

Women and Artisanal Mining: Gender Roles and the Road Ahead

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A hot, dry wind envelopes a statuesque woman as she kneels over wind-sifted trays of tin-bearing pulverized ore in Uis, Namibia. In Bolivia, a nine-year old girl scrambles down a steep pit wall yet again to refill her bucket of metal-rich sand. And yet another woman stokes the fire in her wood burning stove in the Philippines, releasing the mercury from doré in a poorly ventilated kitchen; the thick black soot coating the kitchen wall contains more than 15% mercury. Up to her knees in muddy water, a woman pans for gold to supplement the meagre family income in a Malian “orpaillage”. The faces are as varied as these scenarios but there is one commonality – artisanal mining represents an opportunity. To some, participation is driven by the allure of riches; however, for many women, artisanal mining signifies an opportunity to relieve the strains of poverty¹.

Artisanal miners² employ rudimentary techniques for mineral extraction and often operate under hazardous, labour-intensive, highly disorganized and illegal conditions. Despite these factors, artisanal mining is an essential activity in many developing countries, particularly in regions where economic alternatives are critically limited. The International Labour Organization (1999) estimates that the number of artisanal miners is currently around 13 million in 55 countries, which is roughly equivalent to the global workforce of large-scale mining. From this, it has been extrapolated that 80 to 100 million people worldwide are directly and indirectly dependent on this activity for their livelihood. ILO further estimates that artisanal mining

activities have increased by up to 20% in the past decade.

Approximately 30% of the world’s artisanal miners are women who occupy a number of roles ranging from labour-intensive mining methods to the processing aspect of artisanal mining, including amalgamation with mercury in the case of gold extraction. As processing activities are often conducted in the home, women and their families can be at great risk from mercury poisoning and silicosis. In many cases, the roles of women in artisanal mining communities differ significantly from those of men, and extend well beyond direct participation in mining activities – this added facet brings with it different contributions and a completely unique set of risks and opportunities.

This chapter intends to explore existing and evolving gender³ roles of women in artisanal mining communities, and provides a rationale and strategy for women to maximize potential benefits from participation in the sector. Women are often overlooked by initiatives and development programmes directed at catalyzing the transformation of artisanal mining. Due to their critical role, not only in mineral production, but also in the development of sustainable communities, combined with their susceptibility to poverty, enhancing the role of women in artisanal mining may be a means to “bridge the gap” between the well-conceived technical and socio-economic changes often prescribed for artisanal mining, and the actual facilitation of positive transformation of the artisanal mining sector. This may be accomplished in a number of ways, including:

- Gender-sensitive technology assistance initiatives;

¹ The term *poverty* is used in a broad sense in this chapter. As described by Çagatay (2001), poverty refers to “human poverty”, which includes lack of assets, dignity, autonomy and time in addition to income poverty.

² *Artisanal mining* is used to denote all small-scale as well as medium and large-scale mining that may be illegal or legal, formal or informal. Artisanal mining may be better characterized by a lack of long-term mine planning and use of rudimentary techniques (Hinton et al., 2003).

³ *Gender*, as applied herein, refers to the behaviours, attitudes, values, beliefs, etc. that a particular socio-cultural group considers appropriate for males and females. The authors adhere to the belief that gender roles are fluid and can shift over time, space and in different contexts (Butler, 1990).

- Enhancement of other skills, including managerial and accounting;
- Financial support through the establishment of credit lines and micro-lending programmes;
- Support for the acquisition of mineral titles;
- Consideration of women in the development of regulations and policies;
- The awareness of health and safety issues, with consideration of children who may accompany their mothers or take part in artisanal mining activities; and
- The challenging of social norms which prevent women from benefiting from these activities.

It has been well documented that inequities in political power, distribution of income, capital assets, and access to education and information have resulted in the increased susceptibility of women to chronic poverty. In some cultures, this is exacerbated by the fact that women do not always have control of their earned income or they occupy positions in the unpaid economy (e.g. subsistence agriculture, domestic work). Ultimately, it is crucial that women be empowered to transform their skills and capabilities into well-being. Artisanal mining is only one micro-industry; however, as Labonne (1996) articulated “(artisanal) mining... may become a stepping stone towards economic fulfillment, contributing to a better future for women and men in many developing countries”.

PARTICIPATION OF WOMEN IN ARTISANAL MINING COMMUNITIES

Artisanal mining communities around the world are diverse, dynamic and distinct – they vary from culture-to-culture, region-to-region and mine-to-mine, and change over the course of time. The women within these communities are also heterogeneous and unique; however, they tend to be engaged in specific roles throughout the world. Typically, they are labourers (e.g. panners, ore carriers and processors), providers of goods and services (e.g. cooks, shopkeepers) and are often solely responsible for domestic chores. Women’s responsibilities in mineral processing activities range from crushing, grinding, sieving, washing and panning, to amalgamation and amalgam decomposition in

the case of gold mining. Less commonly, women are concession owners, mine operators, dealers and buying agents, and equipment owners. In many locales, women function in multiple capacities. For instance, a women working as a panner may also obtain income as a sex trade worker and a cook. Despite the diverse and important roles undertaken by women in artisanal mining, limited reliable information is available on this topic. The numbers of women involved have been estimated in several countries; however, there are very few accounts telling the stories of individual women and a paucity of information concerning the age, ethnicity, status, wealth, and health of both women and men in these communities. Since the participation of women in non-mining activities is often overshadowed by their involvement in mining, their direct and indirect roles in artisanal mining communities are discussed independently below.

Women as Miners

Women’s direct participation in artisanal mining varies throughout the world. In Asia, generally less than 10% of miners are women, whereas in Latin America, the proportion tends to be higher, approximately 10-20%. The percentage of female artisanal miners is the highest in Africa, ranging between 40 and 50%. In some regions, the artisanal mining workforce is comprised of 60 to 100% women (ILO, 1999; Amutabi and Lutta-Mukhebi, 2001; Onuh, 2002). Women typically play a much larger role in artisanal mining than in the large scale mining sector (WMMF, 2000). Statistics on the participation of women derived from country studies commissioned through the Mining, Minerals and Sustainable Development initiative are shown in Table 1.

As women often work part-time at informal mining operations, and occupy “ancillary roles” (e.g. cooks, service providers), there may be significant discrepancies between the *estimated* and *actual* numbers of women involved in artisanal mining (Wasserman, 1999). Further to this, as women are more frequently associated with transporting and processing materials, as opposed to digging, they are not always identified as “miners” (Susapu and Crispin, 2001).

Table 1: Women in Artisanal Mining in Selected Countries

Country	Number of Women	Proportion of Women
Africa		
Burkina Faso	45,000-85,000	45
Ghana	89,500	45
Malawi	4000	10
Mali	100,000	50
Mozambique	18,000	30
South Africa	500	5
Tanzania	137,500	25
Zambia	9,000	30
Zimbabwe	153,000	50
Asia		
India	33,500	7
Indonesia	10,900	10
Philippines	46,400	25
Papua New Guinea	12,000	20
Latin America		
Bolivia	15,500	22
Ecuador	6,200	10
Total	596,000	

Source: (after Hentschel et al., 2002)

Africa

The involvement of women in Ghanaian small-scale mining has been well documented by Hilson (2001, 2002). Acting as licensed buyers (6%), concession holders (10%), and work group sponsors or participants (15-20%), women comprise approximately 15% of the legal small-scale metal mining labour force in Ghana. Hilson (2001) estimated that illegal involvement in the *galamsey* industry is up to 50%. The involvement of women in industrial minerals (e.g. clay, stone quarries, salt) is much greater, with the proportion of women in salt mining as high as 75%. In the Tarkwa Mining Region, Akabzaa and Darimani (2001) observed women working in all aspects of mining, processing, and marketing. As is found in other countries, women predominantly participate in sieving, sorting, the transport of ore and water, and washing, although involvement differs depending on whether activities are legal and a cooperative is present. For example, in the Akoon mining cooperative, due to risks associated with underground mining, women are not directly engaged in mining but are employed as bookkeepers and security guards. At the illegal Coccoase Camp, women pound rocks, and carry ore and water for wages that are 60% lower than those of men involved in ore digging and washing.

In Burkina Faso, approximately 90% of mineral processing activities are conducted by women (Gueye, 2001). Between 45,000 and 85,000 women work in gold mining alone and as many as 45% of all artisanal miners are women. At many alluvial gold mine sites (*orpillages*), women spend countless hours meticulously hand picking out nuggets. Women in Burkina Faso also take on an important role in the industrial minerals sector (e.g. sand, gravel, quartz), although there is a possibility that their full participation has not been quantified because of the intermittent nature of their involvement.

Approximately 10% of the Malian population depends on gold mining (~1 million people) (Labonne, 1998). Like Burkina Faso, Mali has a high percentage of women active (~50%) in artisanal mining with an emphasis on mineral processing (90% female) (Keita, 2001). High levels of female participation in this region are thought to be related to strong traditional associations with gold mining in some cultural groups, and droughts, which have driven “non-miners” into artisanal mining.

Women tend to dominate salt mining in many West African countries. In the village of Keana, Nigeria, women are exclusively involved in salt

mining (Onuh, 2002). This process involves placing salt-rich sandy soil in pots. Water poured into the pots dissolves the salt and drains through a small hole in the bottom of each container. The salt-rich solution (brine) is collected in a hollowed-out log and heated on a fire in another pot until it crystallizes. Due to revenues generated from salt mining, the women of Keana are renowned for sponsoring their children to attend school.

In the Sudan, it is estimated that 35% and 10% of the gold miners are women and children in the Southern Blue Nile and Eastern Bayuda Desert regions, respectively (UNIDO, 2002). Women's participation in mining in the Sudan has not been ascertained, although it is anticipated that they play similar roles as in adjacent countries.

In a detailed report on artisanal mining in Southern African countries (Malawi, Mozambique, South Africa, Tanzania, Zambia and Zimbabwe), Dreschler (2001) observed that although female participation in artisanal mining is, on average, relatively high (~25%), women are consigned to subordinate or subsistence work. Dreschler attributes this disparity to the fact that, first, women do not participate in large-scale, formal mining, and therefore, do not acquire the same skills as men who more readily find employment at large scale mines, and, second, women are tied to their households through familial obligations.

Approximately 40,000 people are active in small-scale mining in Malawi (Dreschler, 2001). Although the numbers of women participating in different industry activities is not well-documented, it is known that ~300 women are involved in lime production via a European Union sponsored association⁴, three are women participating in gemstone mining, and a presumably large number of are involved in salt mining and illegal stone aggregate "handnapping". The Malawi Association of Women Miners includes women active in limestone, gemstone, and salt mining.

The majority of the 60,000 artisanal and small-scale miners in Mozambique are men (Dreschler, 2001). As in other locations, female involvement is mainly limited to ore and water transport,

⁴ The Lirangwe (women) Limemakers Association of Malawi has received funding from the European Union to purchase mills (Dreschler, 2001).

washing and panning, in addition to numerous domestic responsibilities (childcare, food preparation, etc.). A survey of mining productivity in Manica found that women produce roughly half as much gold as men (10-15 g per miner per month). This is believed to be mainly due to a lack of tools and knowledge about processing methods (Dreschler, 2001).

Approximately 25% of Tanzania's 550,000 artisanal and small-scale miners are women (Dreschler, 2001). As outlined in Table 2, gemstone mining is one of the most important sectors for women, but the gold, dimension stone and salt segments are also significant.

Table 2: Women's Participation in Small-scale Mining in Tanzania

Commodity	Direct	Indirect	Total
Gold	8,400	41,810	50,216
Diamond	523	505	1,028
Gemstone	17,866	56,430	74,296
Salt	9,876	7,585	17,464
Aggregates	14	37	62
Dimension stones	9,920	7,699	17,619
<i>Grand total</i>	<i>46,599</i>	<i>114,066</i>	<i>160,685</i>

Source: (after Dreschler, 2001)

As in other countries, women in South Africa are driven to mining by poverty. Little information exists about women in the small-scale mining sector of South Africa, with the exception of the kaolin miners of Kwa Zulu Natal, where women and children are predominantly responsible for digging and selling clay bricks.

Women in Zambia act as mine owners and workers. An activity of particular importance in the Lusaka region involves crushing and selling marble for use in construction (Dreschler, 2001). Gemstone mining continues to be important throughout the country, although documentation of women's participation is not available.

In Zimbabwe, approximately 1200 of 20,000 legal mining claims have been registered by women (Mugedeza, 1996). In the formal (legal) sector, approximately 10% (or 3000) of the miners are women, 70% of who are full or part mine owners, with the remainder engaged in ore grinding using a mortar and pestle (Dreschler, 2001). Increasing numbers of women are registering claims in the formal sector as the process is responsive to various investors,

including women. This contrasts drastically with the informal sector, where at least 50% of the more than 300,000 artisanal miners in Zimbabwe are women (Dreschler, 2001). Most of these women are involved in gold digging and panning (UNIDO, 2002). Women work part-time in the mining sector far more frequently than men.

A study of gender issues in mining in the Mukibira district indicates that women in Kenya play a central role in artisanal mining activities (Amutabi and Lutta-Mukhebi, 2001). The majority (80%) of the 2000 panners in the region are women, with proceeds supporting a population of approximately 10,000. The average gold panning family income is around 5,000 to 10,000 Kenya shillings per month (US \$60-120), which is high compared to those working in agriculture or the civil service. Local and indigenous women have been engaged in panning in Mukibira for hundreds of years, passing down their expertise to younger generations. Because women are typically regarded as being more honest than men, they are frequently engaged in selling at the markets. Although women's groups have recently formed to market products themselves, most men and women involved in intermediate roles (e.g. buyers) are predominantly of European or Asian descent. Five tonnes of gold are produced annually in Kenya by panning.

Asia

Due to the informal nature and limited number of surveys conducted in Asia, in conjunction with significant variations in involvement from location-to-location and over time, women's participation in artisanal mining has been difficult to assess. In Papua New Guinea (PNG), Susapu and Crispin (2001) infrequently observed women working in artisanal mines, with the exception of family-based mines where multiple generations are involved. In nearby Indonesia, it is only in recent years that women's direct participation in mining activities has been documented. Currently, Indonesian women take part in ore crushing and act as mine owners and operators (Aspinall, 2001). Unlike many other countries, amalgam decomposition is almost exclusively the responsibility of men in both PNG and Indonesia. In Malaysia, licenses to reprocess tin tailings are issued only to women, who use wooden pans (*dulang*s) to recover the low value metal (Cope, 2000). With the

exception of some involvement in business aspects of small-scale mining, women in China typically do not directly participate in mining or mineral processing (Gunson and Yue, 2001).

According to Chakravorty (2001), approximately 6-7% (~20,400) of artisanal miners in India are women. Due to their reliability, lower wage rates, and the infrequency with which they indulge in alcohol, women are sought after in mines. Generally, women are engaged in hand sorting and blending, particularly when it is preferred to mechanical means. Women are banned from working underground due to the *Mines Act* of 1952. In a detailed study of the socio-economic profile of women working in small and medium mines in selected regions in Eastern India, a more significant proportion of miners were found to be tribal women – entrance into the sector was primarily attributed to loss of agricultural land due to land use pressures from population growth (Nandi and Aich, 1996). Lower class women, or higher class women living below the poverty line are also involved in mining in India, particularly with loading bauxite ores.

The participation of women in Lao PDR has been well documented by Beinhoff (1998). Upstream of Luang Prabang on the Mekong and north of Houei Koa, Nam Ou, women are involved in excavating up to two metre deep pits in gold-containing sediments. Sediments are transported to the river, where stones are separated by hand and the clayey components eliminated by washing the material in conical pans. More than 80% of the panners are women, who typically handle 100 charges weighing 10 kg each, which equates to a daily throughput of one tonne per day per miner. Gold is difficult to isolate from the heavy metal rich concentrate, and recoveries of 50% are not uncommon. Mercury amalgamation is conducted using barehands and decomposition takes place in open steel pans – children often visit the site of mercury burning. Miners in this region spend 2,500 Kip on mercury to produce a quantity of gold valued at 20,000 Kip. In the District of Pak Ou at Nam Ou River, women are engaged in highly labour-intensive work. Excavation of gold containing sediments from a riverbed is conducted using 10 m long bamboo rafts tied to bamboo pillars in order to withstand the strong current. Miners use 3 m long digging booms with attached 50 cm long, point-nosed shovels, pulled along by a cable from a wooden capstan –



Figure 1: Young girl engaged in mining in Lao PDR

this is powered mostly by women at the far end of the raft. North of Hatkhe in Nam Ou, female workers predominate in gold mining and more than 80 percent of the workforce (approximately 100 people) consist of girls aged between five and 12, working under extremely harsh conditions, typically under adult supervision (Figure 1).

In the Philippines, women work shallow gold deposits with small groups or family units (“pocket miners”). Typically, women are involved in amalgam decomposition, sorting and milling (Murao et al., 2002). At the Kias Gold Mine, all members of the mining association are men, but women are often contracted by miners to conduct panning in exchange for payment in tailings that contain residual gold (“*linang*”) (Bugnosen, 1998). Some of the highest rates of female participation (25%) in Asia have been estimated for the Philippines (Bugnosen, 2001). In Luzon and Mindanao, UNIDO (1998) has indicated that a significant proportion of miners are women.

Latin America

Women in Bolivia occupy a number of roles ranging from labourers conducting the most labour-intensive and informal jobs at the mine site (e.g. digging, washing), to owners and operators to women who work reprocessing

tailings (“*palliris*”). Women also work as intermediaries (“*las rescatiris*”) who sell products to processing plants for *palliris* and mine operators. Most *rescatiris* are believed to be unlicensed. Women work as part of cooperatives (there are more than 100 mining cooperatives in Bolivia where approximately 7500 of 60,000 members are female) or conduct shift work, where remuneration is based on a percentage of material produced (typically 20-30%) during a shift (Jerez, 2001).

In Brazil, as in many other Latin American countries, women work at very small operations panning for gold along riverbanks to supplement family needs (Veiga, 1997). The entrance of women into small-scale production related activities at *garimpos* (artisanal mining sites) is often carried out by intermediaries, such as their spouses or relatives (Sena, 2001). Women at *garimpos* may be involved in panning, amalgam decomposition or refining (i.e. in gold shops), or may own and rent machinery. Most women occupy ancillary roles at the *garimpo*, such as

⁵ *Palliris* are typically women (often widows or wives of miners) who supplement their incomes by extracting small amounts of metal from mine tailings (Jerez, 2001). Typically, *palliris* make less than 25% of the Bolivian minimum wage, although some women who inhabit mine sites also act as security guards, who make approximately 55-65% of minimum wage.

cooks or sex trade workers. At medium-size operations, women are more likely to have secondary-level education and own their own mining property (Veiga, 1997). This scenario is, however, more typical of rock quarries, and sand and gravel operations than gold mines. In the context of medium-scale mining, Brazilian women have been quite successful in commanding teams of men and adopting novel methods.

In the emeralds mines of Campos Verdes, in Goiás State, Brazil, women are in charge of the concentration step. Most *garimpeiros* (i.e. artisanal miners) in the region extract ore from underground workings. After manually crushing and screening, the friable schist is visually inspected by men in order to select the good stones. Women and children usually spend the day looking for smaller, less valuable stones in the tailings. Since 1981, Campos Verdes has been the primary producer of local quality emeralds. Despite this, its 12,000 inhabitants are among the poorest in Brazil. In the 1990s, an automated mine was constructed in Campo Verdes by a mining company from the State capital. Ore is transported by truck to a beneficiation plant, where it is crushed and screened. The screened material is conveyed through an encased glove box, where six women on each side of the conveyor hand pick the emeralds still aggregated to rock fragments and place them within a bucket in the enclosed system. Liberation of emeralds in the buckets takes place at the end of the day in an adjacent shed. After handpicking, fines (<1 inch) and tailings are sold to local small-scale miners, who hire women to carefully collect any remaining emeralds (Figure 2).

In Colombia, women involved in extraction are most commonly associated with subsistence activities, using pans and sluices to work rivers or rework tailings. The involvement of women exceeds men in subsistence practices in the Pacific region (Veiga, 1997). In some regions, Colombian women have been recognized as entrepreneurs with demonstrated success as owners-operators of mining operations and processing shops. In these roles, women have been known to employ alternative techniques, such as the use of nitric acid to dissolve mercury from the amalgams and the use of cyanide in lieu of mercury. Women have also been known to operate equipment (e.g. crushers) or act as gold dealers (Rodríguez, 2003). Unless the woman

becomes head of the household due to death or abandonment of a spouse, men typically maintain control of finances in family mining operations.



Figure 2: Women handpicking emeralds in Campos Verdes, Brazil

In 1997, it was estimated that 15,000 to 30,000 artisanal miners were producing five to 10 tonnes of gold annually in Suriname (Veiga, 1997). A large number of these miners (~8000) are Brazilian *garimpeiros* (Veiga, 1997), although indigenous forest people, the Maroons, are also active. In the Sella Creek region of Suriname, hydraulic miners typically work in teams consisting of six labourers, a boss and overseer (Heemskerk, 2000). Both men and women work as shop owners, merchants, camp bosses and cooks; however, only men are directly engaged in hydraulic monitoring and gold processing.

In 1995, the number of artisanal miners in Venezuela was estimated at between 30,000 and 40,000, approximately 25% being illegal (Veiga, 1997). The proportion of miners that are women

has not been determined, although it has been observed that women are often relegated to the most dangerous roles, based on the reasoning that they are more meticulous and thus better suited to “more refined” work, such as panning, amalgamation and amalgam decomposition. Despite the added chemical dangers associated with this, women are usually unaware of the hazards and are typically paid less than men.

Indirect Roles of Women

Despite their significance, women occupying roles not directly related to mineral production have received minimal attention by researchers, development programmes and governments. In addition to their contribution to productivity, women in artisanal mining communities are critical to community stability, cohesiveness, morale and general well being, and act as primary agents in facilitating positive change.

The lives of women at the *garimpos* – or mine sites – of Brazil, may be the best depicted of all women in artisanal mining (Figure 3). Despite the often deplorable conditions and poor familial ties in hastily created *garimpos*, women are attracted to *garimpos* by salaries often considerably higher than those obtained through similar work in rural or urban areas. Women who act as “cooks” are particularly significant, not only in terms of food preparation, but also with respect to managing food stocks and related financial resources. They also frequently provide administrative assistance to mine owners and represent a stabilizing factor in *garimpos* – this is achieved through maintenance of regular schedules, and provision of emotional and (occasionally) medical support (Rodrigues, 1993; Veiga, 1997). Women also act as goods and service providers, including owner-operators of bars and equipment owners. Lured by the promise of riches and opportunity (and often an initial lump sum of money), many young girls are brought to remote regions to work in “night clubs” as prostitutes. These bars are regarded as a center of conflict in the community, a place where men, alcohol and guns signify a dangerous mixture for women, particularly those involved in the sex trade. In later stages, as communities become more established, women act as community leaders, as observed in the well-established artisanal mining regions of Cachoeira do Piriá (Hinton, 2002) and Itaituba, Brazil (Rodrigues, 1993).

Interestingly, women’s lives at *garimpos* are not unlike those observed in many communities throughout the world (Amutabi and Lutta-Mukhebi, 2001; Dreschler, 2001; Veiga, 1997). Within the community, women predominantly provide goods and services, in addition to a host of domestic chores. Women engaged in mining also tend to take on other jobs to supplement their incomes. In Guinea, although women undertake the same labour as men, inequities in pay (men are paid four times more for the same quantity of gold) often leads to a “troc”, or trade of sex for additional money or gold (USAID, 2000). Although there is considerable variability from community to community, gender-based divisions of labour typically result in women working more hours per day than men.

Both direct and indirect involvement of women in artisanal mining is believed to be on the rise. This can be attributed to a number of factors, including: escalation of rural poverty from droughts and/or structural adjustment programmes resulting in a greater need to supplement incomes; outward migration of skilled male miners from artisanal mining areas due to increased large-scale mining development in other regions *or* in pursuit of other opportunities in urban areas; evolving cultural norms with respect to gender roles; lack of employment in other sectors; and high birth rates and growth of extended families⁶.

HEALTH AND SAFETY ISSUES

The World Health Organization (WHO) defines health as “a state of complete physical, mental and social well-being and not merely the absence of disease and infirmity.” Health is not “an objective for living but a resource of everyday life.” Poor health generates a vicious cycle – when spouses or family members are infirmed and their capacity to work is diminished, a “healthy” family member must work harder to pay for normal living expenses in addition to health costs. Ill health of a family member may initially drive women and children into mining. Arduous work, combined with inexperience in mining and lack of knowledge about chemical exposures, can further exacerbate the potential

⁶ With escalating mortality rates in many countries due to AIDS and other causes, families are increasingly inheriting their relatives’ children, resulting in larger families and a greater economic strain (Wente, 2002).



Figure 3: Girls in an established Brazilian mining community – high hopes but limited opportunities

for injury or illness; thus, the cycle of ill health and poverty is perpetuated.

The health and safety issues that plague artisanal mining can primarily be attributed to: the informal and often illegal nature of artisanal mining⁷, economic demands that result in inadequate equipment and neglect of safety measures, and a frequent lack of expertise and insufficient training. Although the chemical dangers, in particular, those associated with mercury and cyanide misuse, first come to mind, most occupational hazards are a consequence of poor physical conditions, such as ground failure, shaft collapses and machinery accidents. Hydraulic monitoring⁸ of secondary deposits can also be extremely unsafe, as there is potential to undercut hill slopes and induce landslides (Hinton et al., 2003). Methane or coal dust explosions are also significant in small coal mines, such as those found in China, where at least 6000 miners die annually (ILO, 1999). Poor lighting and ventilation, electrocution and

explosives misuse are other frequent causes of accidents. Although accidents are underreported due to the illegality of artisanal mining, ILO (1999) states that non-fatal accidents in artisanal mining are still six to seven times greater than in formal, large-scale operations.

Women, men and children who work in artisanal mines face additional illness, injury and stress from dust and noise pollution, as well as extreme exertion from highly labour-intensive jobs. For instance, several hours of digging, carrying large weights great distances, and bending over in awkward positions (e.g. during panning or scavenging for gems) can result in painful, chronic injuries (e.g. lower back pain) and fatigue (Figure 4).

Inhalation of fine, crystalline silica dust, which is generated from breaking and crushing rock, can result in silicosis. Silicosis is an incurable lung disease that kills thousands annually (WHO, 2000). Conditions resulting from silicosis include emphysema, lung fibrosis and silica-tuberculosis. Advanced stages of silicosis have been documented among women and children as young as 14 in Ghana (ILO, 1999). Primarily due to widespread silicosis, life expectancy in the Bolivian Altiplano is barely 48 years (Quiroga,

⁷ ILO (1999) estimated that approximately 80% of artisanal mining activities take place outside of a legal framework.

⁸ *Hydraulic monitoring* involves the high pressure application of water to “fluidize” metal-bearing highly weathered soils (Hinton et al., 2003).

2000), an overwhelming difference from the national average of 63 years (World Bank, 2002). In Lusaka, Zambia, women are illegally involved in the manual crushing of marble, and face a high potential for developing pneumoconiosis (Dreschler, 2001). Crushing and grinding can be accomplished using a number of mechanical means (e.g. hammer mills) or manual techniques, such as a mortar and pestle. When the degree of mechanization is low, women are more likely to predominantly be engaged in this activity.



Figure 4: Children Engaged in Panning in Laos

As women are most commonly involved in the processing aspects of artisanal mining, they are also highly susceptible to chemical dangers, particularly in association with mercury misuse in gold mining. Mercury is widely recognized as one of the most toxic metals known to man. Mercury vapour released during amalgam decomposition poses a serious hazard to women and others in close proximity to gold shops and amalgam decomposition sites. In many countries, gold decomposition takes place in the home (using the kitchen stove) or in small sheds adjacent to processing sites. In a study by Murao et al. (2002), women who conducted in-house amalgam decomposition in pocket mines of Luzon Island in the Philippines frequently had elevated levels of mercury accumulation in hair and exhibited symptoms, including kidney pain, respiratory problems, and dizziness. Chronic exposure to mercury vapour can also result in gingivitis and muscular tremors. Mild cases of mercury poisoning have many psychopathological symptoms, such as depression and exaggerated emotional responses, which can be mistaken for alcoholism, fever, malaria or other tropical diseases. Exposure to acute levels can

produce dysfunction of kidneys and urinary tract, vomiting, and, potentially, death.

The situation in El Callao, Venezuela exemplifies the need for mercury education programs for artisanal miners. In El Callao, where thousands of artisanal miners actively excavate ore from hillsides, the amalgamation process is performed by "molineros", who typically own moderately mechanized plants consisting of three to five lines of jaw crushers, small hammer crushers (capacity of five tonnes/h) and amalgamation tables (mercury-covered copper plates (Beinhoff, 2003). Approximately three to 20 grams of gold is recovered from each of the 50 kg bags of ore processed through comminution, concentration and amalgamation. During this operation, the *molineros* direct the pulp with their bare hands over the mercury-covered plates. By doing this operation, all people working in the ore treatment plant are constantly exposed to mercury vapors – many miners have evident symptoms of mercury toxicity. Amalgam decomposition is conducted by burning. Gold production of 650 *molineros* amount to approximately 45 kg gold per month (Beinhoff, 2003). On a visit to a *molinero*, Veiga (1996) documented the following:

"We have talked to a molinero, Mr. David Mejias who recently lost his brother with mercurialism symptoms. According to Mr. Mejias, his brother, who used to take care of the amalgamation work, died due to kidney problems, breathing deficiency and swollen heart. As Mr. Melijas was telling this story, his helper, now a woman, was burning amalgam in a shovel. At this point, he said: "from now on I will be inside of my office when she burns the amalgam". Mr. Melias has never seen a retort and no environmental or mining inspector has ever given him technical advice. He prefers to hire unaware women for the dirty work".

In addition to educational campaigns targeting women involved in amalgamation, spouses of miners can also play a key role in advocating better amalgamation practices to their partners. In addition to posing numerous other health risks, mercury vapours can cause irritability and depression; thus, communicating the potential

for diminished sexual performance may be means of capturing miners' attention. A similar approach was actually explored by the Secretary of Mining of Goiás State, Brazil, who in 1985 started a campaign promoting retort use. This included a brochure illustrating the effects of mercurialism. Impotence was stressed as one of the initial symptoms, which is somewhat questionable from an ethical standpoint but was nevertheless extremely effective in intriguing miners (Hinton et al., 2003). In 1995, in a talk to artisanal miners in the interior of Venezuela, M. Veiga explored this aspect by asking the women in the audience to point out impotent miners in the room. Although women did not act on this request, miners quickly became very interested in using retorts.

Women involved in reworking tailings may simultaneously be exposed to multiple pollutants. For instance, *palliris* in Bolivia may spend several hours per day working in tailings saturated with heavy, metal-rich acidic drainage and cyanide residues (Jerez, 2001). Cyanide, which is used as an alternative to mercury in recovering gold, is an effective asphyxiant and hydrogen cyanide gas (HCN), and can be fatal to humans at concentrations around 250 ppm in air. Chronic exposure to low concentrations of cyanide has been linked to neuropathological lesions and optical degeneration (Potter et al., 2001). In addition to cyanide and mercury, women reworking tailings may be exposed to highly toxic metals, including lead, cadmium and arsenic.

Women and the Natural Environment

Although mercury vapour can pose a serious health risk if inhaled, organic forms of mercury – specifically, methylmercury – is of the greatest concern in terms of exposure from food. Metallic mercury discharged into the environment (air, water, tailings) from gold mining practices can be transformed into methylmercury, a readily bioavailable form of mercury. Due to its tendency to increase in concentration upward through aquatic food chains (i.e. it is biomagnified), individuals reliant on fish in mercury impacted areas may be at risk. Chronic exposure to moderate levels of methylmercury results in symptoms including: visual constriction; numbness of the extremities; impairment of hearing; impairment of speech; and impairment of gait. In cases of acute

intoxication, muscular atrophy, seizures and mental disturbance are prominent. Women of childbearing age and their children are particularly susceptible, as methylmercury readily crosses placental barriers and is considered to be a developmental toxicant (Grandjean, 1999). Depending on the frequency and degree of exposure, effects can range from sterility, and spontaneous abortion, to mild to severe neurological symptoms.

As women are predominantly responsible for provision of food, and children and pregnant women are vulnerable to methylmercury, strategies to reduce methylmercury exposure should target women. This is the case in Bolívar State, Venezuela, where measures were taken to limit ingestion of carnivorous fish (Veiga, 1997). Efforts primarily focused on consumption advisories that used clear signage indicating safe and unsafe species, and the establishment of 'safe' quantities for consumption. An interesting component of the program involved the provision of recipes to dilute fish with vegetables, thereby reducing the amount of fish, and, as a result, the amount of methylmercury, ingested. This innovative approach presents an interesting opportunity to involve women in the development of educational programmes. Educational campaigns have employed measures, including the distribution of information packages, such as pamphlets, comics and videos, while others have relied on verbal communication through community meetings or door-to-door campaigns (Hinton, 2002).

In addition to mercury, exposure to other potentially toxic metals (e.g. cadmium, lead) can also occur through inhalation (i.e. of dust) or consumption of contaminated drinking water and food. This can be facilitated by metals mobilization, in association with acid rock drainage, or direct uptake from tailings into crops or grazing animals. Heavy metals can result in a host of negative health effects. Chronic exposure to cadmium, for example, can have effects that include kidney stones to osteomalacia, a form of rickets (WHO, 1996).

In informal economies in particular, the natural environment is critical to women's abilities to generate income and satisfy household needs. In addition to crop production, women are typically the main providers of water and biomass fuels, and further rely on the natural environment for medicinal plants and resins. Due to the direct

link between women, family health and the natural environment, women can be highly effective in land management and particularly influential in advocating practices that prevent environmental damage and related human health effects. Women and other groups are less likely to invest time and resources into more sustainable practices on land they do not own (Sass, 2002).

In addition to chemical contamination, artisanal mining can detrimentally impact ecosystems through deforestation and the modifications of hydrologic systems, for example, through silt accumulation in rivers or construction of water reservoirs (Akagi and Naganuma, 2000). Siltation of rivers caused by discharge of tailings into waterways reduces light penetration and dissolved oxygen levels, thereby jeopardizing fisheries, and may result in flooding (Hinton, 2002). As flooding increases the net area of standing water, it also contributes to malaria and other mosquito-transmitted diseases. Deforestation can significantly impact women and families, due to the importance of forests for fuelwood and, sometimes, food and medicine.

Despite the evidence that indicates the strong link between mental and physical health (WHO, 2001), indicators of mental health or stress have not been studied in the context of artisanal mining. Factors such as heavy workload, poverty, and family illness are expected to negatively impact the mental health of men and women. The effects of migration may also weigh heavily on the psychological well-being of women. Migration of women to artisanal mining regions, as observed in the *garimpos* of Brazil (Sena, 2001; Veiga, 1997), is often related to poverty and economic crises in their homelands. In some cases, women migrate to mining areas for periods of time, leaving their children in the care of relatives (Heemskerk, 2000). Factors such as change in diet and stress associated with leaving traditional lands, often breaking social ties in the process, has been linked to negative impacts on women. In Mashonaland, Zimbabwe, a study of effects of rural economic development on women's blood pressure revealed notably elevated levels in mining areas in comparison to areas where large-scale agriculture and traditional economic activities took place (Hunter et al., 2000).

Women and Children

Children are typically the responsibility of their mothers. At many mine sites, women work with young babies tied to their backs and toddlers at their side (Figure 5). In cases where alternative childcare or schooling is unavailable or additional supplementation of income is needed, older children accompany women in artisanal mining activities, and often participate. In accordance with this, the health and safety risks faced by children depend on the type of mineral exploited, the techniques employed, and whether these activities take place in the home (e.g. in the kitchen) or at a mine site.



Figure 5: A miner and her child in Ghana

The participation of girls and boys in artisanal mining around the world has been well-documented (ILO, 1999; Hentschel et al., 2002) and continues to persist in response to economic pressures faced by impoverished families. Malnutrition, thermal injuries, and skeletal damage in young children resulting from child labour in artisanal mining has also been extensively documented (Wasserman, 1999). Although generally to a lesser extent than boys, girls are likely to be involved in activities such as digging, grinding, crushing and transporting materials, typically using tools such as picks, shovels and hammers and without any protective equipment (ILO, 1999). Girls are somewhat more susceptible to sexual exploitation than boys, and child prostitution is common, in part due to the status given to virginity, but also as young girls are deemed unlikely to carry HIV-AIDS or other sexually transmitted diseases.

Violence and Sexual Abuse

A major study conducted on artisanal mining in Latin America states that the living conditions of

girls and women in these communities are “usually on the boundary between poverty and misery” (Veiga, 1997). Many girls are enticed from extreme poverty-stricken situations to work in “night clubs”. Initially, they are loaned money to escape their poverty but very few can repay their debts, particularly given the exorbitant cost of food and accommodation imposed on them. Controlled by violence, most women work seven days a week and often suffer from malnutrition and sexually transmitted diseases. Often, sex trade workers are living in a veritable prison and attempts at escape are commonly punished by death (Veiga, 1997).

Incidences of violence towards women in artisanal mining communities have been documented throughout the world. In Guyana, rape of Amerindian girls by foreign miners has been reported (Anon, 2001). In addition, increases in acts of aggression by Amerindian men have also been attributed to the influence of miners and the “mining culture”. Martha Bitwale of the Tanzania Women Miners Association has described the fear of sexual abuse associated with women conducting mining and exploration in remote areas (Machipisa, 1997). Maroon women admittedly battle sexual harassment and other hardships (e.g. malaria) only because of the absence of viable alternatives (Heemskerck, 2000). In the mining camp Huaypetuhe in the Madre de Dios gold mining region of Peru, high crime rates and incidences of rape and violence are, in part, attributed to the absence of police and lawlessness common in many artisanal mining communities (Kuramoto, 2001). Escalating violence in Ecuadorian communities has been attributed to rising poverty levels and inequity between men and women (World Bank, 2000).

Given the potential for acts of violence, combined with the sex trade typically present in artisanal mining communities, it is not surprising that many artisanal mining regions are plagued by high incidences of HIV-AIDS and other sexually transmitted diseases. At least 70% of women interviewed in a major mining area of Kenya reported at least one incidence of venereal or sexually transmitted disease (Amutabi and Lutta-Mukhebi, 2001). Educational campaigns by organizations such as USAID have had some success in promoting condom use and safer practices, thereby reducing transmission rates,

but these efforts are challenging given taboos associated with their use, as well as cost⁹.

The pervasiveness of violence and sexual exploitation tends to depend, in part, on the characteristics of the community. For example, unlawful activities (e.g. drugs, violence and prostitution) may be more prevalent in *ad hoc* communities created in response to a ‘rush’, than in well-established communities where government presence may be more significant, familial ties are stronger, and social cohesion is more evident. The influence of the various factors on artisanal mining communities and women in particular are described in greater detail below.

DIFFERENT FACES, DIFFERENT LIVES

The experience of women in artisanal mining communities is uniquely dependent on circumstance. For instance, one woman in a Peruvian mining village may undertake arduous tasks under virtual slave-like conditions, whereas another woman in the same community may independently own and operate a gold shop, using revenues to finance the education of her children. Every woman’s story is unique; however, identifying in a more general sense the factors that shape women’s realities in artisanal mining communities is also critical to better understanding how women affect, and are affected by, this sector. Key factors are presented in Figure 6 and described further below.

These factors are some of the critical drivers that define gender roles for women and men in artisanal mining communities and affect how mining activities impact the natural environment, the health of individuals and communities, and socio-economic conditions. In order to better understand how gender roles influence, and are influenced by, artisanal mining and other environment-impacting activities, issues beyond divisions of labour must be explored. Key topics include: women’s and men’s access to, and control of, resources; their ability to attain knowledge of resources, their decision-making capacity or political power; and beliefs or

⁹ In some artisanal mining regions, condoms are provided at subsidized costs. High condom costs relative to incomes has been documented in many areas. In Sierra Leone, for example, three condoms cost the equivalent of one woman’s weekly earnings in the sex trade (Wente, 2002).

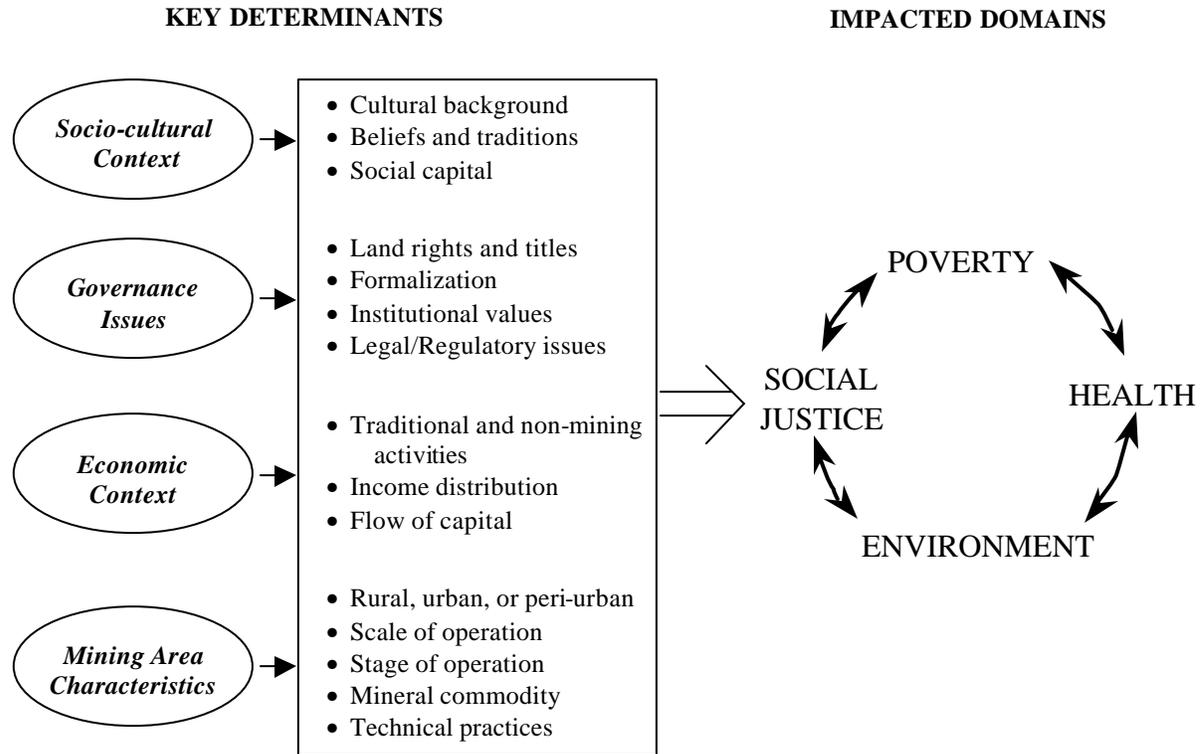


Figure 6: Key Factors Shaping Women’s Realities in Artisanal Mining Communities

attitudes that support or impede the transformation of gender roles. These issues are described further in the context of the determinants identified in Figure 6.

Socio-cultural Context

Cultural beliefs and traditions strongly influence interactions between individuals and groups, the nature of community organization and societal rules or norms. Although these factors are critical, not only in terms of gender roles, but also with respect to the extent to which artisanal mining impacts and benefits communities, they have been poorly studied in the context of artisanal mining.

Likely, the most comprehensive analysis of gender roles in artisanal mining has been conducted by Heemskerk (2000). While studying the Ndjuka Maroons in the forests of Suriname, Heemskerk observed that the participation of women in gold mining in the Sella Creek region is primarily constrained by a lack of resources and limited mobility due to domestic and agricultural responsibilities. Ndjuka women are more likely to be engaged in mining if they have

embraced urban values with respect to gender roles. This contrasts with other cultures, where centuries of mining tradition has determined women’s involvement, as observed in mining regions of Mali (Keita, 2001).

In Suriname, Heemskerk (2000) determined that exclusively male pit-workers are paid based on gold recovery (~US\$ 360/mo) and other workers (e.g. male and female cooks) are paid a fixed wage (~US\$ 540/mo). Women, who are predominantly employed as travelling merchants (~US\$ 90/mo), supplement their earnings by providing additional services (domestic and sexual). Even the lowest paid workers earn wages considerably higher than those found in other sectors. Despite the potential economic benefits and extensive social networks in the Maroon-dominated mining areas, Ndjuka women infrequently participate in this sector, presumably due to traditional gender roles.

In an assessment of women’s participation in tin mining in the Jos region of Nigeria, Ogbe (2001) ascertained that the role of a woman is largely determined by her husband –in this case, mining is predominantly conducted by women.

Although many differences exist between the 374 different cultural groups in Nigeria, women are generally subordinate to their husbands and in-laws, with little autonomy.

Education can be critical in transforming gender stereotypes and empowering women to derive greater benefits from artisanal mining. In many countries, girls are systematically discriminated against in terms of education – this is mainly attributed to family expectations concerning domestic responsibilities, in addition to social and cultural barriers. Amutabi and Lutta-Mukhebi (2001) determined that families in Kenya are more likely to send boys to school than girls, as has been observed in many other African and South East Asian countries (UNESCO, 2000). In some cases, girls are removed from school at the onset of puberty, due to mistrust of male teachers and students and fears of unwanted pregnancies (UNESCO, 2000). When girls do enter the school system, they tend to be responsible for considerably more extracurricular chores than boys, thereby resulting in a longer hours worked daily and less attention paid to homework. Gender inequities may be further exacerbated by educational practices and beliefs that reinforce gender stereotypes. For instance, educators may associate men with public life and corresponding lifestyles (work, politics, power), and link women with domestic responsibilities.

Social beliefs may, in some cases, lead to poorer health for women compared to their male counterparts. In Eastern India, for example, disparities between women and men's health have been attributed to a lack of rest houses for women at mine sites, despite Government regulations, and the accepted norm that men receive the larger portion of the food, a better part of the lodging, and contribute less to the upkeep of the household (Chakravorty, 2001). Ill health inevitably translates to losses in working days, and thus, wages.

A significant barrier to women's equitable participation in mining involves cultural taboos and superstitions. In Zambia, for instance, Namakau Kaingu, mine owner and Chairperson of the SADC Women in Mining Trust, described challenges in gemstone mining due to the belief that women should not approach a gemstone mine as the spirits of the stones would drive the gems deeper into the earth (Synergy Africa, 2001) or would disappear altogether (Kaingu,

2003). Some believe this is particularly significant during menses. Disappearance of the stones can be averted with the slaughter of a goat or cow, and the calling of the spirits of ancestors (Kaingu, 2003).

In N'tulo, Mozambique, women are believed to attract bad spirits, and therefore, are banned from working in the mines (Dreschler, 2001). They are, however, permitted to sell food and beer. In nearby Manica, women are prohibited from digging trenches but can transport and wash the gold-bearing ore.

Due to the belief that women bring bad luck, women have been banned or deterred from working underground in countries throughout the world (Robinson, 1998). Up until the mid-1980s, organized mining companies adhered to this superstition in Brazil, and, in the 1970s, coal miners in Eastern US states adhered to the belief that the presence of women underground would cause explosions (Bryson Hodel, 2000).

Menstrual taboos in the Maroon culture, which prohibit women from engaging in activities, including sex, cooking for men, or touching items used by men, essentially result in the exile of women to a menstrual hut for a portion of each month (Heemskerk, 2000). As a consequence, they are reportedly bored, isolated from the community, and their productivity is impeded. The perceived repercussions of violating the taboos include illness, death and other misfortune to people in the community. Some women working at mine sites take oral contraceptives to prevent menstruation (Heemskerk, 2000).

In some instances, women's participation is hindered by prejudice, often under the guise of concerns for women's safety. In the gold rush in Serra Pelada¹⁰, Brazil, women were strictly prohibited from entering the artisanal mining reserve (Veiga, 1997). In Zambia and Zimbabwe, regulations restrict women from working underground. In Zambia, Rita Mittal of the Association of Zambian Women Miners

¹⁰ *Serra Pelada* was a phenomenon wherein government intervention into the discovery of a major gold deposit resulted in the formation of the first artisanal mining reserve (Veiga and Hinton, 2002). Approximately 80,000 men were drawn to the region, wherein ~90 tonnes of gold was produced from a single open pit.

(AZWM) has described the difficulty women have with initiating mining in some areas due to the hostility of chiefs threatened by their presence (Machipisa, 1997). The justifications for discrimination in each of these cases may differ; however, the end result is ultimately a system that undermines a woman's ability to participate fully in mining.

Since the individual who has access to, and control of, land is likely to derive the most benefit from this finite commodity, issues concerning land rights and ownership are crucial to women's lives; it may even be the single most important factor in women's struggle for gender equality and empowerment (Mushunje, 2001). In some cultures, women maintain control of lands in association with matrilineal ties. This is the case on the phosphate-rich island of Nauru in the South Pacific, where mining has taken place over the past 100 years (Pollock, 1996). The Ndjuka Maroons of Suriname and French Guyana are also matrilineal, and women frequently own land, houses and canoes (Heemskerk, 2000). Despite this, rural Ndjuka women infrequently hold positions of religious or political significance, and have less access to capital, education, and the outside world than their male counterparts. In pre-colonial Zimbabwe¹¹, women also had rights of ownership, but land allocation was based on the birth of a child, was often limited to a vegetable garden sufficient to provide for the family, and could be revoked by a husband (Mushunje, 2001). Clearly, ownership does not necessarily equate to access and control of land.

Due to its importance in terms of poverty reduction and community wellbeing (World Bank, 1998), the contribution of women to social capital, which features elements of social organization, networks, norms, and trust, is a vital issue in artisanal mining communities. In Kangaba, Mali, Beatrice Labonne described the commitment of Malinke women to community health (Labonne, 1998). Normally, Malinke

¹¹ Traditionally, Zimbabwean women were given land upon marriage and birth of a first child (Mushunje, 2001). With the institution of taxation systems, which relegated men to working in money-generating jobs (*i.e.* working in colonial mines or farms), combined with the *Land Husbandry Act* of 1951, women's land rights degraded, and their primary role was transformed into the protector of food security.

women are required to turn over all gold recovered to their spouses. However, during the inter-season when agricultural responsibilities had concluded and full scale "orpaillage" activities had not yet resumed, men rest and women commence mining activities early. In this "moonlighting" period, women are allowed to retain the profits from gold mining in order to purchase food and spices, children's clothing and medicine. Labonne (1998) documented women assisting elderly women with the cultivation of gardens, and with revenue planning behind hiring a midwife for the community.

The capacity and tendency to organize is a significant element of social capital. There are numerous examples of women's cooperatives throughout the world. In Peru, in the adjacent mining settlements of La Rinconada and Cerro Lunar, 800 women belong to a cooperative of women *pallaqueras*, who rework tailings to extract gold (Kumamoto, 2001). When united, women are more likely to broach topics of rights and safety, may be more amenable to adopting alternative methods, and may be in a better position to access credit.

Governance Issues

Governance refers to "the process whereby elements in society wield power and authority, and influence and enact policies and decisions concerning public life, and economic and social development" (Anon, 1996). Governance includes the conventional responsibilities of government but also concerns interactions between formal agencies and institutions and civil society. In the context of women and artisanal mining, key governance issues pertain to the effectiveness of policy in advancing equality, particularly in terms of land rights, representation of women in decision-making processes, and an institutional environment that is conducive to participation by women.

For rural households in particular, access to land is a key determinant of poverty, not only due to its relevance in terms of ownership of products, but also in terms of collateral (World Bank, 2000). Thus, policies that restrict or deter women from obtaining concessions or land rights further contributes to the feminization of poverty. In Kenya, female miners have access to land, but do not control land, and therefore, mining activities (Amutabi and Lutta-Mukhebi, 2001). Because men own the land, they also tend to dictate

PROFILES OF SUCCESS:

Namakau Kaingu, Mine Owner-Operator and Chairperson of the SADC Women in Mining Trust

Namakau Kaingu is a remarkable individual. She has overcome significant hurdles to achieve considerable success in gemstone mining in Zambia, and generously shares her time and expertise with other women. Namakau arrived on foot to a major gemstone mining area where women had not ventured before and were forbidden from participating in mining*. Initially, she was continually requested by men to leave the area, but Namakau persevered. She learned the requirements of the mining authorities and used her knowledge and determination to excel beyond the men working in the region. Namakau now owns her own well-developed mine that supports a community of 18 male workers and their wives and children. As the government school is 25 kilometres from the community, Namakau has built a school for local children and is committed to sustainability, environmental responsibility, and the well being of workers and their families.

In addition to her responsibilities at the mine, Namakau continues to advance women's involvement in mining through her volunteer activities. She is Chairperson of the SADC Women in Mining Trust, one of the most recognized women's mining associations in the world, and is currently in the process of assisting native women in forming their own mining association. Namakau also offers her time and expertise by conducting workshops for women in topics ranging from gemmology, mine development, basic geology, environmental preservation, and management and safety issues.

Given her impressive accomplishments and contributions, Namakau Kaingu has broken new ground as one of the most important role models for women in mining.

** As previously discussed in the chapter, numerous beliefs in Zambia persist concerning the disappearance of gemstones when women enter the mine; they are, therefore, prohibited from entering the mine.*

women's roles in production; as a result, they are usually consigned to transporting, washing and panning, and turning over the profits. In Zimbabwe, Burkina Faso and Cameroon, women have equal rights to own land, but it is almost solely controlled by men (Sass, 2002). In some countries, women may have legal access to land, and may not be aware of these rights, or these rights may be lost once upon the death of a husband or a divorce.

These barriers on women's land rights hinder their ability to access other resources. Of unable to use land as collateral to obtain loans, women have difficulty adopting alternative technologies and hiring labour when needed. In addition, women may not be able to access other supportive services, such as extension programs and training on innovative land management approaches. In certain countries inequities are further exacerbated by laws that stipulate that women cannot take out a loan without the consent of her husband or father, as is the case in Botswana and Lesotho (Carr, 1993). Difficulty obtaining financing has also been documented by Hilson (2001).

In many developing countries, in rural communities in particular, women's voices are largely absent from political decision-making.

The effects of this inadequacy can be felt at both a national (i.e. policy-driven) and local level, and results in women's perspectives, needs, knowledge and proposed solutions being largely ignored (Sass, 2002). Exclusion of women in decision making can result in policies that criminalize and further marginalize their activities. Sass (2002) documented a case in El Salvador where efforts to protect a mangrove ecosystem involved restrictions on fishing in estuaries and shoreline timber collection. Men, who fish in the open seas, were predominantly responsible for the policy but were largely unaffected by it. Women, who fish and collect fuelwood along the shoreline for subsistence purposes, were not consulted in policy development and continue to conduct these activities illegally. Incorporation of women into decision-making is a vital factor in the development of gender-sensitive policies and successful implementation of any programme that modifies the use of resources, such as artisanal mining.

Government agencies can play a key role in supporting women in various sectors. The National Council of Women in Ecuador, CONAMU, has been particularly successful in responding to the public sector, mainstreaming gender in various programmes and implementing

PROFILES OF SUCCESS:

Maria Rodriguez*, Mineral Processor and Smelter, Shop Owner

Maria Rodriguez has demonstrated how skill, diligence and a commitment to quality can earn the respect and trust of clients, and result in the establishment of a successful business. Since 1985, Maria has owned and operated a mineral processing and smelting shop that services artisanal and small-scale miners in a major gold mining region of a Latin American country*. Upon the passing of her husband eight years ago, Maria took on the management and operation of the shop independently, but the customers who had grown to appreciate the quality service she provided continued to frequent the shop. As a result, Maria's shop outlasted a decline in mining activities that saw 20 of 24 gold refining shops in the city disappear. Working up to 70 hours per week, Maria services between five and 10 clients daily who are mainly engaged in gold refining, although she also provides consulting services for processing a variety of minerals

As in many Latin American cities, safety issues plague the operation of many businesses. In Maria's community, police are largely ineffectual, and generally cannot be trusted. Maria, her assistants and clients face the risk of violent confrontation with criminals as they enter and leave the shop. Maria faces additional hazards working with mercury and nitric acid; despite her awareness of health risks, she often foregoes precautions (*i.e.* use of a retort), as they are comparatively loud, uncomfortable and inconvenient. Maria's situation is further exacerbated by a policy environment that opts for apathy or threats of shop closure in *lieu* of provision of support. Despite these challenges, and an inability to generate capital, Maria has been able to make a decent living. She has put five children through university, and has been able to support other members of her family in a country hard hit by recession. Maria Rodriguez is certainly a remarkable example of perseverance, dedication, and excellence, and is a valuable role model for women throughout the world.

* Due to risks to Maria's personal safety, her name has been changed and the location of her operation has been omitted upon her request.

a number of initiatives (World Bank, 2000). The Mineral Resources Department and other government agencies in Tanzania are also conducting workshops and seminars to create awareness and encourage female participation in mining (Dreschler, 2001).

One of the most significant barriers to women deriving benefits from mining relates to regulations that are predominantly oriented towards men. Women such as South Africa's Minister of Mining, Phumizile Mlambo Ngcuka, and Tanzania's Women's Minister, Halima Hatibu, are working to develop more gender appropriate mining regulations (Synergy Africa, 2001). As mining ministries may be difficult to approach for many women, particularly as those employed there tend to predominantly be male (Machipisa, 1997), these agencies could better assist women by diversifying their workforce and sensitizing their services. One strategy adopted by several countries, including India, Uganda, Brazil, and the Philippines, involves formal allocation of a percentage of seats to

women on national and local bodies (Sass, 2002).

Economic Context

The significance of non-mining activities (e.g. agriculture, forestry), and the control and flow of capital, speak directly to socio-cultural values and issues of equity within mining communities. As it is often poverty that drives many to artisanal mining, the economic context of mining plays a critical role in defining gender roles.

Certain jobs are specifically the domain of women, who are accordingly afforded lower pay. For instance, in many parts of Africa, gold panning is deemed the responsibility of women, as it requires a gentle, sensitive touch (ILO, 1999). In other locations, women are relegated to unskilled, menial work, such as transporting ore or water. Even when women undertake the same work as men, they are often paid considerably less. In Siguiri, Guinea, for example, women and men work side-by-side, washing gold from the lateritic soil (USAID, 2000). For every five

calabashes (a large carrying container) of ore that the women wash, male intermediaries receive the profits from four and the woman retains only one.

Increases in household income do not necessarily equate with improved well-being of family members, particularly in households where men continue to control finances. Quite often, women's work in the small mining sector is unpaid, and conducted to enhance the earnings of their husbands. In Kangaba, Mali, for instance, although women and men work side-by-side with men gold digging, Malinke tradition dictates that women turn over all gold to their husbands (Labonne, 1998). The same tradition typically applies to women in Kenya, although there are a number of examples where women manage family finances and give their husbands an allowance (Amutabi and Lutta-Mukhebi, 2001). Despite the expectation that women will turn over all profits to their spouses, in some Latin American countries, they have been known to withhold products and revenues from their husbands, often through informal agreements with local buyers (Sandoval, 2002).

Many studies indicate that the revenue generated by women in artisanal mining contributes more directly to the well-being of households than that of men (UNDP, 1999; ILO, 1999, Veiga, 1997). Specifically, the income generated by women is more likely to be directed towards improving the quality-of-life in the family – *i.e.* through education, food, agriculture, etc. – whereas men tend to spend revenue on gambling, prostitution and alcohol (Hentschel et al., 2001). In addition, when women receive and manage earnings, their economic dependence on men may decline, thereby testing existing gender roles.

In addition to different spending habits, increased female participation in artisanal mining may result in decreased attention to agricultural crops, resulting in poorer nutrition. Alternately, participation in other traditional occupations (e.g. crop production) may continue, resulting in a substantial increase in the work burden of women (Çagatay, 2001). In fact, one of the most significant gender inequities relates to time. Women are often exclusively responsible for domestic responsibilities even when they participate in the labour market, whereas men tend to be responsible for predominantly economic activities (Veiga, 1997). This reality, coupled with differing spending habits, generally

means that women's participation in activities that generate revenue can be equated with increased labour hours. In the Mukibiri district of Kenya, it is estimated that ~90% of all mining work is done by women, in addition to domestic chores.

Most artisanal miners are rural and poor (Hentschel et al., 2002). Due to migration of men to urban areas or large mining districts, women are often *de facto* heads of households; these households are often the poorest in rural communities. Male migration and return to households has been shown to modify values, which weakens women's positions in certain circumstances. In the Sierra region of Ecuador, for instance, it has been documented that men return home with a greater sense of "machismo" than is traditionally observed in indigenous Sierrans (World Bank, 2000). Alternately, in the absence of men, women's position may actually be enhanced, mainly because they become solely responsible for management of the household and agriculture during this period. In Suriname, men are often encouraged by their wives to migrate to mining areas, as they are ultimately better off economically than women with spouses who are not miners (Heemskerk, 2000). This phenomenon has also been observed in Brazil where men from the Northeast leave their families behind to become *garimpeiros* (*i.e.* miners) in the Amazon. *Garimpeiros* may send money home for years, but when their luck runs out, they establish new families in mining villages, women are left to support the family independently.

Characteristics of the Mining Region or Operation

Unlike the majority of the aforementioned factors shaping women's lives, most characteristics of a given mining operation are fixed (e.g. location, reserves, mineral resource, etc.). These features do, however, also provide insight into gender roles in artisanal mining communities, as well as a basis for addressing gender issues under specific circumstances. The influence of various characteristics of mine sites, specifically the location, mineral mined, and the scale and stage of an operation, are discussed in greater detail below.

Most artisanal mining communities are located in sparsely populated, rural, and often, remote, regions. Some exceptions are large mining

districts, such as Ashanti in Ghana, or towns that form around discoveries and happen to develop into major centres. In comparison to their urban counterparts, women in rural communities typically have less access to services, such as health care and education; a reduced dependence on the cash economy for food and non-food purchases, fewer health problems due to contamination (e.g. air, water pollution) from overcrowding (Ruel et al., 1999). In hastily-established artisanal mining communities, residents may experience the worst of both urban and rural environments, being able to access exclusively poor services, becoming increasingly dependent upon the cash economy, and exposing themselves to pollutants. A major review of gender issues in Ecuador (World Bank, 2000), where income inequity has worsened in recent years, found that women living in rural areas also have higher fertility levels and lower education levels than women in urban areas (4.1 versus 7.1 yrs).

Perhaps one of the most interesting determinants of the roles and responsibilities of women involves the type of commodity mined. In the extraction of high value products, such as gold, men more commonly maintain control of the mine site and are involved in digging, whereas women are typically relegated to washing, panning and transport activities. The basis for this division of labour is presumably related to the limited physical capacity of women for pit labour. Interestingly, women are engaged in digging and equally laborious activities for agricultural purposes, or in the extraction of high volume, low value commodities (e.g. clay, limestone, dimension stones). Women are more likely to participate in greater numbers and play a more significant role in control of the land and decisions surrounding its use for low value commodities, as observed in Nigeria (salt), South Africa (kaolinite) and Brazil (sand and gravel). Differences in participation in high versus low value commodities can be viewed either as a startling indicator of gender inequity in artisanal mining (i.e. women are proffered control of land of lesser value) or a reflection of women's entrepreneurial capacity; nevertheless, these minerals represent an important source of livelihood for women. In the case of gemstones, women are beginning to challenge norms – as observed in Zambia – and are taking on a greater role in this sector. Namakau Kaingu has stated that many opportunities exist for women in gemstone mining (Machipisa, 1997); the case of

Zambia may therefore become an important exception to the rule.

Differences in methods employed for mineral extraction and processing also affect women. As observed in gold mining, women are predominantly involved in processing aspects and so are at risk of exposure to dust and mercury. In some cases, men are somewhat aware of the dangers associated with mercury use and consign women to undertake processing responsibilities.

It has been found that women's participation in artisanal mining generally increases with the decreasing scale of the operation, particularly in the case of small family operations, where mining takes place to supplement other income (e.g. from subsistence agriculture). This may also be related to disparities in education and training in small-scale mining techniques. Typically, women's direct participation decreases with increased scale of operation and prevalence of mechanization.

The stage of an operation strongly influences the nature of artisanal mining communities, and the lives of residents. Clark and Cook-Clark (1996) described two phases in the case of artisanal gold mining in Asia: a "rush" stage, which typically lasts between one and three years, and a post-rush stabilization period, wherein the number of miners tends to decrease by 30 to 50%. In many communities in the Amazon, the artisanal mining cycle is comprised of phases of discovery, migration, and relative economic prosperity, followed by periods of resource depletion, outward migration and economic destitution (Veiga and Hinton, 2002). Either scenario could apply to communities in the artisanal mining regions of the world. In general, hastily-created "rush" communities lack infrastructure, organization, the presence of government or law enforcement, and are often pervaded by violence, prostitution, drug and alcohol abuse, and gambling – elements that make for difficult conditions for community residents. During the Fourth World Conference on Women in Beijing (1995), Noeleen Heyzer stated:

In conditions of rapid change – including environmental deterioration, the outmigration of men, changing economic activities and aspirations, and government interventions – women play an even more crucial role in the

maintenance of livelihoods, cultural continuity, and community cohesiveness.

Artisanal mining communities formed as a consequence of 'rushes' seem to experience all of the conditions of rapid change, generally with the exception of government intervention. It seems apparent that support of women and men during the resource depletion phase can be critical to the development of more stable, resilient communities.

CHALLENGING GENDER INEQUITIES, AND THE ROAD AHEAD

At the World Bank Roundtable on Regularizing Artisanal Mining (1995), Mrs. Ofei-Aboagye of the Ghana Institute of Management and Public Administration stated that primary constraints to the effective participation of women include "legal and social taboos; widespread illiteracy; and organizational, technical, and financial constraints". These issues are inextricably linked to gender inequity. Inequities have been evidenced by limited political power, access to resources (capital, information, education, etc.), mobility, and basic human rights. Given this reality, it is not surprising that "while the positive impacts (of artisanal mining) are hardly felt by women, they are hard-hit by the negative impacts" (Traore, 1997). Dreschler (2001) further articulates that "women (in Tanzania) make up 50% of the work force but do not receive 50% of the rewards."

It is apparent that social equality must be achieved before women and men will fully benefit from artisanal mining. As gender roles are socially and culturally constructed, social change induced by economic transformation, incentives and regulatory reform can contribute to the transformation of these roles (World Bank, 1994). Specific courses of action to facilitate this change may also include the strengthening of networks, gender mainstreaming in government agencies and assistance programmes, the adoption of strategies that are inclusive and accessible to both women and men, additional research into gender roles in this sector, and the advancement of sustainable livelihoods in artisanal mining communities.

Strengthening of Networks

Connecting women with Non-Governmental Organizations (NGOs) and strengthening linkages between individuals or groups of women can markedly improve women's access to resources. Factors that affect access to information include the availability of time, literacy, control over household media, access to written material, and the ability to travel (Appleton et al., 1995). Within a formal network or organization, women are better equipped to respond to negative impacts of artisanal mining and take advantage of opportunities in this sector (Wiego, 2002).

Organizing women – for instance through creation of Miners' Association or business coalitions – has been recognized as a key step to obtaining funding. Women are increasingly being financed through microcredit programmes¹², which have shown tremendous success in revolutionizing women's lives. The formation of organizations or cooperatives may put women in an even better position to receive financial support from international charities and religious organizations, or formal lending institutions.

Strong women's civil society organizations can make considerable strides in advancing women's issues in political agendas. The National Council of Women (Consejo Nacional de la Mujer, CONAMU) in Ecuador, which was formed largely as a result of the efforts of women's NGOs, is one such example (World Bank, 2000). In part due to the efforts of CONAMU, gender seems to be better mainstreamed into public programs, and the private sector has adopted a number of creative gender initiatives.

¹² Additional information on microcredit programmes can be found through Women in Informal Employment Globalizing and Organizing (WIEGO), a worldwide coalition of institutions and individuals concerned with improving the status of women in the economy's informal sector (www.wiego.org). A key example of a microcredit programme is the UN sponsored Microcredit Summit Council, whose goal is to reach 100 million of the poorest families, especially women, with micro-finance for self-employment.

Women and Assistance Programmes

A number of technology assistance programmes have been carried out to facilitate the use of more environmentally sound techniques, advance the commercial benefits derived from this activity, and formalize the artisanal mining sector. Organizations that have made significant contributions in these endeavours include the Industrial Development Organization (UNIDO), Intermediate Technology Development Group (ITDG), UN Projekt-Consult GmbH, Project GAMA and the Brazilian Centre for Mineral Technology (CETEM).

The assumption that “what is good for men is good for their families” has been a major shortcoming of some technical assistance programmes. Most development programmes do not recognize the gender-specific nature of development, and are therefore, oriented towards men’s tasks, interests and needs. A detailed study of systemic deficiencies in development programmes identified a shortage of gender-sensitive scientists, inadequate support systems for women, and an inequitable allocation of resources (Muntemba and Chimedza, 1995). Another common failing is an emphasis on commercial versus domestic benefits (Everts, 1998). In detailed assessments of the effects of development programmes on the lives of women involved in agriculture and forestry (Wightman, 2001; Wakhungu and Cecelski, 1995), it was found that the quality of their lives did not, in fact, improve, and even declined as a consequence of certain development initiatives. As women’s direct involvement frequently decreases with increased scale and mechanization of a mining operation, it is easy to speculate how technical assistance programmes could negatively impact women. Incorporation of women in programme development and implementation represents an important opportunity for technical assistance programmes to build upon the demonstrated successes of past efforts.

One programme that has specifically targeted women was conducted by the Intermediate Technology Development Group in Zimbabwe (ITDG, 2002). Upon completion of courses on a number of mining-related topics, women applied this knowledge to obtain financing to initiate an environmentally sound, economically viable, small-scale mining operation. As a result of the

success of the school, it has been extended to men and women in other regions.

In a recently implemented project in Mindanao, Philippines, UNIDO made special efforts to ensure that women equally participated in mining, and benefited from the introduction of new equipment and processing techniques (UNIDO, 1998). The Federation of Small-scale Miners in Mindanao played a critical role in encouraging and monitoring the incorporation of women into project educational and training programmes. A similar UNIDO project in Zimbabwe, Sudan, Tanzania, Lao PDR, Indonesia, and Brazil, entitled “Removal of Barriers to the Introduction of Cleaner Artisanal Gold Mining and Extraction Technologies”, will implement specific measures to support the direct entry of women into artisanal mining, and will conduct special training and awareness programs for women that address health issues specific to them (UNIDO, 2002).

As women have little knowledge of the hazards associated with mercury, and are often involved in the processing of gold, it is logical that they be targeted by campaigns to reduce mercury use. They are also predominantly responsible for food preparation and, as women of childbearing age and children are particularly susceptible to methylmercury exposure from fish, gender-specific educational programs could prove highly effective at reducing exposure through ingestion (Veiga, 1997). Due to the importance of amalgamation in gold recovery, combined with generally poor health conditions related to a lack of sanitation, widespread disease (malaria, cholera, STDs, etc.) and generally limited access to health care providers, initiatives directed at reducing the comparatively invisible health impacts from mercury will have limited success if the programme does not also comprehensively address these broader community issues (Hinton et al., 2003).

Insufficiently broad participation in artisanal mining technical assistance programmes not only has ramifications for women, but for the success of the programmes as well (Gender Working Group, 1995). When technological innovations are derived from traditional, local knowledge and comprehensively consider the impacts on users and other stakeholders, communities are more likely to benefit from their development. In order to be truly comprehensive, technical assistance programs may need to disrupt local norms with

respect to participation and authority, in order to promote inclusiveness and maximize community benefits.

Women and Appropriate Technology Development

In the past, technology assistance programs have typically involved the transfer of modern, science based technologies as opposed to building upon traditional technologies that have evolved within communities (Appleton et al., 1995). A technology development programme would be more likely sustained if it built upon people's strengths, inherent skills and knowledge. Marcelle and Jacob (1995) further identified the need to make "historically and culturally specific recommendations in any policy intervention and to identify policy alternatives in a fully participatory mode." The ITGD, an organization involved in the development of technologies that support the alleviation of poverty, has stated that women's technical knowledge tends to be less prestigious and is of lower profile because they tend to focus on processes and organization of production, rather than equipment or hardware (Appleton et al., 1995). Incorporation of this process-oriented local knowledge into more traditional hardware-focused technologies could significantly improve artisanal mining technologies as a whole.

In addition to building on local knowledge, there are also opportunities to explore the application of innovative, locally developed technologies in some countries and transfer or modify these to other locales. For instance, an inexpensive method to decompose the mercury-gold amalgam and recover volatilized mercury has been developed in Papua New Guinea and China (Hinton et al., 2003). Both systems essentially consist of a small metallic bowl contained within a larger bowl filled with sand or water. A larger bucket is placed over the smaller bowl, such that when the amalgam in the smaller container is heated, mercury is volatilized, condenses on the larger bucket and is collected in the underlying sand or water. Something so simple could result in considerable health benefits, particularly for the women and men involved in amalgam decomposition.

In a detailed study of gender and technology (Evert, 1998), it was found that interventions did not benefit women when: the 'improvements'

were not more convenient and accessible than traditional sources or activities (e.g. clean water wells), modifications were directed towards commercial uses (e.g. development of forests for resale when fodder needs were not being met), and technologies were generally inappropriate (e.g. 'improved' stoves that did not consider the cultural value of traditional food preparation techniques). Projects directed at commercialization can also undermine the position of women by disrupting links to agriculture, forest and livestock sectors (i.e. severing links with food, fodder and fuel). In the context of artisanal mining, increasing the scale of an operation could impact resource flows by: altering the quantity and quality of water; increasing pressure on women to spend more time mining, thereby reducing their attention to other responsibilities; and causing more widespread environmental damage (e.g. deforestation, damage to fisheries). In many instances, a greater focus on commercialization has resulted in the loss of women's control of production and access to resources, transforming their role more and more into that of labourers (Appleton et al., 1995).

As time is one of the most important commodities for many women, it should be a critical consideration in appropriate technology development. More time can enable women to pursue more productive tasks, can reduce stress levels, and may ultimately improve quality-of-life. As many woman miners are responsible for carrying ore or water, the increased use of donkeys and/or carts may be an effective means to decrease transport time and labour requirements. In one credit scheme described by Everts (1998), a participatory approach was employed with Maasai women in Kenya to develop appropriate panniers for donkey transport. The project involved the development of a cooperative of 18 women divided into six groups. Each group of women raised half of the purchase price of a donkey and the creditors loaned the remaining amount. In order to overcome traditional concerns with the use of donkeys, Maasai men and women visited communities where donkeys were used. Women who participated in donkey time-sharing reduced their carrying time by approximately 25 hours per week, time that was spent on other tasks, leisure, and participation in community work. In a similar non-gender sensitive programme in Tanzania, the introduction of donkeys exacerbated gender inequities, as women had

little disposable income and were unable to purchase donkeys (Everts, 1998). Men employ their donkeys to carry crop harvests.

In cases where processing activities take place closer to home, the construction of on-site mills could markedly reduce time and effort dedicated to carrying ore. A modification such as this, however, may be less attractive to women simultaneously conducting child care or when security issues are of greater concern. The state of existing machinery may also influence women's burden of work. In the Makate district of Tanzania, improved functioning of grinding mills considerably benefited women by reducing the tonne/km load by more than 90 per cent (Everts, 1998). Although the mill was applied in an agricultural context, this lesson is readily transferable to artisanal mining.



Figure 7: Venezuelan Women and a Wooden "Batea"

One of the better known examples of appropriate technologies for women involved in artisanal mining is the wooden pan (Figure 7). As this pan is lighter and equally effective as metallic pans, it has been well received by women throughout the world. This underscores the importance of developing technologies specifically for users.

Research on Gender and Artisanal Mining

The paucity of reliable information concerning women's involvement in artisanal mining represents a major knowledge gap. In most reports on artisanal mining, a discussion of a women's role is altogether absent, or is grouped together with child labour, often in the same paragraph. This is particularly disturbing, as child labour is widely condemned; thus, it is implied, by association, that women's involvement should also be limited. In most instances, artisanal mining represents an opportunity for both women and men to relieve the burdens of poverty.

An additional shortcoming of most research conducted to date involves the use of terms like "ancillary", "secondary" and even "subordinate" in documentation of women's indirect participation in artisanal mining. As spouses of miners, cooks, shopkeepers and other service providers, women not directly involved in artisanal mining activities (in addition to those who are) play a pivotal role in the health and well-being of households, as well as in the community. Terms that imply women are of secondary importance place their participation on the periphery, and marginalize their achievements in the sector. This is further exacerbated by the tendency to omit part-time workers from statistical reports of mining activities; consensus is needed as to how part-time direct involvement should be enumerated.

The differential impact of both current practices and technical change on the lives of women and men also requires more in-depth research. This knowledge can significantly contribute to the development of gender sensitive strategies to advance positive change in artisanal mining communities and increase the likelihood that initiatives will be sustained.

Women and Sustainable Livelihoods

In a given region, artisanal mining can provide a viable means of employment for a limited number of people until depletion of the resource. Artisanal mining can also contribute to sustainable development of the surrounding community by supporting auxiliary enterprises (e.g. jewellery production) and agricultural development (Hinton et al., 2003). This sort of diversification may be well suited to women in artisanal mining communities for a number of

reasons. The majority of women involved in small-scale enterprises are sole proprietors who make little use of hired labour, or participate in income generating groups on a part-time basis (Carr, 1993); thus, they may be easily adapted to small-scale ventures. In addition, women are frequently responsible for food security and have demonstrated competencies in agriculture.

Due to unequal access to information, credit and training, in addition to time-consuming domestic responsibilities, particularly in comparison to their male counterparts, women face significant challenges in establishing new ventures. They have difficulty obtaining capital and training because they do not know it is available (if it is) and how to access it. In Tanzania, for example, only 3% of the National Bank of Commerce clients are women (Carr, 1993). In addition, women may lack the skills to market products and manage business ventures. These challenges have been described by Marcelle and Jacob (1995) as the “double bind”, which is a consequence of an unsupportive policy environment, combined with uncertain markets for products.

The Mining Sector Diversification Programme (MSDP) of Zambia has made strides in conquering the “double bind” by sending five mining associations, including one Women in Mining association, to a major gemstone fair in Tucson, Arizona in 2003 (Anon, 2002). This endeavour will link the Zambian gemstone market with foreign buyers, and build the capacity of small miners to add value to their stones. Efforts to develop value-added processes in the production and marketing chain of gemstones, particularly through lapidaries and jewellery manufacturing, have been recognized as an important opportunity for women in Zambia (Kaingu, 2003) and many other countries (Hinton et al., 2003).

With the exception of the UN Development Programme (UNDP), which has outlined a strategy for the development of sustainable livelihoods in artisanal mining communities (Labonne and Gilman, 1999), very few examples of sustainable livelihoods initiatives have been documented. In Mali, the Sadiola Gold Mining Project was created by Anglo Gold to provide technical assistance to artisanal miners and support alternative revenue generating activities, such as agriculture, jewellery production, and fabrication of dyes and soaps (Keita, 2001). In

the Tapajós region of Brazil, governments and NGOs are implementing jewellery schools in mining areas to add value to the miners’ product and, in regions where the resource has been depleted, entrepreneurs have invested in cattle farming, and palm tree and “açaf-nut” production (Hinton et al., 2003). In KwaZulu Natal, South Africa, brickmaking provides a means to add value to kaolin mines by women, and has been shown to support sustainability in the community of Ozizweni (Dreschler, 2001). In Alta Floresta, Brazil, ex-miners have been working with local experts and the government to turn flooded mine pits into aquaculture operations (Otchere et al., unpubl).

Artisanal mining has the potential to be an important catalyst for entrepreneurial activities, and the formation of strong, resilient communities, but progress will be severely limited until all stakeholders have the necessary tools to affect positive change and challenge existing inequities. Women can play a vital role in this transformation, in part, through the development of sustainable livelihoods. Providing women with access to information, credit, and training combined with an amenable policy framework are key steps to facilitating this change.

CONCLUSIONS

An estimated 70% of the world's 1.3 billion poor are comprised of women and girls (UNIFEM, 2000). The feminization of poverty, combined with other factors (*i.e.* the outward migration of men, evolving cultural norms with respect to gender roles, lack of employment in other sectors, and high fertility rates) have led to the escalation of women’s direct and indirect involvement in artisanal mining. Currently, approximately 30% of the world’s artisanal miners are women, although, as women often occupy multiple roles in artisanal mining communities, their direct participation may be significantly higher when part-time work is considered.

This review has integrated information on women’s direct and indirect participation in artisanal mining, in order to provide a basis for: identifying major gaps in the knowledge base, determining significant factors shaping gender roles in this sector, and recommending a course of action for policy makers, artisanal mining

researchers, assistance programme officers, and other actors. Key findings are summarized as follows:

- Women working in mines are most commonly involved in transporting ore and water, washing, or seemingly 'delicate' work such as panning, amalgamation and amalgam decomposition. Women also function as small mine owners and operators, but this tends to be more of an exception than the rule.
- In extraction of high value products, such as gold, men more commonly maintain control of the mine site. Women are more likely to participate in greater numbers and play a more significant role in control of the land, and decisions surrounding its use for low value commodities, such as industrial minerals.
- Women's direct participation in artisanal mining generally increases with the decreasing scale of the operation; thus, they are most prevalent in small family operations where mining takes place to supplement other income (e.g. from subsistence agriculture).
- Outside of mining, women often assume key roles in the provision of goods and services (e.g. cooks, sex trade workers, shop owners, housekeepers). Moreover, within the community, women are of fundamental importance in terms of food security, are critical to community stability, cohesiveness, and morale, and act as primary agents in facilitating change.

Significant barriers exist that prevent women from fully benefiting from this sector. In order to respond to inequities in political power, access to resources (capital, information, education and training, etc.), mobility and basic human rights, combined with the presence of legal, socio-cultural, and financial constraints, the following are recommended:

- Commitment to gender mainstreaming in government agencies, and appropriate recognition of women in policy frameworks, particularly in relation to land ownership rights.
- Adoption of strategies inclusive of, and accessible to, both women and men, and which support women's participation in political decision-making.

- Elimination of discrimination from educational systems, and provision of support for families sending children to school.
- Formal incorporation of gender issues, and the adoption of holistic approaches to artisanal mining communities through technical assistance and community development programmes.
- Promotion of micro-credit and other programmes that provide financing for women.
- Execution of educational campaigns that target women in order to mitigate specific health risks, and which provide the means for them to access other resources;
- Implementation of programs to train women in various aspects of mining, as well as in marketing, management and bookkeeping.
- In-depth research on women's involvement in artisanal mining communities, and the differential impact of current practices and technical change on the lives of both women and men.

The extent to which women are positively or negatively impacted by artisanal mining largely depends on issues of equity. As inequities are challenged, gender roles will inevitably evolve, and artisanal mining will be better equipped to support sustainability in the communities where it takes place. Ultimately, any work undertaken in artisanal mining must adopt a community-centric approach. Women have a demonstrated capacity to drive positive change. The next steps taken will be critical in determining whether women will be empowered to apply this capability in order to advance their lives and the artisanal mining sector as a whole.

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