guaranteed some national control over mineral resources. The government now grants foreign interests 100% ownership of deposits in some circumstances and allows the direct export of all the gold mined. In addition, tax holidays are granted for an initial three year period, profits can be freely sent offshore and excise duties have also been cut from 5% to 2%.

A coalition of people's groups, including the Cordillera-based Mining Communities Development Centre, is concerned that tens of thousands of
Indigenous People, many of whom are small-scale miners, will lose out to the foreign companies. Small-scale mining is a vast undertaking often under communal control. But their workings are under corporate scrutiny. The new companies often prospect by taking test samples of their waste. "These guys pan for gold in the rivers and then follow the trail upstream until they find the main source. They won't stick around if it's not worth their while, so finding them is a sure way of finding high-grade gold deposits," said a foreign mining prospector. A major worry is that the granting of FTAs will lead to small-scale miners and Indigenous People being evicted from their mining plots and ancestral lands.

And there have been precedents. According to Minewatch, the impact on indigenous Filipinos - especially in the Igorot region of the northern Cordillera and on the southern island of Mindanao - has been severe. An estimated 24,000 indigenous miners, who previously co-existed with the Benguet Corporation, the country's biggest gold miner and partially owned by the state, are now barred from mining. "Now their mines, farms, burial sites and even houses are being torn out in the final search for gold," says Minewatch. [11].

**Return of the private sector**

According to the Swedish-based Raw Materials Group, state control of the mining sector is diminishing all over the world. State assets are being put up for sale from Bolivia to Zambia. Few countries have so far resisted the temptation to sell off the family silver, gold, copper, diamonds and other mineral wealth.

One of the biggest prizes could be Brazil's largest company, Companhia do Vale Rio Doce (CVRD). Though still a minor gold miner by world standards - 13.5 tonnes in 1994 - CVRD is nonetheless one of Latin America's biggest producers and a lucrative target. And early this year, the state corporation announced the biggest gold find ever in Latin America. Situated in the eastern Amazon, the Curionopolis deposit is a massive 150 tonnes, which could make it one of the five or six largest gold mines in the world. Privatisation plans were advanced during 1995. However, they could prove difficult to follow through. Many nationalist politicians are arguing that CVRD's gold potential is too important to be consigned to foreign corporations.

In Peru, Latin America's second biggest gold producer behind Brazil, mining privatisation has probably advanced further than anywhere else on the continent. "North American newcomers have introduced a refreshingly modern approach to labour policy...eliminating the traditional division between white and blue-collar workers...Better management-labour relations have yielded immediate results," reported the Financial Times recently. In some cases, restructuring may lead to further investment in new and expanded mines, but it can also come at a heavy cost. In Peru, new companies have substantially reduced their workforces" - in one case by nearly three-quarters.
4 THE SPEAR OF DEVELOPMENT

"We are thrusting a spear of development into the heart of West Papua." James Moffett, Chairman, Freeport McMoRan Inc Developing infrastructure Guinea's minister of mines and energy recently said that mining companies "...will be the standard - bearer for foreign investment in this country...not only for the economic benefits they bring with them, but also as a means of developing Guinea's extremely limited infrastructure" [12].

"Mining operations often provide a way of opening up undeveloped regions," says the Financial Times. "New mines require not only new roads, power and communications but sometimes new townships and accompanying medical, educational and shopping facilities." And this brings jobs for under- and unemployed hands. In Peru, company estimates say one direct mining job creates 10 additional jobs in the area.

Clearly, mining operations can have considerable benefits for developing economies. Nor is this limited to infrastructure and jobs. Since Ghana deregulated its mining sector in the mid-1980s to attract foreign investment, gold exports are now the economy's star performer. In spite of lowering the tax on mining profits, the government continues to raise vast revenues. The development of the gold industry has been an important factor in Ghana's recent economic growth.

South African gold loses its shine

In the South, it is South Africa where the gold industry has been the backbone of the economy and brought big dividends. However, the gilt is beginning to tarnish. Plagued by low productivity and ageing gold mines, output in the industry dropped to below 600 tonnes in 1994 for the first time in three decades, and has plummeted since then.

Gold's contribution to the country's foreign exchange earnings fell in the 1995 financial year from 28% to 21%. This represented a loss of about US$737 million.

Short-lived projects

Many mining projects are short-lived, while all are dependent on volatile markets and changing fortunes. It is no accident that "ghost town" has become a byword for relinquished mining sites. Nor is this phenomenon confined to North America or Australia: abandoned mining settlements are to be found throughout Latin America, Africa and Asia. Gold, in particular, may appear a fast money-spinner but - after capital and interest costs are repaid and realistic compensation made
to local landowners - considerably less is left for "roll-over" investment, either in the local economy or national development.

Even where a mine proves profitable over decades, rather than years, the profits of transnationals tend to be deployed in opening up new prospects, rather than consolidating existing ones. RTZ has a reputation as a long-term investor in a given region. Its Lihir project in Papua New Guinea promises a production lifetime of 30 years or more and local landowners have been given part of a government stake in the project for no cost. In addition, they will be given the chance of buying a 5% equity interest. Of course, the bulk of the parent company's net earnings goes not towards South-based country-specific development, but on global exploration and opening up new mines.

**Killings at Freeport Mine**

Protesters in West Papua (Indonesian Irian Jaya) recently forced the temporary closure of one of the world's most profitable gold and copper mines. They broke windows and damaged equipment at an environmental laboratory owned by Freeport-McMoRan which operates the mine. Local Indigenous People are reported to be angry about the social and environmental impact of the mine and the arrival of Indonesians from other parts of the archipelago. Political tensions are also running high. A number of independence groups want West Papua to secede from Indonesia, which claimed the former Dutch colony in the mid-1960s. According to UK-based Survival International, an organisation campaigning for the rights of Indigenous People, 2,000 tribal people are threatened with eviction to make way for the mine's expansion. Reports say that when locals protested last year, the army moved in and 37 people were killed or 'disappeared'. NGOs have alleged that the company has been involved in military human rights abuses, a charge denied by Freeport. "Freeport is digging our mother's brain. That is why we are resisting," said a local leader.

**Power to invest**

While many mines require new oil, coal or hydro-power schemes, their financing usually derives from government and multilateral institutions, not the corporate sector. Nor is there any guarantee that a significant proportion of electricity generated will go to local people. Rolls Royce of Britain is building a US$100 million gas-fired power plant at Samarinda, capital of east Kalimantan (Indonesian Borneo). Much of this power will go to the RTZ-CRA Kelian Mine [13] and virtually none will end up in the homes of poor transmigrants, let alone the indigenous Dayak communities - not for want of power, but because neither the companies nor government are prepared to provide transmission lines.

However, some companies do invest in local communities. In Peru, the US-Peruvian joint venture partners Newmont Mining and Buenaventura invested US$3 million in 1995 in poverty-alleviation schemes last year and paid US$14
RTZ's Rossing Foundation, set up on profits from mining operations in Namibia, has funded overseas scholarships, an agricultural support programme and other local amenities.

**Discovering the informal sector - the rush to Yanomami territory**

In Brazil, where the 1980s goldrush continues, studies of the northernmost state, Roraima, which produces 10% of the informal sector’s output, show that mining is important in supplementing smallholder incomes. Mining allows smallholders, who make up the bulk of miners in this region, to farm their fields in the wet season when mining comes to a halt.

Many smallholders migrate from other regions and the influx of miners heightens demand for food and rooms in villages. Jobs for cooks and other workers open up. Locals prosper. But once the roads are built or airstrips hacked out of the jungle, it is the nearby towns that house the money magnates, selling everything from mining equipment and services to transport, entertainment and consumer goods. The Brazilian goldrush has seen cities such as Porto Velho and Boa Vista expand almost overnight in the Amazon’s interior, providing large-scale employment opportunities.

Academic Gordon MacMillan concludes that in Brazil the informal gold sector is likely to have had a greater impact on the regional economy than the formal one.

**Profit and loss**

Gold production can also be a big boost for the government's treasury. In Roraima alone, it is estimated that gold worth US$540 million was extracted in the last two years of the 1980s. However, the state often has a tough time getting its share. Corruption and the smuggling of gold abroad is endemic - and the story is much the same the world over.

In the West African state of Burkina Faso, for example, where many people revived prospecting in the mid-1970s after a devastating drought, gold must be sold to the government. However, the price tends to be below the market rate and the lure of higher returns abroad has seen the emergence of a well-organised smuggling racket involving businessmen, politicians and members of the military and police. There are reports that 80% of gold mined is smuggled to neighbouring Mali and the Ivory Coast, and then on to Belgium. In many countries, miners are forced to sell their gold abroad as their workings are illegal.
Gold’s social costs

Across the resurgent goldfields, there are tens of thousands of mineworkers who only just subsist. In Zimbabwe, many of the mine claims are owned by absentee owners who include bus operators, shopkeepers and teachers. The mineworkers are largely landless, often squatting on commercial farms or on temporary settlements on the mine claims. The men are usually part-time miners while the women tend to work as agricultural labourers. The typical mine employs 5-15 people who build up a monthly stockpile of ore which is then milled. Often the gold recovered is insufficient to pay the wages.

Even in the richest goldstrikes, the sprouting of towns around gold deposits has its costs. In the Amazonia region, drug use, prostitution, and violent crime are all part of goldrush life. Cocaine and marijuana are both readily available and widely consumed. Many divers working on the river rafts smoke a mix of cocaine and marijuana before starting their shift on the riverbed. And cocaine traders prefer to deal in gold because, unlike dollars, it cannot be traced.

Recruited from poor areas and often deserted by their partners, women prostitutes are kept in virtual slavery. And child prostitution is also prevalent. Many miners regard condoms as an affront to their virility, an attitude which has encouraged the spread of sexually transmitted diseases and HIV/AIDS [14].

Indigenous costs

In opening up highways and gold deposits, the lands of many Indigenous People have been invaded by waves of prospectors. As in previous centuries, the meeting between outsiders and Indians can be deadly. Between 1988-1990, during the height of the gold rush into the Yanomami Reserve in Amazonia, at least 15% of the Yanomami people died. They perished largely from diseases such as malaria and tuberculosis which miners helped to transmit [15].

Indigenous People may cautiously welcome the miners in the beginning, but as game is scared away and their rivers and lands are polluted, violent clashes loom. A lawyer for the Conselho Indigena de Roraima recorded the murders of 14 Yanomami people between 1987 and 1992. But these appear to be conservative figures, as many violent incidents in this remote area went unrecorded.

The chaos extends to their spiritual universe. One Yanomami said the ill-health of miners and themselves is bound up with a spirit released from the subsoil during mining. And this spirit, Xawara, threatens others which protect the sky and forests. The undermining of the sky and forests heralds the end of the world [16].
Indigenous control and the Kayapo

Some indigenous communities have managed to hold their own against outsiders, and even profit from them. The Kayapó are probably the most successful of Brazil's Indians in controlling gold mining on their lands. In the early 1980s, Kayapó leaders struck deals with miners. They guaranteed to police and keep mines open for a levied tax of between 1% and 10% of gold production. In 1985 they evicted 5,000 miners with the help of the Brazilian air force when they closed the Maria Bonita Mine after its contract expired. By insisting that the mine would only be reopened if the authorities agreed to demarcate their lands, the Kayapo succeeded in establishing a three-million-hectare reserve. The mine was eventually reopened on condition that the Kayapo received 5% of the mining royalties.

5 ENVIRONMENTAL AND HEALTH COSTS

"The press only talks about the environment. Everybody criticises us gold-seekers. But we are just workers. We are not here risking our lives and working hard because we enjoy it. We need to survive to take care of our families."

Antonio Ferreira, Brazilian gold miner

Danger - miners at work

According to the International Labour Organisation (ILO), mining is one of the world's most hazardous sectors, causing more than 15,000 deaths each year. Says the ILO: "Mine workers are continually exposed to risks such as extremes of noise, vibration, heat and cold, repetitive task strain and harmful chemicals, radioactive materials, dangerous gases and dust inhalation. Worse still, they often face combinations of many of these risks at the same time." The ILO is now completing a two-year (1994-96) project to create new standards of health and safety among the world's estimated 25 million corporate mineworkers.

South African and Chinese gold miners feature at the top of the casualty lists. According to South Africa's minister for mineral and energy affairs, Pik Botha, each tonne of gold mined in the country costs "one life and 12 serious injuries".

Small-scale miners also have to contend with dangerous working conditions. For those underground, frequent rockfalls, mudslides, fires from overturned lamps, poor ventilation, dust and smoke concentrations are among the risks. The Chinese press regularly reports mining accidents as a warning to illegal miners. When a collapsed mountainside buried 50 miners, the official China Gold said "that this should be a lesson to those who covet gold more than life".
Mercury poisoning

Apart from a very small proportion of traditionally mined gold - in the Philippines and Papua New Guinea, for example - all gold mining has potentially heavy environmental costs, as it usually involves the use of either cyanide or mercury.

Whether they labour in the rainforests of Amazonia or on the banks of Zimbabwe's rivers, small-scale goldminers carry out a practice handed down from classical times to separate the gold from the earth. Liquid mercury is poured over crushed ore in a pan or sluice to form an amalgam. By hand they press this through a cloth to remove the excess mercury. Crowding round, they then light it. The mercury burns off as a white vapour and is inhaled by the miners as they weigh up their shiny payroll.

Mercury's toxicity is well known. It enters the body through inhalation, ingestion and skin absorption. Much of it is passed out again in urine, but high exposure can result in the metal being deposited in the central nervous system and the brain. Chronic poisoning can lead to insomnia, severe tremors, brain damage, and even death. And by entering the placenta, it can cause birth defects.

Clearly, miners and their communities are at immediate risk. The UK-based Ecologist magazine cited a study conducted in the Philippines which showed that of people exposed to mercury for an average of 30 months, or who lived within 500 metres of a source of mercury, almost 75% of those examined showed clinical symptoms of poisoning. And tests from several mining communities in Brazil found that more than 30% of miners examined had mercury levels above the World Health Organization's tolerable limit [17].

Contamination also occurs through the consumption of fish, and this is perhaps a greater long-term hazard. The constant flow of water used in the production process causes mercury to be washed into rivers. In a highly unregulated and competitive industry, many miners work ceaselessly to maximise earnings and take risks. Just how much spills is difficult to say. In Brazil, researchers say that for every tonne of gold produced, about one tonne of mercury is lost in spillage. It is estimated that 80-100 tonnes is discharged into the Amazonian river system every year [18].

Eventually the mercury settles in riverbed sediment, where it is joined by more deposits from the atmosphere as it condenses following the burning process. Bottom-feeding fish and other organisms absorb the metal on the riverbeds and they in turn are eaten by predatory fish. In Brazil's Pantanal, the world's largest wetlands, researchers have found fish with mercury concentrations 24 times above the WHO's permissible standards [19].

Some communities dependent on fish are seriously at risk. In Brazil, tests on the Kayapo, whose territory is dotted by gold-mining excavations, indicate that 25%
have high levels of mercury. The amount of mercury in the blood of children was found to be only slightly less than that in miners' blood [20]. Studies show that the populations of the Amazon's gold cities are not yet at serious risk, but warn there is little room for complacency.

**Impact on fish stocks**

Fish reproduction is also affected by mining operations. Quite apart from the run-off of petrol, diesel oil, detergents and mercury, there is the widespread disturbance of river and stream sediments. As miners use land pressure hoses, sift for gold and dredge the riverbeds, they increase the turbidity of the water, turning the rivers into an impenetrable muddy brown. In such conditions, fish-breeding habitats can be affected, causing stocks to decline.

In Brazil, one of the best-documented cases is the Rio Fresco, in the Gorotire Reserve of the Kayap-Indians. After the discovery of gold in the early 1980s on the borders of the Reserve and upstream, the crystal-like river turned opaque and fish yields declined [21].

**How to reduce hazards**

The United Nations Environment Program (UNEP) recommends that the "use of mercury amalgamation should be prohibited". Alternative gravity-based technologies exist and are likely to spread in years to come. But for small-scale miners today, UNEP's recommendation is akin to suggesting a ban on football in Brazil.

Reducing discharges is key and breakthroughs in modifying technology have been made. Retorts, which eliminate mercury gas given off during the burning process and burn just as quickly, can now be made, locally. In Brazil they sell for under US$20 - a small sum for most miners - but the take-up remains low. This may be partly due to the illegal status of miners which makes it difficult to approach them and gain their trust, and the cheapness of mercury. Gold traders can also well afford sponge filters which can be attached to furnaces. But when municipal authorities are weak, the necessary regulations will be difficult to enforce. Regulation in countries such as Colombia, Ecuador and Guyana has met with little success.

Other low-cost modifications include better sluice gates and traps to help prevent mercury spilling into watercourses, and processes to cleanse and recycle mercury. Of course, take-up is critical, but there are signs that it can be achieved. Elsewhere, NGOs have introduced safe technology after setting up long-term health-care projects. "This twin approach drives home the health hazards," says John Twigg of Intermediate Technology. "But the bottom line is to demonstrate that new technology must be viable and provide decent returns."
Small-scale to giant-scale impacts

Small-scale mining often leads to vegetation loss as hillsides are cleared when miners follow a vein of gold. Forest is also felled to make way for airstrips and working areas. In the Philippines, hillsides on Mindanao island show heavy soil erosion due to widespread excavation.

In many parts of the world, notably Guyana, Suriname and Venezuela, medium-scale operators use great suction pumps set on floating barges which undermine river banks, creating huge waste piles which alter the flow and currents. This can drastically change the landscape, often endangering villages on the banks, and causes excessive siltation which can reduce the efficiency of hydroelectric projects.

As well as forcing many people off their land, large-scale corporate mining operations can also leave big scars on the landscape. Open pit mines may be over 1.5 miles long, 1,500 feet deep and 4,000 feet wide. In the process of mining billions of tonnes of ore, whole mountainsides can be gouged out, leading to the severe loss of topsoil, habitat, trees and vegetation.

Business and the environment

Corporate mining interests largely abandoned the use of mercury in the early 1970s. The US Bureau of Mines came up with a much cheaper method allowing companies to mine and process ore containing as little as .01 troy ounces of gold per tonne of ore. ‘Heap leaching’ can produce an ounce of gold for under US$200.

The heap leaching process usually involves the open-air spraying of ores - sometimes piled 200 feet high over several hundred acres - with cyanide solution. In a typical operation, crushed ore is placed on pads lined with clay or plastic. The solution dissolves the gold as it seeps through on its way to a collection pond. Once the liquid has passed through a series of processes to remove the gold, the cyanide solution is reconstituted and reused until the ore is completely leached.

Cyanide solution begins to break down naturally when exposed to the atmosphere and sunlight, though in some conditions remains harmful for years. Cyanide degradation also releases nitrates and other nitrogen compounds that can contaminate water sources. Spills from collection ponds or leakage through linings can have a severe environmental impact. Cyanide is extremely poisonous for people, plants and wildlife. Very small doses of cyanide are fatal if ingested, inhaled or absorbed.
Political risk insurance

The World Bank's Multilateral Investment Guarantee Agency (MIGA) grants political risk insurance to over 20 mining projects worldwide. Although MIGA is supposed to conform to the Bank's social and environmental guidelines, critics claim that these fall well short of the standards set by the Bank [22]. Ongoing MIGA contracts include the controversial new Lihir gold project in Papua New Guinea and the vast Freeport/RTZ copper and gold operations in West Papua (Indonesian Irian Jaya). In October 1995, the US government's own Overseas Private Investment Corporation (OPIC) - which also provides political risk insurance - withdrew from the West Papua mine on environmental grounds. "Mining has resulted in the massive deposition of tailings in the Ajikwa river and degraded a large area of lowland rainforest between the Ajikwa river and Minajeri river," declared OPIC. "These and other effects of the project have posed unreasonable or major environmental, health or safety hazards." OPIC has also refused to grant insurance cover to the Lihir mine, again citing environmental reasons. MIGA and other insurers such as the Canadian Export Development Corporation continue to provide insurance. A senior official at MIGA said that political risk insurance only goes ahead if the Bank's strict environmental and social guidelines, which also extends to worker safety, are met.

Numerous spills have been reported in the US during the 1980s when the country's gold industry increased its output 20-fold from heap leach mining. In 1989, 92,000 gallons of cyanide solution spilled from a leach unit in California and polluted a reservoir used for municipal, recreational and agricultural purposes. The US Fish and Wildlife Service estimated that from 1986-1991, heap leaching operations poisoned more than 10,000 animals [23].

Regulating cyanide heap leaching has proved difficult. Federal State regulators have reportedly been unable to enforce compliance with the law, raising growing concerns. "We are spraying tens of thousands of tonnes of one of the most acute poisons to man across the landscape," wrote Philip Hocker of the Washington-based Mineral Policy Centre. "There will be more deaths if this programme is not strictly monitored and the dead will not be all birds and animals."

The comparatively low costs of heap leaching and open pit mining have already led to expansion of these processes in Australia and Latin America.

Effluent and waste

Whether it be through heap leaching or more conventional mining processes, vast residues of waste and effluent are generated. This comprises rock and soil, and residual matter from ore concentration or so-called tailings. The waste, and especially the tailings, can contain cyanide, acids, nitrogen compounds, copper,
zinc, lead and arsenic. Tailings should be deposited in ponds and treated with further chemicals to break down pollutants before being discharged into lakes, rivers and seas. However, there have been several major cases, including the Australian-owned Ok Tedi mine in Papua New Guinea and the Freeport-RTZ mine in West Papua (Indonesian Irian Jaya), of untreated tailings being dumped in rivers and seas.

Such tailings contribute enormously to the most intractable environmental problem in mining - acid mine drainage. This occurs when sulphides contained in rock or waste interact with oxygen and water, creating sulphuric acid. The acid leaches out heavy metals which can poison marine life downstream of the mine.

According to a senior mining official at the World Bank, corporations spend significant sums - US$4 million in the case of the Ok Tedi mine - safeguarding the environment. He said that the best technology is used and the same standards apply whether the mine is in a rich or developing country. "Few companies can afford to operate fast and loose," said the official. "They don't want grief at their shareholders' meeting, and institutional funders don't want to see anything undertaken that puts their investment at risk."

The potentially harmful environmental impact of tailings has led to a tightening of discharge laws in some rich industrial countries. The US now has a "zero discharge policy". And in Australia, the dumping of tailings into rivers and lakes is forbidden, while sea disposal is being phased out. In the South, Chile has recently introduced strict environmental regulations. Some researchers believe that for most developing countries, project-specific agreements with the companies which incorporate on-going environmental impact assessments remain the most practical way to try and ensure strict safeguards. These could include an insurance bond - now required for new gold mines in countries including the US and New Zealand - which covers reclamation costs if an accident occurs [24].

Mine's end

The end of a mine's life may be only just the beginning for potentially more lethal environmental problems. New research in the US shows that abandoned and exhausted gold workings can result in acid mine drainage which happens when mining operations fail to reclaim or cap the waste with impermeable material such as clay. Some US rivers have already been heavily contaminated. In response, the government has set up a special fund to combat the problem.

Responsible companies comply and build the necessary ponds and treatment plants in an attempt to stabilise the problem, but others refuse to accept responsibility and are contesting tighter regulations and clean-up operations which run into tens of millions of dollars [25].
Guyana's poisoned rivers

South America's second largest gold mine, the Omai in Guyana, began operations in 1992/93. In 1994, it produced over 250,000 ounces of gold, accounting for more than 20% of the country's gross national product. Owned largely by Canadian companies, Cambior Inc and Golden Star Resources, concern was raised by environmentalists at the outset about the design of the clay-cored tailings' dam which stood between millions of gallons of cyanide-laced effluent and a tributary of the country's largest river, the Essequibo. The operating company, Omai Gold Mines Limited, gave repeated assurances of the dam's safety and even increased its height, despite criticisms by the Canadian engineers who built it. [26].

In mid-1995, five months after an unauthorised discharge, the dam fissured and three million cubic meters of cyanide-tainted water and other residues, including heavy metals, poured out. Part of the torrent was diverted into the mineworkings, but for four days most of it poured into the Essequibo River, which provides fish and drinking water for the Amerindian and Creole communities along its banks. Claims of dangerous cyanide concentrations in the effluent were disputed by the company. However, the government said the leak, which formed a bright red plume some 45 miles long, was, in places, 14 times more concentrated than the World Health Organization permits - the WHO puts the permitted maximum cyanide concentration at two parts per million (ppm) for drinking water. Within 36 hours, the government declared the area a disaster zone. A spokesman for Omai Gold Mines reportedly said the "accident had not resulted in an environmental disaster". But a United Nations report released soon after the disaster said that "aquatic life in the Omai River and parts of the Essequibo River had been seriously impacted". Eyewitness reports spoke of dead fish and hogs floating downstream.

The government distributed potable water to affected villages. Reports allege that Omai Gold Mines offered local people compensation if they gave a guarantee not to make any further claims against the company, but the government quickly acted against this. The company gave out some equipment and compensation. Although there were no deaths, reports say three people were hospitalised for four days with suspected cyanide poisoning and others complained of blistering of the mouth after drinking water. The long-term social and health consequences are difficult to gauge, but toxic metals may build up in the food chain as fish ingest polluted micro-organisms.

Six months after the spill the mine was reopened. This followed the report of a commission of inquiry set up by the government which found the company responsible for the spill and liable for damages. It called for improved
environmental protection measures including facilities to improve cyanide degradation before it is released into the Essequibo. But reports say the main opposition party and environmental groups remain concerned about the overall operations of the mine, and some are calling for a ban on discharges into the river.

The government has pledged to pass an Environmental Protection Bill, first drafted in 1993. This would create an Environmental Protection Agency, to set environmental standards and impose penalties on polluters. Critics say that it needs to go further and include specific regulations and penalties for mining activities. This may be a step forward, but as one Caribbean environmentalist said: "Guyana's external debt is comparatively small - the country really has to ask itself how much it is prepared to pay for mining activities. It has to weigh up the value of gold against the destruction of rainforest, fish stocks and diseases like malaria. This is the critical question we face today."

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