The Needs of Miners: Political Ethics, Mercury Abatement, and Intervention in Artisanal Gold Mining Communities

by

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Abstract

This dissertation examines the role of donor-funded international projects to reduce mercury pollution from artisanal and small-scale gold mining (ASM). ASM is the second largest source of anthropogenic global mercury pollution, accounting for roughly 1000 tonnes of atmospheric emissions and releases to the environment per annum. The artisanal mining economy involves 10-15 million people across the developing world, and supports 80-100 million people directly and indirectly. In 2003 the Governing Council of the United Nations Environment Program reached consensus that there is sufficient scientific evidence to trigger an international response to global mercury pollution, including the pollution generated by ASM. Yet thus far most international interventions have concentrated on environmental monitoring and assessment, while virtually no efforts have focused on implementing solutions. The aim of this dissertation is to move global mercury policy for ASM past its emphasis on assessments. It does this by developing a philosophical and strategic policy framework to guide future interventions by international institutions. A brief history of global mercury policy is provided, illustrating how ASM has been neglected and examining divisions between ecocentric and technocentric theories of environmental intervention. The relationship between ASM and poverty is examined, reaching the conclusion that because artisanal gold mining is a form of upward mobility for the world's extreme poor, the idea of reducing mercury pollution by redirecting miners into alternative livelihoods is unrealistic; indeed gold itself is the alternative livelihood. Using case studies collected in the field, the issue of conflict over property rights between artisanal miners and large-scale mining companies is explored, and a risk mitigation framework presented to assist companies to coexist with artisanal miners. Finally, a new approach to international intervention is proposed based on three interdependent principles of formalization, capitalization, and education. A plan is developed for directing more expertise and financial resources to the field, and more effectively meeting the needs of miners. Specific recommendations include a rapid assessment methodology to select project sites, and improving operational linkages among public and private institutions.

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Dedication

For my father, who made tending to fringes his discipline.

For my grandfather, who dreamed of being an engineer.

For my grand-uncle, who reminded me about missing the boat.

And for Hesch Yosef, peace upon him, and the desire to realize a true calling.

In the order of nature everything dies which is not sustained by an intense and brutal love of self.

(Bertrand de Jouvenel)

I may be a sinner who does not expect forgiveness, but at least I am not a government official.

(Wolcott, Deadwood, Season II)

Learning by hibernation,
Myself and the polar bear.

Unknown passage from my notebook)

In science failures are often as important as successes, because they tell us where the limits are. Only by looking honestly at our mistakes can we hope to overcome them.

(H. Epstein)

1 INTRODUCTION

It is the fate of every science that, in the wake of the wonderful perspectives opened up by the earlier discoveries, the multitude of researches complicates and confuses the landscape.
(B. de Jouvenel)

1.1 Statement of Problem

This dissertation is concerned with the role of donor-funded international interventions to reduce mercury pollution from artisanal gold mines. Artisanal and small-scale gold mining is the world's second largest source of mercury pollution, and its most important "intentional" source. The need for a global mercury pollution reduction strategy emerged from scientific revolutions of the 1950s and 1960s. Thus far, political solutions for integrating this knowledge have proved elusive, especially in the context of ASM. Mercury pollution from ASM is linked to poverty: it is primarily a problem of the developing world, where mercury use is increasing, even as it decreases in developed countries (Swain et. al., 2007). A complex issue involving numerous natural and social sciences, there remains much confusion about what values the international community ought to embrace with respect to intervention, and what actions might flow from these values. The existence of both ecocentric and technocentric ideologies of intervention has paralyzed the public policy process. Likewise, unresolved disputes over the "informal" status of many miners are contributing to numerous resource conflicts between the industrial and ASM sectors, for which few solutions have been introduced. Moreover, changes in the authority and resourcefulness of the United Nations system have diminished the capacity of international institutions to negotiate comprehensive global policies. Absent strong leadership and direction, most international programs concentrate on environmental or health assessments, and fail to provide solutions for either metallic mercury exposure or methylmercury pollution (Veiga and Hinton, 2002; Hentschel, et. al., 2003). Accordingly, how miners use mercury and what technologies could decrease losses to the environment are the subjects of numerous studies and projects. However, few researchers have focused on the political ethics that are appropriate for the theory and practice of environmental intervention in ASM communities. Clear and consistent principles, accommodating both ecocentric and

technocentric values, could contribute to advancing global mercury abatement beyond its assessment phase, and into a spirit of action.

1.2 Significance of the Work

A social science emerges in response to an external collective need. Discoveries in medicine and technology or revolutions in political consciousness, trigger social responses aimed at integrating these discoveries into social systems. Whether in the history of religion, development of political identity, or study of disease, it is rare that a transformative idea meets with acceptance in a single generation, much less overnight. However, social and intellectual evolution can be punctuated by major events, especially crisis.

For environmental contaminants, Minamata, Japan, where thousands of people were poisoned after eating toxic fish, was one of several crises in the 1950s and 1960s that proved there was a connection between low concentrations of chemicals in aquatic systems and biological accumulation up the food chain (Benjamin and Honeyman, 1992). Within a short time, the science of mercury methylation emerged as a paradigm, or what Kuhn (1962) calls a "normal science." A paradigm exists when scientific study is focused on clarifying unknowns that rest atop accepted truths, such as ongoing debates about how methylation of inorganic to organic mercury occurs, rather than over *whether* methylation occurs. Depending on where one begins counting, it has taken between 35-50 years for this knowledge to emerge as a paradigm. However, the social science of communicating the risks of mercury contamination, and integrating this knowledge into public policy, industrial practice, and consumer awareness is significantly less mature than the mercury science paradigm. Until only recently, the mercury policy community thought it had squared its mandate: cap emissions from coal-fired power plants, and reduce intentional uses wherever mercury is still part of industrial processes. Yet when the fact emerged that artisanal and small-scale gold mining is the biggest consumer, and second biggest polluter of metallic mercury, this data threw the emerging social science of mercury pollution abatement into disarray. ASM is unlike any other mercury policy issue: it is so deeply linked to the economics of gold mining, and gold mining to the economics of poverty and the politics of

currency trading, that there is minimal knowledge about what policies actually reduce mercury pollution from ASM, or if there even are any.

Developing mercury policy for the ASM sector involves many overlapping environmental, engineering, public health, humanitarian, and economic development priorities, and one's perspective about what makes for healthier mining communities is often defined by disciplinary expertise. An engineer may tend to view intervention in terms of technology, a biologist as ecological mitigation, an economist as a development issue, a geographer as land-use planning, and so forth. Developing interventions that touch all these areas requires a unification of streams of environmental, mineralogical, and humanitarian policy not generally treated holistically. This dissertation contributes to what Carlile and Christensen (2005), following Kuhn, define as the "descriptive" component of paradigm development, in this case the social science that unites the various streams of natural and social science needed to stem the growing tide of mercury pollution from ASM in the developing world.

The need for greater interdisciplinarity in delivering intervention to ASM areas was identified more than a decade ago by Veiga (1997b), who writes: "One of the greatest difficulties in reducing emissions and recognizing dangerous sites is the scarcity of people of who can transfer knowledge about the issues. A multi-disciplinary approach is needed which can handle field observations as a preliminary step for rapid evaluation of the pollution extent." If approached too casually, interdisciplinary science — social or natural — risks devaluing the verities of established disciplines. As Kuhn points out, before a science emerges as a paradigm there is often considerable confusion within a field. Early data collection, writes Kuhn (1962), is a "far more nearly random activity than the one that subsequent scientific development makes familiar." At the same time, the pre-paradigmatic moment can also be fertile ground for new insights, particularly when there is a transgression of conventional disciplinary thinking. The different methods and interests that interdisciplinary research brings to a subject at times allow for things to be seen through fresh eyes.

The social science of risk communication and policy development for mercury pollution abatement is in this kind of theory-building moment prior to the emergence of a paradigm. Carlile and Christensen (2005) argue that in the early stages of a theory, before it becomes normative, research should concentrate on descriptive observations. Descriptive observation is a first step of theory building, a stage followed by classification of frameworks and typologies, and defining relationships or models. This descriptive phase of theory-building is followed by a "normative" stage when research becomes more careful and precise, and a theory moves beyond statements of correlation toward a definition of causes. The descriptive phase involves precise written and statistical observation, documentation, and measurement of the subject, which may include observation about people, organizations, and technologies, as well as processes of human relations. "Without insightful descriptions to subsequently build upon, researchers can find themselves optimizing misleading concepts" (Carlile and Christensen, 2005). Much contemporary academic literature has stopped using the descriptive voice altogether, particularly in more static fields where normative theory is firmly rooted. But in an emerging specialty like mercury pollution from ASM, descriptive data collection remains a crucial form of theory development. The key point perhaps is that descriptive research contributes to a larger theory: it is not the theory itself.

1.3 Methods

The research synthesized here is a result of extensive fieldwork that took place between 2001-2006, much of it as assignments for the United Nations Industrial Development Organization (UNIDO), as well as in other capacities as a journalist and policy writer. The fieldwork involved visits to artisanal gold mines in six countries in South America and Africa; gold refineries in Europe and the Middle East; two of the world's great gold markets in Dubai and Khartoum; intergovernmental conferences, workshops, and negotiations; and consultations with major and minor multinational gold mining companies. Insofar as it included fieldwork in a total of 12 countries and provided virtually unlimited access to the inner-workings of many policy institutions, this experience was a graduate student's dream. The following contacts with all the relevant sectors in the field occurred in the form of unstructured participatory meetings, informal workshops, and professional experience.

a) The *Intergovernmental Sector*: Global Environment Facility; United Nations Development Program; UN Industrial Development Organisation; UN Environment Program; UN Pan-American Health Organization: International Maritime Organization; the World Bank; Nile Basin Initiative; Guinea Current Large Marine Ecosystem.

b) The *Private Sector*: Newmont Ghana Gold; Freeport McMoran; Goldfields Mineral Services (GFMS); Dubai Metals and Commodities Center (DMCC); Al Ghurair Giga (refinery in Dubai); S&P Trading (French gold refinery).

c) The *Public Sector*: Governments of Sudan, Ethiopia, Uganda, Ghana, Guinea, Brazil, Guyana, United States, Canada. Embassy staff of Japan, Canada, U.S., and Netherlands.

d) The *Non-Governmental Sector*: Natural Resources Defense Council; Mercury Policy Project; Basel Action Network; Zero Mercury Campaign; Association for Responsible Mining.

e) The *Media*: National Geographic, Wall Street Journal, Globe & Mail, and the CBC.

Throughout this dissertation, the observations collected in the field are augmented with scholarly and public policy literature available on the subject. Where it was needed, key texts were integrated from a variety of disciplines — historical, economic, political theory — to shed light on how certain social processes work. This is particularly evident in the theory of formalization advanced in Chapter 5, which for the first time incorporates the work of the economic historian Hernando De Soto (2000) about extralegal economies in the developing world into the context of artisanal mining.

This venture into the "soft side" of research is part of the early process of building up the hard edges of normative science. At times this brings a subjective perspective that makes much of what is said conjectural, and perhaps less replicable than the results of research

conducted along the harder edges of an established paradigm. This subjectivity, however, is ultimately shared by nearly all data, which "whether presented in the form of large data sample analysis on one extreme, or an ethnographic description of behavior on the other — are subjective" (Carlile and Christensen, 2005).

The conjectural quality of this work is further heightened by the effort to apply the research to public policy, an area of human affairs for which there is little remaining agreement on what does and does not work. Setting politics aside for a moment, making public policy is a combination of understanding human needs, action, evaluation, and hopefully revision of the actions pursued based on the results of the evaluation. However, it is not often the case that the wisdom of one policy can be transferred to another area. Most situations are simply too unique and too dependent on unpredictable human or natural variables, to warrant governance by extrapolation. As Homer-Dixon (1999) writes: "The policy tools available in one case will not be available in another, for wholly idiosyncratic reasons."

How then are we to know whether the conclusions and recommendations of this dissertation are truthful? To some extent, each case study, experience, or interpretation offered can be considered a data point that contributes to the general analysis. In this respect, the verity of each datum could conceivably be challenged, for instance, by retracing the steps of a particular field visit. Taking this approach, however, risks preventing the theory of how to reduce ASM mercury pollution from progressing beyond its descriptive phase. Given that as of 2002 there were at least 160,000 artisanal mine sites around the world (Hinton, 2002), this is unlikely to be an efficient approach.

While the interpretations offered in this dissertation will certainly be superseded as the hard lines of the discipline emerge, they will hopefully contribute to the evolution of a social science that is emerging in response to a profound human and ecological need. In the meantime, the way to judge the value of the data presented here is by their outcome (Carlile and Christensen, 2005). "True ideas," as the pragmatic philosopher William James (1907) once said, "are those that we can assimilate, validate, corroborate, and verify. False ideas are

those that we cannot...Truth is simply a collective name for the verification processes. Truth is made, just as health, wealth, and strength are made, *in the course of experience.*"

1.4 Outline of Work

The dissertation consists of five chapters guided by five key hypotheses:

1. The politics of mercury must include ASM as part of global mercury abatement.
2. ASM is the alternative livelihood of millions of people in the developing world.
3. Addressing mercury pollution from ASM is about both environmental intervention and poverty alleviation.
4. The key elements of poverty alleviation in ASM communities are education, formalization, and capitalization.
5. International institutions need to develop interventions that are holistic, rather than defined by strict ecocentrism or technocentrism.

Each chapter is written to reflect the different forms that are used to communicate in public policy debates. To the extent that policy is influenced discursively, there is no fixed style in which these debates occur. The policy process is interdisciplinary and multimedia; it includes political institutions, advocacy groups, academia, the media, and business, and each participating sector has its own expectations about how ideas are communicated. Because the aim of this dissertation is to be an applied piece of work, each chapter is therefore modeled after a different medium relevant to this policy process. This includes narrative and descriptive writing, ethics, polemics, policy analysis, case studies, and finally the style of UN special reports.

Chapter 2, "The Politics of Mercury," is written as an extended narrative tracing the evolution of international mercury policy. The form is appropriate insomuch as it is an effort to describe history in the making. True to the post-modernist understanding of narrative, the narrator is part of the process he is describing, and the line between observer and participant fluid. The chapter is meant both to record and influence policy making, and therefore includes ethical reasoning that is later used to judge the virtues of various policy initiatives.

Chapter 3, "The Myth of Alternative Livelihoods," is very much a polemic. Its style follows that used by Marx in the *Poverty of Philosophy* (1847) and James in *Pragmatism* (1907), both examples of how an idea is developed by exposing two opposing perspectives and arguing one side forcibly. It is common for a polemic to be critical in style, as it builds a robust case for one view over another. This includes offering examples that reflect the polemicist's personal experience, which in this chapter is provided through encounters between the author and characters in the gold souks of the Sudan. The polemic developed here unpacks the historical and economic weaknesses of the idea that artisanal miners should be shifted away from gold and into alternative livelihoods, and challenges parts of the argument put forth by the international environmental campaign to end all uses of mercury (Zero Mercury). It is also based on conflicts between some of what is recorded in academic literature and observations from working the field itself. Though part of the policy process, a polemic does not always have direct consequences for policy. Instead, polemical reasoning exposes intolerable situations that create gridlock among competing interests. In this case, so long as there is a perception that it is possible to make artisanal mining disappear — and with it mercury pollution — it means the international community cannot provide a solution to this urgent issue.

Chapter 4, "On the Fence," combines policy analysis and case study to address the widespread problem of resource conflict between industrial and artisanal miners. The case studies are an example of the descriptive aspect of theory building. With respect to these resource conflicts, the existing case-study work and prescriptive policies are noticeably thin. Indeed the call for a consistent methodology is coming not from the social sciences, but directly from mining companies wishing to explore non-coercive conflict management measures. Therefore, this chapter is framed in terms of social license and risk mitigation, two key factors for mining companies operating in developing countries.

Finally, Chapter 5, "The Needs of Miners," is written in the manner peculiar to UN commissions and special rapporteurs, such as the report on "Human Rights and the Environment" (Ksentini, 1994), or the "International Commission on Intervention and State

Sovereignty" (Responsibility to Protect, 2001). These documents typically address both ideological and operational constraints, and present political arguments for major policy shifts. "Responsibility to Protect," for example, calls for the United Nations to alter its understanding of sovereignty in order to allow for preemptive intervention in cases of genocide or ethnic cleansing. In the "Needs of Miners," the policy shift is more modest: it calls for intervention to be transformed from economically inefficient patchwork projects that are divided by ecocentric and technocentric priorities, to holistic initiatives driven by more fieldwork, long-term commitment to community development, and a merging of human rights and environmental objectives. This is, however, the first such effort that specifically addresses the interdependence of mercury pollution and ASM in this policy format. Parts of this chapter are currently circulating as a strategic planning document inside the UN system (UNIDO, 2007a), a process whose verification or falsification may be said, following James (1907), to be identified in its outcome.

1.5 Terminology

1.5.1 ASM

There is no accepted definition of ASM amongst the different policy institutions that deal with this issue (Jennings, 1999; Hilson 2003). "Despite many attempts, a common definition of ASM has yet to be established" (Hentschel et. al., 2003). As a term ASM does little to capture the phenomenon it aims to describe. ASM can refer to any form of mining that is not a large industrial mine operating at economy of scale and paying its workers a regular daily wage. This collapses all other mining activity into a single sector, including everything from small household panning operations to well-financed mines employing expensive missile dredges, automated pumps, and elaborate sluices. Both in terms of the technology used, and their different labour arrangements, the relationship between, for instance, panners and missile dredgers is, at best, loose.

In fact, ASM often serves as shorthand for many different phenomena which take numerous forms among, and even within, specific countries or regions. It describes a plethora of demographic scenarios, whose only common-denominator is often the type of metal or mineral being pursued. While mercury pollution is common amongst artisanal and small-

scale miners, there are many groups of miners — from Uganda, to Guinea, to Indonesia — where mercury is not used. To speak of miners, gold miners, artisanal miners, small-scale miners, or community miners as if they were all part of a single group whose needs can be universally defined has little utility. Moreover, there are many types of miners and artisanal mining areas, including complex economic structures that can separate high-earning bosses to low-wage employees (Cleary, 1990). As Veiga (1997a) points out: "The economic structure of artisanal miners is not different from any other capitalist activity. The concept of maximum profit with minimum investment is always present. Regardless of the size of the activity, this always creates a kind of organization with hierarchy, duties and rules for all participants." While the overall phenomenon of ASM can be referred to as a poverty-driven activity (MMSD, 2002), this does not mean that all miners occupy the identical economic position, nor that ASM operations can be assumed to have the same features in all locations.

1.5.2 Intervention

The term "intervention" has a wide and scattered history, also without any one dominant definition. In economics, intervention refers to the role played by government in adjusting rates of inflation and unemployment through fiscal policy measures. An interventionist government is one which rejects the view that the market forces of supply and demand must be allowed to operate freely; it veers towards the Keynesian notion that without guidance from central banks the relationship between a country's monetary base and its money supply can lead to dysfunction, and depression (Krugman, 2007).

In matters of war and peace, however, intervention refers to the use of military force by an external party to stop or prevent an atrocity or humanitarian crisis (Ignatieff, 1997). The forms of military intervention are diverse, ranging from alliance-based incursions authorized by NATO, peacekeeping operations organized by the UN Security Council, and, some would argue, powerful nations using military force to prevent genocide and ethnic cleansing (Responsibility to Protect, 2001).

A third use of the term is part of a softer set of principles, and is more along the lines of what is being discussed in this dissertation. In most cases of mercury pollution and ASM,

intervention comes in the form of policy (just as it would when a government intervenes with fiscal measures), the delivery of an educational or technical training service, or working with governments, companies, and miners to mediate conflict. In effect, intervention refers broadly to efforts by international development agencies to alter the customary practices in a specific location.

However, the question to be raised is whether projects dealing with mercury and poverty alleviation deserve the gravity ascribed to military or fiscal intervention. In this respect, it can be argued that matters of ecological security do have this urgency, insofar as these problems have a profound "procrastination penalty" (McKibben, 2007). Using the term intervention reflects the view that ecological security deserves consideration alongside economics and violence as the core values for which governments are vested as public caretakers.

2 THE POLITICS OF GLOBAL MERCURY POLLUTION

Let poison be but mixed with sugar: they will cram it into their mouths.

(Rumi)

2.1 Mercury as a Global Pollutant

In the Spring of 2004, the United Nations Environment Program hosted a series of awareness raising workshops to disseminate the findings of the Chemicals Division's Global Mercury Assessment. This consensus report — which had been formally delivered to the UNEP Governing Council one year earlier in Nairobi — concluded that mercury poses a clear and present danger to both human health and environmental security. The Governing Council accepted the results, and took the decision to move towards comprehensive global action.

Despite the Council's call for its members to consider every policy instrument available — including binding treaties — to combat mercury pollution, the only substantive outcome of the process was the handful of regional workshops held throughout the developing world. Until then, the Global Mercury Assessment had been heralded by environmentalists as the precursor to a campaign of international diplomacy, one that would begin the process of abating mercury pollution on a grand scale. Beginning in 2001, a global coalition of NGOs had publicly advocated a binding treaty — or protocol to an existing treaty — along the lines of the Stockholm Convention on Persistent Organic Pollutants or the Basel Convention on the transboundary trade of hazardous materials.

From the outset, this advocacy campaign focused on a gradual phase-out of all intentional mercury uses, rather than on emissions reductions; all subsidies for state-owned mercury mines would be ended, making primary mining of mercury uneconomical; and long-term storage facilities were to be created to enable the permanent retirement of mercury from commerce. The main instrument pursued for achieving these goals was an international convention (Siegel, 2001). This advocacy approach was a natural outcome of the environmental politics of the 1980s and 1990s. In roughly a ten year period from 1987-1997, international institutions produced at least a dozen environmental mission statements,

plans, and agreements, beginning with the Brundtland Report on Sustainable Development and culminating with the Kyoto Protocol in 1997. From global climate change to species preservation, this expansion of international environmental agreements covered much of the spectrum of global environmental threats — ozone depletion, acid rain, smog, nuclear energy, international watercourses — in what was, to that point, the most progressive movement to manage the global commons in history. This movement to reconcile modern industrial society with the ecological limits to growth, emerged out of a revolution in political ideas that transformed not only thinking about the environment, but about human rights, gender equality, and international development (Eckersley, 1992).

The early 1970s were a watershed for the advance of these ideas into the political and legal mainstream. Environmental laws were enacted to safeguard air, water, and lands, and new government agencies created to the manage environmental policy. The women's movement triumphed with the U.S. Supreme Court's decision to strengthen the right to privacy, coming on the heals of the most-far reaching civil rights reform since the Civil War. The absorption of these concepts — civil rights, the environment, women's rights — helped legitimize and turn them from aspirations into values. These values soon made their way into the mandates of international organizations, beginning with a series of reports such as The Club of Rome's *Limits to Growth* (Meadows et. al., 1972), and the UN's 1972 Stockholm Conference on the Human Environment.

For the most part, the regime of international environmental conventions that grew out of these political transformations falls into the category of customary law. Even where there are specifically stated targets, the function of customary law is rarely to define specific policies, since the implementation plans of UN member-states are initiated through national political systems, not international institutions. Customary international law serves as what Ignatieff (1999) calls "moral dynamite" — a way of calibrating progress towards a mutually agreed-upon goal. It is possible to draw many examples of how customary law operates in this fashion. To take one, the Kyoto Protocol has largely failed in its effort to spread a regime of six-percent reductions of greenhouse gas emissions below 1990-levels. However, the formal presence of the Kyoto Protocol kept the issue public for a decade. After a long

period of climate change ambivalence, political cycles are rotating again in favour of aggressive climate diplomacy, with the issue emerging as a political advantage to parties on all sides of the political spectrum. Throughout, the Kyoto Protocol has survived as a benchmark for this debate. In this sense, the power of customary law is more formal than functional. By having a secretariat which organizes bi-annual Conferences of the Parties, and fixing the ritual of releasing reports aimed at updating knowledge on a calendrical schedule, ideas remain in circulation even if action remains slow.

Given the emphasis on international environmental law around the turn of the millennium, it made sense that environmental groups would be pursuing further action to include mercury in the canon of ecological concerns. Despite achieving astonishing complexity in just a short time, international environmental law is still an immature organism with many gaps in coverage of key global issues. Chief among the overlooked issues is mercury, whose toxic behaviour in local environments has been well-understood for half a century.

2.2 Origins of Mercury Pollution

Many people, when you speak to them of mercury, revel in telling an identical story about how in high school they gleefully rolled liquid mercury across the countertops of the chemistry lab. Mercury is filled with life, hence its reputation as quicksilver (living silver), and inspires a kind of lyrical attention enjoyed by few other elements. This "fluid, shimmering mirror, a contradiction, a metal that embodies the qualities of fire's contrary element water," rhapsodizes the writer Philip Ball (2006), "Its silvery sheen evokes the complement of sulfurs' hot sun: the cold light of the moon."

There is, however, a less esoteric reason the high school chemistry lab story repeats: people are wondering whether handling mercury was bad for them, and if perhaps this explains an ailment from which they now suffer.

Mercury is a powerful neurotoxin and nephrotoxin, and in public policy debates it is considered one of the four main industrial air pollutants, alongside carbon dioxide, sulfur dioxide, and nitrogen oxide. Mercury was the first chemical for which a relationship was

established between low-level concentrations in aquatic systems, bioaccumulation, and "a serious health impact on a human population at the top of the food chain" (Benjamin and Honeyman, 1992). It is one of the few metal pollutants to cause death as a result of its ingestion through contaminated food. Between 1957 and 1997, mercury is believed to have caused 1400 known deaths and afflicted more than 20,000 people (Lacerda, 1997). Although it is identified as a main industrial pollutant, mercury has remained an elusive public policy issue. Unlike the smog and soot of sulfur and nitrogen, none of us can see mercury pollution with the naked eye. Even climate changing impacts associated with carbon dioxide are more tangible: people in rural areas see when their ice is forming late or melting early; they notice when annual fish migrations arrive a month overdue, or if rainy seasons come unpredictably. However, mercury and its associated ecological and health effects are abstract, diffuse, and complex. The effects of mercury are many, and are dependant on the chemical composition, pathway of exposure, length of exposure, and the individual organism exposed. There is also a mind-straining global cycle in motion, and what the public receives is a complex story of coal plants in one part of the world releasing mercury to the atmosphere, and these emissions later being linked to elevated mercury levels found in Arctic seals (Cone, 2005). Meanwhile, a fisherman in Tobago spears a swordfish tainted by mercury, and celebrities are taking to talk-shows asserting that mercury causes autism. It is a confusing scenario for the public. Can mercury really travel in the atmosphere from China to the Arctic? If it also settles in oceans, does this mean all fish are contaminated? If there is a link between mercury and autism, does this impact derive from handling mercury in the high school chemistry lab, from immunization injections, from eating tuna sandwiches, from dental fillings? All of these questions are confusing for the general public, and contribute to a general lack of clarity about the public health effects of mercury pollution. Just how big an issue is this? Who does it really affect? How concerned should a person be?

The mercury pollution cycle is not only difficult to explain, its toxic effects can be a challenge to isolate. Mercury is among the most extensively studied contaminants, and yet its behaviour in the environment, particularly its buildup in fish, is still difficult to predict (Hickey et. al., 2005). This can also be true of mercury vapour exposure. When, for

instance, basic skills tests are administered to gold miners who work routinely with mercury, the results show childlike cognitive abilities in mature adults. This is consistent with the neurological damage expected of someone with mercury poisoning. But it is important to identify these tests are administered to people living with numerous hardships including disease, malnutrition, and in some cases a lack of education, all of which can be causes or contributing causes of poor cognitive faculties (Veiga and Baker, 2004).

Efforts to document the toxicity of mercury date back to 1533, when Paracelsus classified mercury poisoning among the sicknesses of miners. Yet for much of history mercury was considered a holy metal. The interaction of mercury and gold is traced to antiquity, when Romans used it both to separate gold from unwanted metals and combine it with other choice metals like copper (Veiga and Meech, 1995b). Mercury was regarded by medieval alchemists as the key to the Philosopher's Stone, the "medicine of metals" that would transmute base metals to gold. In the Arab alchemical tradition, mercury and sulfur were the "parents" of all other metals, which were composed of these two fundamental components "blended in different ratios" (Ball, 2006). Where today we see impurity mixed with purity (mercury mixed with gold), the alchemists saw all the elements as parts of the one big Earth element — indivisible from each other in their shared qualities. It was this idea that every element is part of every other element, which led to the belief that mercury could be transformed into gold.

In addition to Paracelsus, whose views on many medical subjects were rejected during his turbulent life, there were numerous stories of a more folkloric nature such as those ascribing Newton's mental breakdowns to his experiments with mercury, connecting the madness of hat makers to the mercury used in felt linings, and the theory that heavy metals contamination of aqueducts contributed to the decline of the Roman Empire. Yet these observations did not fundamentally alter the way people used mercury in medicine, industrial manufacturing, or in gold mining, until a tragedy in Minamata, Japan, transformed the perception of mercury forever (D'itri and D'itri, 1977). It was in Minamata, on the western shores of the Japanese island Kyushu, that the chemical manufacturer Nippon Chisso dumped its mercury-laden wastes from the plant where it produced nitrogen fertilizers into

Minamata Bay. It was there mercury went from being a valuable commodity to one of the industrial world's most feared pollutants.

Minamata had been a village of rice farmers and fishermen who supplemented their income with wages earned by producing salt in one of the bay's coves. Fishermen relied on sea bream, gray mullet, sardines, squid, octopus, and shellfish to support themselves and feed the community. In the early 20th century, economic conditions began changing: coal was discovered nearby and, though not enough to support the entire area, Minamata started shifting toward industrial production and trade. When local salt production collapsed after the government nationalized the industry, residents went looking for a new source of income, and Minamata soon became a company town.

Nippon Chisso emerged before the First World War as a major chemicals manufacturer in Japan and throughout the Japanese colonies. After World War II, the company diversified from chemicals into plastics and fertilizers. For years, it was common knowledge that Chisso discharged much of its metals-bearing waste into Minamata Bay. However, it was not public that these wastes contained mercury, which was used as a catalyst to combine with acetylene to produce vinyl chlorides and acetaldehyde. According to data submitted by Chisso to the Kumamoto prefectural Government, from 1932 to 1970 a total of 81.5 tonnes of mercury were released into the bay (Kumamoto, 1998).

As early as the 1930s, local fishermen had complained of fish stocks being devastated by something the company was putting in the ocean. In 1953, residents began arriving at hospital with neurological symptoms described as a combination of epilepsy and palsy. Three years later — when four patients were admitted to hospital and later died from similar neurological conditions — public health authorities were finally contacted, and what would later come to be known as Minamata Disease was born. An extreme and acute form of mercury poisoning, Minamata Disease attacks the central nervous system, causing the extremities to go numb, constricting vision, impairing hearing, motor skills and speech, and resulting in loss of muscle coordination, convulsions, and mental capacity. When the illness is congenital it often results in severe mental impairment (Mishima, 1992).

Mercury occurs in many different chemical species, but is found in two main forms in the environment: elemental (also called metallic), and organic mercury (also called methylmercury). Both species of mercury can be highly toxic, but the toxicity manifests in very different ways. Mercury is the only metal that exists as a liquid at room temperature. Though poorly absorbed in the digestive track, it can vapourize at relatively low temperatures. When inhaled as vapour, chronic low-level exposure or acute high-level exposure can result in severe neurological dysfunction (Carpi, 1998). According to the World Health Organization (1991), a safe level of mercury vapour exposure below which no adverse effects occur has never been established. Several hours of exposure to high mercury levels of 1000 to 2000 micrograms per cubic metre of air can cause acute chemical bronchitis and pneumonitis. Mild subclinical signs of central nervous system toxicity are observed in people who have been exposed occupationally to elemental mercury at a concentration of 20 micrograms per cubic metre, or above, for a period of several years. Background mercury concentration in urban air is about 1000 times lower than occupational exposure levels. Today mercury continues to be used in dentistry, pharmaceuticals, electronics, and other industrial, military, and agricultural practices. Historically, it was also commonly used in medical practice to treat syphilis (Epstein, 2007), and remains a tool of the healing arts in many parts of the world (Veiga et. al., 2001).

Just as metallic mercury has found its practical uses throughout history, organic mercury has also been part of industrial and agricultural production. Until the 1970s, seed grain treated with alkylmercury fungicides was commonly used throughout the world. This led to one of the largest mercury epidemics in recorded history, when over 6000 Iraqis were poisoned after consuming bread made from wheat treated with this type of fungicide. More than 500 deaths were reported in this case, and many others are believed to have gone unreported (Benjamin and Honeyman, 1992; D'itri and D'itri, 1977).

Although the amount of methylmercury is relatively insignificant in the global mercury pool, its propensity to bioaccumulate and biomagnify in the food chain makes it the species with the greatest risk of affecting large populations. In certain conditions, when elemental

mercury is released in its liquid or vapour form, it settles into aquatic environments or sediment. The transport of mercury is enhanced by the presence of organic acids, or by hitching a ride on suspended sediment. Sulfate-reducing bacteria are thought to methylate mercury and transform it into its most toxic organic species, methylmercury (CH_3Hg^+). Methylmercury biomagnifies as it is passed up the food chain, especially in the muscles of fish (Kainz et. al., 2006; Meech et. al., 1998); in some cases this occurs years after its initial release (Veiga and Hinton, 2002). Perhaps the key point is that it is in fish rather than water that methylmercury accumulates: the concentration of methylmercury in fish is 100,000 to one-million times more concentrated than in water (Veiga and Baker, 2004).

Methylmercury damages the brain, kidneys, and liver, and is linked to a wide array of medical symptoms including developmental problems; reproductive disorders; sensory disturbances; cardiovascular issues; impairment of speech and vision; and difficulty with motor functions. In high enough doses, methylmercury is fatal. It passes through the placental and blood-brain barriers, exposing infants during the most fragile fetal period. This connection to fetal development results in more than 600,000 children being born each year in the U.S with mercury levels exceeding health standards (Mahaffey, 2004).

The failure to draw this distinction between metallic and methylmercury has frequently led to great confusion about the health impacts of mercury in the environment. At times, this confusion has been used for political and economic gain. In 1987, Brazilian gold mining leader Jose Altino Machado made a public display of swallowing liquid mercury on television to prove its safety. "There is no relation with the mercury in Japan," Machado told reporters. "I challenge someone to show me a person, just one person, contaminated by mercury in the Amazon" (Veiga and Meech, 1995a). At the time, Machado was resisting the accusation that artisanal gold miners — *garimpeiros* — were causing the kind of ecological destruction to the Amazon alleged by environmental groups. And Machado, in a stroke of performative brilliance, correctly showed that handling and even swallowing metallic mercury does not cause immediate seizure, nor any other notable physical reaction. An identical strategy was employed in 1959 by Chisso President Yoshioka, who attempted to suppress suspicions that a new purification system the company had installed was still not

removing mercury from its effluents. Yoshioka filled a glass of water from a drainage pipe, drank it, and announced: "The waste water from our plant is now as clean as the water in the Minamata River" (Mishima, 1992). Both performances helped perpetuate misinformation about how and when mercury is harmful, taking advantage of the human inclination to ignore the distinction between acute and chronic exposure to poisons. The subversive part of Yoshioka's and Machado's campaigns was the veiling of distinctions among different species of mercury. Swallowing metallic mercury or drinking dilute water may not cause immediate harm, but inhaling mercury vapour or eating large doses of methylmercury via fish will.

Indeed, Chisso had informed the public that it used only inorganic mercury in its process, when in fact the catalytic sulfate it was using transformed metallic mercury into methylmercury inside the company's reactors. This meant that the mercury dumped into Minamata Bay was pre-methylated. Already in its organic form, the mercury quickly bioaccumulated in the local fish population, and it was too late to rectify ecological harm. After the four deaths in 1956, Chisso assembled a research team to study the source of the illnesses. In 1959, by which time hundreds more cases had been reported, magnesium, selenium, thallium, and other substances were ruled-out, and methylmercury determined as the cause of Minamata Disease. But these results were buried, and research into the matter discontinued. It was not until a decade later, in 1968, that the Japanese government officially acknowledged methylmercury as the cause of Minamata's epidemic. This admission contributed to a revolution in the way mercury is perceived. One year later, Jansen and Jernelov's (1969) breakthrough publication in the journal *Nature* demonstrated how inorganic mercury is transformed in the environment into methylmercury. By 1990, Minamata Disease was officially determined as the cause of death for nearly 1000 people. Two-thousand patients had been declared as having Minamata Disease, and another 3000 awaited certification. When the case was closed in 1997, more than 10,000 documented cases had been recorded (Watts, 2001).

Minamata and the subsequent research conducted by the global scientific community ultimately transformed the human relationship to mercury, by substantiating the evidence

that methylmercury bioaccumulates in the food chain, penetrating with enough force to damage the brain, or bring life to a painful, premature end. In so doing, it also created a new problematique for the world's policy community. Today, even the most skeptical environmentalists rarely challenge the veracity of mercury toxicity, or the need for more stringent controls on emissions and releases. The scientific, political, and civic communities have all committed to control mercury. But effective measures have been slow in coming. The global atmospheric mercury pool has not decreased in the last 30 years, and bioaccumulation in aqueous species appears to be increasing (Madison Declaration, 2007).

Current estimates of total annual atmospheric mercury emissions range from 6060-6600 tonnes, with anthropogenic air emissions accounting for roughly 2000-2400 tonnes per annum (Swain et. al, 2007). These atmospheric emissions — sometimes called unintentional or byproduct emissions — come largely from coal-fired power plants which account for 70 percent of global anthropogenic emissions (UNEP, 2002). They also are emitted from the smelting of sulfides to produce metals such as gold, lead, and zinc, and the incineration of mercury-containing products at landfills. Byproduct mercury released from the smelting of metals is among the most overlooked sources of elemental mercury to the atmosphere and the marketplace. UNEP estimates the number at around 400 tonnes a year, though it may actually be higher than this. The three largest point sources of mercury emissions in the United States are in fact not coal mines, but the southwestern gold mines of Jerritt Canyon, Twin Creeks, Gold Query. Peak emissions caused by smelting at these mines exceeds four tonnes, as opposed to an average of 200 kilograms from coal power plants. Uncaptured mercury emissions from gold mines are thought to account for 4-8 percent of total U.S. emissions (BAN Mercury Migration Series, 2002).

In addition to emissions from coal combustion and metals smelting, a significant source of atmospheric mercury emissions comes from the burning of biomass, such as from large forest fires in the Amazon. As Veiga et al (1994) observed, the mercury contained in biomass is mobilized by forest fires and emitted to the atmosphere as either vapour or attached to particulates. While there are different estimates for the amount of Hg emitted as a result of deforestation, the significance of deforestation as a vector for atmospheric

emissions is considered "indisputable" by Veiga and Baker (2004), who refer to studies from Paulo Artaxo, the University of São Paulo, and NASA suggesting that in the Amazon deforestation may account for 30 percent of mercury emissions, with ASM accounting for 63 percent. Recent studies of the Amazon confirm the original conclusion of Veiga et al from 13 years ago, suggesting that during the main burning season emissions from biomass burning may be equal to or even higher than "intentional" anthropogenic emissions (Ebinghaus et. al., 2007).

In all matters of mercury pollution estimates, however, there exists a great deal of uncertainty, less about the sources of pollution than the precise percentage of the global pool attributed to specific sources. When mercury is measured in the atmosphere, for instance, it can be difficult to differentiate among mercury pollution sources, such as when emissions from ASM and deforestation are mixed in the Amazon (Veiga and Baker, 2004). But the most critical knowledge gap is the question of how far mercury vapour emitted from the burning of amalgam in ASM areas and gold shops travels from its source (Telmer et. al., 2006b).

It is clear that of all "intentional" sources of mercury pollution ASM is the greatest. In 2004, intentional use of Hg was roughly 3300 tonnes, and was comprised of ASM (1000 tonnes), the chlor-alkali industry (700 tonnes), disposable batteries (600 tonnes), catalysts for vinyl chloride monomer (250 tonnes), dental amalgam (270 tonnes), measuring/control equipment (160 tonnes), electrical switches and relays (150 tonnes), energy-efficient lighting (110 tonnes), and 50 tonnes of "other" sources (Swain, et al., 2007). Because conservation practices during burning amalgam are virtually non-existent in most places, it is a fair assumption that close to all of this 1000 tonnes used annually in ASM is lost in one form or another to air, soil, or water (Veiga and Baker, 2004). To be clear, the question is not whether mercury released from ASM is an environmental or public health problem: this is not in dispute. The issue is the extent to which this mercury is distributed to the global environment. This question has an important bearing on policy decisions, since it leaves in question whether mercury pollution from ASM is a matter of both local and global priority,

or exclusively a matter of local concern that international institutions have decided to help communities address.

Some studies suggest mercury emitted from ASM is deposited within just 1-3 km of its source (Veiga and Baker, 2004). Others point out that even when deposition occurs close to its source, the mercury from ASM can be remobilized when a fire is ignited, creating the opportunity for this mercury to travel significantly further away (Meech et. al., 1998). Meanwhile, certain simulation models propose that mercury can travel thousands of kilometers from its source (Veiga and Hinton, 2002). Without knowing just how far mercury is transported in the atmosphere, it is not yet possible to determine what percentage of the global population is at risk as a result of emissions from ASM.

2.3 ASM Overlooked

Given its cumulative global effects, mercury pollution is what climate experts call a problem with a very high *procrastination penalty*: "a penalty that just grows and grows with each passing year of inaction" (McKibben, 2007). According to the 2007 Madison Declaration, atmospheric deposition of mercury has increased by a factor of 2-4 since the Industrial Revolution. But by the time UNEP hosted the mercury awareness raising workshops in 2004, the idea of expanding international law to include mercury had all but collapsed. International institutions in general — not only those dealing with environmental issues — were in retreat, after losing attention, resources, and legitimacy in a world more focused on military intervention than the environmental and humanitarian norms of the previous decade.

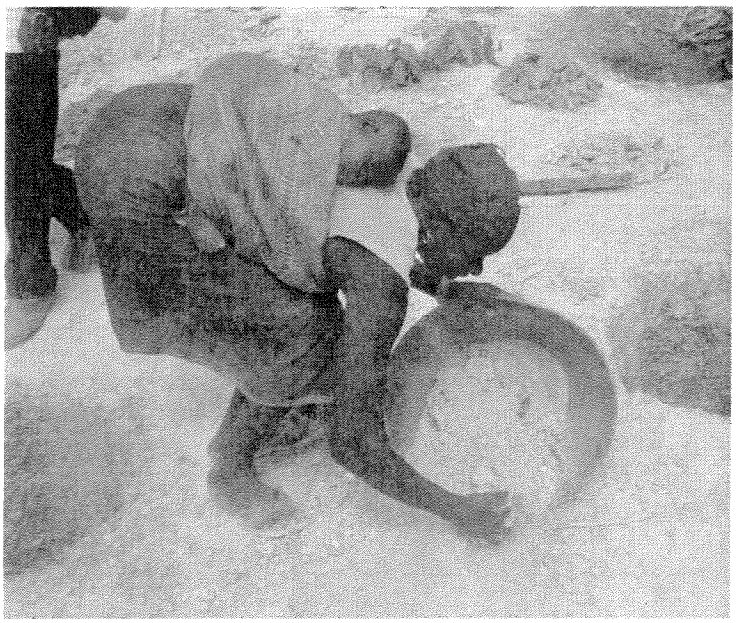

Fig. 1 – Woman mining in Guinea

At a workshop in Pretoria, South Africa (2004), UNEP hosted governmental delegates from more than 30 so-called Anglophone African countries. As each country took to the podium, one delegate after another highlighted mercury-use in artisanal and small-scale gold mining. The emphasis spanned the continent from Eritrea, Ethiopia, and Kenya in the East, to Ghana, Sierra Leone, and Liberia in the West. With few exceptions, countries had little reliable data about the extent of the problem, nor the resources needed at the ministerial level to concentrate on it. Civil war, corruption, and poverty made it difficult to envision how countries could even start wrestling with mercury pollution from gold mining. Yet delegates stressed that focusing on precisely this kind of issue — one which brings environmental planning directly to the people (in this case miners) — was a very life-affirming action to pursue. "Going to a miner in the bush and talking to him about how to use mercury, this shows him somebody cares about who he is and his individual health," a Liberian delegate said. "This can start to bring some sanity back to places where people no longer believe they matter" (E. Yarkpazuo, Liberia Planning Ministry, 2004 — Pers. Comm.).

Next to emissions from coal, ASM is the world's second largest source of mercury pollution. In much of the developing world — for instance across Africa where there are few coal-fired power plants — ASM is the main source of mercury pollution. Depending on the number of gold miners in a given year, 650 to 1000 tonnes of mercury are used to extract gold by creating amalgam. Various estimates propose the discharges from amalgamation and smelting in ASM account for one-tenth to one-third of the world's anthropogenic mercury pollution (Madison Declaration, 2007; Veiga and Baker, 2004; Swain et. al., 2007).

In spite of its centrality to the politics of mercury abatement, the UNEP Global Mercury Assessment (2002) scarcely mentions the role of ASM in global mercury pollution. Discussion of the issue is limited to a section on data gaps, which suggests "special attention" should be paid to mercury from ASM. Elsewhere, buried in a footnote, the authors admit their data is limited and that more study is needed. The Global Mercury Assessment was not the only place ASM was overlooked. Until recently, the data used to guide policymaking underestimated the use of mercury in gold mining and in vinyl chloride

monomer production, and overestimated its use in batteries and the chlor-alkali industry (Greer et. al., 2006). And in an otherwise fine account of the toxification of the Arctic, Cone (2005) makes no mention of the role of artisanal gold mining as a source of global mercury pollution, identifying only coal-burning power plants and chemical factories as culprits, reinforcing the point that ASM has remained below the radar of journalists, policymakers, and academia. As Porcella et. al. (1997) point out in the science community, particularly that part of it which studies atmospheric mercury emissions, "Published information on global Hg sources to the atmosphere has focused primarily on industrial and combustion sources from Europe and North America. Other anthropogenic and natural sources have not been characterized adequately. Consequently, the global balance of atmospheric Hg is incomplete..."

Indeed, it was not until the WorldWatch Institute published its annual State of the World report in 2006 that the environmental community finally recognized artisanal mining as "perhaps the most important global source of mercury pollution" (Greer et. al., 2006). Still, for a report that should have been mercury's equivalent of the Intergovernmental Panel on Climate Change, the 2002 Global Mercury Assessment's absence of sound data on ASM was a startling omission. The UN's approach to mercury pollution abatement presupposes that regulating byproduct emissions from coal and metals smelting will be addressed at the national level. This means its real targets are so-called intentional uses of mercury — industrial processes where elemental mercury is deliberately added. The small-scale gold mining industry is the world's biggest intentional user and polluter of elemental mercury. Further, if there is any mercury issue that requires international planning and coordination, it is ASM. Despite their magnitude, mercury emissions from thermoelectric production and minerals smelting have the advantage of being easily identifiable; there is little question about the source of the mercury, which must be coming out of this or that stack. Governments in every country know where large-scale smelting is occurring. At least in terms of policy — if not economics — the answer is a no-brainer: capture and retire the mercury before it departs the top of a stack. By contrast, mercury pollution from ASM is decentralized and diffuse. There are known to be artisanal miners in at least 55 countries on six continents; the industry involves around 15 million miners, including 4.5 million women,

and one-million children (Jennings, 1999; Veiga and Baker, 2004). In 2002, prior to the expansion of the current global gold rush, there were an estimated 160,000 artisanal mine sites around the world (Hinton, 2002).

2.4 Structural Problems of Intervention

At roughly the same time that UNEP and environmental groups were coalescing on global mercury issues, another UN agency, the Industrial Development Organisation (UNIDO), was starting a pilot program to address the role of mercury in ASM. In 2002, UNIDO, UNDP, and the Global Environment Facility (GEF), launched a six-country program — the Global Mercury Project (GMP) — to identify field methods and policy instruments for reducing mercury pollution released by artisanal and small-scale gold miners (Bernaudat, 2002). This project helped establish certain verities — mercury vapour inhalation, methylation of mercury in transboundary waterways, inefficiencies in extractive processes, child labour, extreme poverty — as constants in artisanal gold communities (Spiegel & Veiga, 2005).

Calls for global action to reduce mercury pollution from artisanal gold mining have been issued since the 1970s. Earlier efforts to address issues connected to ASM have been initiated by the World Bank, International Labour Organization, the mining industry, and European development agencies. UNIDO itself had since 1995 administered programs in Ghana, the Philippines, Venezuela, and Tanzania, where it promoted cleaner technology, environmental education for miners, and central processing centres where miners could all bring their ores (Pedro et. al., 2002).

Yet despite three decades of intervention activities, it is especially hard to point to successful projects, or to find places where less rather than more mercury is being used today. Because most mines are remote, scattered, and sometimes hostile to outsiders, tracking mercury use in gold mining can be anything from slogging through the jungle on foot to stumbling upon bloody internecine violence between hostile stakeholders. It is precisely the kind of situation cumbersome bureaucracies were not invented to manage. As a result, the collective efforts of international organizations have amounted mostly to workshops, reports, assessments, and calls for further study.

While the GMP attempted to overcome these difficulties by concentrating on the transfer of low-cost, locally available technology, by and large this was not enough to overcome serious weaknesses in the delivery of international assistance to artisanal miners. The GMP provided constructive educational and awareness raising seminars, but its successes in terms of physical reductions of mercury remained minor, given the overall global scale of the issue, one where 80-100 million people are affected. Critics of global efforts to reduce mercury pollution from ASM argue the weak results of international programs stem from excessive emphasis on quantifying the impact of mercury releases on public health and the environment, and too little attention to the political-economy of modern artisanal gold mining (Veiga and Hinton, 2002). As a result, interventions are designed without direct knowledge about the needs of miners. The technologies transferred to them are frequently unsuited to local conditions, and beyond the economic capacity of miners to afford and sustain (Hilson, 2006).

In addition to these issues, inadequate forms of funding also play a role in disrupting the progress of intervention. Though officially a $12 million project, roughly one-third of the GMP's resources came in the form of co-financing. Amongst the six countries involved in the project, no government dedicated actual dollars. This placed the burden of raising funds on the international community, at a time when many of the chief financiers — mainly the U.S. — have shifted development and environmental financing into other areas, leaving donor agencies to rely on partnerships with the private sector. Designing effective intervention into artisanal gold mining communities is costly and complex. At least in part, mercury pollution from ASM has not been abated because funding to the scale of the problem has never been allocated. As Greer (2006) observes, "the scale of the resources available to develop and promote solutions to miners has to date not been proportional to the scale of the global problem that mercury use and release in this sector represents."

But while some of the dilemmas with intervention can be attributed to insufficient funding, much of the problem with international programs stems from structural issues in the international system. UN agencies are increasingly deprived of the authority, resources, and

expertise to tackle global problems systematically. This dismantling of the UN began with the break-up of the Soviet Union, when funding for the United Nations decreased and more resources were shifted into bilateral agreements (Epstein, 2007). Yet despite decreasing legitimacy in some parts of the world, the UN and its numerous specialized agencies are still expected to provide solutions to most global problems (Sachs 2005; Urquhart, 2006; Judt, 2007). This has created a vacuum where direction comes from flailing bureaucracies chasing the wrong issues, and divided by questions about how to incorporate the ecological, economic, and sociological dimensions of ASM and mercury pollution into a consistent theory and practice of intervention.

ASM, with all of its dispersed, field-heavy activity, also poses a problem for the UN's cumbersome administrative complexity. The bureaucracy lacks the flexibility to disburse expeditiously the funds needed to operate in the field, where activities are most needed. Moreover, the UN's field presence in the minerals sector is next to nothing. In 2000, the UN downsized the revolving fund for natural resource exploration. This led to most field units being eliminated, along with the agency for Technical Cooperation for Development. Only two agencies, the Economic Commission for Africa (UNECA) and UN Latin America-Caribbean, even have minerals teams. Within UNECA — which is responsible for one of the fastest growing ASM sectors in Sub-Saharan Africa — these minerals teams are focused on policy, capacity building, best practices, and awareness campaigns (Pedro, 2004a-d).

With international law and institutions in retreat, most new opportunities for common action revolve around increasingly informal projects that establish partnerships among donors, development agencies, the United Nations, NGOs, and governments. These partnerships are viewed as ways of leveraging resources from a variety of existing sources, rather than taking new funding requests to international political leaders. So for example, the U.S. Environmental Protection Agency's Office for International Affairs (OIA) might direct funds toward an American NGO to conduct mercury abatement trainings with a partner organization in Mozambique. In theory, this methodology is beneficial because it requires little advanced administrative infrastructure, and avoids difficult political entanglements by keeping the mercury issue away from the public spotlight. But in practice, devolving

environmental intervention to the project-level means limited resources are devoted to the problem. The money that becomes available is often restricted by targets created for other purposes that do no apply to the specific issue being addressed. For instance, absolute reductions of mercury pollution are only one measure of the success of an intervention in artisanal gold mining communities. Yet if the money a government office uncovers for ASM was originally allocated for reducing global mercury pollution, this binds projects to absolute reductions, which may in fact be the wrong principle.

To give another example, when "projects" became the preferred means of environmental intervention, this led most groups with mercury and artisanal mining related interests to the GEF. The GEF collects money from donor countries and distributes it for environmental projects all over the world, operating like a World Bank for ecological management. It is organized by six focal areas: biodiversity, climate change, international waters, land degradation, ozone depletion, and persistent organic pollutants. None of these focal areas was designed to manage mercury or mining issues. As a result, ASM became part of the International Waters Portfolio, tying its targets to the prevention of methylmercury accumulation in global waters. But the bioaccumulation of methylmercury formed in aquatic and terrestrial ecosystems through discarded tailings and emissions to the atmosphere (which may become global), is only one aspect of the problem. Indeed, household and occupational exposure to mercury vapour and methylmercury in local fish are more urgent issues than global ecological threats (UNIDO, 2006; Castilhos et. al., 2006). Miners are routinely exposed to metallic mercury levels as high as 50,000 microgram per cubic metre (the WHO standard for metallic mercury in air is one-microgram per cubic metre for public exposure, and 25 micrograms for occupational exposure). Yet, to comply with the terms of the grant as the Executing Agency, UNIDO had to concentrate on direct pollution abatement activities, rather than the broader scope needed to address the suite of public health, local, and global ecological issues resulting from mercury use in artisanal gold mining.

Structural change to the UN system also aggravates an already difficult problem for working in ASM areas, namely the absence of trained field experts. "One of the greatest difficulties in reducing emissions and recognizing dangerous sites, is the scarcity of people who can

transfer knowledge about the issues" (Veiga, 1997b). The combination of inadequate expertise and the UN's increasing reliance on decentralized hiring practices means three things:

1. Project implementation is turned over to consultants.
2. Projects are increasingly short-lived.
3. There is little continued presence in the field.

Programs are typically funded for only 3-5 years; once project money is exhausted there is neither the mandate nor the manpower to maintain initiatives, nor preparation at any level of government to assume responsibility for the issue. Because there is no guarantee of project renewal, agencies look for whatever can bring financing for new projects. Rather than taking ten or fifteen years to concentrate on an issue, initiatives are quickly abandoned, making enduring achievements minimal and progress hard to measure. Pressure to locate new sources of funding means that international organizations routinely shift priorities to harmonize with whatever trend is dominating the cultures of various donor agencies.

Indeed many of the failures of intervention are in fact failures of concentration. Most programs are pilots, meaning they have no long-term financing. As a result, follow-up with miners ranges from inconsistent to non-existent. Whatever technologies were introduced are not maintained, and miners revert to traditional methods of processing gold. A typical example of this scenario is UNIDO's Mercury Pollution Abatement Program in Western Ghana, a project which involved distributing free retorts and conducting awareness campaigns (Babut et. al, 2003). A processing centre was built in Japa, which was reportedly enjoyed by miners. Yet no official has visited the site since the end of the project cycle in 2003 (E. Asafu-Adjaye, UNIDO-Ghana, 2006 – Pers. Comm.). Amongst other things, the brevity of project-cycles miscalculates the timescale needed for development to take root. The emphasis on short-term, narrowly defined projects reduces the broad interdisciplinary thinking demanded by most complex environmental problems. As a result, priorities emerge artificially and the political ethics needed to guide sustainable pollution abatement are ignored, or never developed.

2.5 Ecocentrism and Technocentrism

At the UNEP Pretoria meeting (2004), the idea of dealing with the role of mercury in artisanal gold mining met resistance from many conference delegates, amongst whom a philosophical rift emerged between ecocentric and technocentric policy practitioners (on relationship between eco- and technocentrism see Thompson, 1998). The proponents of an ecocentric approach viewed ASM as principally a mercury problem, and specifically a methylmercury problem. They argued that artisanal and small-scale gold mining is fundamentally destructive to the environment, and the only plausible means of mitigating environmental degradation is to prevent people from mining. Ecocentrists supported top-down policy initiatives such as restricting the trade of mercury and stringent regulatory enforcement, framing intervention as part of a campaign to protect global fisheries. As the Zero Mercury alliance writes in its policy primer (2005): "Further actions must be undertaken to drastically reduce mercury pollution in order to bring mercury levels down to background levels over time and to preserve the viability of fish as one of the world's most important protein sources."

By contrast, technocentrists characterized ASM as a less than ideal but ultimately inevitable survival strategy. They argued that trying to eliminate mining would only further impoverish an already vulnerable part of the population, making the enforcement of anti-mining laws impractical, potentially volatile, and perhaps unethical. The preferred policy for technocentrists was technology transfer to improve the efficiency, sustainability, and safety of artisanal mining — in effect to legitimize it.

In political theory, an ecocentric ethic is one which views human activity as something that is constrained by ecological conditions. When a specialized activity alters the homeostasis of an ecosystem, this is a threat to the very system which makes life, and therefore that specialized activity, possible. Applied to politics, ecocentrism is a natural ally of the precautionary principle: both ideologies advise cautious relations wherever human activity has the potential to change ecological systems. Less obvious is the attraction between strict ecocentrism and top-down, even draconian policymaking. It is virtually impossible to identify human behaviour that does not alter ecosystems. While the degree of perturbation is

obviously diverse, there is no action that does not somehow draw on the energies of nature. The only way a person can hope to create no impact on the environment is by lying in bed and holding his breath. But if one believes that the state of the environment is a race against time, there is a logic to asking whether the snail's pace of democracy is going to produce too little change, far too late to avert ecological collapse. For rapid environmental policy change, authoritarianism often proves a far more efficient vehicle than democracy, as Diamond (2005) observes in his analyses of environmental reform in the Dominican Republic and Japan, and Lubow (2007) finds in his portrait of the Brazilian city, Curitiba.

Technocentrism, meanwhile, is a variety of anthropocentrism. Its starting point for policymaking is the place of humans in the environment, rather than the state of the environment itself. It might be suggested that all policy in all of history is anthropocentric, since the governance of human beings is generally the purpose of political institutions. But in modern political terms anthropocentrism counterbalances the idea that public policy is purely a means to driving industrial and macroeconomic growth. The instruments of anthropocentrism are individual and group rights, popular education, and social welfare systems. An anthropocentric ethic is one which views human dignity as the organizing principle of social policy, and where interventions by the state are judged on whether they support a person's capability not just to survive but to flourish. Technocentrism grows out of the educational motive of anthropocentrism, particularly where it seems that advancing technological knowledge will improve productivity, generate capital, and hopefully provide people greater ease and more choices.

But as Eckersley (1992) points out, few issues can be defined as purely ecocentric or technocentric. Instead, most fall between these two poles. Mercury pollution from artisanal gold mining is precisely this kind of in-between problem: it blurs most traditional boundaries between environmental and economic development priorities. In terms of policy, this interdisciplinarity adds to the confusion about whether ASM falls under the auspices of ecological, occupational, or industrial policy. This explains why so many different kinds of political agencies have examined the effect of artisanal mining on the environment: the International Labour Organisation is involved from an occupational safety and labour rights

perspective, the World Bank from an economic development perspective, the GEF from an ecological position, UNIDO for industrial development, UNECE from a policy and poverty alleviation point of view, and the Mining Industry from its interest in resource distribution. Every one of these groups, agencies, and organizations brings a valid perspective about ASM to the table. Yet none possesses a clear mandate to become the lead agency the way the World Food Program is the focal point for responses to famine, or the World Health Organisation is responsible for monitoring the spread of disease.

Neither technocentric nor ecocentric ethics offers an appropriately holistic perspective to negotiate solutions to mercury pollution from ASM. Common sense suggests that any approach to intervention must be a middle-path that unites anthropocentric and ecocentric values under a big tent. Indeed the imperative to alleviate poverty is as potent as the imperative to protect the environment; neither can ultimately be said to be a higher value, just as neither can ultimately be separated from the other. Given the overlapping priorities of ASM, it is also clear that unifying these two ethical streams may be the only way to aggregate enough resources and technical knowledge to confront the issue. However, this unification cannot occur unless ecocentrists reevaluate the perception of mercury-use as uniformly destructive.

Indeed, mercury is increasingly reaching the status of a taboo element, not unlike many dietary taboos in religious and tribal systems which associate impurity with even incidental contact with specific foods. So long as mercury is used, it is unlikely that any method can eliminate pollution altogether; but closed circuit approaches can greatly reduce mercury consumption. Yet a point often missed by ecocentrists — who are generally unfamiliar with mining operations — is that mercury use differs widely from place to place, and the way miners go about amalgamating gold influences the scale of pollution. Miners can introduce mercury at two points: the beginning of mineral processing, or later in the process after ores have already been concentrated by panning. If miners are amalgamating gravity concentrates, the distribution of mercury from the artisanal gold mining process is roughly 70 percent released as vapour, 20 percent discharged in tailings, and 10 percent released at gold shops. When miners amalgamate whole ores, the numbers are reversed and 70 percent

is lost to tailings (Veiga and Meech, 1995a). Either way, once this amalgam is formed, mercury is removed in two stages. Initially, the amalgam is squeezed inside a cloth, the way one rings out a towel to shake off water. What remains is an amalgam of roughly 60 percent gold. The second step is for the amalgam to be roasted, which often occurs in the open-air, either in a pan on a stovetop or using a blowtorch. Roasting brings the amalgam to between 90-95 percent purity — enough to sell. This gold will then be refined again when it reaches a smelter with more sophisticated purification techniques. In cases where miners burn amalgam at low temperatures, for example in open fires, they stop the smelting process when they see the surface of the amalgam turn yellow. In these cases the mercury in the interior of the amalgam remains unvolatilized; this produces a gold *doré* consisting of approximately 20 percent mercury. The mercury is later released in the gold shops when miners sell their gold and the gold buyers melt the *doré* to remove excess mercury and other impurities such as grains of minerals (Veiga and Baker, 2004).

Throughout these stages, mercury losses occur at three points: (1) in the tailings discarded after separating, crushing, and grinding the ores (with the ratio of lost Hg:Au production depending on the type of operation, such as copper-amalgamating plates, the use of ball mills, adding Hg in the sluice boxes, etc.); (2) during roasting of amalgam in open pans without any mercury condensing system; and (3) in gold shops where doré is melted and refined before going further up the supply chain toward jewelry manufacturers and the retail sector. With proper technologies, education, and institutional support, mercury pollution from all of these sources can be significantly reduced, and the fear of widespread toxification of entire regions eliminated without injury to the small-scale gold mining economy. At the same time, it is a myth that there is a technological solution for every ASM site.

For example, when miners practice whole-ore amalgamation, mercury losses can be more than three-times higher than gold production (ratio Hg lost: Au produced > 3). By contrast, when gravity concentrates are amalgamated the ratio of Hg lost: Au produced can be reduced to 1:1 when retorts are not used, or even 0.001 when the amalgamation process involves efficient retorts (Veiga and Hinton, 2002).

While technocentrism is more conciliatory to miners' use of mercury, technological solutions are rarely silver bullets. It is not always the case that addressing mining methods is even the most direct route to protecting the environment (Telmer et. al., 2006a). Furthermore, technology transfer only has a chance of succeeding as a form of poverty alleviation when it is matched appropriately to what miners need: there are many instances where this does not happen (Hilson, 2006). Finally, given the paucity of trained experts in the field, inefficient bureaucracy, and the resistance of miners to alter prevailing customs, there are intense barriers to effectively transferring technology. Often by the time the appropriate meetings are taken, budget cycles fixed, and teams assembled the opportunity for preventive action is lost, or miners have moved on to another site or neighboring country.

The practical result of the divide between ecocentric and technocentric policymaking is that most governments do not know whether to assist or arrest artisanal miners. While some countries have a national office mandated to formalize small-scale mining, elsewhere miners are subjected to military intervention. In still other places, the military itself is secretly active in mining operations. Even where countries have offices to deal with artisanal gold mining, there is rarely consensus on what policies to pursue, nor regional or international diplomacy efforts to build consensus. Although it's clear some form of regulatory intervention is needed, it's not clear what that intervention is. This uncertainty is exacerbated by a lack of integration between ecocentric mercury abatement professionals and the rural development specialists needed to integrate small-scale mining into poverty alleviation programs.

2.6 The Ethics of Intervention

At an afternoon session of the UNEP Pretoria meeting (2004), an Eritrean geologist delivered an extensive talk about the role of ASM in Eritrea. Unlike most other places, Eritrea had conducted a thorough study of its small-scale gold mining economy, though by then it was already a decade old. Its conclusion was that artisanal mining is a longstanding survival strategy, used by people throughout history to compensate for downward turns in economic sustainability. "Artisanal gold mining is "drought-driven work," the delegate observed. This statement can be supported by much of the key policy literature on ASM.

The industry-sponsored 2002 report, Minerals, Mining, and Sustainable Development (MMSD) asserts that "Artisanal mining will persist as long as poverty drives it," and projects a trebling of miners in Sub-Saharan Africa by 2012, matching the rise of people living in extreme poverty. (Indeed, within the year it emerged that Eritrea was in the midst of a famine, a fact the country's geologists already knew — despite attempts by the government to hide it — because they were witnessing increasing numbers of artisanal miners in the bush.) The rise of ASM in the developing world in the 1980s and 1990s, and the mercury use that accompanied it, led to ominous predictions now proving accurate. "If this growth in the use of Hg continues," writes Lacerda (1997), "its impact on human and environmental health will reach alarming proportions in the 21st century."

Established in 1972 after the UN Conference on Human Development, the mandate of UNEP is primarily ecocentric. Bureaucracies are governed by the programs they administer, and UNEP hosts the secretariats for several ecological conventions including ozone depletion, trade in endangered species, biological diversity, migratory species, and toxics — all ecocentric policy frameworks. Although the international aid community has adapted the poverty alleviation rhetoric of the Millennium Development Goals (GEF, 2005), neither UNEP nor the NGO community was prepared to integrate mercury and economic development. The platform of the NGO alliance remains based on a doctrine that intentional uses of mercury can be eliminated through economically viable alternatives. When the UNEP Governing Council met in 2003, the Mercury Working Group told the NY Times (Lacey, 2003): "There are alternatives to mercury, but there is no alternative to international cooperation," the implication being that mercury had replacements in all sectors, and the obstacle to the elimination of mercury pollution was bureaucratic malaise. Anti-mercury advocates were convinced that if the chlor-alkali industry can make chlorine without mercury and mercury thermometers can be replaced by digital ones, there must also be economically rational mercury-free alternatives for ASM (Hylander and Plath, 2006). Likewise, in their publications NGOs advocated that mercury was not essential to gold recovery; that it was purely a matter of custom that mercury remained in use; and that miners might introduce the practice of blowing on gold dust to eliminate their need for mercury amalgamation. Yet inside the policy, journalistic, and NGO communities there was limited

knowledge about the economics of mercury use in ASM, or about the realities of mineral processing. Indeed it was hard to find anybody from the governmental, non-governmental, or intergovernmental sectors who had visited an artisanal gold mine.

The small-scale gold economy is to rural areas what slums and favelas are to urban ones: it is an informal place of refuge created by rising inequality between rich and poor. Consequently, the political and economic drivers of mercury emissions from ASM are unlike other forms of mercury pollution. Whereas emissions from coal-fired power plants or gold refineries are byproducts of prosperity — electricity generation or industrial-scale mining require large inputs of capital — mercury pollution from ASM is a byproduct of social and economic deterioration. Particularly in Sub-Saharan Africa, but also in other regions, the explosion of artisanal mining is part of a greater movement into informal economies as a result of failing small-scale agricultural and industry (De Soto, 2000; Epstein, 2007).

Different explanations are offered for why more traditional economies are breaking down, and leading to more gold mining. One critical factor is that the depletion of soils and aging of seed supplies is making it harder for farmers to produce sufficient crops to subsist, much less turn a profit. However, the chief cause is widely considered to be political not natural. This of course is the controversial theory that increasing global poverty is a negative feedback of globalization, in particular neoliberal structural adjustment programs. These policies encouraged governments to privatize resource industries and public services, and invest less in social welfare and subsidies for the agricultural sector (Etemad and Salmasi, 2003; Hilson and Potter, 2005; Epstein, 2007). Overall, such policies have made it harder to access markets, while exposing rural populations to a consumer and cash economy for which they lack the wages and capital to participate. As the UN Commission on State Sovereignty and Intervention puts it:

"The trade policies applied by many richer industrialized countries, unfairly disadvantaging or restricting access to markets, together with the terms of trade being experienced by many developing countries, have not made any easier...the capacity to meet the social and economic development needs of their populations" (Responsibility to Protect, 2001).

In many cases, gold mining is also an auxiliary, seasonal, activity to normal economic routines, a way of compensating for lost income during periods of drought or hardship. To take one example, Guinea's gold miners work seasonally, as if the goldfields are their spring and summer harvest, before the rains come and raise the water tables above workable levels. When this happens, miners return to their farms, and await the next dry season. This pattern has been repeating itself for more than a thousand years (Veiga et. al., 2006b). Gold harvested in this way looks more like a renewable resource than the boom-bust commodity normally imagined for gold mining. Veiga and Beinhoff (1997) write: "Clearly the gold panners who conduct very small-scale mining for their subsistence will exist for many decades, as long as they discover alluvial gold in remote regions."

That failing agricultural economies and rising rates of extreme poverty could stimulate more mercury pollution was not something widely considered prior to the UNEP Pretoria meeting (2004). By U.S. law, mercury remains a commodity-with-value, a regulatory term which means it is not subject to complex and expensive hazardous waste restrictions, and can be traded freely on the market. Most North American mercury waste travels to Bethlehem Apparatus, a refinery in Pennsylvania, where it is purified and sold for shipment overseas. Mercury is legally traded to and from virtually every major maritime hub: the U.S., Netherlands, Spain, China, Japan, Algeria, South Africa, Australia, India, and Great Britain. There are other intra- and inter-continental transfers routes going from Canada to the U.S., Germany and Switzerland to the Netherlands, Brazil to Guyana, Tanzania to Uganda, as well as numerous smuggling operations (Veiga et. al., 2006a). And there are many inconsistencies with this policy: companies with large mercury stocks can export thousands of tonnes of high-grade elemental mercury, but cannot transfer equipment to miners in developing countries if it contains even trace amounts of lower-grade mercury. Teck Cominco, for example, is required to bury all the equipment from its mine at Pinchi Lake, British Columbia, because it contains grams of mercury, even though the company has in the past exported 4000 tonnes of mercury (M. Veiga, UBC-UNIDO, 2006, Pers. Comm.).

From 1960-2000, the demand for mercury fell from 9000 tonnes to fewer than 4000 tonnes (Greer et. al., 2006). Amongst others, the chlor-alkali industry, manufacturers of medical equipment, auto-manufacturers, electronics, and defense industries are phasing mercury out of their processes, reducing the net demand. But while the demand for mercury in the developed world is decreasing, mercury pollution in the developing world is increasing (Madison Declaration, 2007). Artisanal gold mining is at the centre of this story. In 2000, the cost of mercury hovered around $4-5 dollars per kilogram. The overall decline in demand resulted in a surplus of mercury on the market, and prices dropped to just five-percent of peak levels.

The demand for mercury increased during the period of market uncertainty that followed September 11th, 2001, when investors reverted to a reliable favourite and gold experienced its most electric surge in 25 years. The ascent of gold caused a surge of artisanal mining so strong, it surprised even witnesses of the 1980s gold rush in Brazil. In Indonesia, UNIDO's project staff observed a quadrupling of dredges operating on the Kahayan River in Central Kalimantan — from 2000 to 8000 — over just a two year period. Rising gold prices results in more small-scale mining, which is more elastic than industrial-scale mining. The low barriers to entry allow artisanal miners a temporary advantage, as multinational companies assemble the capital to meet rising demand. Mercury and gold are interdependent commodities: between 2000-2002 mercury imports to Sub-Saharan Africa rose from 34 to 57 tonnes (UNIDO, 2007). As the price of gold increased sharply, reaching US $725/oz. (troy ounce) and an average price of US $19.3/g on May 12, 2006, so did the price of mercury. From 2002-2006, the average price of mercury climbed from US $4.50/kg to an average of US $18.8/kg (Platt's Metals Week, 2007). In some artisanal mining areas, the price reached as much as US $150/kg.

Even at these prices, the cost of using mercury is often still not high enough to encourage conservation or alternative technologies; not when gold is over $600 per ounce. Yet experience in places like Mozambique demonstrates that when local mercury prices are at least 25 times the international fixed rate, there is less overall use, more conservation, and

openness to technological innovation.[1] Why not, therefore, create policies that increase the price of mercury? As Veiga and Meech (1999) argue: "If more control were exerted on mercury sales, the price would increase (even with smuggling) and the miners would probably stop using mercury in riffled sluices to amalgamate the whole ore, and stop spreading mercury on the ground."

In 2005, this supply-side approach received a major boost when the European Union announced it would ban mercury trading by 2011, a significant move given the EU's possession of 12,000 tonnes of mercury (Maxson, 2004b). In the right regulatory climate, a foundation or development agency could also end new inputs of mercury to the economy by cornering the market and retiring the stockpiles. The entire exchange value of the mercury market is only about $60 million, nothing by the standards of the global metals market.[2] By targeting three kinds of sources — the chloralkali industry, mining companies, and government reserves — many of the biggest stockpiles and byproduct sources could be taken off the market. The chloralkali industry has long been in the process of moving away from using mercury as a cathode for caustic soda production. Likewise, the mercury produced by the mining industry, in particular the gold sector, has little economic benefit for companies, even with mercury prices rising fivefold over the last few years. Finally, governments are also large holders of mercury supplies collected from years of using mercury in the manufacturing of weapons. In the U.S., the Department of Defense has formally committed to keeping its 4400 ton stockpile locked in three separate sights around the country (Siegel, 2001).

Yet in the U.S. and Canada, retiring mercury permanently is far from being national policy, and successive governments have been slow to recognize the benefits of developing a long-term storage plan to prevent large stockpiles from entering the open market. It was reported recently that the Department of Energy, which holds another 1300 tons of mercury, was considering dumping its stockpile on the market (Hawthorne, 2006).

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[1] Report from Government of Mozambique, UNEP Awareness Raising Workshop, Pretoria, SA, June 2004.
[2] Calculated as 3000 t/a at $20-25 USD. The amount has significantly increased along with the rise of the price of mercury since Greer suggested $25 million as a baseline figure (2006).

Meanwhile, the U.S. Commerce Department would likely oppose any economic restrictions on supply, be it tariffs, bans, or retirement (M. Dieu, US EPA-Office of International Affairs, 2005 – Pers. Comm.). But intervening in the mercury market poses no threat to any country's GDP. At the same time, without statutory clarity about who bears responsibility for storing or sequestering mercury, there is little to prevent mercury supplies from being dumped on the market, depressing the international price, and making ASM even more attractive.

To prevent this, the mercury market needs what has existed for decades in the gold market: strategic hording that balances the price against gold. This requires a short-term intervention in the marketplace to create incentives for companies and governments to assemble stockpiles, coupled with a long-term retirement strategy.[3] It is possible for such long-term reduction efforts to be achieved without any one agency assuming the lead, much the way the industrial gold mining sector recently created the International Cyanide Management Code. In this case, retirement strategies would include all active participants in the mercury market, but actions would be decentralized and voluntary. In the Cyanide Code, signatories include mining companies (nine at the initial signing with more expected to join), as well as government agencies, cyanide manufacturers, and transport companies. Though voluntary in principle, the code is financed by what amounts to a tax on the signatories, who submit to third-party auditing of their cyanide management practices, as well as consultations with communities to explain how cyanide is used and to document and report accidents whenever they occur. The companies involved also agree to meet specific standards for holding tanks, with auditing teams inspecting sites to ensure the standards are being met (Kosich, 2005). While international mercury management presents a drastically different landscape from cyanide, the model of gathering public and private sector stakeholders together with

[3]A pilot of this sort was attempted in 2002, when the Natural Resources Defense Council of Maine teamed with Mallinkrodt, the former owner of a chlor-alkali facility, to retire a stockpile of mercury rendered useless when the plant closed. The parties agreed to share the costs of storage for eight years, while the EPA committed to work on a long-term plan for permanently retiring large stockpiles of mercury. Mallinkrodt and NRDC located a private facility in the Midwest that was willing to store the mercury for $200,000 per year. The hope was this would establish a precedent for the polluter pays principle. But after September 11th, the U.S. government determined that private facilities were not equipped with the security needed to protect mercury. The deal was annulled, the mercury dumped on the open market, and the EPA never produced its long-term retirement strategy.

suppliers, manufacturers, and transporters is transferable. However, a voluntary system poses a potential problem of continuity once the state is no longer serving in an oversight capacity. If a company should crumble or be bought out, what then for the fate of its retired mercury?

Still, even if local mercury prices could be dramatically altered through trade policy, there are other reasons to approach the choking of supply or taxing of commerce cautiously. Because ASM is a last-resort survival economy, sudden policy changes affecting global supply will not deter artisanal gold mining. Likewise, given the remoteness of much artisanal mining and the absence of capital amongst miners, it is unlikely that cleaner technologies will be transferred by market forces alone. Instead, the more plausible scenario is one that already exists in many places, including Ghana, Indonesia, and Zimbabwe: the empowerment of mercury brokers.

The value of mercury is 1000 times less than the value of gold. Even at inflated local prices, mercury amalgamation remains the cheapest reagent for extracting gold, with a cost equivalent of 0.08 grams for gold per tonne of ore processed. When mercury prices rise high enough to exclude miners from the market, there are brokers who step in to loan mercury in exchange for gold sold to them at below-market prices (Spiegel, et. al., 2006). In effect cutting-off miners from mercury is a kind of regressive tax that forces the group at the lowest economic rung to take a pay-cut, without necessarily reducing mercury pollution.

As a result, supply-side trade policy is only as effective — and as ethical — as the demand-side strategy for intervention in ASM communities. Ethically, supply-side policies must be wedded to increased financing for field-based interventions with miners (Telmer, 2006). Mercury plays an instrumental, if not essential, role in making ASM a feasible economic alternative: in places where mercury is not used, miners recover only coarse gold grains, and their productivity decreases by 20-40 percent (Veiga et. al., 2006c). Were the price of mercury to rise dramatically, miners would need access to the education, capital, and technologies that enable ecological protection without inhibiting economic development.

The ethics of ecocentrism and technocentrism would have to be treated as one basket of human and ecological needs.

2.7 Political Ethics for a New Body Politic

At the conclusion of discussions at the UNEP Pretoria meeting (2004), a delegate from Swaziland approached an observer attending the workshop. She was at a loss, she explained, to understand how to integrate any of the information delivered in lectures and slide-shows during the past week. There was no government office in her country dedicated to mercury; there probably was no money to initiate a study or assemble a national inventory. Once the conference dispersed, with whom could she follow-up? What was she supposed to do? She found the crash course in mercury science and policy disorienting, overwhelming, and more than a little upsetting. Here the United Nations was exuding concern about a profound new threat, yet offering little practical guidance or commitment to leadership.

This delegate was not alone in her sense of abandonment. Many environmental bureaus in Africa, and elsewhere in the developing world, operate on shoestring budgets, with officials such as those congregating in Pretoria earning perhaps $100 per month. Without support from somewhere, there is little chance of expanding the mandate of these departments. In more than four years since the UNEP Governing Council endorsed the findings of the Chemicals Division, no international or regional policy organization has stepped up to fill this void for mercury pollution from artisanal mining, or any mercury pollution for that matter.

Historically, reports such as the Global Mercury Assessment functioned as preludes to a bigger push by global institutions to bring governments together on international public policy. It has not been uncommon for this process to take a decade, or longer. The 1987 report of the Brundtland Commission on Sustainable Development — which was formed in 1983 and itself followed the issuance of numerous other global reports on the environment — did not manifest as international law until the 1992 Earth Summit in Rio. Even then, binding language on climate change was not negotiated until 1997, a full decade after the publication of *Our Common Future*. And still the outcomes of Rio and Kyoto are hazy.

Good democratic governance can take longer to mature than either the science or advocacy communities would perhaps prefer.

But environmental politics have become increasingly polarized and show little evidence of progress. As recently as February 2007 in the 24th session of the Governing Council/Global Ministerial Environment Forum of the United Nations Environment Programme, efforts to create binding international targets were thwarted for the third time in six years by a small, but powerful, block led by the U.S., Canada, and India (Canadian Press, 2007). Yet if there is to be progress on global mercury abatement, it is imperative for the international community to have consistent and credible standards to guide intergovernmental practice. Delegating responsibility for the governance of mercury and other environmental issues exclusively to "project" status results in a system too decentralized and too unaccountable to expect significant progress.

At the same time, widespread disillusion with the efficacy of international environmental law has paralyzed the will toward collective action. Establishing a new instrument of international law and the secretariat to administer it, be it a protocol to the Stockholm Convention or an original convention, would cost upwards of $50 million (P. Huidobro, UNIDO, 2007 – Pers. Comm.). For roughly the equivalent cost, virtually all the mercury in circulation could be consolidated and retired. Likewise, $50 million could support long-term fieldwork in two-dozen countries, instead of financing yet more bureaucracy to feed the endless stream of talks, conferences, and workshops. Nonetheless, it is hard — perhaps impossible — to imagine how any such grand initiatives can occur without coordination or leadership. The principles needed for determining global courses of action are not likely to occur spontaneously. As a scientific discipline and policy discourse, the ASM and mercury abatement policy community is little more than a decade old; its body politic is still coalescing around core ideas and values. It needs coordination by a credible international institution, one capable of taking the ethics of intervention from mere moral dynamite to effective international practice.

3 THE MYTH OF ALTERNATIVE LIVELIHOODS

Gold wins its way where angels might despair.

(A.W. Kinglake)

And God created the two precious metals, gold and silver, to serve as the measure of value of all commodities. They are also generally used by men as a store or treasure. For although other goods are sometimes stored it is only with the intention of acquiring gold or silver. For other goods are subject to the fluctuations of the market, from which they are immune.

(Ibn Khaldun)

3.1 The Polemics of Mercury and Poverty

In any applied discipline, field, or science there are certain paradigmatic questions that define the contours of research and experimentation. Left unresolved, these questions create polemics which divide professional and academic communities, and interfere with the delivery of policy prescriptions. The study of the small-scale mining sector in developing countries is yet an emerging science; much of its terrain is unmapped, its hard edges still being determined, and its aspirations coming into focus. Within this decade-old community of professional ASM experts, one obstacle preventing the design and implementation of effective policy — domestic and international — has been inadequate concentration on the economic and anthropological dynamics of small-scale mining communities (Heemskerk, 2005; Hilson, 2006).

With respect to mercury pollution, an outcome of this gap in research and intellectual attention is the prolonged anxiety over whether to promote the expansion or reduction of artisanal gold mining. In policymaking situations, this polemic divides people into two camps: those who approach ASM as an issue of *sustainable livelihoods*, and those who view it in terms of *alternative livelihoods*. The similarity of the two terms leaves an impression that they are feathers of the same bird, especially since both refer to the question of what policies should be formulated to address artisanal mining. This, however, is their only commonality. When policy professionals use sustainable livelihoods it implies consideration of policies such as technical and economic assistance, conflict resolution, and human rights

recognition (Hinton, 2005a). By contrast, alternative livelihoods is about creating laws or economic incentives to transfer people out of artisanal mining altogether.

Unfortunately, there are also occasions when these terms are used interchangeably, such as when alternative livelihoods deals with industrial activities that mining communities might pursue after a gold rush (Otchere et. al., 2004; Hinton et. al., 2003). These discussions about post-mining activities such as fish farming, brick production, cattle ranching, or agricultural development are not meant to replace artisanal mining while gold mining is productive. Instead, they fall into the category of economic diversification after the gold rush. Post-gold economic diversification is not the subject of this chapter. Rather, the specific concept of alternative livelihoods toward which this chapter is aimed is one where mining is framed as something that can be stopped by political or economic intervention.

Indeed, one could argue that the only way to achieve meaningful reductions in global mercury pollution is to reduce — and ultimately eliminate — the industries producing the pollution. Given the miserable state in which gold mining can leave the environment, its legacy of pollution and resource depletion, and the boom-bust economic cycles to which gold mining communities are subjected, could the right answer not be the end of gold? Should international diplomacy and national policymaking efforts not be dedicated to discouraging people from becoming gold miners by directing them to alternative livelihoods?

It is possible to observe this debate being rehearsed in numerous policy settings. In international conferences, ecocentric delegates debate technocentric delegates over whether to pursue ways to eliminate artisanal mining. For bureaus of environmental protection whose mandate is ecological management, artisanal gold mining is an intolerable activity. Likewise, mining companies confronted with artisanal miners working on and around their concessions have traditionally preferred to see ASM swept away. There are also many mining ministries which waver over whether to tolerate and formalize artisanal miners, or criminalize and prosecute them.

While understandable, proposing as a solution that all miners find alternative livelihoods is not a solution at all. In all its diverse forms, mercury pollution is linked to essential economic activities, chief among them coal production. Yet it is hard to argue that because of mercury pollution the coal industry — still among the vehicles of industrial growth after hundreds of years — ought to be dismantled. More to the point, promoting alternative livelihoods for artisanal gold miners is not simply a matter of providing job training for other industries. This is the myth of alternative livelihoods. Gold rushes are an economic force like few others: once gold mining has begun, there is little chance of pushing it back. Further, the motivation to become miners is propelled as much by necessity as by choice. "Artisanal mining will persist for as long as poverty drives it" (MMSD, 2002). To redirect miners into other livelihoods requires capital, infrastructure, and access to markets. Typically, the best hope of accumulating such capital is in the gold already being extracted.

Several commentators have noted that introducing environmental intervention to artisanal gold mining communities requires its own set of principles, different from the way such interventions would be conceived for wealthier societies. "Concepts such as conservation, heritage values, and aesthetics, that are commonly established principles in developed countries, are superseded by the struggle for survival and need for employment in poorer countries where choices are few and people are unable to plan beyond their immediate future" (Veiga et. al., 2001). Put differently, in poor countries "environmental issues are poverty issues" (A. Pedro, UNECA – UN Economic Commission for Africa, 2006 – Pers. Comm.).

Even advocacy groups which reject much mainstream thinking about the essential place of mining in modern development, concede that artisanal mining at least has the potential to generate capital that contributes to local economic development (C. Coumans, MiningWatch Canada, 2005, Pers. Comm.). Likewise, most UN agencies working on the issue promote artisanal mining as a means of poverty alleviation (Pedro, 2004a-d).

3.2 The Gold Souk of Khartoum

The great gold souk of Khartoum — famous through the ages as an exporter to the world — occupies an entire square block adjoining the central bus station and the city's biggest mosque. It is a precious metals market so abundant in jewels that even street vendors trade in gold. Khartoum is a sprawling city without a main commercial district or downtown core. In many ways, the souk is the centre of the city.

For the most part, shoppers circulate around the perimeter of the market, competing for space with a vibrant exchange in used cellphones. But the heart of the souk is an open-air interior courtyard used for smelting, smithing, trading, and offering the afternoon prayer.

Fig. 2 – Outside Khartoum gold market

From the courtyard the stairs wind up three more floors housing jewelry manufacturers. These workshops specialize in reprocessing scrap metals recycled through a complex East African and Middle Eastern trade network, of which Dubai is the uncontested hub.

Ninety-five percent of all gold trading conducted in the gold souk of Khartoum is in imported recycled metal, rather than raw gold arriving from artisanal mines located in the distant corners of the country. Officially, the Sudan produces just five tonnes of gold per annum, all from one mine operated by a French company in the Northeast (GFMS, 2005). But there is much that is omitted from the official ledgers. This is especially true in parts of the country where Khartoum's authority is limited, and gold serves more bellicose purposes.

The Sudan, Africa's biggest country, has four principal artisanal gold mining areas. Near the towns of Kurmuk and Khor Yabus on the headwaters of the Blue Nile along the Ethiopian border, there are 100,000-200,000 miners working deposits on both sides of the frontier; in the Bayuda Desert of Northern Sudan 5000-10,000 miners compete for resources with

mining companies recently issued exploration licenses; in the Nuba Mountains to the west of the White Nile, there is an area believed to involve several hundred miners; finally in Southern Sudan gold is mined artisanally and smuggled across the border into Kenya. During the long civil war between the North and South, the Sudanese People's Liberation Army relied on this gold to finance its operations and traffic in arms, an arrangement similar to that between Congolese rebels and Ugandan gold traders documented by Human Rights Watch (2005).

As a result, the gold souk of Khartoum is not primarily a trading post for artisanal gold. This makes it all the more surprising to find that background mercury levels rise exponentially deeper into the sanctum of the souk. The Geological Research Authority of Sudan found that average mercury levels were 29,000 nanograms per cubic metre inside the marketplace, compared to just 39 nanograms outside the market. Equally perplexing is the legal trade in elemental mercury, which can be purchased in the souk for Sufi medicinal practices, as well as another more obscure use.

From the third floor of the souk a small staircase leads to a flat rooftop. The roof — which overlooks the bus station and many half-finished buildings — is used primarily for discarding waste; old chairs, cardboard boxes with batteries and light bulbs, the odd piece of pipe. But in one corner there is a man crouched over a large bowl. Next to him is a pail of water and a small pile of dirt. His posture is oddly familiar, but so out of context in this environment that it takes a moment to recognize what he is doing. Here in the centre of Khartoum, this man on the roof is panning gold from a slag of cigarette butts and pebbles. He scowls as visitors approach. When he lifts his arms to drain water from the pan, he exposes the tip of a knife strapped above his elbow.

Fig. 3 – Sudanese panner mining on roof

In fact, this solitary panner is one of many

dozens of "miners" who gather in the souk at daybreak to scoop dust that settles on the floors during goldsmithing and smelting. From the souk, most people take what they collect to the banks of the River Nile to pan and amalgamate the gold dust. The undocumented presence of these urban miners explains the sale of mercury. But this activity represents something more prescient than just another source of mercury pollution: it is the absolute bottom of an intricate global gold supply chain. The miners' earnings cannot amount to much. Yet this panning is still productive enough to keep them returning to scavenge the offal for minute particles of gold. Even this low on the supply chain, artisanal gold mining is a compelling livelihood strategy.

3.3 The End of Adventure

It is not hard to appreciate the popularity of gold mining among the rural, and, at least in Khartoum, the urban poor. Those who label gold as an antiquated relic of history miss an important fact: especially for women, throughout the developing world gold remains a vital currency. Gold mining is part of a living economy.

Artisanal gold mining is expanding faster than at any time in history. A high gold price is one reason for this surge: the peak of the current spike occurred May 12, 2006 when the price of gold hit $US 725/oz., the highest since the all time modern peak of $US 850/oz., Jan. 25, 1980. Yet the 21st century rush started before the international fix skyrocketed at the outset of this millennium. More than high international prices, it is a transformation in the profile of miners that is giving rise to the search for gold. There are today as many people living in extreme poverty as inhabited the entire world a century ago (Wright, 2004). Combined with failing local economies, and failing states, population growth and extreme poverty are creating a perfect storm for the scale of global gold rushing seen today.

The great 19th century gold rushes in California, Australia, South Africa, Russia, the Yukon, and Alaska were often characterized by a type of gold seeker one rarely encounters anymore, namely the adventurer (Veiga and Meech, 1995b). Some of these miners were heralded as pioneers venturing into remote regions to stake new ground. They were viewed as valuable contributors to the development of national wealth, their exploits recorded for posterity as

one recounts the triumph of a great footballer bringing home the World Cup. One has only to read the documents of the 19th century rushes to understand how people from a variety of classes — not just the poor — comprised the vanguard of fortune hunters. When the pioneers of northern gold hunting returned to California in 1897 with $500,000 in gold, it catalyzed a march to Alaska where one of the first to strike it rich was J.S. Lippey, a professor who had been Secretary of the Seattle YMCA. Lippey carried home $85,000 dollars in bullion, a feat matched by numerous farmers, merchants, and artisans of different economic backgrounds (Ingersoll, 1897).

Perhaps no person better characterized the adventuring spirit of this gold-seeking than British explorer Richard Burton. Burton spoke thirty-six languages, including many African dialects he personally decoded. He famously translated classic Eastern texts such as Arabian Nights and the Kama Sutra, and was one of the explorers credited with locating the long-pursued sources of the Nile. Yet when the gold rush hit, Burton proclaimed gold to be "better than geography." From 1877-1882 he embarked on three failed expeditions labeled by one of his biographers "glorified treasure hunts." The literary product of this first three week expedition, *The Gold Mines of Midian*, shows the journey to be nothing more than a caricature of the times — the dream of an instant California-style bonanza, only more steeped in Burton's intellectual brilliance (Brodie, 1967).

According to Arendt (1968), these 19th century adventurers viewed gold much the way gamblers and stock market speculators envision a grand payoff and the "permanent emancipation from work." Describing the gold rush in South Africa, Arendt draws on the historian Kiewiet who wrote: "All of them [gold seekers] belonged to 'a class of persons who prefer adventure and speculation to settled industry, and who do not work well in the harness of ordinary life... [There were] diggers from America, German speculators, traders, saloonkeepers, professional gamblers, barristers..., ex-officers of the army and navy, younger sons of good families..."

The driving feature of these gold rushes was that with very little investment one could return rich from the bush. Ingersoll (1897), who documented the early bonanzas of the Klondike,

writes: "Any man who has pocket money and about $500 for grub and staking a claim can safely go to the Klondike region and expect to reap a liberal reward for his efforts." Evidence of this kind of claim came not only from miners returning home with their bounty, but from travelers and writers covering the global bonanzas. In 1875, the English novelist Anthony Trollope toured the British colonies, recording his observations in dispatches for the newspaper the Liverpool Mercury. Detailing falling output from gold mines in Victoria, Australia, Trollope excavated the records of the early period of the rush between 1853-1857, when over three million ounces were exported from the colony. "That and the produce of the next four years may be said to represent the state of things *when the rivers ran gold, when men had but to wash the mud in the gullies to find wealth on the surface.*"

To be sure, part of the 21st century appeal of gold mining remains this aspiration of plucking plum-sized nuggets from the banks of the river and retiring on the profits. In gold rich regions, it is still common to hear rumours circulating about someone hitting the motherlode. When this happens a "shout" goes out. The news spreads rapidly by word of mouth, usually with the value of the discovery fluctuating dramatically from place to place. One miner will say: "I heard he sold it for $500,000." Elsewhere, another might claim: "No he got so much for it the buyer had to go home first to collect enough money to pay him." Finally, a third miner will contend: "They are both wrong. I actually know a guy who saw the nugget, and it was worth $1.2 million." And so on and so forth.

This oral tradition of spreading news of a gold discovery is chronicled by Cleary (1990) in his study of the 1980s gold rush in the Brazilian Amazon. The formation of a *garimpo* (mining area) begins with a *fofoca*, a term used to describe the moment when an area is producing a lot of gold and miners are congregating in a new spot. But *fofoca* also refers to world of mouth reports (*radio peao)*, often embellished, about an exceptionally rich discovery; these reports attract more people to the area, who secure mining rights from the pioneer prospector who made the discovery. A *fofoca* is usually a frantic period of extraction, but it is also when the formal arrangements for organizing activity on the mining claim are developed.

Although the prospect of a shout remains part of gold's allure, most artisanal gold mining has transformed from a boom-bust cycle to a refuge for the world's poor. As Cleary (1990) observes, 96 percent of the workers in the artisanal gold mines he surveyed came from the lower classes of Brazilian society. Cleary takes this to mean that, in fact, ASM represents a significant opportunity for "upward mobility" for people who have very few options or prospects outside of the *garimpo*. Indeed, by any current ethical measure of wellbeing and baseline livelihood, today's artisanal gold miners are marginalized, impoverished, and vulnerable. All of the core development issues identified by the UN Millennium Goals are critical for gold miners. The MDGs propose seven markers of extreme poverty: hunger; primary education; gender inequality; child mortality; maternal health; HIV/AIDS; malaria and other diseases; and environmental sustainability. On each one of these indicators, gold mining communities are typically lacking the most basic social and economic infrastructure to break out of extreme poverty (Spiegel & Veiga, 2005; Heemskerk, 2005).

For many millions of people who lack the capital and rights to be active participants in the cash economy, gold is one of the few commodities requiring little investment or infrastructure. In this sense, there is a common thread connecting today's gold miners to those of the Klondike: the barriers to entry remain low enough that anybody with a strong back and the need for income can enter the labour force. What is different, perhaps, is the outcome a miner can expect in return for his — or her — efforts. "Pocket money and about $500" can still get a person going as a miner. The question is, what returns will a miner see from this work?

3.4 Gold and Development

A miner's wages differ depending on the type of mineral deposit, technology, market access, and organization of labour. Most artisanal gold miners make 0.2-1g of Au/day ($5-15 USD), but in the right conditions gold can be far more profitable. Telmer (2007) points out that around the town of Kareng Pangi, Indonesia "Land and river based gold production may have generated 50 million USD in 2006...enough to support 20,000 households of 5 people at 2400 USD/year — far above the average Indonesian wage." These wages, Telmer argues, "can support many more when it is spent and re-spent, cycling through the community."

Yet despite this potential for development from artisanal gold mining, it is reasonable to fear the negative fallouts of an artisanal gold economy. Few can deny the mayhem created by the madness over gold. As Trollope (1875) observes, gold makes people crazy. "No one who has not seen it can understand how continual and how detrimental is the hankering after gold in an auriferous country. It upsets the minds of men with a propensity for gambling, and induces them to waste their honest earnings in the pursuit, with a lavish extravagance which soon reproduces poverty and distress."

Indeed, Trollope witnessed many conditions still common in artisanal gold mining areas around the world: gangs of miners washing gold in rivers; men working without wages; no management or accounting systems; everyone hoping for a big payoff, with as many men dying in poverty as retiring to wealth. "Who can compute how much such a one threw into the general stock of loss?" Trollope asked. "Who can say how much money was thus expended with absolutely no result in produce? A true report of expenditure and receipts in this great enterprise can never be furnished."

When coupled with ecological ruin, gold mining can be a powerful force of economic chaos and social upheaval. Once triggered, there is no known means of ending a gold rush without exhausting the resource. In the 19th century, fear of the consequences of a gold rush led the Russian Governor Baranov to repress knowledge about gold in Alaska, after it was discovered in 1804 by Russian fur traders. Baranov and successive governors loyal to the fur trade managed to suppress this fact for more than sixty years. When Russia at last ceded the territory to the United States in 1867, rumours of Alaska's mineral wealth brought prospectors to the region, leading eventually to the great gold rush of the Klondike (Ingersoll, 1897).

Dipping into the historical debate amongst philosophers reveals divergent opinions about whether gold builds or destroys capital. In *The Poverty of Philosophy*, Marx (1847) argues that gold, along with other precious metals, imported from the Americas provided the capital needed by European nations to bankroll the industrial revolution. "An indispensable

condition for the establishment of manufacturing industry was the accumulation of capital facilitated by the discovery of America and the importation of precious metals."

This idea that gold finances the development of wealthy societies can be traced to the medieval Islamic philosopher, Ibn Khaldun (1950 edition), whose *Prolegomena* to the *Arab Philosophy of History* is credited with being a precursor of modern sociology. According to Ibn Khaldun, a country's stockpiling of gold is a signal of its imminent rise as an economic power, and evidence that somewhere else a country is declining.

> The quantity existing in the hands of men circulates and is transmitted from generation to generation. And it probably circulates from country to country and from state to state, according the price paid for it and the [need of] different societies for it. Thus if such wealth has decreased in North Africa, it has not diminished in the land of the Franks or Slavs; and if it has decreased in Egypt or Syria, it has not diminished in India or China. For it is a social effort, the search for profit and the use of tools that cause the increase or decrease of the quantity of precious metals in circulation...

Other commentators, however, reject the view that gold builds capital. Picking up Marx's mantra (1847) that "In our age, the superfluous is easier to produce than the necessary," Arendt (1968) scorns gold as "The most superfluous raw material on earth," and ridicules the idea that its possession provides anything resembling sustainable economic development. "Gold hardly has a place in human production and is of no importance compared with iron, coal, oil, and rubber; instead, it is the most ancient symbol of mere wealth."

Despite her scorn for gold, Arendt concedes one critical point which may be gleaned as a virtue of gold mining. At its peak, the South African gold rush of the 1880s provided a living for one-half of the country's population, and financed half of all government expenses. But not even this fact is enough to convince Arendt that gold adds value to an economy. She concludes:

> In its uselessness in industrial production it bears an ironical resemblance to the superfluous money that financed the digging of gold and to the

> superfluous men who did the digging. To the imperialists' pretense of having discovered a permanent savior for a decadent society and antiquated political organization, it added its own pretense of apparently eternal stability and independence of all functional determinants.

It is Max Weber, however, who comes closest to understanding that the issue with gold is fundamentally occupational not appropriational. Weber argued that gold and other precious metals can build capital if they are accompanied by the right organization of labour (Eldridge, 1971). An inflow of precious metals may cause price revolutions, as occurred in 1530 in Europe, but to bring about capitalism increasing the supply of precious metals works only "when other favourable conditions are present, as when a certain form of labour organisation in the process of development, the progress may be stimulated by the fact that large stocks of cash come into the hands of certain groups."

To make his point, Weber summons the example of India in the period of Roman power, when the rajahs were receiving enormous sums of precious metals — 25 million *sestertii*[4] annually — in exchange for domestic goods. And yet commercial capitalism did not appear because the rajahs hoarded the metals rather than converting them into cash by investing in "enterprises of a rational capitalistic character," leading Weber to conclude:

> This fact proves that it depends entirely upon the nature of the labour system what tendency will result from an inflow of precious metal. The gold and silver from America, after the discovery, flowed in the first place to Spain; but in that country a recession of capitalistic development took place parallel with the importation. There followed, on the one hand, the suppression of the *communeros* and the destruction of the commercial interests of the Spanish grandees, and, on the other, the employment of the money for military ends. Consequently, the stream of precious metal flowed through Spain, scarcely touching it, and fertilized other countries, which in the fifteenth century were already undergoing a process of transformation in labour relations which was favourable to capitalism.

[4] Sestertii was an Ancient Roman coin thought first to be silver, then later bronze.

Ibn Khaldun (1950 edition) made a similar case some 500 years before Weber, arguing that "such forms of wealth as gold, silver, precious stones and objects [made out of them] are only minerals and products having an exchange-value, like iron, copper, lead, and the other metals and minerals. *It is society, acting through human labour, which brings them to light and increases or decreases their quantity.*"

3.5 The Gold Souk of Omdurman

Across the Nile from the gold souk of Khartoum, lies another equally impressive market. The gold souk of Omdurman has 76 gold shops, overseen by Yousef Tabidi, Chief of the souk's Public Committee. Tabidi works out of a small storefront office where he deals in specialty items, mostly antiques. He proudly exhibits a 1901 U.S. dollar, which weighs eight grams, as well as a 10 gram Swiss ingot, and a 1927 English pound. He has a fantastic grey handlebar moustache that makes him look like the great Red Sox pitcher Luis Tiant. He is a generous, gracious host, in the almost passive Sudanese custom of hospitality, offering gifts and patience to his guests.

Tabidi's family has been in the gold business since the 15th century (Tabidi means goldsmith), when the Sudan was the chief source of supply for gold and silver to the world's major civilizations. By the 19th century, the centres of gold mining had shifted to North America, Australia, Russia, and South Africa, and the merchants of Khartoum and neighboring Omdurman shifted to buying their gold from banks. But today the central bank either no longer has, or no longer sells gold to the shopowners. So Tabidi and the merchants of the city have returned to an older system of

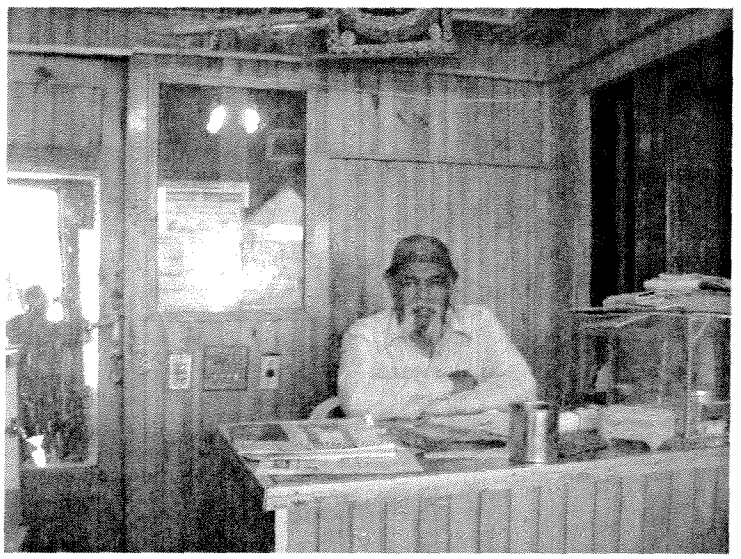

Fig. 4 – Yosef Tabidi, Chief of Omdurman market

relying on a robust hand-to-hand exchange of scrap metal.

Just six months earlier, Tabidi was buying gold at 2900 dinar per gram and selling it for 3500 (about fifteen U.S. dollars); now in February of 2006 he buys it for 3500 and sells for 4200. Since 95 percent of the gold is coming from abroad, largely through Dubai, the local price fluctuates with the London fix. At the moment, the value of gold is high. As a result there is plenty of action in the marketplace.

As Tabidi is talking, a woman fixes on his shop and enters, seductively extending an open palm in which she carries several rings. His eyes widen for a moment before he shakes his head no, and she moves on quietly. Tabidi will not buy from her because she has no invoice, and he worries it might be stolen.

In financial markets gold rarely, if ever, needs to pass physically from hand to hand. The world gold supply consists of primary production and existing stocks. Stocks of "recycled" or reclaimed scrap gold are generally included in estimates of existing stocks. In the modern era, the world's aboveground stocks have grown exponentially. The Earth's surface gold concentration is 2.5 parts per billion (Ball, 2002). In the early 16th century, the total amount of mined gold in the world was about 155 tonnes. In 1800, there were 4200 tonnes of gold above ground. Cyanidation and other technological advances of the industrial mining era caused monumental growth in the gold mining industry in the last 100 years. In 1941, 50 years after the introduction of modern industrial mining and business methods, holdings had quadrupled to 16,000 tonnes (O'Callaghan, 1993). At the conclusion of World War II, the Bretton Woods convention fixed the price of gold at $35 per ounce. This system tied the value of gold to the U.S. dollar, making it illegal in many places for private citizens to own gold, and capping the holdings of central banks. Bretton Woods did not, however, limit the growth of gold mining. Aboveground stocks nearly quadrupled again by 1968, accumulating to 70,000 tonnes, fully half of which belonged to official monetary institutions. From 1985-1991, the largest producing countries were South Africa (33 percent of production), the Soviet Union (15 percent), and the United States (10 percent). By 1991, the

world stock surpassed 100,000 tonnes, with new production leveling at around 2500 tonnes per year (GFMS, 2005).

With 100,000 tonnes of gold in circulation — 40-times annual production (O'Callaghan, 1993) — it is rare for banks to need additional supplies of virgin gold (O'Connell, 2006). High volume trading is mostly paper not physical; but in the Sudan and other countries where there is less capital accumulation than in financial centres, the physical trading of "scrap" or used (as opposed to raw) gold is a central feature of the economy.

The undisputed trade centre for this voluminous exchange in scrap is Dubai, where the gold dealers of India, Iran, Saudi Arabia, and East Africa converge in what the brilliant marketers of the Emirate call The City of Gold. In 2005, The Dubai Multi Commodities Centre (DMCC) traded 523 tonnes of recycled gold, recovered primarily from Indian scrap jewelry, as well as gold bars purchased from central banks. The scrap is melted into smaller bars and sold to investors and manufacturers. Global marketing campaigns engineered by ruler of Dubai, as well as by the World Gold Council, have helped drive up jewelry demand over the last five years, especially in China. As of 2004 (GFMS, 2005), increased marketing of more traditionally valued 18-carat gold has helped make China the third biggest consumer of jewelry (224 tonnes), behind India (517 tonnes) and the United States (352 tonnes), followed by Turkey (189) and Saudi Arabia (136 tonnes).

The resale of jewelry by women is an important part of this transcontinental exchange. If a Sudanese woman is fortunate, she will accumulate enough gold in her lifetime to cover both arms, her fingers, and neck. The parts of her body she cannot drape with gold — the palms of her hands and soles of her feet — will be died with henna. Women receive gold at lifecycle moments such as weddings, births, and religious festivals, with gold sales peaking at the end of Ramadan and during the Hajj, the way Christmas and Easter are bookends to the jewelry seasons in the West.

Much of what is sold is what Tabidi calls "show-off gold." Virtually all the jewelry in the souk is in the style of Emirati or Bahraini ornamentation one sees in the Gulf or dangling on

the arms of Persian children and Indian brides; enormous bangles that clink together like ice in a glass; necklaces covering the whole chest to ward off the evil eye. It is bright, yellow, twenty-one carat gold — bulky and gaudy by European standards. When refiners in Dubai receive ingots or scrap from Canada or Tokyo, they have to reduce the purity from .999 to .995 to give the gold the colour preferred in India, the Middle East, and East Africa. Unlike New York or Paris, where the value of a gold ornament is determined by brand and design, in the Sudan, just as in Dubai and Teheran, jewels are sold by weight. The defining characteristic of gold ownership is how much gold you have in your possession, not where it comes from. When a woman is widowed, divorced or disgraced, gold is her the only investment. Indeed, gold is not just a source of a woman's pride and beauty, it is her insurance.

Thus critics who protest that gold is "the most ancient symbol of mere wealth" (Arendt), or call it a "barbarous relic" as Keynes did (Green, 1968), neglect an economic reality. The issue of whether gold builds capital is not about who possesses the gold, but the context in which gold is being produced and traded. The value of gold is established not through intrinsic value but via social relations (Marx, 1847).[5] For miners, gold is not mere wealth, it is an essential economic activity. Similarly, outside the world's financial capitals — in places beyond the reach of banks and certainly beyond digital credit — gold continues to thrive as the "lubricant of trade" (Ball 2002). For people in the developing world, particularly women, gold is hardly a relic: it is hard currency.

3.6 The Value of Gold

In dubbing gold a "barbarous relic," Keynes (see Green, 1968) was referring to the role of gold as the base value for the international monetary system. As such, he was refuting a position held at the time by, among others, French Prime Minister Charles de Gaulle, who at a press conference in 1965 delivered an almost erotic sermon praising the virtues of gold.

[5]Marx was supporting Voltaire's statement that "The sole intrinsic value of a silver mark, is a mark of silver, half a pound weighing eight ounces."

"There can be no other criterion, no other standard than gold. Yes, gold, which never changes, which can be shaped into ingots, bars, coins, which has no nationality and which is eternally and universally accepted as the unalterable fiduciary value par excellence" (Green, 1968). De Gaulle was caricaturing gold in a way that it has been described as "the delusion of absolute value" (Arendt, 1968). Gold of course can be devalued rather easily, either by over-hoarding, such as when the Roman emperor Nero removed too much gold from the market to build his palace; or by depressing the market through oversupply, as when the King of Mali distributed so much gold along his path to Mecca that he deflated prices from Bamako to Khartoum.

But it is important to draw a distinction between the question of absolute value and sociological value. The fact that the value of gold can be diminished globally does not change the fact that gold retains value socially. In 2005 gold demand included 2700 tonnes for jewelry and 600 tonnes for hoarding, exceeding new official production by nearly 1000 tonnes. (O'Connell, 2006; this does not include an additional 400 tonnes for industrial use). It is commonly assumed that gold production serves no purpose; that gold is merely stashed in central banks. Contrary to public perception, gold demand from private individuals is greater than what industrial gold mining companies can produce. It is also presumed, correctly, that gold supports mostly jewelry markets — jewelry being a symbol of frivolity ("show-off gold"). However, in most of the world jewelry, and all gold for that matter, is fundamentally about security not ostentation.

There are a variety of reasons gold endures as hard currency, principal among them chemistry, efficiency, and hedging. To begin, "Gold reacts with great reluctance," as Ball writes (2002). This lack of oxidation to air has helped gold remain highly prized for jewelry. The non-tarnishing, incorruptibility of gold — so different from the way paper dollars become soiled after changing hands and being used to wipe fish grease from one's fingers — is especially important to women in developing countries. These chemical virtues create the conditions for gold to act as an efficient currency. Historically, gold transcended silver because of its indestructibility and ease of transport. In the 1700s, one thousand guineas in gold weighed about 18.5 pounds as opposed to 280 pounds in silver. In the 19th century the

cost of transporting gold coins was much lower than the cost of moving the same value in silver. "This simple physical difference against silver operated as a tax on international movement" (Bernstein, 2000).

Gold's elegance as a high value, small volume, currency can be appreciated by anybody who has been in a bank in a country where inflation is increasing by the hour. The burden of counting out bills by the trunkload quickens the angst of customers, whose anger boils over as they queue hour after hour. As opposed to the temperamental quality of paper transactions, exchanges of gold are remarkably sanguine considering the value at stake. The buyer and seller sit face to face, and weigh the gold together so that there is little chance for disagreement. At the end, the gold can rest benignly in a pocket. Millions of dollars in gold bars take up about as much space as a footstool. By contrast, there is nothing more conspicuous than exiting a bank with an enormous bag of cash slung over each shoulder.

As a result, gold remains a terrific currency to carry long distances, particularly in times of turmoil. In his account of the lead-up to the Angolan civil war in 1976, the Polish writer Ryszard Kapuscinski describes the exodus from the country in anticipation of the bloodshed that would follow Portuguese departure. Books were the first thing to be abandoned: paper, after all, is very heavy. To Kapuscinski (2001b) the luckiest person in Luanda was the owner of the jewelry store. "Dom Urbano Tavares, the proprietor of a jewelry shop on the main street, can feel content despite the mad unhappiness everywhere. When he chose his line of work years ago, he hit the bull's eye. Gold always sells, and what's left fits easily into carry-on luggage."

To many living in western capitalist countries, gold appears to be a mere remnant of previous economic eras. Gold is ornamental; it is something people get once they have made it in order to prove they have made it. It is symbolic, a demonstration of class and status, and possesses little, if any, legitimate commercial value. Indeed, gold is insignificant in the global investment environment. On the three trillion dollar London Stock Exchange, the 40-60 billion dollar gold market hardly occupies the attention of most traders, whose eyes are locked on pension funds and the 9.1 billion dollar profit recorded by Exxon-Mobil in the

third-quarter of 2006. Overall, gold amounts to little more than one-percent of investment portfolios.

Yet it is not as if the transportability or reliability of gold is somehow diminishing. In 2006 it was revealed that the late Chilean dictator Augusto Pinochet stashed nine tonnes of bullion worth $160 million in a Hong Kong bank. Pinochet was using gold as a hedge against any downward turn in his political fortune. Indeed, however diminutive gold is on the London Exchange, when there is economic uncertainty banks and individuals still revert to gold as a hedge against currency depreciation and sudden emergencies (Green, 1968). The reliance on gold as a hedge was revived in September 2001, when fear of economic collapse led to whispering on the floor of the stock exchanges that quickly turned to a shout: buy gold. In the ensuing five years, the international price for gold more than doubled. Central banks in Russia, China, and Argentina began stockpiling, in some cases doubling their current reserves. This move validated the view of some economists that heavy gold trading is evidence of imminent political upheaval (Cassidy, 2006).

3.7 Poverty and Mining

Especially high volume international trading does not immediately lead to increased industrial world gold production. Because paper trading does not necessarily demand any physical exchange, there is a lagtime between a price spike and increased supply. While the gold price was more than doubling from 2001-2005, official global production actually dropped from 2600 to 2400 tonnes (GFMS, 2005). But these numbers tell only part of the story. Gold industry analysts acknowledge there is a certain amount of "loss" in any accounting of global supply and demand. "It is difficult...to provide a systematic analysis of the manner in which stocks respond to price increases because, as noted earlier, many gold movements are netted out in the data" (O'Callaghan, 1993).

Official supply does not immediately climb to meet demand because it takes time for companies operating at economies of scale to increase production. For example, when gold prices reached record highs in 1979 and 1980, mine output did not match demand until 1984. Raising capital, assembling infrastructure, and acquiring licenses is a multiyear effort in the

best of times. In the meantime, spikes in demand are met at a smaller scale by increased trade in aboveground stocks and by artisanal mining. With the high volumes of gold already available aboveground, so-called dishoarding — when private owners unload their stocks — can at times account for more supply than primary production. This was the case in 1931 when a 50 percent devaluation of sterling led British India to dishoard as much gold as South Africa produced that year (O'Callaghan, 1993). Green (1984) describes being in the gold souk in Kuwait the day prices peaked at $850 an ounce in January 1980:

> The street of gold shops was under siege. Perhaps two or three thousand people milled around, fighting their way into the overcrowded shops with cigar boxes and biscuit tins crammed with bangles and necklaces. The goldsmiths weighed the ornaments — often two or three kilos from one woman [worth $50,000 - $75,000] — and paid cash. Those ornaments were melted down in a nearby basement and the rough gold bars air-freighted to London and Zurich the same night.

In addition to dishoarding, increased hedging in the gold economy puts pressure on artisanal mining to ramp-up production. Because of its low entry barriers, artisanal mining persists even when low gold prices make large-scale mining uneconomic (Green, 1968). As Cleary (1990) points out, in the Amazon gold rush of the 1980s it was possible, in certain circumstances, "to find the ideal combination of low capital costs and a highly valuable product." As a result of this dynamic, higher prices coupled with greater international demand results in more artisanal miners (P. Ryan, GFMS – GoldFields Minerals Services, 2006 – Pers. Comm.). Even so, the growth of artisanal mining is unlikely to register statistically, largely because smuggling makes a complete accounting of gold difficult. For example, 100 tonnes are suspected smuggled out of Dubai every year, an astonishing fact given that all gold in Dubai is traded tax free (C. Griffith, DMCC – Dubai Multi Commodities Centre, 2006 – Pers. Comm.). Still, the proper measure of the growth of artisanal mining is its labour force rather than its rate of production. Because artisanal mining is notoriously inefficient and trade so difficult to monitor, growth in ASM should be determined by a rise in the number of miners rather than increased official production. A country like Guinea, Ghana, or Guyana can produce just 5-10 tonnes of gold artisanally, yet

still have hundreds of thousands of miners working the goldfields to extract what a few thousand workers could recover working with industrial methods. Therefore, a price spike in London creates tens-of-thousands of jobs in rural Indonesia, Ethiopia, and Ecuador, and dozens of developing countries. In effect, global financial institutions and private investors hedge their bets on the backs of miners.

Despite this correspondence between the wealth of nations and the work of miners, it remains common for miners to be regarded as irrelevant or a nuisance. A unique kind of dismissiveness is frequently used to refer to miners. "A miner's life is short," goes a popular saying in South America. "It is harder to turn a man into a gold miner than to turn a gold miner into a man," was the longstanding refrain of one Brazilian *garimpeiro.* In cases where miners are more vilified, the sloganism casting them as subhuman is filled with vitriol, as in "The only good gold miner is a dead one," a phrase promoted in the 1980s by the executives of a large mining company.

Since at least the Bronze Age, miners of all kind have been treated not merely with disdain but as "a separate race of humans" (Freese, 2003). In antiquity, when Southern Egypt was the primary source of gold traded throughout the Near East and Mediterranean, mines in the Eastern Desert gave the Egyptians so much gold the Mitannanian King was moved to say "Gold is as dust in the land of Egypt" (McEvedy, 2002). This gold helped Egypt become one of the most prosperous ancient civilizations. But when the Roman writer Diodorus Siculus traveled to the mines of the Nubian Desert in the first century BC, he observed wretched slave conditions:

> Out of these laborious mines, those appointed overseers cause the gold to be dug up by the labour of a vast multitude of people. For the Kings of Egypt condemn to these mines notorious criminals, captives taken in warn, persons sometimes falsely accused, or against whom the King is incensed. No care at all is taken of the bodies of these poor creatures, so that they have not a rag so much as to cover their nakedness... though they are sick, maimed or lame, no rest nor intermission in the least is allowed them... till

> at length, overborne with the intolerable weight of their misery, they drop down dead in the midst of their insufferable labours (Ball, 2002).

More recently, the modern coal industry created an unprecedented division of classes, where miners were cast completely apart, made to live separately, and considered subhuman. At the height of the coal boom in England, mining centres like Newcastle were flooded with rural immigrants abandoning their pastoral lives to work in the mines. The British government had fully embraced industrialization by providing incentives for technical innovation in capital goods industries such as mechanized weaving (Hobsbawm, 1969). This policy rapidly antiquated many traditional artisanal professions, creating a vast unskilled labour pool to produce the power required to sustain the industrial revolution. The treacherous work of coal mining exposed miners to toxic gases like carbon dioxide, carbon monoxide, and methane that were potent enough to kill them instantly; children were lowered into shafts too narrow for any adult body, creating a vital market for child workers; when miners accidentally penetrated old mines, they were swept away by torrents of water to die by drowning or starvation. The only obstacle preventing their complete transformation to a breed beneath animal — for even animals had rights by the 19th century — was the lack of an infinite labour pool.

Much like artisanal gold miners today, coal miners were accused by residents of being wretched thieves, "lewd persons, the Scums and dregs of many [counties], from whence they have been driven...horrible Swearers...daillie drunkards, some having towe or three wyves a piece now living, others...notorious whoremongers" (Freese, 2003). Accordingly, the term *garimpeiro*, used in Brazil to refer to artisanal miners, means thieves from caves (*grimpas*), whose meaning hearkens back to the 18th century when formal mining rights were granted only to the Portuguese elite and Brazilians invaded mining shafts and tunnels in the middle of the night (Veiga, 1997a). In part, the mistreatment of coal miners reflected natural tensions arising between small landholders with deep roots in the community and transient miners arriving new on the scene. However, disdain for miners runs much deeper than something that can be explained by xenophobia or traditional class struggle. Mining is the lifeforce of modern capitalism, an economic model whose success relies upon first creating

surplus labour pools, before exploiting this labour in the race to accumulate capital. The French philosopher Fourier understood this industrial drive for power and expansion as a process of rapid dehumanization to which all men were becoming subservient. Fourier "saw the unbridled drive towards production heedless of distribution, as breaking natural human relations, turning men into commodities, mocking justice, twisting men's faculties into channels in which they are blocked or turned against men's most natural needs, creating a hideous, mutually destructive field of jungle warfare, curbed only by ruthless centralization, which equally crushed its victims and which the frenzied expansion of productive enterprises seemed to make inescapable" (Berlin, 1971).

Indeed, the indignities suffered by gold miners are not a relic belonging to a distant, less civilized age. Neither the labour movement nor the human rights revolution has remedied the wrongs continuing to be perpetrated against miners by the public and private sectors in the name of domestic production, growth, and expansion. And in some ways, the fate of miners has worsened since Diodorus. The obstacle that once prevented miners from being treated like so much dust, has finally been removed: there is at last an infinite labour pool, and so much poverty gripping people by their throats that in spite of its exploitative, dehumanizing qualities, artisanal gold rushing is rising to unprecedented heights, or lows as the case may be.

3.8 Catalyst and Consequence

There is no other commodity like gold, whose market has an irrational lifeforce that boggles most efforts to explain it. This near mystic irrationality evokes great surges of human activity. These surges are potent enough to help build regions — California, Australia, South Africa, West Africa, Egypt, Alaska — not just through the gold that comes out of the ground, but the economy that emerges around mining. That same irrationality also makes people feverish with desire. Unfulfilled desires are perverted into madness. "Gold," as the French trader Patrick Schein says, "is a holy metal. Man makes it into shit" (S&P Trading, 2005 – Pers. Comm.).

The myth of alternative livelihoods is that gold mining activities can be fundamentally altered through political or economic intervention. The notion that miners can, or should, be persuaded to exchange gold mining for agriculture or other light industries forgets what Hinton (2005a) calls the *Problematique of ASM*, in which "poverty is both the catalyst and consequence of ASM." Modern artisanal gold miners are motivated less by adventure than by survival. Most artisanal gold mining happens in places where the daily average wage is one or two dollars a day. The ideology of alternative livelihoods does not consider that gold mining is flourishing because it is the most accessible, lucrative, replacement for economies that are failing people. Gold mining itself is the alternative livelihood. Relative to other options, the additional earnings miners receive from gold are significant. Invested effectively, these earnings can help build capital and diversify economies.

Alternative livelihoods also perpetuates a perception of gold miners as corrupt or criminal, when in fact the entire industrialized world relies on artisanal miners at the first sign of global instability. Women and artisanal miners are the first responders to international financial crises. Labeling gold as antiquated misses the fact that throughout the world gold remains a vital currency and part of a living economy. This economy cannot merely be legislated away or eliminated through environmental intervention. Artisanal mining is going to persist for as long as poverty drives it, and for as long as humanity desires gold. If gold is the alternative livelihood, then the question is how can it contribute to poverty alleviation and strengthen local economic development? For despite its many miseries, in times of privation, war, or extreme poverty, gold offers what few other commodities — save perhaps poppies and weapons — can provide: an established market with a firmly rooted infrastructure for trade and commerce. Rather than marginalizing miners by promoting their criminality, solutions to mercury pollution and other social ills created by ASM must come from tolerance, legitimation, and adding value through manufacturing and diversification.

4 ON THE FENCE: SOCIAL LICENSE, RISK MITIGATION, AND RESOURCE CONFLICT BETWEEN INDUSTRIAL AND ARTISANAL GOLD MINERS

The past resembles the future as water resembles water.

(Ibn Khaldun)

The real serious issues of life cannot be calculated.

(E.F. Schumacher)

4.1 Chapter Introduction

This chapter addresses a growing problem in the gold mining sector: the surge of mineral resource conflicts between industrial-scale and artisanal or small-scale miners. These conflicts have multiplied over the last decade because of a combination of factors, including inequitable resource distribution, over-reliance on force by companies and governments to resolve problems, the resurgent value of gold, population growth, and rising poverty rates — particularly in Africa. These issues are explored here in the context of social license to operate. The research is based on fieldwork conducted by the author in South America and Africa, and by others in Asia. Case studies of resource conflicts and attempts to resolve these conflicts, are presented from Guyana, Ghana, and Indonesia. There is also a review of documented cases from the scholarly literature and professional reports conducted on this topic. This subject is an emerging issue, whose contours remain relatively undefined. The survey provided here is meant to initiate a compendium of related casework for advancing knowledge about how mineral resource conflicts operate, and how mining companies can turn the corner from conflict to peaceful coexistence with artisanal miners. An analytical instrument concerning the different varieties of mineral resource conflict is presented, along with tools for evaluating suitable conditions for mining companies to work alongside artisanal miners. Both are based on the work of Telmer and Siegel (2007).

4.2 Social License and Artisanal Miners

Over the last decade a paradigm shift has occurred in the mining sector. Increasingly vilified by the media and advocacy organizations, the mining industry exposed its practices to a series of internal and external reviews. The assessments include the 2002 Mining, Minerals, and Sustainable Development Project (MMSD); the World Bank's Extractive Industries Review (EIR); the United Nations Economic Commission for Africa's reports on managing mineral wealth and mainstreaming mining into poverty reduction strategies; the NGO-driven Extractive Industries Transparency Initiative, as well as attention from print (NY Times, Ottawa Citizen, National Geographic), film ("The Devil's Miner"), television (PBS/ABC Frontline), and new media outlets (CorpWatch).

These reviews address questions about the mining industry's contributions to sustainable development. They do this from vastly different perspectives but are guided by a unifying theme. Specifically, the issue is how mining companies can integrate more humane relations with communities into their operations, without sacrificing profitability. Indeed this dilemma between human rights and economic competitiveness frames two potent imperatives. More than ever, multinational resource industries are subjected to public scrutiny over the sustainability of extractive processes. The various reviews conducted recently have helped clarify the principles of responsible mining. Extractive industries must grapple with these norms, or risk opprobrium in a global watchdog universe where transmission of information from the bush to leading media offices can be instantaneous. "Companies that still insist on applying outdated and inflexible approaches to dealing with the public — regarding only the legal and not the ethical side of their actions — are paying a high price..." (Veiga et. al., 2007).

A March 2006 Citigroup report advises that a company's sustainability profile should no longer be considered an economic afterthought. According to Citigroup, companies that place a premium on environmental and social progress are more likely to have long-term growth, and therefore make more reliable investments for shareholders. Consequently, the decision to invest based on social and environmental factors is becoming a pure financial

risk rather than a function of morality, as traditional soft issues are assuming a decidedly harder edge.

At the same time that sustainability is becoming a meaningful fiscal imperative, the rapid industrialization of China, India, and other geopolitical shifts have intensified competition into a global resource scramble. In 2005, Chinese trade with Africa quadrupled to 40 billion dollars. Most new contracts are signed under what China calls a "non-interventionist policy," meaning they do not necessarily adhere to Western demands for transparency or sustainability (Bezlova, 2006). According to the Frontier Strategy Group, which assesses geopolitical risk in natural resources, few Western companies or governments are confronting this economic reality. "Such short-sightedness could severely impede the ability of Western firms to replace reserves and deliver value to shareholders" (Turkeltaub, 2006).

As a result, the demand to internalize social and environmental responsibility is being met by a profound change in resource economics, even before the terms of the new paradigm have firmly taken root. As one Newmont official framed things: "We're not over the other side yet." The swiftly changing economic and geopolitical landscape often leaves it unclear what basic tenets of accountability companies are expected to adopt, or whether these expectations are fiscally plausible. "The need for behavioural change has arisen very quickly, and the mining sector has had a very short time to adapt to this new paradigm" (Veiga et. al., 2007).

For mining companies, much of what comprises the internalizing of social and environmental responsibility falls under what is being called social license, a concept to which executives and operations managers are quickly becoming more attuned. As a Newmont official put it: "We won't have a mine if we don't do these things. It's a matter of social license, which is much more important than the mining permit" (C. Anderson, 2006 – Pers. Comm.). Through an exhaustive survey process, Nelsen and Scoble (2006) have identified that social license to operate (SLO) is coming to be perceived as an essential component of any mining operation. According to their research, SLO "comprises a set of concepts, values, tools and practices that represent a way of viewing reality for the communities." Though sometimes intangible, SLO is nonetheless the foundation of every

aspect of the life of a mine, from the first contact between geologists and communities, through the phases of exploration, discovery, development, production, and reclamation. This concept is ultimately changing the way mining companies understand their relations with communities (Nelsen, 2006).

4.2.1 ASM and Resource Conflict

The principle of social license challenges companies to find equitable solutions for many community relations issues, including population resettlement, crop and land compensation, reforestation, chemicals management, and mine closure. Among this suite of issues, resource distribution with artisanal gold miners remains underexposed. Resource conflict between local artisanal miners and foreign-owned mining companies is a growing worldwide phenomenon, with at least a dozen such disputes identified across Africa, Latin America, and Asia. Yet important new public-private partnerships — such as the $10 million Ghana Responsible Mining Alliance (USAID, Ghana Chamber of Mines, Newmont, Gold Fields, and a variety of implementing partners) — still rarely include relations with artisanal miners as part of their objectives.

The nature of mineral resource conflicts between industrial and artisanal miners varies widely from place to place (its varieties are examined below). But they all share the basic dilemma of the appearance of unofficial artisanal miners working on parts of concessions operated by multinational companies. This dilemma creates two opposing risks: if a company tolerates incursions onto its concession this exposes its assets to unpredictability; however, forcibly removing miners can undermine the legitimacy of social license to operate.

Conflict between the informal ASM sector and the formal industrial mining sector has persisted since at least the 19th century, and Cleary (1990) goes so far as to suggest that in Brazil these two sectors have to a great extent "defined themselves in opposition to each other." But according to Etemad and Salmasi (2003), modern conflicts between industrial and artisanal miners is at least in part a byproduct of the greater trend towards privatization of mineral production. They argue that this trend has consolidated more resources, leaving

fewer opportunities for the kind of independent entrepreneurship that characterizes artisanal mining. "Under the pressure of global competition, large mining enterprise — mainly, multinational enterprises — have lobbied for progressively larger concessions and greater privileges from local governments."

Focusing on Ghana, Andrew and Hilson (2003) offer a similar explanation by linking conflict to the arrival in the 1990s of neo-liberal economic reforms. They contend that structural adjustment programs shifted the playing field towards foreign direct investment, in part by inventing formalization requirements for all miners. This effort was aimed at creating a reliable investment climate. But absent adequate bureaucratic infrastructure to carry out formalization, tens-of-thousands of small-scale miners were rendered incapable of meeting complex regulatory and licensing obligations. As a result, an accepted economy of artisanal mining was rapidly transformed from an informal to a criminal activity.

A third cause of resource conflicts, stated more explicitly by Hilson and Potter (2005), is the widening poverty rate observed in many Sub-Saharan countries, where increased GDP from mineral exports masks a crisis in rural and subsistence economies. "Ghana's structural adjustment programs have further marginalized indigenous artisanal gold mine operators, both procedurally and through its general policy stance." While the emergence of multinational investment in the natural resource sector provides labour in the thousands and royalties in the tens of millions, the exclusion of artisanal miners from the largest, most abundant mineral deposits also adversely affects livelihood strategies. When coupled with accelerating population growth, even the creation of several thousand jobs inside the fences of mining camps cannot compensate for the loss of access to resources for artisanal miners. (As observed in the previous chapter, artisanal gold mining is an essential, if undesirable, alternative livelihood in countries where the state cannot meet the needs of a growing class of poverty dwellers.)

Hence, when defining social license, relations with artisanal miners are a kind of litmus test for companies. All too often, miners are cast as a renegade group gleaning corporate profits and impeding growth. Not only does this deny the longstanding presence of artisanal mining

in most places, it reflects a myopia among companies and governments about economic conditions on the grounds around them. Indeed, few companies possess even the most rudimentary understanding about the dynamics of artisanal gold mining; fewer still have developed meaningful lines of communication with miners.

While there are several existing recommendations for collaboration between the large-scale and small-scale sectors, such as the "Tri-sector Partnership Model" to involve business, governments, and communities (UNECA, 2003), most relations between mining companies and artisanal miners are characterized by misinformation, rumour, and often fear. The journalist Daniel Glick has keenly observed how mining companies struggle to gather a clear sense of what is occurring outside the fences of their operations (D. Glick, 2006 – Pers. Comm.). Although several companies have attempted to improve relations with artisanal miners, examples of successful efforts are limited, and there remain many unanswered questions about whether it is possible for industrial and artisanal miners to coexist. As a Newmont official framed the question: "What I want to know is whether there has ever been a successful project dealing with this issue, or if it's just an unmanageable problem." Indeed, most mineral resource conflicts continue to follow unpredictable cycles of unrest and détente, marked by risk, distrust, and violence. In this sense, the concept of social license has not yet matured into peaceful arrangements between industrial and artisanal miners. While mining companies increasingly want to evolve solutions, most are ambivalent about how, or if, to relate to miners, choosing instead to remain on the fence.

4.3 Peaceful Coexistence as Risk Mitigation

As already noted, contact with artisanal miners is just one of many social and environmental issues rapidly becoming part of the operational imperative for mining companies. Indeed the direct costs of conflict with miners pale next to the figures associated with crop compensation or population transfer, which can exceed 20 million dollars for a specific site. By contrast, Newmont estimates that conflict with artisanal miners in Akyem, Ghana, where the company is negotiating the license for a new mine, has cost around two million dollars (M. Woods, 2006 – Pers. Comm.).

To be sure, two million dollars is not going to raise concern within a company's financial group. But this figure reflects only the cost of crisis management, and presupposes that once an immediate crisis is resolved the conflict is over. In fact, extended resource conflicts with artisanal miners perpetuate long-term, multifaceted risks. Since small-scale and large-scale miners often pursue very different kinds of deposits, these risks frequently have little to do with conflict over physical resources. Over the lifetime of a mine, these risks can threaten the viability of operations.

While conflict over the physical spoils of a gold deposit is one component of the problem, it is rarely, if ever, the crux of the issue. Because they lack the technological sophistication of mining companies, artisanal miners pursue the low hanging fruits of high-grade free gold, rather than the high volume but often lower grade ores extracted using industrial methods. Resource conflicts with artisanal miners involve risks connected to environmental and occupational hazards, as well as cultural questions about how companies coexist with communities and smaller-scale resource extractors.

4.3.1 Environmental Health & Occupational Safety

Unregulated artisanal mining on their Contracts of Work (CoW) exposes companies to allegations of environmental degradation, toxification of water and fish, and negligent safety practices. Even baseless allegations of pollution, such as those Newmont endured at its Buyat Bay operation in North Sulawesi, Indonesia, can damage a company's reputation. Indeed, when PT Newmont Minahasa Raya (PTNMR) President Richard Ness was exonerated by Indonesian courts in April 2007, there were many who presumed this was a case of corporate leaders maneuvering for freedom through backroom dealing. The real story about Newmont's complicated relations with nearby small-scale miners remains grossly unreported. In North Sulawesi there are three regions within 100 kilometres of Manado, the regional capital. These regions are Talawaan, Tanoyan, and Buyat Bay. Ores are extracted by small-scale miners from underground mines extending about 50 feet deep. Small-scale miners operating in both Talawaan and Buyat Bay are working on concessions granted to large-scale mining companies, including Archipelago and Newmont. Buyat bay is Newmont's 80 percent owned subsidiary, PTNMR, which operated the Mesel Gold Mine in

North Sulawesi. In 2004, shortly before operations were scheduled to cease, a campaign was launched alleging that PTNMR's use of submarine tailings placement had polluted Buyat Bay and caused Minamata disease. Subsequently, the Government of Indonesia initiated civil and criminal proceedings against PTNMR and Ness, in spite of the conclusions of the World Health Organisation and Japan's Institute of Minamata Disease that no such levels of mercury pollution were emanating from Newmont's operation.

Mercury *is* commonly used in the area, but its use is by small-scale miners working around Newmont's concession (Edinger et. al., 2007). Ores from these locations are produced from dangerous underground operations that reportedly lead to many deaths each year. Because miners practice whole ore amalgamation, losses of mercury to the environment are high – up to 30 units of mercury for every unit of gold produced (Telmer & Siegel, 2007). Further, the practice of combining mercury use with cyanidation likely causes mercury to be transported further than normal distances and to become more bioavailable in the environment. However, none of this information was considered in the legal proceedings. Nor has any major news company reported the more obvious link between mercury and artisanal mining, largely because journalists and watchdog organizations do not want to be viewed as targeting impoverished local miners.

In addition to mercury contamination, companies routinely have to deal with fallout from miners dying on or near their concessions. In 2005, Newmont intervened after a mine collapsed on part of their Akyem lease in Eastern Ghana, trapping as many as 40 miners. Newmont partnered with AngloGold to bring in rescue equipment, but after more than a week of efforts none of the miners could be saved (leading some to conclude the collapse was faked as a way of getting Newmont to open deeper access to gold veins). Fearing reprisal for somehow causing the mine collapse, Newmont (2005) issued a comprehensive daily report of the rescue effort. Deaths also occur in other ways, such as when miners are killed trying to spill ore out the back of company trucks. This is a common practice where people jump on the backs of trucks, push dirt onto the road, jump off, collect and process it. There are those within Newmont who believe the reported deaths are only the tip of the

iceberg; that miners are buried alive, alone, every week but cover it up to avoid government intervention.

4.3.2 The Role of Force

While being pinned to these environmental and occupational risks is a concern for companies, there is an even deeper risk created by the appearance of thousands of semi-organized, often desperate, or armed miners. Once a gold rush is in motion, there is little besides eliminating the gold deposit that can be done to stop it. There is no recorded case of a gold rush being pushed back. From a security perspective, how does a company faced with public pressure to be more humane, respond to throngs of miners refusing to leave a concession or even organizing blockades of essential access roads, effectively shutting down mining operations? With each passing year the possibility increases that a group of organized, determined, and militant miners could derail multi-billion dollar companies. As a Newmont official asked: "They have machetes and guns; what do we have? How can we compete with them?"

Still, a major multinational retains one critical advantage in any standoff with miners. Most militaries — particularly in countries where the armed forces have to raise their own funds — are prepared to conduct heavy-handed sweeps of mining camps. Force is traditionally how companies have dealt with this problem. But in today's political climate, using force against local civilians risks loss of international legitimacy, loss of profit, and ultimately loss of shareholder confidence. At the same time, local populations have never been more aware that they possess strength in numbers, as well as the ability to leverage the global vilification of multinational companies.

As a result, relying on state-sanctioned intimidation, force, and violence is an increasingly complex political maneuver. Major companies know they are being scrutinized, and that even supplying a government with equipment makes them complicit if force results in mass killing. What's more, inviting an under-financed military into a gold mining area is like handing a prisoner the key to his cell. Once soldiers or police see the profits to be made as middlemen in the gold supply chain, there is little to prevent corruption or desertion.

Finally, relying on force to clear concessions of miners is flawed policy because it does not work — a fact reinforced by historical and modern examples.

In 18th century America attempts by the federal government to scatter miners, migrants, and squatters were resisted, and ultimately overcome, by the same people who only later were dubbed pioneers. De Soto (2000) emphasizes this point by using the example of the debate over preemption. At issue was the question of whether squatters should have the right of refusal to purchase land on which they were living without formal property rights. This clash with informal settlers had long vexed the American political elite, moving George Washington to refer to squatters and immigrants as "banditti...skimming and disposing of the cream of the country at the expense of the many." There were repeated attempts to clear the country of illegal settlements. Yet no matter how aggressive the government's tactics, settlers ignored official policy and remained on the land, even enduring violence. Speaking at the first session of the Congress of 1789, one congressman observed:

> There are, at this moment, a great number of people on the ground, who are willing to acquire by purchase a right to the soil they are seated upon. What will these men think, who have placed themselves on the vacant spot, anxiously waiting its disposition by the Government, to find their preemption right engrossed by the purchase of a million acres? Will they expect themselves to be preyed upon by these men?
>
> ...They will do one of two things: either move into Spanish territory, where they are not altogether uninvited, and become an accession of power to a foreign nation forming to us a dangerous frontier; or they will take this course, move on the United States territory, and take possession without your leave. What then will be the case? They will not pay you money. *Will you then raise a force to drive them off? That has been tried; troops were raised, and sent... to effect that purpose. They burnt the cabins, broke down the fences, and tore up the potatoe [sic] patches; but three hours after the troops were gone, these people returned again, repaired the damage, and are now settled upon the land in open defiance of the Union* (Tatter, 1933).

To use a more modern example, in the 1980s Brazil took the decision to use the military to disperse garimpeiros working in Amerindian reserves, conservation areas, and large-scale concessions. At most, this measure provided temporary relief. Securing 250,000 square kilometers of rainforest and restraining more than 100,000 garimpeiros proved far too big an area to control; miners who had been forced to leave their areas soon returned (Veiga et. al., 1995). Further, restrictive Brazilian policy simply transferred the problem elsewhere. Miners migrated north into the remote river forests of Guyana and Suriname, where the authority of government is virtually non-existent and mining occurs with relative impunity.

4.3.3 Case 1: Force and its Discontents (Marudi Mountains, Guyana)

In 2002 the Canadian junior Vannessa Ventures clashed with the 50 miners working the alluvial and hardrock deposits in the Marudi Mountains of southern Guyana. Vannessa had taken over exploratory rights to the area in 1997 from Romanex International, which was preceded by at least four other mining companies, none of which had progressed beyond feasibility studies. Rudimentary small-scale gold mining using manual tools and mercury amalgamation dates back more than 30 years in Marudi, where artisanal miners have continuously worked the area around Mazoa Mountain alongside large-scale prospecting operations. In addition to the presence of miners, land rights to the area have been contested by the local Wapishana tribe since Guyanese independence in 1966. The miners considered themselves legal occupants, in part because they paid annual licensing fees to the Geology & Mines Commission (GGMC).

Initially, Vannessa announced it would honour the practice of previous companies and coexist with the artisanal miners. But in 2001 Vannessa informed miners their presence would no longer be tolerated in the CoW. This occurred at a meeting that most of the miners did not attend. After issuing several additional warnings to clear the area, an armed group of local police, GGMC officers, and company officials entered the site and forced miners to vacate at gunpoint, burning their houses and belongings to deter them from returning.

Yet within weeks at least half of the miners had returned. Recent fieldwork in the region reports that the miners have rebuilt their homes and the situation has returned to the way it was prior to the security sweep (E. Wilson, North-South Institute, 2007 – Pers. Comm.). Vannessa, which has not been issued a mining license, maintains a camp on the site but does not communicate with miners, nor has it attempted to create any formal arrangements with them.

Expanding Guyana's gold mining industry is one of the lynchpins of the government's more than decade-long effort to open the country's vast mineral resources to foreign investment. This agenda — launched mid-way through the 1990s under the guidance of World Bank structural adjustment policies — has already resulted in enormous tracts of the country being auctioned to transnational investors. It is estimated that as much as one-fifth of Guyana has been licensed to multinational companies for exploration and mining (Colchester et. al., 2002). But Guyana had a mining industry long before anybody ever heard of a structural adjustment program. The country's artisanal miners, or *pork-knockers*, have been part of the national landscape for as long as anyone remembers. Guyana after all was believed to be the location of El Dorado, a fantasy which brought colonial traders up its riverways for centuries (Naipul, 1970).

There are numerous gold rich regions in the country, including the Marudi Mountains, which is located in an area commonly known as the Deep South. This area marks the end of the vast savannahs of the South Rupununi. Here cattle ranching ends and the forest grows increasingly dense, until there is only bush as far as the eye can see. From May to July, the rivers swell from heavy rains and serve as fishing grounds for local villagers who feast on predatory species like haimara, tiger fish, lukunani, and paku. These fish are often smoked and salted for use once the rivers have run dry from lack of rain. Villagers also consume turtle meat, caiman, birds of prey, and bush animals such as tapir, as well as armadillo and laba. The creeks and rivers flowing down the Marudi Mountains run into the Paunch and Meriwau creeks. These flow downhill from Marudi into Tote creek – a primary fishing area for the Amerindian villages of Aishalton and Karaudernaua. The creeks eventually converge with the Kuyuwini and Kuitaro Rivers, whose waters empty into the Essequibo River —

Guyana's most important waterway and a source of food and resources for numerous communities on its path north toward the Atlantic Ocean.

Historically, Marudi's remoteness and questions about the nature and size of its gold deposits have prevented the area from being exploited on any larger scale. Roads throughout the region are rugged. The absence of an effective system of bridges makes them virtually impassable during parts of rainy season, leaving many areas — including Marudi — inaccessible several months out of the year. As a result, transporting heavy equipment from the nation's capital Georgetown, or even the regional capital Lethem, is difficult. The small aircraft flying into the area have limited carrying capacity, and can only get supplies and machinery as far as Aishalton. From Aishalton it's a hard day's ride through dense jungle to reach Marudi — longer if one is carrying a heavy load across the 19 bridges that lead up to the mining area.

Throughout the 20th century exploitation in the Marudi Mountains remained manual. Miners descend more than 150 feet into a part of the mountain known as Mazoa, passing 100 pound bags of gravel through narrow shafts to hilltops where they can be rolled down to the river for processing. According to the GGMC, the number of small-scale miners living at Marudi has remained more or less constant the last 20-30 years. Indeed for most miners Marudi is home. Mining gold serves as a supplemental source of income that is used as currency for purchasing goods carried into the mountain from Aishalton. The pork-knockers' primary staples, however, come from permanent crops grown on small farms alongside modest wood houses covered with thatched or zinc roofs, as well as from an abundance of cultivated and wild fruit trees.

While there is no formally recognized village called Marudi, the pork-knockers exercise their right to vote in national and regional elections from there; they are counted for the nation-wide census at Marudi; and notably, GGMC wardens sell mining privileges to the miners when they visit the site. "When I went to Aishalton to be counted in the 2002 census, they sent me back to Marudi to be counted," says Clifton Rodrigues, a member of the pork-knockers' committee. "In the 2001 election and in the previous election, we all voted at the

compound. A mines officer comes to sell us mining privileges. The government sends in medical teams. So are we illegal?"

Small-scale mining accounts for as much 30-percent of GDP in Guyana, though such numbers are nearly impossible to confirm because of the high percentage of undeclared gold discoveries (Colchester, 1997). In many cases a relationship — called "symbiotic" by one government official — develops between mining companies and small-scale miners. This relationship involves companies following the booms and busts of small-scale mining to locate potential mines, and small-scale miners entering into agreements with companies as a way of earning extra income. Prior to Vannessa, the exploratory rights at Marudi were held at different times by Norman Mines, Rio Rupununi, Eastern Caribbean, GuyMines, and Romanex International, without conflict with artisanal miners. According to the GGMC: "The companies before Vannessa recognized that the people who were there don't threaten the reserves bigger companies are looking at, and that they actually serve a beneficial interest to them by showing them where the gold is and keeping watch of the property. Norman Mines and Romanex recognized the pork-knockers as homesteaders."

In 1995 Romanex got as far as conducting a feasibility study for an open-pit mine on the 21-square mile concession, and claimed to have discovered a 600,000-700,000 ounce deposit at Mazoa (Khan, 1995). But Romanex also expressed doubts over the economic viability of the mine because of the area's distance from access routes on the coast and lack of infrastructure and services. After nearly ten years of prospecting, Romanex finally gave up, telling miners the deposits at Marudi were not rich enough to pursue.

When it purchased the concession from Romanex in 1997, Vannessa Ventures, a Vancouver-based junior, entered the area and proclaimed they would preserve good relations with the miners. According to Vernen De Camp (2002), a 20 year resident of Marudi, "The Chairman of Vannessa told the residents that they would allow us to continue living in Marudi because Vannessa is an exploring Company and they came and meet us in there (Marudi) and they would leave us."

At a one-day public consultation in June 1999, Vannessa Vice-President Erich Rauguth announced that small-scale mining would be permitted to continue. In a letter to one of the villages, the Managing-Director of Vannessa, Marshal Mintz (1997), told villagers: "We have always conducted our exploration and mining activities in all countries with strong company policies that dictated our relationship with local peoples and the environment, two areas which we have found to be inseparable, especially in remote regions. We have to date, and will continue in the future, to commit to the highest standard of corporate conduct in all our activities while doing business in Guyana."

But just months after publicly declaring their intent to deal amicably with the miners, a mines warden appeared at Marudi and instructed the miners to leave the area within three days. When the miners protested and asked that they be given more time vacate their homes, the warden declined their petition. "This is our home," one miner said. "Most of us have been here 20 years, some longer. We have nowhere else to go. Vannessa even owns the other mines in the area. What are we supposed to do?"

When a month passed and the miners were still there, Vannessa and the GGMC took a different approach. On the week of November 10th, 1999 a company of 8-10 men, including Vannessa officials, a mines warden, and police from Lethem and Aishalton, arrived at Marudi brandishing self-loading rifles. They demanded that the pork-knockers and their families leave the mountain immediately. "They pointed them right at us," one miner said, referring to the rifles. Then, without warning, the party began torching miners' homes with their household belongings still inside, burning 25 houses. "We lost everything," says Vernen De Camp. "We lost our beds, our pots and pans, hammocks. They even burned our fruit trees and our gardens."

Approximately half the miners left the mountain under the watch of Vannessa and GGMC officials. But a large group did not leave, fleeing into the bush until the party had left the mountain. This group, which numbered at least 20 people, promptly returned to Marudi and resumed mining. "We help each other to get by," says De Camp. "We share what we have. But I sent my family to Aishalton. I'm too scared to have them here now."

Initially, Vannessa asserted it had not had any involvement in the sweep of the village. But the company's on-site manager later acknowledged having accompanied the police and personally torching houses. "The exercise, more-or-less, was carried out by the GGMC. But I lit one of the shelters at Peace Creek," he said.

According to the miners, it was not only one house that Vannessa officials burned. "I personally saw them light a few houses, including mine," said Patrick Morrison, a resident of Marudi for 17 years. Nevertheless, Vannessa's senior management remained unrepentant about the treatment of the pork-knockers. "Let's be honest," said James Stonehouse, Vannessa's Director of Operations in Georgetown. "There are houses, and then there are houses. If houses were burned, this could have meant just a few poles with a tent on top."

When news of the sweep reached the media, GGMC officers portrayed the miners as "itinerant raiders" whose presence, according to Mines Commissioner Robeson Benn, threatened the *promotability of the property*. "There are no legal residents at Marudi Mountain," Benn told the Stabroek News (Lucas, 2003). "The Marudi Mountain is a concession which is being operated by Vannessa Ventures... There is no permission and no legal sanction for [the miners] to be on the property. We have not signed off mining privileges. We have not given residential permissions, or any other document by which they can be legally on the property."

The legal case of the miners was taken up by Camilla Edwards, a Georgetown lawyer. Speaking informally in her office, Edwards said, "The law allows that even if some people were there illegally, these persons, by long and undisturbed use for over three decades, have a proper right of claim to occupation. There is substantial evidence that these people lived and enjoyed uninterrupted occupation prior to Vannessa Company."

Several of the miners retrieved documents signed by mines warden Anthony Paul. These licenses give individuals prospecting rights and privileges to mining District 6, where Marudi is located. "Where do they think we're going to use the privileges?" Clifton

Rodrigues asks. "We all live here. They sell us the privileges here. We are paying the GGMC to mine at Marudi."

Legally, it may be possible to argue that neither Vannessa nor the pork-knockers possess the right to mine at Marudi. In theory, as long as Vannessa holds the prospecting license, there should only be mineral exploration on the claim, but no extraction. Further, the privileges sold to miners do not constitute a right to mine in and of themselves: privileges must be endorsed by a claim-holder, which in this case is Vannessa. (Whether Vannessa could lease parts of the area once it has a mining license is another question.)

Still, this does not reverse the fact that the miners' presence at Marudi has been common knowledge throughout the GGMC for years, and there was never any public discussion of removing them. "When the GGMC has slipped on its responsibility to ensure that no one occupies and operates in the area for over three-decades, it cannot now be heard to say that such occupation is illegal," argues Camilla Edwards.

In the end, the issue is not simply a question of legal right to the land, but that force was used as a way of resolving a land dispute in which there are at least four legitimate groups claiming mineral resource rights. "Whether the pork-knockers had legal right or not, it's not the way to go about it," says Patrick de Silva, a resident of Aishalton who serves the community at Marudi as a pastor. A GGMC official agrees: "Even if Vannessa wants to argue that they needed to move them to set the stage for mining, that still doesn't justify their actions. "They need to accommodate and compensate these people."

While Vannessa's Georgetown office remained adamant that they were "unaware of any Vannessa personnel burning anybody's anything," the company's on-site manager expressed regret for having participated in the burning of the miners' homes. "It is wrong," he said. "The warden told me he was going to burn the houses because otherwise these people will come back, and I was in total agreement. But it's wrong; it is wrong to burn down a dwelling."

4.4 Defining Artisanal Mining: Illegal or Extralegal?

Much of the tendency to resort to force stems from two misjudgments. The first is examined at length earlier in this dissertation, mainly the idea that once pushed off the land miners will simply turn to alternative livelihoods. This myth ignores the fact that gold mining is five to 20 times more profitable than average daily income from other economic activities. A serious strategy of alternative livelihoods depends on identifying the potential for macroeconomic growth in other sectors, rather than speculation that miners will spontaneously turn to other trades.

The second strategic error comes from declaring artisanal miners categorically illegal. Strictly speaking, a miner working on part of a company's concession is operating outside the law. But few cases are this simple. For more than a century industrial and artisanal miners have coexisted in a symbiotic, if troubled, relationship. Companies often follow local miners toward gold deposits, while miners keep a close eye on where companies are prospecting (Colchester, 1997). More to the point, branding miners as illegal creates an illusion of legal permanence — an assumption that today's law has always and will always be the way things are. In fact, the tendency to categorize miners as illegal is a new phenomenon, created by countries attempting to create an attractive investment climate which is uncomplicated by the murky status of artisanal miners (Hilson and Potter, 2005). The question to ask is this: if a miner is working on part of a concession or processing tailings that a company does not intend to exploit, does this make him a criminal or a capitalist?

A more suitable term for unofficial artisanal mining is De Soto's (2000) nomenclature of extralegality. Illegality casts miners as outlaws, whereas extralegality implies that artisanal mining is an activity for which a formal legal framework has not yet been created. When miners are categorized as illegal this prevents any official organization, or company, from initiating pollution or poverty reduction programs. The shift towards thinking of miners as extralegal follows the reasoning of legal theorists who argue that in order to reduce conflict the state must find ways to adapt law to natural conditions, rather than legislating from a preconceived notion of what ought to be legal. As De Soto argues: "Massive extralegality is

not a new phenomenon. It is what always happens when governments fail to make the law coincide with the way people live and work."

As a case in point, an official from Ghana's Minerals Commission asserted that his government opposed all forms of illegal mining, and intended to address the issue by conducting sweeps consented to by gold mining companies (I. Bawa, 2006 – Pers. Comm.). Yet when faced with the proposition that some companies might relinquish parts of their concession to formalize extralegal mining activity, the official changed his position, saying "Well then of course we would be happy to legalize them."

In short, the same agencies enforcing the law are also capable of changing the law. Dubbing artisanal miners as illegal merely perpetuates an uncomfortable dissonance between codified law and customary practice. If a government possessed viable economic alternatives for miners, then there might be value to approaching industrial-artisanal conflicts as an enforcement issue. Instead, governments are offering piecemeal solutions which only scatter miners temporarily. Rather than solving the problem, this practice diminishes the country's attractiveness to foreign investors, since protracted instability alters the willingness of companies to pursue new mines. "A 2001 survey of mining companies revealed that when such conflict is violent, it often serves as a significant disincentive for mining companies to maintain and make further investments in their operations in the area of unrest" (Hilson & Potter, 2005, based on MMSD 2002).

Thus for all three of the major parties involved in mineral resource conflicts — artisanal miners, companies, and governments — resolving conflicts through peaceful coexistence is the most effective avenue to mitigating risk. It is also the most economical course, though this efficiency is not always visible. "It is very hard to cost the negative of something that became positive. How do you put a price on a problem that did not happen?" (C. Anderson, NGGL – Newmont-Ghana, 2006 – Pers. Comm.). Yet any company can calculate the costs of lost production when access roads are blocked by angry miners demanding fair treatment, or from mining operations hanging in limbo because questions about social license are holding up the issuance of mining permits. Likewise, it benefits governments to get off the

fence about their relationship to artisanal and small-scale miners, whose contentment is a critical facet of maintaining the peace and order required to attract foreign investment.

4.4.1 The Economic Potential of a "Gold Colony"

Mining areas frequently evolve into regional centres of trade, growth, and dynamism. As a result, when a gold mining area is "swept" free of miners, this decision ripples through the entire economy, often leaving thousands or even tens-of-thousands of people without jobs. Ironically, this only makes gold mining more attractive, if not in the site that was originally contested, then elsewhere — potentially including areas a company actually intends to mine.

In addition to the three parties — industrial and artisanal miners, and government — mentioned above, a fourth group also stands to benefit from the resolution of resource conflicts through peaceful means. These are of course the local communities. Artisanal gold mining is correctly blamed for introducing many social risks to communities, including prostitution, the spread of sexually transmitted diseases, and legal disorder. But at the same time there can be little argument about the way small-scale gold mining creates a capital system that generates alternative livelihoods. As Trollope (1875) reported about 19th century Australian gold mining:

> And thus not only miners came, but also the wiser tribe who condescended to cater for the miners' wants. Houses were built, and banks were opened – and with banks, schools and churches. And thus a colony was formed, owing its existence almost as much to those who failed as to those who succeeded. Whether it be good or bad to go into the gold trade may be doubted, but there can be no doubt that it is a fine thing to belong to a gold colony.

It is easy to walk into an artisanal mining site and see in it nothing more than chaos. But contrary to this perception, even the most chaotic artisanal mining areas frequently evolve deep organizational structures. Perhaps the most illustrative example is the infamous case of Serra Pelada. In the Carajas region of Northern Brazil, the government-run company, CVRD/DNPM, owned a large manganese claim. When gold was discovered on the claim by artisanal miners in the late 1970s, it began what is generally considered the most intense gold

rush of the 20th Century. Believing the area could produce enough gold to cover its $100 billion foreign debt, the Brazilian government encouraged expansion of this area — known as Serra Pelada (the Naked Hill) — by creating the first artisanal mining reserve, or *garimpo.* At its peak, Serra Pelada supported as many as 80,000 miners.

While these 80,000 people were packed back-to-back into the open pit, the gold rush was not without organization, including an elaborate system of staking claims and paying royalties of between 5-7 percent (Veiga, 1997a). A cooperative run by the military —perhaps the first known gold mining cooperative in the modern gold rushes of the developing world, and the first time ASM was organized in South America — was established by General Sebastiao Curio, after whom the town Curionopolis, which sprung up around Serra Pelada, is now named. The area was originally controlled by the then state-owned company, Vale do Rio Doce (CVRD). But in 1984 the government granted the garimpeiros rights to 100 of the 10,000 hectares held by the company. Seven years later, the rights were revoked and violence erupted. Recently, the Brazilian Senate has approved a decree giving miners access to their original 100 hectares - although much of the most easily accessible gold is long gone. The legal battle between the company and the garimpeiros froze virtually all mining activities in the area. There is still strong local resentment towards CVRD because of the company's state-backed efforts to expel garimpeiros still living on the land in the mid 1990s, despite the fact that the once state-owned company has been privatized and transformed. The new CVRD has begun promoting health, education, and agricultural programmes that could give the miners an alternative to gold mining.

4.4.2 Case 2: Emergence of a Gold Economy (Noyem, Ghana)

Though on a smaller-scale than the development of Curionopolis, an economic scenario with some similar features recently unfolded in the Eastern Region of Ghana, albeit with a very different outcome from Serra Pelada. Gold deposits near the town of Noyem fall inside Newmont Ghana's (NGGL) undeveloped concession (called Akyem). These reserves, however, are not part of the concession Newmont intends to explore. Until their evacuation in November 2006, many thousands of extralegal miners had converged on Noyem, as well as at a smaller second site, Ntronang. Like Noyem, Ntronang is inside the concession but is

not targeted for exploration, though Newmont does plan to divert water from the nearby River Pra. Because mining was underground in both places, safety issues were paramount. Miners at these two sites relied on mercury to process gold.

Estimates of the number of miners at Noyem varied greatly; one researcher suggested there were a few thousand miners (Zandvliet, 2005); another proposed a much higher figure closer to 20,000 (G. Hilson, Univ. of Manchester, 2006 – Pers. Comm.). The latter estimate seemed high, but no census was conducted by the government or by Newmont. Though smaller, Ntronang still involved around 1000 people when all 200 pits were being mined. At Ntronang, miners were using dynamite to blast through quartz deposits, and excavating hard rock from 30 metres deep using pickaxes and their backs.

Formerly known as the Gold Coast, Ghana has been a prime target of foreign gold investors since at least the 1500s. Amongst others, the Portuguese, Germans, and British have held claims to the country's vast gold resources. But following independence in 1957 — Ghana was the first African colony to emancipate — minerals were nationalized. This policy lasted into the 1990s, when neo-liberal investment reforms were made a precondition of loans from international financial institutions. Since then, foreign investment in gold mining has assumed a central role in the country's economic development strategy. For mining companies as well as the government, exploitation of Ghana's gold reserves is now a pivotal feature of their financial portfolios. Next to the Yanacocha mine in Peru, Newmont's expansion into Ghana is its biggest single investment. However, Newmont's growth has been slowed by several issues relating to social license, and the environmental permit for Akyem still has not been issued.

By 2006 mineral resource conflicts existed in Ghana between artisanal miners, or *galamsey*, and at least four mining companies including GoldFields, AngloGold Ashanti, Golden Star, and Newmont. Discussions about non-coercive forms of conflict resolution were ongoing at various levels among mining companies, the Ghanaian government, local communities, NGOs, the United Nations, and academic researchers. Between September 2004 and January 2007, Newmont engaged at least four separate groups of external consultants to

assess and monitor the situations at Noyem and Ntronang. These consultants produced a series of reports, beginning with a straightforward accounting of how miners operate, their affiliations, and the gold supply chain, to a policy framework aimed at legalizing and formalizing the small-scale miners, and ways for NGGL to help develop a sustainable small-scale gold mining industry in the country. This plan had the support of senior company executives in Ghana, but was never endorsed by corporate headquarters in Denver nor adopted as company policy. No ASM engagement programs were initiated.

In the meantime, galamsey leaders — some legitimate, others not — wrote to the Mines Commission requesting the government intervene by recognizing their mineral resource rights. Some of these spokesmen submitted similar proposals to mining companies, in particular to Newmont. These requests had as much to do with intertribal competition over mineral rights as with contesting any company's right to mine.

One organization operating in Ntronang — the United Small-Scale Mining Association (USSMA) — went so far as to establish an office decorated with a sign bearing its own name and the brand logo of Newmont, giving the impression it was an affiliate of the parent company. When Newmont officials saw the sign they requested it be removed immediately. USSMA also set about registering close to 200 miners, telling them the fees they paid were an official tax. Another office was established on Ntronang's main street with a sign announcing that USSMA was responsible for the "regularisation and legalization" of miners, though the organization had no such formal authority.

The organizational structure of Noyem was more complex than Ntronang. Its camp sprawled for several miles, with one big underground mine at the front. As noted earlier, this mine was fortified after Newmont excavated property trying to save trapped miners in 2005. Beyond the entrance there were hundreds of 30 foot deep pit mines. Miners worked in groups that were loosely assembled into four cooperatives. Gold claims were marked using the natural landscape; in one place a mango tree served as the line between two claims (what De Soto (2000) calls the "Barking Dog" test, where one knows he has crossed from one property to another because he hears the barking of dogs defending the territory). These four

cooperatives ultimately fell under two separate authorities, the tribal chiefs of Noyem and Nyamfoman who both claimed the Noyem mining camp as customary "stool" land. Each tribe had different financial backers who provided basic equipment such as pumps and sluices. Their access to capital endowed the equipment suppliers with significant power, weakening the political and economic authority of the chiefs.

Noyem also had an undercurrent of violence that Ntronang did not. In general, rumours of extreme violence occurring in gold mining areas are overstated. As Cleary (1990) points out about the Amazon, "violence measured in terms of death or injury, although present, is proverbial rather than real, and the ubiquitous violence in descriptions of *garimpos* by journalists and others is usually no more than a cultural construct that comes from people with no direct experience of garimpos." But on one visit to the Noyem site, a fight broke out near an area designated for processing ores and roasting amalgam. One man claimed another attempted to steal his bag of ore. They pushed and yelled, but did not strike each other. People around them called for order, and the aggressor of the fight stormed off down the path. On a another visit, miners threw rocks from a hill above the big underground mine. The rocks pelted the zinc roof and rolled away. While the sense of violence was noticeable, there was no way to gauge its depth without sustained fieldwork. It could have been caused by intertribal, or at least factional, conflicts. But the cramped conditions of the camp were also enough to stoke tensions. Thousands of people crammed in close quarters, sleep deprived, drunk, dirty, high, malarial, syphilitic, exhausted, and hungry; miners sleeping where they work, defecating where they sleep, and eating where they defecate— no sanitation, garbage collection or water treatment; no infirmary; no law enforcement; and an abundance of

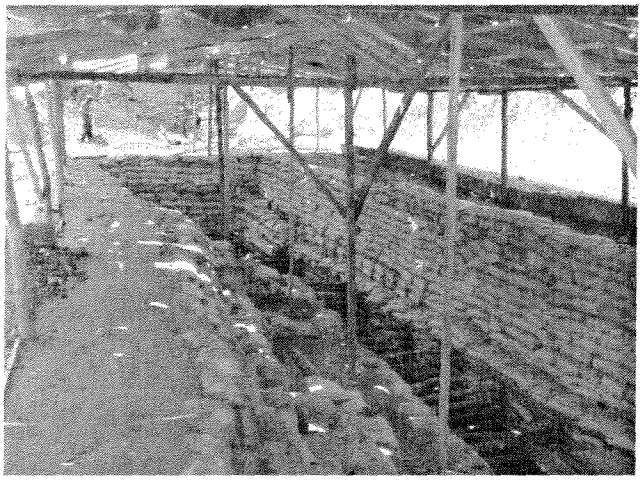

Fig. 6 – Underground mine at Noyem, Ghana

history's most desirable precious metal. It seems logical there would be at least some conflict even without tribalism.

Inside the fences of Newmont's mining camp the stories about extreme violence occurring amongst the galamsey could be outlandish, bordering on apocryphal. "Machetes at dawn" was how one person described it. The origins of these stories were never clear; they often seemed to be unconfirmed tales based on tertiary sources. Despite evidence of violence at Noyem, an offer of financial assistance to modernize the mining process remained a powerful incentive for rival groups to federate. Miners are in the end rational businessmen. By linking security demands to technology assistance that would increase their profits from gold mining, it could have been possible to cool the area of its tension.

Persuading company officials of this possibility was made difficult by how poorly informed they were about the specific mining community they were dealing with, and the dynamics of artisanal mining in general. In fact, few official visits to Noyem were even conducted until Luc Zandvliet (2005), a human rights and humanitarian consultant, conducted a brief assessment on Newmont's behalf. Until then, virtually all information was collected indirectly. Newmont officials believed they would be targets of violence if they walked directly into the mining area. Walking into the site is exactly what Zandvliet ultimately did (as well as Hilson in a different capacity); neither reported any security risk.

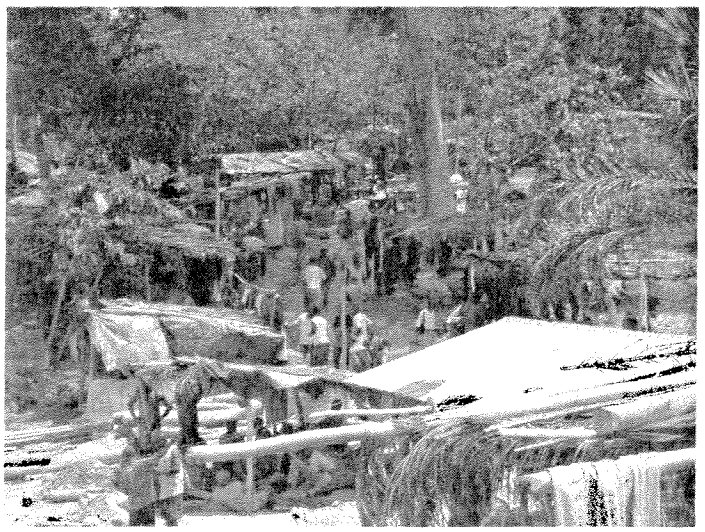

Fig. 7 – Marketplace on road to Noyem mines

If one took this walk from the road into the mining camp, what he found was a new city emerging around the gold rush, not unlike a town in the Dakotas or the Sierras in the 19th century. There were not only miners but gold processors, gold buyers (who were also the mercury suppliers), restauranteurs,

clothing retailers, blacksmiths, pharmacists, equipment suppliers, whoremongers, saloonkeepers, drug dealers, money lenders, nurses dispensing Chinese herbs, and political organizers; all of the alternative livelihoods which, just as Trollope described, "condescend to cater for the miners' wants" (that is, the *needs* of miners). When at last he visited the busy marketplace leading into the mining camp, a Newmont official observed: "Look at what's happening here. We can't provide this."

Indeed, when it comes to social license one of the dilemmas companies face is the sense that they are becoming responsible for services they do not know how to provide. Governments are now deferring development decisions to mining companies; municipal offices and polices units expect a company to boost their budgets. "Everybody has complimentary roles here. But we want to fill in the gaps, not bankroll the government" (C. Anderson, NGGL – Newmont Ghana, 2006 – Pers. Comm.). Therefore, it is worth asking the questions: What role, if any, should mining companies play with respect to artisanal mining? Is it a mining company's responsibility to protect miners from each other? Should it be underwriting urban development in an artisanal mining area? Does this contribute to social license?

"Whether it be good or bad to go into the gold trade," as Trollope asked, is a question for the ages. Still, there is simply no way a company or government can hope to replicate the kind of rapid development of the marketplace that accompanies a gold economy. This is hardly to say that gold colonies are idyllic, or that resolving conflict within a complex camp environment is simple. However, an unregulated economy alone is not enough to bring about peace and stability: the institutions of the state exist in order to monopolize violence. A mining camp has tremendous economic inputs and outputs, but where there is no sanitation system, clean water, medical care, disease control, or law enforcement; without the instruments for peace — no civil infrastructure, no banking, no leadership, it is only natural there would be tension, conflict, and violence. At the same time, the economic potential in such a place is undeniable.

Yet despite the potential benefits for risk mitigation and social license that might have been achieved through engagement with miners, Newmont remained apprehensive about

empowering the wrong parties, fearing it could trigger wider intertribal conflict. NGGL's Vice-President of African Operations supported the legitimization of artisanal gold miners — as did several key officials within the organization — through apportioning part of Newmont's concession to local communities, or even some kind of joint industrial-artisanal business venture (B. Zisch, NGGL – Newmont Ghana, 2006 – Pers. Comm.). However, a Catch-22 emerged where the government claimed it could not offer miners any legal standing unless Newmont relinquished the areas sought by miners, while Newmont cited a law prohibiting companies from formally engaging in or permitting small-scale mining.

Rather than offering to reexamine this law, the government, led by the Ministry of National Security, pushed for the evacuation of miners through a series of military sweeps, choosing a short-term solution to a long-term problem. Late in the autumn of 2006, Ghana's Ministry of National Security authorized a country-wide initiative to remove all galamsey from mining concessions leased by large-scale mining companies (Statesman, 6 Nov. 2006). The decision to evict miners signaled an end to this period of negotiation, and marked a return to a more traditional top-down approach to resource conflict. After close to two years of deliberation, NGGL elected to cooperate with the prevailing policy of conducting sweeps of extralegal mining areas. Both Noyem and Ntronang were cleared of miners, and access to them restricted by the military. For how long this strategy can be sustained, and whether miners will ultimately return to the site are questions whose answers remain to be seen.

4.5 Varieties of Industrial-Artisanal Resource Conflict

This section reviews a selection of seven cases where conflict is occurring or has occurred between industrial and artisanal miners. Two additional cases have already been reviewed above (Guyana, Ghana). By no means does this constitute an exhaustive inventory. The database for evaluating extralegal mining conflicts is too small, and lacks the ground-truth to be considered comprehensive. Further research into the dynamics of these conflicts, and an evaluation of previous efforts at conflict resolution, would benefit the entire mining industry. This survey is intended as the initiation of that database. Because conditions in the field are always changing, an ideal form for this database is an updateable web domain to which researchers around the world could enter and change information as it becomes available.

4.5.1 Siguiri, Guinea: AngloGold Ashanti

(Primary/Colluvial Gold Ore)

Since 1993, AngloGold Ashanti has operated the Siguiri mine in northeastern Guinea. The mine, located in the heart of one of the world's oldest gold mining regions, produces 10 tonnes per year, and employs 1228 people. From the outset of operations, AngloGold has had problems with artisanal miners coming onto the Contract of Work to process its tailings. Recently, miners have become more aggressive by coming directly into the open pit, causing several accidents for which AngloGold is considered liable. The company relies on security forces to manage the situation, but has trouble monitoring the mine because the main office is 25 kilometres from the site. According to AngloGold, "It's a constant problem. It's not just a few miners coming into the open pit, it's a whole society; it's the entire structure" (T. N'nady Conte, AngloGold Guinea, 2006 – Pers. Comm.).

AngloGold recognizes artisanal gold mining as a potential avenue to poverty alleviation, and wants to find a diplomatic rather than a security solution to the problem. But it does not have a model for addressing the issue. There is also a concern that any effort to legalize miners will involve a renegotiation of the CoW with the Guinean government. AngloGold is paying less in export taxes than the fixed rate recommended by the World Bank. The government, which is considered amongst the most corrupt in Africa, has made it clear it is looking for a different deal. AngloGold pays a 0.4 percent tax to the local prefecture. These funds are directed toward a commission for local development managed jointly by the prefecture and AngloGold. In 2006, AngloGold initiated a project to begin working with extralegal miners. No results of this program are available.

4.5.2 Bangka Belitung, Indonesia: PT Koba Tin

(Tin)

In a non-gold related case, the Bangka-Belitung police recently arrested three executives from Malaysian controlled PT Koba Tin, alleging the company was violating Indonesian mining law by operating outside its CoW. Law enforcement officials also seized 500 tonnes of refined tin. The charge apparently emerged out of Koba Tin's effort to support small-scale tin producers by purchasing tin from miners to eliminate middle-operators in the supply

chain. Koba Tin asserts it was purchasing tin only from small-scale miners who were operating within its CoW, and that these purchases were documented and approved.

Small-scale global production accounts for around 60,000 tonnes of tin a year, roughly the same amount produced by Koba Tin and another company, Timah. Even before arresting Koba Tin's executives, the government had signaled its intent to clamp down on small-scale production. In October 2006, police closed three smelters for working without proper mining permits, reportedly triggering violent protests by miners. Dozens of small-scale smelters stopped operating. Coupled with uncertainty around Koba Tin's production, international tin prices skyrocketed to a record high of $12,225 a tonne.

This case is important because it challenges two major assumptions within the professional and academic community working on mineral resource conflicts. First, these conflicts are often treated as if they are standoffs between two parties — industrial and artisanal or small-scale miners. For example, in their plan for mediated dispute resolution between companies and artisanal miners, Andrew and Hilson (2003) present a helpful prescription involving multi-stakeholder participation, impartial mediation, confidentiality, equality, and fair representation. Though ideologically accurate, these recommendations are based on the aspiration that there are stable bilateral or multilateral negotiating partners. In many cases, however, the stability of negotiating partners is considerably more complex. It was already observed in the case of Noyem that there can be numerous divisions and factions among artisanal miners. Koba Tin underscores the point that there at least three major groups to consider: mining companies, artisanal miners, and government. Within these groups there are generally multiple parties that have to be involved in negotiations; in companies there must be consent among the operations managers, national office, and corporate headquarters; amongst artisanal miners there are almost always several labour organizations or tribal affiliations; and government involvement can include multiple national ministries, state and municipal officials, and military or police forces.

A second critical assumption challenged by the Koba Tin case is that mining companies can improve relations with artisanal miners by purchasing their ores, as some analysts have

suggested (Jennings, 1999; M. Woods, NGGL – Newmont Ghana, 2006 – Pers. Comm.). On the surface, this appears to be a good policy. Companies have a more direct link to the marketplace than small-scale miners, whose products also frequently need further stages of smelting than their technology allows. Purchasing ore from miners and combining it in an industrial smelter can add value to small-scale production. However, the universal problem with artisanal and small-scale economies — be it mineral, agricultural, or manufacturing — is the inability of artisans to access markets directly. Next to inefficient processing, poor access to markets is the most vexing problem for small-scale miners. The amount they produce is rarely enough to cover transportation costs. This creates a niche for middle-operators to accumulate the scale quantities needed to support transport costs. In bush areas, where so much mining activity occurs, it is common for the military or another powerful party to participate in the middle part of the supply chain. People in Indonesia familiar with the case speculate that by altering the supply chain Koba Tin disturbed an official office that benefits from the existing arrangement. Mining companies cannot easily challenge this arrangement without provoking a conflict with government. As noted in several cases, mining companies resist this conflict out of concern it will lead to demand that CoWs be renegotiated. In extremely remote conditions, companies also fear violent reprisal from the aggrieved party targeting their employees as a message not to disrupt supply chains.

4.5.3 Busia, Uganda: Tira Gold

(Alluvial and Primary Gold Ore)

The Tira Gold Mine, in the Busia Goldfield in Southeastern Uganda, sits at the northern end of a Greenstone belt starting in Tanzania and spanning western Kenya (Hinton, 2005a). The mine is Uganda's largest, most mechanized, and organized gold producer, accounting for half of the country's total gold production. It is owned and operated by Busitema CIE Ltd., and involves both open pit and underground operations. Gold occurs in quartz veins, and as a secondary enrichment within a banded iron formation unit at the base of laterites overlying gold-enriched greenstone rocks. This gold is processed with a combination of cyanide vat leaching and carbon adsorption. It is believed that miners use amalgamation before cyanidation. The mine produces about 3 kg per month, and employs 100 people.

Tira Gold first reported production in 2002, and between 2003 and 2004 produced roughly 65 kg of gold. But Busia has been a source of gold production since 1932. Prior to the arrival of large-scale mining, the majority of rural households in Busia were working either full- or part-time in gold mining or gold processing. Artisanal miners work both above ground and below. Underground mining is performed by sinking shafts and following seams laterally. Pit walls routinely collapse, and fatalities are common.

With the occasional exception of some stamp mills, artisanal mining activities are performed manually, using hammers and steel mortars for crushing and grinding. Miners use mercury to amalgamate whole ores, and have little in the way of environmental or health management capacity. Miners work in groups of 8-10, and recover approximately 4g/tonne of gold (Hinton, 2005a).

Partly because the Tira Mine is only 7 km from the town of Busia, the presence of 200 to 300 seasonal and permanent artisanal miners remains a persistent issue for Busitema Mining. While the company maintains a non-confrontational stance toward miners, relations between the two groups are generally poor. In an effort to obtain a legal small-scale mining concession — for which there are provisions in the 2003 Uganda Mining Act — miners attempted to unite their interests by forming the Eastern Artisan Miners Company. However, the area of interest to Eastern Artisan overlaps with the concession held by the Busitema. The Government of Uganda and World Bank have expressed interest in developing a solution to this conflict. To date, no specific intervention has been initiated.

4.5.4 Kalimantan, Indonesia: PT Hampalit

(Alluvial Gold Ore)

The town of Kereng Pangi (also known as Hampalit) was formerly the concession area of PT Hampalit Mas Perdahana, a state-run company operated by the Soeharto Government. Artisanal gold mining developed alongside large-scale mining, with miners working on the periphery of the company's concession. When PT Hampalit ceased operation after the financial crash of 1997, the concession was overrun by ASM activities. The method of gold extraction is mercury amalgamation of concentrate. Until June 2007, this was an area of focus of the United Nations Industrial Development Organization's

Global Mercury Project (Purwana, 2003).

In addition to environmental issues, ethnic conflict between the early settlers from Banjar Mansin and later Madurese immigrants has occurred. In 2000, following a period of civil unrest, all Madurese were forcibly evicted from the mines. More recently, the indigenous Dyaks, who typically mine only by dredging local rivers, have entered the land-based mines by invoking their indigenous rights to the land through the burning of swaths of forest. Through this method, they have acquired the richest claim currently active in the territory. (Based on fieldwork conducted by Kevin Telmer, Associate Professor, Dept of Earth and Ocean Science, University of Victoria, consultant to UNIDO, 2006 – Pers. Comm.)

4.5.5 Wassa West, Ghana: Gold Fields

(Primary/Colluvial Gold Ore)

Gold Fields Ghana partnered with the British Department for International Development (DFID) to manage small-scale mining around its operations in the district of Wassa West. A UK-based consulting firm was contracted to develop a policy framework for the ASM sector. The plan is due to be completed in 2007, and is expected to resemble an effort similar to one being tried in Tanzania by AngloGold Ashanti. Its main features include:

- Baseline socioeconomic assessments of ASM communities in the district;
- Community development plans which include health/AIDS, education, water and sanitation, alternative livelihood interventions, and capacity building programs;
- Identifying alternative sites suitable for small-scale mining;
- Development of best practices guidance for relations between small-scale and large-scale mining operations.

The plan was also expected to propose guidelines for accessing the development funds needed for implementation, as well as define methods used to address the issue and lessons learned from different experiences. It is not clear how this policy framework will be affected by the government of Ghana's decision to eradicate illegal artisanal gold mining activities on large-scale concessions (Tejeda, 2006).

4.5.6 Papua, Indonesia: Freeport McMoran

(Alluvial copper-gold tailings reclamation)

In one of the most intriguing examples of mineral resource conflict, the American company Freeport McMoran has recently become embroiled with artisanal miners at its Grasberg mine (PTFI), the world's biggest industrial copper-gold mine. Grasberg lies more than 4000 metres high in the mountains on the Indonesian side of the island of Papua. PTFI's milling processes do not capture all of the gold contained in the feed ore. The tailings produced by the mine are released into the East Aghawagong River. These tailings are transported by the river 40 miles down rugged mountains, before reaching a lowland deposition area which extends an additional 34 miles towards the Arafuru Sea. The gold found in the tailings is being extracted by artisanal panners using rudimentary manual sluicing techniques. As the number of miners grows or if technology improves, it is possible that miners will also explore areas beyond the river. This could result in pit mining, heavier equipment, and greater environmental impacts than mining the tailings.

Artisanal miners discovered the area only within the last five years. The miners come from the local Papuan population, the immigrant Papuan population, and immigrants from other Indonesian Islands (Mulukus, Bugis, Buton, Ambon, Sulawesi, Java). With the exception of the Papuan Komoro tribe, there is much intermingling of ethnic groups. There are now roughly 3000 to 5000 miners working in the river. It is estimated that these miners are also supporting around 30,000 people living in the port city of Timika, where a substantial gold market comprised of more than 20 gold shops has emerged. Gold is purified by skilled refiners and exported to Makasar, Jakarta, or Bali.

In many ways, the Grasberg situation offers the best possible conditions for resolving a mineral resource conflict amicably. There is no mercury use or underground mining, thus reducing environmental and occupational risks to which Freeport could be linked, and the gold is abundant. But relations with miners, which are minimal, have showed signs of strain. PTFI attempted to remove miners forcibly from the deposition area on at least one occasion. Miners were unhappy about the way they were treated, but quickly returned to the river, rebuilt their shelters, and resumed mining. More than once, miners have protested by

blocking PTFI's access to the only road leading to Grasberg. This cost Freeport upwards of two million dollars a day. Reasons for the miners' protests are unclear; some company officials suspect the miners are used as proxies by organizations connected to the Papuan independence movement, but this issue requires greater ground truth.

A second issue is more complicated than the cycle of protests and sweeps that PTFI and miners have engaged in. Gold shop owners estimate that the police collect about half of all gold production as payment for transporting miners from the river to Timika. The law enforcement situation is complicated. There are both military and police forces in the area. A police brigade of 600 men has official jurisdiction of the mine area. The police control transportation and supplies. They provide one way transportation from the river to Timika at high costs, charging $160 US from higher elevations and selling supplies at double or triple their cost in Timika. Since officially no artisanal mining is permissible on the Grasberg concession, the involvement of a security force in the trade of artisanal gold is not exactly legal. However, Indonesian security forces typically have to raise 60 percent of their own operating budgets. The police in this region are believed to have strong ties to Chinese companies. In effect, disempowering the role of security forces in the artisanal gold trade could backfire by empowering the Chinese mining industry. If PTFI loses the police on Papua, it is not clear they could protect themselves or their assets. Freeport has strong ties at high levels in Jakarta, but has less support in Papua itself. If Freeport supports empowering the artisanal miners by, for instance, purchasing their gold, this could exchange an unpredictable arrangement between miners and the police for a much more unpredictable alliance between the police and medium-sized Chinese mining companies. In this scenario, Freeport could ultimately lose its mine.

If this picture seems like science fiction, the arrest of three Koba Tin executives and the show trial of Newmont's Richard Ness are evidence that Western mining companies are not as secure as they would like. PTFI has also already had one tragic incident where the police ambushed and killed two teachers working at the international school run by the company near the mine. Since then, PTFI has been reluctant to challenge existing security arrangements. The security forces are of course over-taxing the miners. There is no reason

miners should lose 50 percent of their earnings to middle-operators. Legally, the gold should belong to Freeport since the tailings deposition in the river is within the CoW. It would make sense for Freeport to become the interlocutor of miners' gold, give them a fair price, and help develop ways for this income to be turned into capital. However, any effort by the company to engage with artisanal miners would signal some kind of formal recognition of the miners. A legal artisanal mining economy is a threat to the undeclared profits earned by the security forces. It also may not benefit Freeport, which suspects that a proposal to legalize small-scale mining in the river will prompt the government to insist on renegotiating the CoW. (Based on Telmer and Siegel, 2007, and fieldwork by Kevin Telmer, 2006.)

4.5.7 Las Cristinas, Venezuela: Placer Dome

(Primary/Colluvial Gold Ore)

In terms of efforts to resolve industrial-artisanal mineral resource conflicts, there are at least a few examples of attempts to find peaceful means of conflict resolution. In the Philippines, the Benguet Corporation reportedly allowed small-scale miners to operate legally on their concession, in exchange for exclusive rights to working the tailings of small-scale miners. Likewise, in the Great Dike area of Zimbabwe companies allowed artisanal miners to rework tailings and operate in marginal and abandoned parts of concessions, with the agreement that miners sell part of what they produced to the company (Andrew & Hilson, 2005).

But it is Las Cristinas that is most frequently hailed as the benchmark for resolving conflict between industrial and artisanal miners. As Heemskerk and Van Der Kooye (2003) write: "Las Cristinas teaches that working with local miners decreases sabotage by local people, lost work days due to conflict, the need to hire armed guards, negative public opinion, and international court cases."

Minera Las Cristinas (MINCA) started as a joint venture run by Placer Dome Venezuela and the Corporacion Venezolana de Guayana. At the time of MINCA's creation in 1992, there were roughly 1000 artisanal miners operating on and near its concession. By 1994, tensions between the artisanal miners and Placer Dome had escalated to demonstrations, open

conflict, and violence. After commissioning a study to evaluate the situation, Placer Dome initiated a series of steps to manage the conflict.

Initially, artisanal miners on the MINCA concession were limited to manual equipment. So long as they did not intrude on active company exploration sites, miners were permitted to access as many ores as they could process. Eventually, a designated area of the concession was set aside for artisanal mining. Vehicles were allowed in this area, and miners were expected to apply rules for occupational safety. Placer Dome provided security and also introduced several community engagement projects. One of these projects helped the miners form Los Rojas, an association created to formalize mining and processing. Place Dome assisted the miners with clerical support, a study tour to Bolivia, strategic planning, and education about mining laws and regulations. For a time, Los Rojas involved approximately 750 local miners and served as an umbrella organization for several mining associations, including a group run by women. Los Rojas had a four-year project development budget of $1.5 million, which covered project staff and included the development of a health center. The International Finance Corporation and World Bank supplemented baseline funding provided by Placer Dome (Tejeda, 2006).

Placer Dome also tried to help modernize artisanal mining by engineering several open-pit mining operations, investing in a processing mill, developing a better system of water supply, and attempting to eliminate mercury amalgamation by improving sluicing techniques. The mill eventually came to serve several different mining associations, which paid into the operation in exchange for batch-processing. Placer Dome provided the initial equipment purchases for the mill, and the miners helped design, build, and manage it (Davidson, 1997). By the time Placer Dome withdrew from the project in 2001, the mill was independently operated (Tejeda, 2006).

In addition to the mill, the engagement project supported miners with job training, environmental management, economic diversification, and a revolving loan fund. During the period of the project, miners are believed to have benefited from improved production, safer conditions, and higher wages. More women were included in the gold economy, and child

labour was eliminated on the concession. Placer Dome experienced a more stable business environment and fewer delays to operations. The World Bank, Conservation International, and DFID praised the project as a model for coexistence. The local community benefited from reduced tensions, improved access to health care, fewer environmental risks, and improvements in employment and education (Tejeda, 2006).

While widely heralded as the most progressive model of coexistence between large- and small-scale gold miners, Las Cristinas also illustrates the complexity of developing a sustainable intervention. The coexistence effort began under Placer Dome, but Crystallex now holds the rights to the concession area. For several years Crystallex has been applying for permission from the Ministry of Environment to begin mining. In the meantime, the concession has reportedly been invaded by numerous – perhaps thousands – of artisanal miners using sluices and mercury (Davidson and Wotruba, 2003).

4.6 Criteria for Evaluating the Feasibility of Coexistence

Although the database is far from complete, it is possible nonetheless to extract the obvious aspects of mineral resource conflicts from the existing case studies. These aspects of conflict between industrial and artisanal miners are sufficient data to determine the criteria for when, and if, gold mining companies should pursue a policy of engagement with artisanal miners. Indeed, it is not the case that all mineral resource conflicts should be negotiated in the same way, nor that mining companies ought always to pursue engagement. There are optimal and sub-optimal conditions for mining companies to engage artisanal miners in coexistence efforts. These conditions should be clarified before any recommendations for action are proposed.

Mineral resource conflicts occur in five distinct forms: when artisanal miners process a company's tailings; when they work virgin land; when miners compete for the same deposit as a company; when they operate on the periphery of a concession; or when they exploit an abandoned concession. In any of these five scenarios, the intensity of conflict is affected by the types of ores miners are pursuing; the mining methods they employ; their concentration techniques; and the purification process. These varieties of industrial-artisanal conflict are

laid out in Table 1 (Telmer & Siegel, 2007) alongside examples drawn from the cases reviewed earlier.

With these conditions as the backdrop, it is observed that in most situations a mining company's ability to initiate an engagement project with artisanal miners is determined by five factors. These are:

1. **Ease of Mining** (e.g., gold grades, location of ores, underground/primary vs. alluvial/secondary)
2. **Safety Compliance** (mine engineering, underground tunneling, child labour, exposure to heavy metals)
3. **Ease of Formalization** (e.g., land rights disputes, governmental relations, tribal conflict)
4. **Sustainability/Environmental Impact** (e.g., use of chemicals, scale of operations, alteration of land and water, level of industrialization)
5. **Life Quality** (e.g., health, wealth, war & peace, food security, education)

The prevalence or deficit of these five factors can subsequently be used to assess whether the benefits of engaging artisanal miners outweigh the risks.

1. **Ease of Mining**: In terms of mining conditions, Grasberg has a favourable working environment. Gold grades are high, its location is well known, and extraction is simple.

2. **Safety Compliance**: All artisanal mining is currently aboveground. Working with aboveground miners simplifies any engagement scenario by reducing the liabilities inherent to informal underground mining. This alone gives Grasberg more potential for developing a creative solution than other cases where miners are working below ground.

Table 1 – Varieties of Large-Scale Mining (LSM)–ASM Conflict

Varieties of ASM & Conflict	Examples
1. ASM work LSM tailings	PTFI, Guinea, Philippines, Zimbabwe
2. ASM work virgin land	Tapajos, Kalimantan
3. LSM & ASM target same ore	Serra Pelada, Guinea, Venezuela, Ghana
4. ASM work periphery of LSM concession	Koba Tin, Ghana, Sulawesi, Venezuela
5. ASM work abandoned LSM concession	Kalimantan, Venezuela, Guyana
Ore types	
A. Alluvial	PTFI, Kalimantan, Tapajos, others
P. Primary and Colluvial	Tapajos, Sulawesi, Serra Pelada, others
Mining method	
a. Above ground	PTFI, Tapajos, Kalimantan
u. Under ground	Guinea, Sulawesi, Tapajos
Concentration method – Chemical Use	
i. Gravity separation only	PTFI, Guinea
ii. Gravity separation + amalgamation	Tapajos, Kalimantan, Venezuela, Serra Pelada, Guyana
iii. Comminution* + whole ore amalgamation	Tapajos, Zimbabwe, Venezuela
iv. Comminution + CN	Sulawesi, Zimbabwe
v. Comminution + amalgamation + CN	Sulawesi, Zimbabwe, Venezuela, Uganda, Philippines
Purification method	
a. Gravity	PTFI, Guinea
b. Amalgam burning	Tapajos, Kalimantan, Zimbabwe,
c. Flux melting	Tapajos, Kalimantan, Zimbabwe, Sulawesi
d. Flux melting + chemical purification	PTFI, Philippines, Sulawesi, others
Legend:	
PTFI	Freeport McMoran - Papua Grasberg Deposit
Guinea	Siguiri, Guinea: AngloGold Ashanti
Guyana	Marudi Mountains, Guyana: Vannessa Ventures
Philippines	Benguet Corporation
Zimbabwe	Great Dike operations
Tapajos	Reserva Garimpeira do Tapajos, Brazil
Kalimantan	Kalimantan, Indonesia: PT Hampalit
Venezuela	Las Cristinas, Venezuela: Placer Dome / Crystallex
Koba Tin	Bangka Belitung, Indonesia: PT Koba Tin
Ghana	(1) Wassa West, Ghana: Gold Fields; (2) New Abirem, Ghana: Newmont Gold (NGGL)
Sulawesi	North Sulawesi, Indonesia PT Newmont Minhasa Raya; PT Archipelago
Serra Pelada	Serra Pelada (The Naked Hill), Brazil, CVRD
Uganda	Busia, Uganda: Tira Gold

*Comminution is the reduction of particle size by crushing, grinding, or attrition (any disaggregating process).

3. **Ease of Formalization**: Formalization of the Grasberg miners is complicated by terms of the CoW, an unstable political environment, the potential influx of tens-of-thousands of miners, and the ethnic diversity of miners. On the upside, the concentration of miners in one location, strong local infrastructure, PTFI's long-term commitment to the area, and resource abundance make formalization possible, if difficult, in the long term.

4. **Sustainability/Environmental Impact**: ASM at Grasberg currently has negligible environmental impact. No chemicals are used and there is no measurable physical disturbance relative to the main mine's tailings process. This is a very positive condition and one which may allow specialized marketing of gold produced by ASM such as economic schemes like Green Gold or Fair Trade Gold (Perlez and Johnson, 2005; Schein, 2005).

5. **Life Quality (health + wealth)**: Given the gold grades, small-scale gold mining at Grasberg has the lowest safety risks and the greatest potential for high quality of life of any similar situation around the world.

According to these criteria, PTFI ranks high in four of the five relevant categories, making it a preferable situation for moving in the direction of engaging with miners. This does not, however, suggest that such a move is a no-brainer for PTFI. Indeed the one criterion that does not grade high is the ease of formalization, which in this case is hindered by the complex role of the security sector at Grasberg. But in terms of evaluating risk, these criteria allow companies like Freeport to view this dilemma in an appropriate context. In this case, security sector reform has to be part of the equation for an engagement policy to succeed. If Grasberg rated low on the other four criteria, it might be argued that detachment is superior to engagement. But given PTFI's otherwise high standing, the need for security sector reform is a negative in a sea of positives.

Because there can be such radical variations in ASM activities from place to place, it is unlikely that an integrated framework for the entire gold mining sector is possible, or even beneficial. It is more realistic that conflicts be approached on a case-by-case basis. Rather

than attempting to define a single grand model, mining companies would be better served to initiate engagement through specific on-the-ground actions that develop functional relations with miners. Once this step occurs, better information about the identity of miners and their aspirations can be collected. Only after this line of communication is established does it become possible to facilitate the development of a long term blueprint for engagement. This is an adaptive approach, one that evolves, filters out false stakeholders, and affords companies the opportunity to build around realistic conditions.

4.7 Chapter Conclusion

Mineral resource conflicts are a lose-lose-lose-lose for artisanal miners, mining companies, governments, and local communities. The perpetuation of conflict threatens every party by creating insecurity, violence, and risk. It is in the interest of all stakeholders to negotiate durable solutions which permit industrial- and artisanal-scale gold mining to coexist. To arrive at this result requires an industry-wide policy shift toward recognizing artisanal mining as a valuable contributor to poverty alleviation. Peaceful coexistence between industrial and artisanal miners can only take root if local communities are moving away from desperation. Because of the high value of gold relative to other resources in many developing countries, idealized scenarios of miners transitioning to alternative trades are unrealistic. As Pedro (2004d) argues and the Yaoundé Vision Statement affirms (UNECA 2002), mainstreaming ASM into poverty alleviation programs must be contextualized as part of a sustainable livelihoods approach.

Further, coexistence with artisanal miners contributes to social license by virtue of promoting peace and economic development. It hardly makes sense to dismantle the best thing communities have going economically. However, social license is only one reason mining companies ought to engage with artisanal miners; it is perhaps not even the most compelling reason. Extralegal mining on a CoW carries profound risks connected to accidents, fatalities, mercury pollution, environmental degradation, and finally existential threats to a company's principal mining activities. The best hope for building peace, and for keeping mining from spreading uncontrollably around or into the heart of a concession, is a strong local economy. Risk mitigation is a function of political stability and economic

predictability. The most erratic scenario possible for a mining company is for miners to be shifting sites every time they encounter a high water table, or discarding rich tailings because they only have inferior mineral processing equipment.

Occasionally, there are relatively simple ways for gold mining companies to reduce some of the environmental risks created by ASM. Companies could, for example, support efforts to reduce the supply of mercury available on the global market by agreeing to capture and retire byproduct mercury from industrial gold mines. Mercury has only nominal commodity value. By doing this, gold mining companies could help create an incentive for miners to make their mercury use more efficient. Coupled with a program for technology transfer, a policy measure of this sort would help the public profile of the gold mining sector. Just as stories which vilify mining companies play well in the press, so do stories about efforts to reform, particularly when the media believes it can take credit for the transformation. Developing solutions to a complex social problem that protect the rights of local communities, support investment in small-scale enterprise, and alleviate poverty will help renew the image of companies as socially responsible.

But no matter how successful these measures might prove, the means to resolving resource conflict with artisanal miners is to grow a sustainable small-scale gold mining economy. While there are cases where potential safety risks are too great for companies to absorb — especially where underground mining prevails — there are also numerous examples where training miners to use more advanced methods will improve productivity. This, in the end, is how small-scale mining will begin to become more sustainable. As Cleary (1990) points out, there is a tendency for artisanal gold miners to continuously chase after newer, richer, deposits, a process known disparagingly in the Amazon as *chasing fofocas*. However, "those [miners] with any experience tend to think that the best strategy is to find a *barranco* [area of gold extraction] that seems promising and stick to it." In other words, because artisanal gold mining is driven by economic necessity, it must be assumed that ASM will persist wherever gold is discovered. But this does not exclude the possibility of guiding miners toward deeper, more efficient, extraction in specific areas, avoiding the type of constant movement that plagues some areas, and continuously pressing closer to large-scale concessions.

Concentrating development assistance on existing mining areas creates incentives for miners to remain settled. This limits the ecological impacts of ASM to a particular zone, laying the foundation for a transferable, replicable, and responsible model for small-scale mining.

Of course, the immediate economic benefits of small-scale mining do not change the fact that mining is fundamentally unsustainable. Gold production is not an end in and of itself, but a vehicle through which sustainable economies can be built. As more civil infrastructure is established and the market around the gold trade enriched, ways to diversify the gold economy can be addressed. As the ILO (Jennings 1999) recommends, companies could reach out to miners through a series of steps, including 1) increasing recovery rates by improving mineral processing; 2) providing technical support in mining engineering, mine design, and assaying; 3) instructing miners in management of chemicals, particularly mercury; 4) and emergency assistance and mine rescue. As relations progress, intervention could evolve towards formalization; relinquishing non-essential parts of a CoW; working out market corrections to make the gold supply chain more fair and improve access to goods and services; and, depending on how the community is organized, contribute to the building of capital by investing in milling operations and processing plants.

The expansion of extralegal mining around the world is changing the economic and political landscape for the industrial gold mining sector. While the 1980s and 1990s saw a global trend towards the privatization of vital mineral deposits (Andrew and Hilson, 2003), companies are now increasingly confronted with large numbers of miners competing for mineral rights. This extremely risky situation is a threat to the long-term profitability of gold mining companies. Third-party intermediaries are needed to evaluate these conflicts and offer remedies that protect both the economic rights of artisanal miners and the viability of industrial mining.

In 2000, the UN General Assembly and Security Council adopted resolutions, such as the Report of the Panel on United Nations Peace Operations, recognizing the vital role of all parts of the United Nations system in conflict prevention (Responsibility to Protect, 2001). But no plan developed by intergovernmental organizations can succeed unless the benefits of

recognizing the importance of small-scale mining to local economies are accepted by both the senior management and the mine managers of companies. Projects for promoting peaceful coexistence are based on the idea that mining companies should take the long view, and that this long view is ultimately where their competitive advantage lies. Without this perspective, companies are unnecessarily exposing themselves to existential risks. Good business or not, few companies possess the in-house expertise to integrate human rights and environmental policy fully into daily operations. While there are efforts to change this, the paradigm shift in corporate culture is still evolving. Social license cannot be extended to artisanal mining communities unless there is commitment from senior management to take the principles of engagement and peaceful coexistence to its shareholders. Absent this, even the most well-meaning plans will continue to fall short.

5 THE NEEDS OF MINERS: POLITICAL ETHICS FOR ENVIRONMENTAL INTERVENTION IN ASM

From a logical point of view, anyone who sets out to create a Great Civilization ought to begin with people, with training cadres of experts in order to form a native intelligentsia.

(R. Kapuscinski)

Development is a treacherous river, as everyone who plunges into its currents knows. On the surface the water flows smoothly and quickly, but if the captain makes one careless or thoughtless move he finds out how many whirlpools and wide shoals the river contains.

(R. Kapuscinski)

5.1 The Needs of Miners: Core Principles

This chapter draws on the policy analysis, political theory, case studies, and polemics developed in earlier parts of the dissertation, to articulate priorities and principles for environmental intervention in ASM situations. As observed by Veiga and Hinton (2002), the field of mercury pollution abatement from ASM has thus far over-emphasized research on specific scientific mechanisms, at the expense of deeper investigation into the implementation of solutions. Defining clear and consistent core principles, such as those expressed here, unites ideological values such as the division between ecocentrism and technocentrism (Chap. 2), the myth of alternative livelihoods (Chap. 3), and the principle of peaceful coexistence (Chap. 4), with operational guidelines aimed at overcoming the structural and ethical dilemmas of intervention (Chap. 2). The principles formulated below create a foundation for global action to reduce mercury pollution from ASM, including the basis for writing international customary law into an existing conventional framework (e.g., protocol to the Stockholm Convention), or a new international legal regime.

(1) Basic Principles

A. Mercury pollution from ASM threatens the ecological security of local and global environments, and is a health risk for 80-100 million people in the developing world.

B. Ecological security and environmental progress are inseparable from economic freedom, equality, and human rights.

C. Environmental intervention must be governed by right authority, and clear and consistent principles to address the needs of artisanal miners.

D. Technology transfer is a means to, rather than an end of, intervention. The main principles of intervention are formalization, capitalization, and education.

(2) Foundations

The foundations of the need to assist artisanal miners as a guiding principle of international environmental policy reside in:

A. Decision 23/9 of February 2005 UNEP Governing Council, reaffirming decision 22/4 of February 2003 that there is sufficient evidence to warrant international action to reduce the risks to human health and the environment from the release of mercury and its compounds into the environment, and establishing the UNEP Mercury Programme.

B. The entry into force of the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade; the Stockholm Convention on Persistent Organic Pollutants; the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, as well as other conventions and agreements to reduce the release of toxins and heavy metals to the environment.

C. Adoption of the Report of the UN Secretary General "In larger freedom: towards development, security and human rights for all" at the 59th session of the United Nations General Assembly (2005), affirming the objective of the Millennium Development Goals to reduce extreme poverty 50 percent by 2015.

D. Amongst others, the 2007 Madison Declaration on Mercury Pollution; the 2002 Mining, Minerals and Sustainable Development report affirming the relationship between ASM and poverty; the 1999 International Labour Organization's Report of the Tripartite Meeting on Social and Labour Issues in Small-Scale Mines; the 2005World Bank Communities and Small Scale Mining: Integrated Review for Development Planning; and the 2002 Yaoundé Vision Statement.

(3) Priorities

The needs of miners embraces three specific responsibilities:

A. The responsibility to reduce mercury pollution and other ecological priorities through education and technology transfer.

B. The responsibility to alleviate poverty by incorporating informal/extralegal mining activities into the legal and economic mainstream.

C. The responsibility to create capital, assist mining communities to diversify economies, and utilize minerals extraction to develop long-term sustainable livelihoods.

(4) Operational Principles

A. **Intervention Criteria**: Prevention is the single most important responsibility of environmental intervention. International organizations can move away from reactive and toward preventive projects by improving the ground-truth on which projects are based. This includes defining better vulnerable areas criteria, establishing a global inventory, and collecting more detailed microeconomic data from miners.

B. **Right Authority:** No international institution possesses a clear mandate to lead a global campaign on mercury pollution from ASM. Increasingly short-lived projects, reliance on consultants, and insufficient field presence are major barriers to pollution abatement and poverty alleviation. International institutions can fill gaps by creating deeper linkages among agencies, but the responsibility to protect citizens ultimately falls to sovereign states.

C. **Moral Commitment:** The chief goal of all intervention is to deliver resources, technology, and advice to the field. Principled dedication of fieldworkers and project administrators is as much a factor in the success of intervention as any ideological or technocratic recommendations. Intervention is ultimately a practice in public service, and the international community must be mindful of its responsibility to serve the needs of miners over its own interests.

5.2 The Policy Challenge

5.2.1 Technology and Custom

In the expanding cities of the industrial coal age, British children were increasingly afflicted by rickets, a crippling disease which causes bones to become soft like cartilage, and predisposes victims to all manner of lung ailments including bronchitis, emphysema, and pneumonia. Rickets is caused by a deficiency of vitamin D, which in the case of industrial England was brought about by air pollution so intense that after visiting Manchester Alexis de Tocqueville called the sun "a disc without rays." Public perception of coal smoke had changed dramatically since the 1500s, when wood was the accepted source of fuel and the sulfuric fumes of coal were presumed part of the devil's work. By the 1800s, with British forests long-since exhausted, coal dominated the urban landscape, and the chimney — used only by the upper classes through the 1500s — was the standard for home heating technology. At one time, residents of London and Manchester resisted chimneys because of

the purported health benefits of inhaling wood smoke. Now they objected to another technology which could reduce urban air pollution enough to clear the skies, allow sunlight to penetrate, and lower the rate of rickets and other diseases: this piece of equipment was the stove (Freese, 2003).

By trapping heat inside a furnace, a stove requires only one-quarter to one-half of the coal consumed by an open hearth. Though many European countries used stoves, Britons refused the technology transfer on grounds that stoves burned, rather than warmed, indoor air. They believed that decreasing ventilation by reducing the amount of outside air drawn through the chimney created a health risk. Equally important, was that people were accustomed to gazing at the flames of an open fire, often the most vibrant exposition of light people experienced in otherwise dusky urban environments.

This resistance to change illustrates an essential psychological dimension of environmental policy: cleaner technologies do not necessarily translate to new behaviour. Each tool develops an acquired wisdom which explains its utility; once this cognized model is imprinted in the mind, it is no longer enough to presume rationality alone will transform custom (Rappaport, 1979). Clinging to traditions, even new or harmful ones, is as powerful an anthropological force as exists in the world. Consequently, introducing enduring environmental change is not merely a function of transferring technology. Human behavioural change is a mysterious process: major cultural or technological paradigm shifts often occur over hundreds of years (Kuhn, 1962; Schumacher, 1973). Introducing new technology is not a question of reason nor of financing: it is a matter of custom. According to Schumacher (1973), change and development are evolutionary processes: "the foremost task of development policy must be to speed this evolution."

5.2.2 Shifting the Terms of the Debate

Mercury pollution from artisanal and small-scale gold mining is a social problem as much as it is a scientific one. To alter behaviour non-coercively, numerous aspects of change, including technology transfer, need to be addressed: these social dimensions of change in

ASM communities fall under three general rubrics, namely education, formalization, and capitalization.

Just as home heating stoves challenged the orthodoxies of 19th century Londoners, technological solutions to mercury pollution often defy the conventions of artisanal miners. Miners typically decompose amalgam by burning it over an open flame, a practice which exposes people to toxic fumes and disperses mercury throughout the environment. The answer to this particular problem is relatively simple: close the loop by roasting amalgam in a handmade retort.[6] When used effectively, a retort reduces atmospheric emissions by 90-99 percent. However, because miners are dealing with gold, nobody wants to lose track of it for an instant; any technology that hides the amalgam from the eye during roasting is not easily introduced. This particular problem can be overcome by constructing low-cost retorts using inverted glass bowls placed atop sand which sits in a larger metal bowl (Veiga et. al, 2006c). But there are many other technical issues where the answer is more complicated. Any mining area, for instance, where whole-ore amalgamation is practiced requires an innovation in the milling process. Mineralogy, access to materials, and access to capital all play important roles in re-engineering how miners concentrate ores. The answer to the question of how to bring miners to the conclusion that they should amalgamate gravity concentrates will be different depending the location, people, and customs of the place.

Economics, power structures, cultural traditions, and knowledge systems can all affect the way behaviour is, or is not, changed. As Jennings (1999) observes: "Merely adding a single piece of equipment — such as a retort or centrifuge — will not bring about the desired improvement in health or safety." This lesson is increasingly being absorbed by the international institutions that deal with ASM. Traditionally, the programs introduced to miners by development agencies have been aimed at altering technical aspects of the mining process. Many of these initiatives have been judged as failures. Notably, the UN Economic

[6] A piece of equipment consisting of a heating chamber and condensing tube that can be used by miners to evaporate and condense mercury from gold amalgam. Amalgam needs to be heated above 500 °C, and the evaporated mercury cooled using either water or air. Condensed mercury captured by use of a retort can be reused by miners.

Commission for Africa (UNECA) reports that "the 'mining alone' programme approach, usually dealing with isolated issues, has very little overall impact" (Pedro et. al., 2002).

UNECA, the World Bank, and UNIDO, and other international institutions support merging ASM programs with rural development and poverty reduction strategies, instead of narrow goals to transfer specific technologies. UNECA recommends that "Programmes for promotion of the sector... need to integrate mining activities within much wider rural development programmes," as "Most initiatives have been isolated practices that do not reverse the poverty cycle that limits development of the SSM sector" (Pedro et. al., 2002). This position was affirmed by the Yaoundé Vision Statement (2002), which calls for ASM to be included in poverty reduction strategies and integrated into rural development programs, and to improve the livelihoods of miners in accordance with the 2015 targets of Millennium Development Goals (MDGs). The philosophy of the Yaoundé Vision Statement is also shared by the MMSD (2002), which asserts that ASM should be considered part of "overall strategies for poverty alleviation and building sustainable livelihoods."

5.2.3 Holistic Intervention

This policy of defining ASM as a poverty alleviation issue signals a shift toward a philosophy of ASM that is more holistic than ecocentric or technocentric. By binding the environmental consequences of mining — pollution, erosion, siltation — to poverty, international institutions are acknowledging that in the developing world, where most artisanal mining occurs, environmental issues are indistinguishable from poverty issues. Unlike the gold bonanzas of previous centuries, gold mining is pursued less as a means to wealth than as a survival strategy. The root of the global gold rush is inequitable economic development: there are today as many people living in extreme poverty as inhabited the entire earth a century ago. It is the failure of rural economies that pushes people to seek refuge either in urban slums, or in gold pans.

When poverty is the organizing principle for intervention, the focus is expanded from an effort to fix a particular problem to one that grapples with the whole. The purpose of intervention is no longer to transfer technology, analyze mercury levels, or administer health

surveys: it is to help miners be human. As a result, the definitions of progress are reevaluated. In addition to specific emissions reductions targets, a successful intervention pours the foundation for environmental progress by strengthening economic resilience. As Heemskerk (2005) observes: "Few miners earn enough to invest in education, more efficient technology, and other assets that would allow their families to advance. These factors keep ASM households trapped in a vicious cycle of poverty and vulnerability." Helping to bring miners out of poverty-traps supports the development of capital; this gives miners access to better environmental management systems.

In fact, this call for a more holistic treatment of mining development policy is not without precedent in international policy. The ILO (Jennings, 1999) recognizes that poverty prevents environmental progress, and envisions development projects in which "...all issues affecting small-scale mines need to be considered together, or at least linked."
The ILO identifies 15 critical issues needing to be addressed for projects to offer tangible benefits to miners: (1) access to credit; (2) laws and regulations; (3) taxation; (4) working conditions; (5) equipment; (6) training; (7) technical assistance; (8) marketing; (9) safety and health; (10) child labour; (11) earnings; (12) resource management; (13) environment; (14) output and productivity; and (15) transport.

Similarly, the MDGs — which are almost universally endorsed by international institutions — propose eight pillars for poverty alleviation programs to target; each of these issues is endemic to artisanal gold mining communities: (1) eradication of extreme poverty and hunger; (2) universal primary education; (3) gender equality; (4) child mortality; (5) maternal health; (6) HIV/AIDS, malaria and other diseases; (7) environmental sustainability; and (8) access to development financing.

5.2.4 Right Authority

The Millennium Goals and other global pacts exist in order to establish consistent and credible standards for intergovernmental practice. Ideologically, it is hard to find fault with the philosophy of holistic intervention. It is common sense to approach development as a multi-disciplinary effort: this way many issues can be addressed simultaneously, resources

maximized, and the needs of miners — rather than the priorities of donor agencies — addressed effectively. For example, when 75 percent of the mining population is HIV-positive, as is the case in the Kadoma mining region in Zimbabwe (Boese-O'Reilly et. al., 2004), focusing on mercury pollution is like staring at a painting through a straw.

But it is also hard to imagine a UN program flexible enough to administer an intervention of this scope. Structural changes to the UN system have resulted in projects that are increasingly short-lived, implemented primarily by consultants, and lacking continued presence in the field. Without specific commitments from leading international institutions the MDGs and other development standards remain purely aspirational.

In addition, the issues of mercury abatement and artisanal mining lack secretariats with the mandate to coordinate intervention activities. The main environmental donor agency, the Global Environment Facility (GEF), is limited by its responsibility to protect international waters, which can make it difficult to develop more holistic, less ecocentric, priorities without the process becoming exceedingly politicized and bureaucratic. While international environmental grant makers have stressed their desire to harmonize ecological priorities with the MDGs, there is still resistance to diverging from traditional focus areas. Meanwhile, projects developed by domestic development departments such as DFID, GTZ, or USAID do not have a mandate to coordinate international activities; nor does the academic community, which concentrates largely on assessment and monitoring but has little influence or knowledge about how to introduce practical solutions in the field.

A common perception is that the World Bank's Communities and Small-Scale Mining (CASM) program serves in a leadership capacity. In fact it is poorly financed, understaffed, and plays more of a networking than an implementing role. As noted in Chapter 2, UNEP has not signaled its intention to add mercury to one of its existing conventions, nor does it have the implementation capacity to support fieldwork in ASM. UNIDO has a record of being an implementing agency for ASM projects since 1995, though its results have been mixed and in some cases outright negative. UNIDO also has complicated existential dilemmas: it has traditionally been a specialized agency for industrial development, that now

has shifted its mandate to alleviate poverty and manage environmental issues through industrial development. In some sense, the ideological direction of UNIDO approximates the desired direction of unifying environmental and developmental themes. It is, however, an underfinanced, understaffed agency, and relies heavily on consultants to implement projects.

Prevention of mercury pollution, alleviation of poverty, and other aspects of intervention in mining communities, are first and foremost the responsibility of sovereign states, and the communities and institutions within them. No matter what role international institutions play in intervention efforts, a firm national commitment to environmental management and equal opportunity is the basis for any progress. Without this collective efficacy inside a country, the international community can only do so much. Ideally, renewed attention to fieldwork by the UN and other international organizations would help strengthen in-country efforts. But absent this change, an answer is to advance institutional strengthening programs at the local level, particularly through NGOs, which often have stronger field presence than intergovernmental agencies. By investing in organizations where there is not a gap between administrators and fieldworkers, this may in fact be a more efficient equation than transacting with old-fashioned bureaucracies. This is one strategy that has worked for UNIDO in Indonesia, Brazil, and Tanzania. Its defining principle is shifting the focus of international experts to education and training of NGOs, rather than relying on long distance relays between consultants and country focal points. The problem, however, is ensuring money directed toward these organizations really goes toward institutional strengthening rather than merely financing operations for flailing advocacy groups. Unless the NGO also has a solid financial base, there is the likelihood these efforts will be wasted on organizations which may or may not exist five years down the road, or may simply have had to shift priorities.

5.2.5 Gold Rush for Consultants

In the abandonment of permanent field units the UN created a vacuum that is filled by consultants. Almost by nature, this professional consulting culture is unfocused, unaccountable, and too erratic to rely on to produce results. "Consultants can be as prone to

'gold rushes' as miners. Developing a package of measures that will bring about real and lasting change to the people concerned takes time, information, dedication, and resources. If corners are cut, trust will be lost and the programmes will fail" (Jennings, 1999).

This presents the international community with acute dilemmas. The brevity of project cycles, and the need for instantaneous results to gratify donor agencies, limits long-term initiative and deeply miscalculates the timescale needed for development to take root. The emphasis on short-term, narrowly defined projects reduces the broad interdisciplinary thinking demanded for complex environmental problems. As a result, priorities emerge artificially, and the political ethics needed to guide sustainable pollution abatement are ignored, or never developed.

The consultants who implement projects are an underclass of development agencies: they do not even receive benefits. The role of consultants is to serve as middlemen between the central agency and "the field," a Sisyphean task for anyone not already operating from the inside of a bureaucracy. Consultancies demand little expertise, and apply minimal pressure to produce, while offering handsome fees. When an agency does manage to build a dedicated staff of consultants, the effect is temporary. Short-term contracts and brief project cycles contribute to a brain-drain away from international policy work. And even if a consultant wanted to remain in the field for months or years at a time, UN custom makes this difficult; a proper mission is brief, focused on a single objective, and demands little complicated logistical planning.

Yet it is no more clear that the issue would be better served through an intergovernmental secretariat, or any kind of public international institution such as a convention, task force, or agency. For one, the chief deficit is fieldwork. As it is, the gap between administrative units and fieldworkers is too wide: investing in administration does not seem the most efficient way to increase field presence. There is also not enough communication between a project's financial source and the point of implementation; the gap between field and office is cavernous, and the percentage of project funds swallowed by administration disgraceful. All of these issues weaken the efficacy and efficiency of intervention. Adding another

bureaucratic layer could potentially diminish results ever more. As the GEF Office of Monitoring & Compliance (2004) points out "the struggle to maintain institutions and institutional memory leads to a loss of credibility, given that the stakeholders see few on-the-ground benefits."

A second potential problem with a bureaucratic solution to the dilemmas of how to intervene, is that it places all responsibility for the delivery of services into the world of officialdom that is international institutions. The role of international organizations is to serve their member states. Thus, in projects where the aim should be to address the needs of miners, the clients are actually governments rather than miners. Many governments are ambivalent about their relations with miners. If a host government is unwilling, or if new incentives arise for a government to change its policy, then development assistance does not do more than finance government offices.

5.2.6 Geopolitical Risk Assessment

To negotiate the issue of how government ministries will implement intervention, project planners need to conduct above-ground geopolitical risk assessments before committing to engagement. There is a tendency to view environmental policy interventions as divorced from the major policies that govern a country. But whether a government is collapsing, or if the country is deep in war, committed to structural adjustment, or nationalizing their resources and industries — all of these issues have profound influence over the success of a project. An intervention is ultimately an investment. Runaway hyperinflation is not a stable investment climate, nor is a country where there is civil, ethnic, or resource war. In such cases, the government may have favourable policies towards miners, but they are not likely to be reliable negotiating partners or project managers. Major policy waves such as privatization (Uganda, Ethiopia, Ghana), nationalization (Latin America), or nationalization in order to privatize (Zimbabwe, Sudan), can alter the rights of miners overnight. If a country is clearing room for foreign investment, or if it is grabbing resources for its own devices, either policy can be used to justify stripping miners of rights. In unstable conditions, a reversal of policy can even occur after or while a country is officially committed to supporting artisanal miners. This scenario unfolded in February 2007, when

the Government of Zimbabwe arrested 29,000 artisanal miners and closed the processing centres, after five years of working with UNIDO on the Global Mercury Project. Unless the express purpose of a project is to work with governments to recognize the rights of miners, there is little hope for an intervention in a place where the human rights framework is unstable.

5.2.7 The Field

The essential dilemma of intervention is how to channel resources more directly to the field. An effective intervention is one that will prevent pollution by transforming customary practices. Because customs are inelastic, changing the way miners operate is not only a matter of having the right ideology or expertise, but a function of persistence, detail, and time. Absent long term residence in the project area, it is hard for the field worker to arrange transport, organize gatherings of miners and officials, and negotiate the logistics of transporting equipment to field sites. Yet in the current system uncorking funds for any purpose, be it a training seminar or to subcontract to a local implementing partner, can mean a multi-year effort.

Few experts believe the devolution of field-based UN units will change course any time soon. "Although there is more emphasis on natural resources and conflict, the emphasis is on the soft side. I don't think field missions will ever be revived, or ever return to the old times with teams on the ground" (A, Pedro, UNECA, 2006 – Pers. Comm.).

5.2.8 Microeconomic Needs Assessment

One result of eroded UN field presence is that international institutions often miscalculate the priorities of intervention by failing to acquire the microeconomic data to assess the needs of miners. An intervention is only as good as what it knows about its constituents. "There are few presumptions in human relations more dangerous than the idea that one knows what another human being needs better than they do themselves" (Ignatieff, 1984).

Indeed the needs of miners are often misconstrued because of troublesome preconceptions about what kind of assistance is needed and effective. To develop wise policy in ASM communities, requires deep knowledge of household income, expenditures, and investment

and savings. Schumacher (1973) writes: "The real achievement lies in the accumulation of precise knowledge," that is, the most essential needs of the target population.

But obtaining these indicators requires a level of trust and consent from communities. Even in the best conditions, identifying what people need is an art, in part because people are not always able to express their needs: it is often hardest to articulate one's own desires. Consultants working on brief field missions have little chance to develop the bonds needed with communities to obtain reliable data, or nurture the collective efficacy that brings legitimacy to a public process. As Heemskerk (2005) argues: "Data collection improves with: longer stays in the communities; formal and informal communication with community leaders and other members; consultation with small-scale miners about appropriate questions and indicators; the participation of local research partners and assistants; and return visits."

5.2.9 The End of Assessments

Understanding the needs of miners, and developing personal relationships between trainers and trainees is a precondition for the success of intervention. At the same time, administering to the world's poorest does not require a complex philosophy of human needs. Access to clean water, refuge from disease, safe management of chemicals, and basic education: not one of these needs is a given for miners, nor is the need for these resources difficult to assess.

It would be easy to misconstrue the necessity for better microeconomic data collection with an emphasis on evaluation and assessments. Until now, most international mercury abatement projects in the ASM sector have concentrated on environmental and social monitoring, stopping short of decisive action. As Veiga and Hinton (2002) observe:

> ...universities, research institutes and international agencies have allocated considerable resources to monitoring programmes to measure levels of mercury in sediment, air, water and biota at active and abandoned artisanal mines...In many monitoring programmes, human beings are seen merely as donors of hair, blood, or urine samples. In most cases affected people never learn the results of the monitoring programme...The number of researchers

> focusing on highly specific scientific mechanisms is far greater than those investigating or implementing solutions (virtually none).

Indeed the common traits among mining communities worldwide — land rights, mercury pollution, high occupational risks, disease, lack of capital, child labour — are well-understood, and their existence classified in numerous reports and assessments. Moreover, the biogeochemistry of methylation and the toxicology of mercury vapour inhalation are established, to the extent that any scientific truth is established. There is little reason to turn development projects into still further opportunities to conduct research on toxic buildup of mercury in the human body, or prove that methylmercury contaminates fish. Likewise, it is not necessary to prove that people are poor when they clearly have no clean drinking water, or rivers are being siltified so heavily that you can see their turbidity with the naked eye. "More often than not what is lacking is not the basic data, but its analysis and translation into policy prescription, and the will to do something about it" (Responsibility to Protect, 2001).

Such action, formulated according to the principles of intervention articulated here, would drastically alter the budgeting for intervention activities, shifting the bulk of resources out of monitoring and assessment and into intervention. In previous interventions, activities for monitoring the environmental and public health effects of mercury pollution consumed 3-5 years – basically the entire duration of a project – while technology transfer (the primary "intervention") consumed as little as one month; this meant virtually all resources were directed towards monitoring and assessment (Veiga and Hinton, 2002). By contrast, in a UN budget for future ASM work based on the work of the author (UNIDO, 2007a), out of a total of US $2.3 million only $247,000 is dedicated to monitoring: the rest goes to fieldwork. And instead of an expensive, three-year preparatory phase that costs US $350,000-$700,000, the new approach presented here provides a site-selection system that can be implemented at 15 percent of previous costs, and in a fraction of the time (See Appendix I, Vulnerable Areas Criteria for Intervention). While most governments will still continue to demand health and environmental assessments in order to justify intervention, the costs of triggering these activities can be significantly reduced, while the potential benefits to miners can be increased by targeting the bulk of resources directly to the field.

5.3 A New Approach: The Needs of Miners

5.3.1 The Principles of Intervention

Shifting the terms of the debate to make poverty alleviation the organizing principle of intervention in ASM areas, is a step toward addressing the root causes of environmental degradation. Root cause prevention is a longstanding idea in modern development theory and practice, going back to Article 55 of the UN Charter. This recognizes that solutions to international economic, social, and health problems; cultural and education cooperation; and respect for human rights are essential for "the creation of conditions of stability and well-being" (Responsibility to Protect, 2001).

There is not a root cause formula, however, that can be applied uniformly to development assistance or environmental intervention. Root cause analysis is simply an effort to make human relations more sustainable, by addressing underlying factors rather than symptoms of deprivation. The argument is that mercury pollution is an interdependent social and ecological ill whose root cause is poverty. Miners are caught in poverty traps: they mine because they are poor, and they are poor because they mine, recalling Hinton's (2005a) problematique where "poverty is both the catalyst and consequence of ASM." As observed in the chapter "The Myth of Alternative Livelihoods," the idea of resolving this poverty trap by eliminating mining is in fact not a solution at all. Instead, mitigating mercury pollution must be an element of a broader development program, one which strengthens sustainable economic growth by concentrating on three principles of intervention: formalization, capitalization, and education.

5.3.2 The Meaning of Formalization

There is an emerging consensus amongst scholars and practitioners that the foundation of intervention is neither mercury abatement nor technology transfer, but the formalization of miners through rights recognition. Veiga and Beinhoff (1997) argue that "Legal and transferable titles are essential to organize and transform this informal industry...and must be understood as a pre-requisite to change behaviour and transform... underprivileged people into citizens."

Similarly, Hinton (2005b) concludes in a report to the Government of Uganda: "Improvements in the technical, environmental and socio-economic performance of the ASM sector hinge on the organization, formalization, and legalization of ASM activities." Many other recent policy reports also emphasize this same point: economic progress in mining communities depends upon miners possessing the right to mine (Jennings, 1999; MMSD, 2002; UNECA, 2002; WB/CASM, 2005).

But insomuch as the call for formalization has become axiomatic, it is not always clear what exactly is meant by this term, nor what it is about formalization that holds the key to economic development and pollution abatement. The term formalization is used to refer to a great many things. To some, the issue of formalization is that many countries possess lapsed or overlapping property laws that leave the status of miners, and the question of who has the right to mine precious metals, in a state of legal vagary. In this context, formalization is therefore about creating a federal legislative framework for small-scale mining. A second meaning of formalization is the ground process of registering, organizing, and tracking mining activity. In addition to the benefit of taxation the state receives by registering miners, formalization is in this sense understood as an effective intervention strategy, one that initiates contact with miners, and enables the collection of microeconomic data to guide project development.

But to speak of formalization is first and foremost to speak of rights: the right to mine, the right to title, the right to minerals. Formal title is the only thing that can give miners transferable capital against which micro-loans can be financed. As Hinton (2005) observes: "With legal land tenure, miners are more likely to access credit for operational improvements, and access support from government agencies." Rights do not only bestow benefits on miners: legal recognition also imposes duties on miners to conform to environmental, labour, and human rights standards. In this vein of rights and duties, a formal system is sometimes characterized as a win-win for both miners and the state: in theory, the state receives the benefits of taxation and reduced vulnerability in part of the population and the environment; miners benefit by receiving the collateral — in the form of land title — that

empowers them to access better technology. In effect, property rights are the basis of poverty alleviation; they are the first step toward turning miners' assets into capital.

Formalization also provides miners two forms of stability: being able to predict their taxation rather than pay the hidden cost of bribes, and worrying less about the cost of rebuilding after a military action against them. Formal property rights are the basis of a miner's access to legal redress when rights are violated by a government or company, as they frequently are. Without a system of rights, there is little to prevent a state or corporation from unilaterally evicting miners. Even with property rights, it is not always easy for miners to protect themselves against bigger players.

Still, the theory of formalization is not necessarily an intuitive principle that is easily accepted by either miners or the state. Formalization is in part about the evolution and expansion of government, the rule of man over man, which often means the rule of the few over the many. Administering formalization costs money; it creates overhead at national and municipal levels, and depending on where one sits it may or may not feel imperial. In advanced capitalist countries, an individual gives little or no thought to the support he is lending to large public and private entities that manage, and profit from property, money, water, transportation, insurance, and law enforcement. There is in formalization an implicit act of surrender to civic and military authority; if this consent is violated by acts of tyranny, or fails to produce noticeable benefits, it threatens the legitimacy of formalization.

5.3.3 De Soto and the Extralegal Economy

According the economic historian Hernando De Soto (2000), the issue of formalization is ultimately about a clash between the mainstream legal economy and the informal extralegal economy. Most of the world, perhaps as much as 80 percent, is part of the extralegal economy. The ILO reports that 85 percent of all new jobs in Latin America and the Caribbean created since 1990 have been extralegal. By not extending rights to the extralegal economy, the institutions of the state are denying economic freedom to what is in fact the overwhelming majority of the world's people. This discrimination amounts, in De Soto's view, to "legal apartheid." (A similar observation was recorded by Schumacher (1973),

who dubbed this the "dual economy.") It is also an economically irrational move for governments. In real estate alone the extralegal sector in the Third World and former communist countries is worth around $9.3 trillion, wasting an enormous tax base that could support the emancipation of developing countries from much foreign aid.

Most of the assets belonging to the poor, however, are tied up in "dead capital." In De Soto's framework, assets are a person's physical property; capital is the ability to represent assets as abstract values, such as land title. Having a process for transacting assets, makes assets "fungible," i.e. they can be traded or transferred. The key to unlocking dead capital resides in generating surplus value out of physical assets; this only happens once an asset comes to have both a visible and an invisible value. What development economics often confuses is the distinction between money and capital: no injection of money helps support sustainable development, if in the end there is still no system for poor people to represent the value of their property. Figuring out what is needed to create this system is "the mystery of capital." For financial assistance to be enduring, there needs to be a coherent property rights system — in effect a language of commerce — that transforms dead capital into "living capital." As De Soto (2000) writes: "Money does not earn money. You need a property right before you can make money... Money presupposes property."

De Soto's theory of there being two economies — the legal and the extralegal — helps put into perspective the situation with artisanal gold mining in the developing world. The modern resurgence of informal artisanal gold mining is a rural component of a much greater, mostly urban movement, in which migrants from failing rural economies create informal ways to survive, with little or no connection to the legal system.

De Soto's contention is that capitalism succeeded in North America, Europe, and Japan because entrepreneurship was integrated — *formalized* — under one property system, thus releasing the potential that is dormant in dead capital. He challenges the mainstream assumption that people living extralegally prefer not to be part of the legal economy, since this would entail duties and responsibilities such as taxation. Who would not prefer security, representation, and the knowledge they won't be stomped, burned out, or beaten? In any

case, De Soto argues, trying to stamp out the extralegal economy is worthless: it costs a government money in military expenditures as it tries to eliminate squatters, miners, migrants and other extralegals. This in the end is a fruitless conflict that is ultimately won through the persistence of those being persecuted.

The key, then, to alleviating poverty and avoiding conflict between the two economies is for governments to realize early on that the best, and perhaps only way, to develop as a capitalist country is to expand property rights systems so that it includes the extralegal economy. De Soto writes: "Countries that made legal efforts to integrate extralegal enterprise prospered more quickly than the countries that resisted change. By easing access to formal property, reducing the obstacles engendered by obsolete regulations, and allowing existing local arrangements to influence lawmaking, European politicians eliminated the contradictions in their legal and economic systems and allowed their nations to carry the Industrial Revolution to new heights."

5.3.4 Formalization Means Adapting Existing Systems into Law

Near the end of De Soto's statement above, the phrase "allowing existing local arrangements to influence lawmaking" stands out as an important, and somewhat radical, concept for intervening in ASM communities. De Soto is hinting at a stream of legal theory which rejects the concept of law as a static instrument that is "created" to govern human relations. Instead, law is a dynamic process that evolves in accordance with the way people truly live. This follows a theory that non-compliance with the law is a function of dissonance between law and custom (Bohannon, 1965; Hart, 1994; Fuller, 1981). Therefore, the assumption that to formalize something involves the "creation" of law is inadequate. Law is not something that is created, rather law adapts to the arrangements and systems that people have already established. "Legislation," as Marx (1847) wrote, "whether political or civil, never does no more than proclaim, express in words, the will of economic relations."

Indeed ASM nearly always progresses in advance of the legal system, which arrives only after gold mining is already in motion, and local arrangements are in place. Most artisanal gold mining is part of the extralegal economy, and occurs in many of the world's real bush

areas where the authority of centralized property laws is limited. In places where the ministry of mines attempts to govern mining activity, this often means just one person administering hundreds of square miles of bush and tens of thousands of people. As a result, there is very little in the way of planned artisanal gold mining. The extent to which mining is integrated in the formal economy varies greatly from place to place; depending on the particular country, informal ASM is either tolerated or prosecuted.

In spite of their anarchic appearance, freelance gold mining areas evolve elaborate informal property systems that fill the void of authoritative federal or provincial law. Though informal, the staked boundaries of gold claims are effective, if imperfect, property rights systems, managed by cooperatives, associations, and organizations that function like mini-municipalities — distributing mineral rights, resolving conflict, supplying equipment.

As De Soto (2000) points out, a main reason gold mining helped build the American West was that in the absence of a strong government presence, miners formed hundreds of extralegal local and regional claim associations with elaborate regulations for marking territories, registering claims, and administering justice. "In California after the gold rush in 1849, there were some 800 separate property jurisdictions, each with its own records and individual regulations established by local consensus." It was not until 1872 that the U.S. Congress finalized the national mining act, a full 23 years after the California gold rush began. In order for the federal Mining Act to have any legitimacy, the legislation had to adapt to the social contracts created by these informal property rights systems. In all (not just the Mining Act), stitching together the different property rights systems created by miners, migrants, and homesteaders into a coherent legal framework took the U.S. Congress 35 separate statutes.

Nevertheless, the interdependence of law, capital, and local property arrangements is often neglected in economic development practice. This oversight, according to De Soto, is the result of forgetfulness among Western advisors to the developing world, who no longer remember what actually strengthened their own capital networks. Rather than focusing on integrating overlapping property rights systems, many countries concentrate on imposing

top-down authority over the extralegal economy, essentially repeating the mistakes of the past. So long as miners and other extralegal actors view themselves as having ownership, they will not consent to a formal legal arrangement that rejects their existing social contract. On the contrary, they are just as likely to go to war over it.

When governments attempt to control rather than integrate the extralegal sector, their only instrument of authority is martial. But using force has only two possible outcomes: it can cause the aggrieved group to seek other alliances, or the violence is simply endured — at great expense to the government. Either way, the government loses. This neglect of the principles of formalization follows a pattern established in the American West, when miners and other migrants "insisted that their labor, not formal paper titles or arbitrary boundary lines, gave land value and established ownership" (Pisani, 1996 in De Soto, 2000). Hoping to deter extralegality, the U.S. Government ordered military strikes, burning farms and destroying property. When the soldiers left, the settlers came back and started over again in the same place. "That past," writes De Soto, "is the Third World's present."

Most mining takes place in the hinterlands, far from regulatory authority, in areas where bribes and force are more likely to rule than taxation and jurisprudence. Instead of trying to control informal parts of the economy, the proper role of government is to unify them, for the sake of peace, as well as to facilitate economic activity amongst different peoples and sectors of society. "Property systems become tremendously powerful when they are interconnected in a larger network... The formal system is capital's hydroelectric plant" (De Soto, 2000). Yet, if formalization is to have legitimacy, certain political conditions need to exist. In particular, there must be strong, reliable, and accountable governments with the political will and capacity to administer the formal property network. Like the rajahs of ancient India who hoarded Roman coins, if governments do not reinvest the profits from gold to provide basic services, this corruption will neither generate efficient capital networks, nor strengthen legitimacy within the informal sector.

This point was emphasized by Galbraith (1964), in a passage worthy of repetition. "It is assumed that capital and technical knowledge are the missing elements. But in many of the

newer African states national government is still in its beginning stages, and in parts of Latin American it has never been brought to a minimal level of efficiency. Under these circumstances, investment, whether public or private, is subject to the risks, uncertainties, tax vagaries, and the other aggressions of a poor public administration. It is idle to imagine that good development plans can be created or carried out without a reasonably good government to do it. And neither technical assistance nor trained technicians do well, or are even much needed, where administration is indifferent or bad. The best agricultural scientist cannot make much headway as advisor to a nonexistent agricultural ministry. The finest tax authority goes to waste if the minister does not believe in collecting taxes or has an overly developed feeling for his friends. The first task here is not to get capital or technicians but to build competent organs of public administration."

In effect, the legitimacy of formalization is earned, not created, through competent governance, evidence of economic growth, and respect for human rights. Legitimacy comes through recognizing the existence of competing property systems, and adapting the law to match preexisting social contracts. Without this recognition of rights, formalization morphs into an imperialistic resource grab, or what Schumacher called an excuse for "gigantism."

If education and technology transfer are the broad objectives of environmental intervention, then formal rights are its spine. Without rights, miners remain trapped in the poverty cycles of the extralegal economy, and unable to afford or maintain new technologies — no matter how rich a specific development project. Without formalization, miners cannot even begin to access the most basic forms of microcredit. Inadequate formal property rights is the downfall of microcredit institutions, only one-percent of which are considered sustainable (Hinton, 2005).

For intervention to facilitate development, it needs to help integrate the informal economy into the mainstream property rights system. "The only question that remains," says De Soto (2000), "is how soon governments will begin to legitimate these extralegal holdings by integrating them into an orderly and coherent legal framework. The alternative is

perpetuating a legal anarchy in which the existing property rights system continually competes with the extralegal one."

At the same time, given that few ASM sites are formalized it is insufficient for international organizations to wait for miners to be formalized before initiating intervention. Instead, international development agencies could be instrumental by examining the extralegal arrangements — the social contracts — that exist in gold mining communities. This is similar to Hinton's report (2003) on the "Organization and Institutionalization of Artisanal and Small Scale Mining" in the Tapajos region in Brazil. This study was rooted in the idea that miners have an incentive to organize because of the access it offers them to funding sources. It could be added that researching how miners are organized collects the baseline ground truth needed for any legitimate future mining laws, while also supporting capacity-building within mining ministries and geological authorities that are often hampered by low technical knowledge or resource deficits.

5.3.5 Capitalization

Formalization establishes the transactional system miners need to unlock dead capital. But attempts to formalize can amount to unmet aspirations if the assets belonging to miners are too insignificant to become capital. Most artisanal (as opposed to small-scale) miners reside at the bottom of the technological chain. In places where tools are still very primitive, the introduction of a water pump, carpeted sluice box, or basic chemicals is a mini-industrial revolution. The answer seems simple: by giving miners better equipment their recovery rates will improve, their profits increased, and development will soon follow. But even when a miner raises the money needed to purchase a formal license, he still often lacks the capital to invest in efficient, productive, and sustainable mining technology. And even where a miner is formally licensed, the title to a $50 dollar claim, and some buckets and shovels are not enough collateral to guarantee a loan. Without capital the only hope, and it is a dim one, is for a major such as AngloGold or Newmont to see enough potential in the claim to buy it out. In such cases, the formal renter might make a quick buck, but the opportunity to build local capital growth is lost. (For a case study of this scenario see Appendix 1.)

On its own, improving the formal property rights system process cannot bring miners out of poverty; there still has to be tangible assistance that miners can bank on. In places where capital is too immature to support formalization, international development agencies can strengthen the process by filling in the gap of missing capital. Rather than being limited-term providers of so-called microequity (grants rather than loans), these institutions could develop government loan facilities — in effect carrying the risk of lending money to miners.

Government loan facilities aimed at the ASM sector have been implemented in several countries, including Namibia and Mozambique. In Namibia, the government used a Minerals Development Fund to provide $92 million in loans for projects like sinking shafts, exploration, and mine expansion. Using low interest rates, slow payment periods, and minimal bureaucratic overhead, 92 percent of loans have been repaid. A similar fund in Mozambique offered financing, provided miners could show a license, proof of collateral (20 percent of loan amount), a feasibility study, and plan for loan repayment. "Although these criteria may be out of reach for many artisans, the programme provides a viable mechanism to encourage development of small-scale mines" (Hinton, 2005).

However, for the international community to approach development locally rather than nationally; with the idea of loans rather than grants; and from the perspective of helping miners overcome the barriers to financial access — all this requires a major shift in thinking. It was Schumacher (1973) who first observed in his artful book *Small is Beautiful,* that international institutions had fallen prey to two fallacies of development: the first, a belief that the answer lies in more money; second, that development could be accomplished exclusively by large-scale macroeconomic reforms, measured purely by growth in GDP.

Schumacher wisely anticipated that the world would soon see more industrial production than all of humanity accomplished up to 1945. Among his chief criticisms of development theory was that the focus of development economics on "gigantic" macroeconomic policies was not synchronized to the vast number of surplus labourers created by modern population growth. He argued that the better way to bring development to the masses, given the population explosion, was through "intermediate technology," which Schumacher defined as

"technology that is made appropriate for labour-surplus societies." Toward this end, Schumacher called for a scientific and technological revolution that would democratize industrialization by improving access to efficient technologies. These technologies would have to be:

- Cheap enough so that they are accessible to virtually everyone
- Suitable for small-scale application
- Compatible for man's need for creativity[7]

Indeed, neither large sums of money nor more bureaucracy necessarily advance development at the village level. Money is not capital, and bureaucracies have a carnal tendency to consume more than they produce. When development does not take root at the village level, a dual economy is created: the modern, urban, industrial world, and the backward, barefoot, rural world; us and them; haves and have-nots. Once the modern cash economy is driven through the engine of the state — as it is in both capitalist and socialist systems — it cuts off the people of the hinterlands, who either do not know how, or do not have the right to obtain the proper value of things, even when they are living in abundance. This is how it comes to be that in the forgotten bush areas of Guinea or Guyana, 20 kilos of mango are sold for 20 cents. The people are cut off, timid, afraid of the walleted man. Village life suffers and dies, the people migrate to the outskirts or inner hells of cities, where they remain economically and politically marginalized. "The key to modernity is the village," writes Kapuscinski (1992b). "As long as the villages are backward, the country will be backward — even if it contains five thousand factories. As long as the son who has moved to the city visits his native village a few years later as if it were some exotic land, the nation to which he belongs will never be modern."

One of Schumacher's great concerns was that international development would simply lapse into an excuse for renewed dependencies of the Third World on the developed world. The question he presented was how to deliver services in such a way that does not create this

[7] On this last issue of creativity, Schumacher was a proponent of the idea attributed to Thomas Aquinas that people, being beings of both brains and hands, enjoy nothing more than to be creatively, usefully, and productively engaged with both their hands and brains.

dependency on agencies, whose bureaucracies are anyways not designed to be long-term providers of public welfare. Indeed, Schumacher's apprehension is much evident in the field today, an example of which can be drawn from the community health sector. A recent report from Uganda about the durability of Village Health Committees supported by outside financing from development agencies points out: "VHCs exist only where an external agency has initiated them and is providing on-going support to their operations. Their coverage is therefore restricted to the agency's operational area, and their sustainability depends on the ability of the external agency to involve the communities, and more importantly, to facilitate their operations" (Kenya-Mugisha and Bikaako-Kajura, 2001).

To support sustainable small-scale minerals economies, instead of handing out assistance development agencies could float interest-free loans to legal, but undercapitalized, claimholders. This would empower the purchase of intermediate technology, as well as provide access to experts in mineral processing, mining engineering, chemicals management, and education for local artisanal miners. The claimholder then jumps from being someone who can employ artisanal miners, to somebody who has a small-scale mine. Now the miners are actually crushing the rocks, using carpets to concentrate gold, reprocessing tailings, and perhaps even using mercury in a closed circuit. If miners were already capturing 30 grams of gold a week using just primitive methods, then with intermediate technologies their profits increase, and as they do the claimholder repays the loan. The loan functions like a tax that either goes back to the UN — which does have its own international banking system — or perhaps the money is channeled into a mining chamber where it helps finance a decentralization program.

What cannot happen, however, is for loan repayments to be allowed to enter the general revenue of the national budget of a country, or for that matter the operational accounts of a development agency. Once this happens, there is no way to trace the money, nor any assurance the money will make its way back to its intended source. In Ghana, for example, the government collects a 10 percent royalty tax from foreign-owned mining companies. This tax is supposed to finance the Minerals Development Fund, and be invested in small-

scale entrepreneurship in rural districts. But the tax goes to general revenue, and does not travel from the Finance Ministry to the Mines Commission.

If this problem is avoided, then the UN, or another development agency, might work with the Mines Chamber to ensure the money goes back into local development, and into environmental programs in the communities where the gold was mined. This venture capital approach would double the lifetime of a development project, whose money would be spent once on the small-scale miner, and then renewed by the profit made off the improved recovery rates from the more efficient operation. Over time, that investment comes back as a tax, and the money gets reinvested in health, water, environmental management, or further entrepreneurship. (The concept is no different from so-called automobile taxes used in London and proposed in NY that target the driving "fees" for investment in mass transit).

While the idea of joint ventures with small-scale miners is not new for governments or for companies (who sometimes dabble in this area to resolve conflict with miners), it would mark a significant change in direction for international development agencies. It steers away from the mistake of throwing money at development, and towards the principle that development must start from the village level, where the access to capital is most limited. "Once forged, partnerships between miners and funding sources can make a major contribution to the development of the ASM sector, into one which effectively supports the reduction of poverty" (Hinton, 2005).

5.3.6 Education

When one looks upon the industrialized world, what appears to be a finished product is in actuality a dynamic process that has unfolded, and is still unfolding, over centuries of economic evolution. This economic process is facilitated not just by money or machines, but by revolutions in political thought, legal ingenuity, and especially popular education. If formalization is the spine of poverty alleviation, then education is what grows and sustains development. "Education is the most vital of all resources," Schumacher (1973) writes. For "Development does not start with goods. It starts with people and their education, organization, and discipline."

"Imagine," Schumacher says, "we are visiting an oil refinery." We look over the plant, at its machines and gauges, talk to the workers, analyze its inputs and outputs. "What we cannot see on our visit is far greater than what we can see: the immensity and complexity of the arrangements that allow crude oil to flow into the refinery...Nor can we see the intellectual achievements behind the planning...Least of all can we see the great educational background which is the precondition of all... the visitor sees only the tip of the iceberg: there is ten times as much somewhere else..."

These invisible things, are nevertheless what bring the finished, visible, product to life. Schumacher argues, with plenty of support, that economic development is an evolutionary process rather than a great leap forward. "Development cannot be an act of creation...it cannot be ordered, bought, comprehensively planned...Education does not 'jump'."

From both an ecocentric and anthropocentric perspective, if there is an ideal for minerals development, it resides in intermediate technologies that promote sustainable small-scale mining. As opposed to the constant movement of artisanal miners, small-scale mining concentrates exploration in fewer areas, without the mountain-moving impact of large-scale mining. Meanwhile, it holds the potential that with greater capital being built amongst local owners, investors, and labour more of the revenue streams will circulate regionally rather than being lost to global capital flight.

According to Galbraith (1964), it is through popular education that the "energies" of a society are released, a path toward greater technical knowledge created. "Literate people will see the need for getting machines. It is not so clear that machines will see the need for getting literate people." Like Schumacher, Galbraith mourned the loss of focus on education, which he contended was considered vital to development in the 19th century but had somehow lost currency in the 20th century. "In the last century, nothing occupied a more prominent place among the requirements for economic and social advance than public education and popular enlightenment."

Promoting efficient, rights-based, small-scale gold mining can be an instrument for strengthening the resilience of rural communities. But as noted earlier, much development work relies on brief 3-5 year project cycles that do not allow the proper time needed for development to take root. Yet all the intentions of intervention — technology transfer, economic development, risk mitigation, ecological restoration — are forms of education. The myriad problems created by artisanal mining cannot be legislated away, nor solved purely by economic means. Whatever the specific activities of a project, intervention must be reinforced by longer-term thinking. There may never be enough experts combing the roughest regions of Africa, Asia, and Latin America to cure the ills of mining and the ecosystems being disrupted. Instead, scientific knowledge — whether about mercury, milling, or marketing — needs to be spread laterally rather than hierarchically; change has to come through the gradual reeducation of miners to improve their mining methods, close the toxic loops, and build local economies.

To reduce mercury pollution, miners need both better education and better technology. There are replacement processes for mercury, but in most cases there is neither the financial nor social capital to transfer technology sustainably. For mercury to become a properly managed or non-essential ingredient of ASM, miners need the capital to make long term investments in public health, education, and the environment. Relative to other chemical processes such as cyanide leaching, introducing education and technology for efficient, safe use of mercury is not economically overwhelming. Unlike the need for building agitated tanks, carbon desorption column, and electrolysis needed for cyanidation, the technology for improving mercury use is simple and affordable.

It is inadequate rights recognition that forms the initial barrier to capital development and environmental management: without property rights, land title and capital, it is not possible to deliver micro-financing and sustainable development. The issue of formal recognition of property rights also extends to consider the role of extralegality in frequent clashes between small- and large-scale gold miners, who both claim rights to the same property. Clarifying the status of artisanal miners is a key factor in mediating conflict between these two groups.

5.3.7 Formalization and Capitalization, Bushenyi, Uganda

In 2001, The Ministry of Energy and Mineral Development of The Republic of Uganda issued a pamphlet called "The New Dawn of Mining." It was the country's first systematic mineral policy, and was viewed as the first step towards repealing the Mining Act of 1964, which The New Dawn labeled as an outdated colonial legacy of concentrating only on exporting minerals out of the country. The regime of Idi Amin had isolated Uganda for decades. According to the New Dawn, it was time for the country to capitalize on its mineral potential, create an attractive climate for private investment, and "regularize as well as encourage small-scale mining."

By its own admission, the New Dawn is a formula for privatization. For a mineral rich country, Uganda's gold fields are considered underexploited. Compared to other East African countries, Uganda has relatively few gold miners, in the range of 11,000-13,000, rather than the hundreds of thousands common in Kenya, Ethiopia, and the Sudan (Hinton, 2005). Uganda, does, however, play a major role in the regional trade of gold. Official sources report that in 2004, Uganda exported $24 million of gold, but only $3 million came from domestic production. This surge is attributed to the reduction of export taxes in the 2003 Mining Act. Gold is also routinely smuggled through the country. From Busia in the east, it is smuggled to Kenya. In the southwest, gold is smuggled across the Congo-Rwanda border. And in the northwest, gold is part of a booming arms trade with the DRC, where it finances arms trafficking by military groups accused of war crimes in that country (Human Rights Watch, 2005).

The government grounds its right to determine the path of mineral development in the 1995 Constitution. But Uganda is a very poor country, and the government does not have the capacity nor a capitalized private sector to exploit the minerals alone. Creating an attractive investment environment means foreign investment, and to encourage this investment, the World Bank put $42 million into building Uganda's Geological Survey.

But insomuch as The Mineral Policy and the Mining Act — which followed two years later — changed the legislative environment to attract outside investment, they also established a

legal framework which officially "encourages" small-scale mining. The Mining Act presupposes a right to mine at a small-scale level, and creates a permitting process for the purchase of licenses. However, the Act also puts limitations on the definition of "small scale operations," defined as "prospecting or mining operations which do not involve expenditure in excess of five hundred currency points or the use of specialized technology." When it was published in 2003, Schedule A of the Mining Act set the currency point at 20,000 shillings, which at today's exchange rates limits small-scale operations to roughly $5800 dollars of investment. Depending on the going rate, this is enough for an efficient group of miners to earn $5-15 per day, when fortunes are good. But it is not nearly enough to grow, or do more than cover the cost of household goods. Further, Uganda's small-scale miners have been cut off from access to the market since 1976, when Itama Mines, which succeeded British Metals Corporation, closed. Itama was keeping marketing arrangements functioning, ensuring miners got fair prices, and providing technology upgrades. Mining associations quickly fell apart, and the small-scale mining sector receded into obscurity and poverty.

A decade later, in 1986, the same fate was suffered by the agricultural sector, when, under pressure from the IMF, the government liberalized its economy and abolished cooperatives. Through the Amin era, there had existed a strong agricultural cooperative movement, particularly amongst coffee growers. Cooperatives purchased products from growers, then passed the coffee up to the labour union. The coffee was finally bought by the Coffee Board, which fixed prices inside the country and controlled the export market. But without support from any level of government, the organizations of growers broke down, and companies were able to exploit this lack of coordination by purchasing coffee and other products at cut rates.

Today, the small-scale agricultural and minerals sectors are impoverished, and there is growing recognition within the government that poverty increases when liberal macroeconomic reforms are the only policies administered. In agriculture, the Ministry of Trade is attempting to rebuild the cooperative movement and bring fair prices back to the local level by helping coffee growers and farmers form associations. This is part of the government's more general receptivity to decentralization policies, which includes

"regularizing and improving" artisanal and small-scale mining. As the Mines Commissioner of Uganda explained: "I am not a Leftist, but I think liberalization has killed the poor people."

Especially in poor countries, where transportation costs are often enormous economic barriers, the government must facilitate the collective marketing that creates economies of scale. Once this infrastructure deteriorates, people do not have the individual capital to access international markets. As part of reviving the minerals sector, The New Dawn envisions "local entrepreneurs [who] will gradually increase mineral production and capital, leading to more employment and alleviation of poverty among the rural population." But, by the admission of the Mines Commissioner, the policy is a "failure."

At least in part, the government has not succeeded in formalizing miners because it no longer knows where to find them, much less what methods they are using. At that moment, the best known site was Busia, where approximately 200 small-scale miners operate extralegally on a concession leased to a private company. According to government officers, miners in Busia are amalgamating whole ore with mercury. But there is much less consistent information about most other sites. Many officials believe miners are not using mercury because their methods are too primitive, and Uganda has significant deposits of coarse gold that are recoverable without mercury. At the same time, there are conflicting reports about the precise location of mines and number of miners.

In March 2006, a team of researchers traveled to Kanungu, in the southwest corner of the country near the borders of Rwanda and the DRC. The team began in Kabale, which is 200 miles from Entebbe, and takes 6-7 hours to reach by vehicle. Though Kabale is directly on the equator, its high altitude makes it cool and damp at night. Kabale is a district of Kigezi, very close to the northern Rwanda border, and the people speak mainly Riukiga or Riufumbiria. In Kabale, the team met Mr. Balaba Ezekiel, who identified himself as the region's former chief inspector of mines, and Uganda's first mining engineer. When asked about the whereabouts of miners in the area, he responded: "They are around, and of course they are using mercury."

The research team passed through the Sheweya, Nyakafare, and Bugwaza valleys, and into an area marked as the Kirima Forest Reserve. A government geologist, who had last visited the area in 2002, was surprised to discover the gold rush that had gripped those valleys during his previous visit, appeared to be over. Eroded patches in the eucalyptus and pine forests showed evidence of mining activity, but it had clearly been some time since mining stopped. New vegetation covered most of the erosion. Villagers claimed gold mining ended after a group called Flemish Investment started exploring the area. It appeared likely villagers were hiding mining activity because they feared fines for mining illegally. But there was nothing to indicate any heavy mining activity in the area.

After following several dead ends near Kabale, the team arrived at a trading centre called Itembezo, in Kanungu District. There they were met by Mr. Alfred Kagyema, a local farmer who claimed to know where artisanal miners were working. Mr. Kagyema led the team to a spot called Rwemerira, where instead of artisanal miners they discovered a tailings pond left by a small company called Macogem that is exploring on a licensed area. There was no sign of active mining. Mr. Kagyema contended there had been a big gold rush with more than 1000 people nearly 20 years ago, and the nearby villages had grown up around gold. These rushes consumed most of the alluvial gold, and now only licensed companies with the technical capacity to explore deeper mines are operating in the area. His claim that artisanal gold mining had ended proved false, however, when one of the researchers encountered a shopkeeper who acknowledged still purchasing gold from miners. Whatever the nature of mining in Kanungu may have been — rush or no rush, mercury or no mercury — the underlying point is that the government did not at that moment have enough knowledge, much less the presence or familiarity, to implement a formalization program of any kind. Indeed, no government can formalize a phantom phenomenon.

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One might suppose from studying De Soto that formalization is a kind of panacea: so long as miners are legalized, they will enter the formal economy, overcome poverty, and reduce pollution. But formalization is a process not a product. Even the best laid plans to formalize

miners fail if the government lacks the will to implement plans, if miners perceive licensing as threatening, or if miners want to formalize but cannot afford it.

Officially, the Government of Uganda's policy recognizes the rights of small-scale miners, establishes a system for their "regularisation," and views them as potential entrepreneurs and contributors to developing the wealth of the nation. And yet, formalization is failing for two reasons. First, the mining associations needed to organize larger-scale buying units have not been rebuilt, and neither the government nor the lending institutions supporting the Geological Survey has committed the resources needed to revive small-scale mining.

In practice small-miners are tolerated rather than persecuted, but the bulk of resources and attention is concentrated on large-scale industrial development. For example, the Mines Chamber is mandated by the Mining Act to execute a decentralization program that would rebuild miners associations. This program has never been staffed. Meanwhile, the government has not yet overcome its disdain for small miners and attended to their needs. As the Mines Commissioner acknowledged: "We don't like them, but we also recognize their need to make a living."

To remedy this knowledge gap, the Geological Survey is preparing a baseline study of artisanal and small-scale mining. This will include estimates of mercury use and pollution based on evaluation of technology and equipment. But the result of having a policy of formalization without the methodology to implement it, is that even when miners want to pursue formal licensing, they often cannot afford the 30-50 dollar location license (giving some indication of just how little fluid capital miners have), or distrust the government's intentions and prefer to remain anonymous and illegal

Even where a miner does raise the money for the license, he still often lacks the capital needed to invest in efficient, productive, and sustainable mining engineering and mineral processing operations. In effect, the New Dawn created a new division of labour, where there are legal "small-scale" miners who have enough money to pay the licensing fees, purchase crude equipment — shovels and hoses — and provide food for illegal "artisanal"

miners who cannot afford the licenses but instead develop informal working arrangements with the "small-scale" licensee. Though technically the arrangement is illegal, the small-scale license holder hires the artisanal miners to work his claim, providing them basic hand tools, daily food, and a split of the profit.

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This is the situation as it existed at the time of the mission in Bushenyi, a lush region with hills covered by tea farms just a few hours from Entebbe. Amongst the tea plantations lies a small gold mine, where miners use some of the most primitive methods any student of mining has ever seen. Two groups of 15 miners work a small, newly dug pit mine. They work only with shovels, picks, and buckets. Their sluice box is a hollowed out log, placed at an angle, with water channeled through a pipe connected to the stream above the mine. Instead of carpet, the miners line the log with grass. They have no method for crushing or concentration, and mine none of the tailings. For all its potential to improve recovery rates, mercury is not even a glimmer in their eyes.

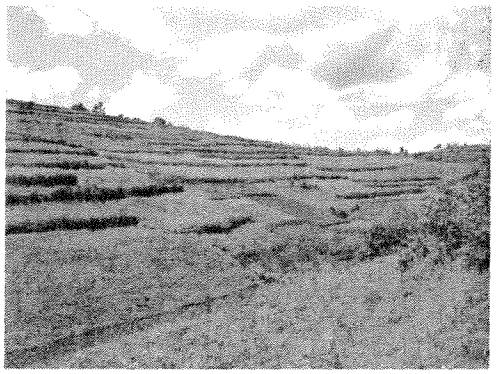

Fig. 8 – Tea plantations in Uganda

But even without sophisticated mineral processing methods or chemical inputs, the area contains enough coarse gold to satisfy the roughly 30 miners working the concession. The miners had produced 30 grams of gold the previous week. As noted, Bushenyi has many active and visibly impressive tea plantations. But on average farmers earn only 3000 shillings (3.5 dollars) a day, as opposed to $15 a day when the gold is good. Given this choice, gold mining in the region is inevitable. The outstanding question is, how will this gold be mined and by whom? Will it be extracted by artisanal miners operating illegally? Licensed small-scale entrepreneurs? Or major mining companies operating at economies of scale?

At the time of the mission, the pit mine being worked by the miners was licensed to John Muruli, who owned licenses for two small concessions in the area (Mashonga and Buwejo). As the licensee, Mr. Muruli allows the miners to work his concession, which is an arrangement that despite being illegal (since the "artisanal" miners are not registered), works well for both parties. Mr. Muruli gets a labour force that works for gross profits rather than daily wages, and supports them with tools and meals, as well as purchasing the gold they produce. Because there are other gold buyers in the area, to maintain the loyalty of the miners Mr. Muruli has an incentive to offer a fair price, which came to about $13-15 per gram.

Unlike many mining sites, there was no sense of conflict or violence permeating the community. The economic arrangement between Mr. Muruli — the "Small-Scale" claim holder — and the artisanal miners is a combination of formal and informal, since formally the miners are trespassing on his property. Despite being trespassers, the reality is that Mr. Muruli lacked the capital to hire a formal crew working for daily wages, and just as the increased income from gold over tea benefits the miners, having the artisanal miners in the area benefits the claimholder.

However, the case of Muruli's mine is a classic story of what De Soto calls "undercapitalization." At one point, Mr. Muruli had in his possession some small-scale equipment, which was owned by a business partner who later withdrew from the arrangement. Mr. Muruli had attempted to use the equipment to process concentrate, but the process did not work because of design failure.

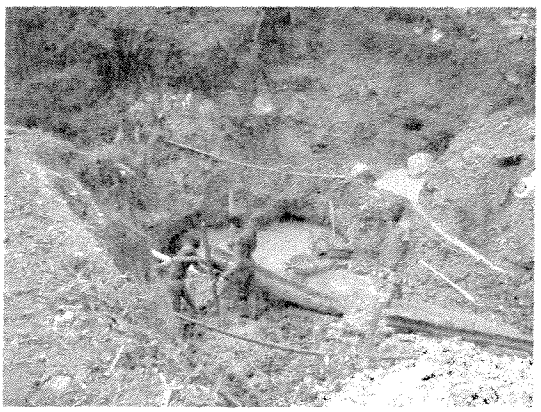

Fig. 9 – Mining for gold in Bushenyi

Indeed, without knowledge of how to mine efficiently, and without the capital to invest in proper mineral processing equipment and design, what Muruli's crew is doing is not so much "mining," but falls more into the realm of what might be called advanced

prospecting. By seeking only coarse gold, the miners fail to recover at least 70 percent of the fine gold deposited in hard rock and tailings. Moreover, the mines are poorly constructed, creating safety risks for miners and causing unnecessary environmental damage, largely in the form of erosion.

While licensed and formal, the Muruli mine suffers badly from being undercapitalized. He had followed the formula for formalization, but without access to financial or technical resources to invest in the operation, or advance it beyond its live-and-go-on artisanal stage. This situation drives miners like him to seek out large-scale gold companies, with the hope that their claims will show evidence of riches plentiful enough to be consolidated as part of a larger regional concession. Indeed, at the time of the visit, Mr. Muruli was collaborating with prospectors form African Precious Metals, a subsidiary of AngloGold Ashanti, by allowing them to drill samples from his claim to determine the feasibility of a larger scale operation.

The result of undercapitalization is that small-scale claim owners have an incentive to sell their concessions to large-scale mining companies. Though this outcome may be unlikely given the scale of deposits a multinational major needs to initiate exploration, it nevertheless underscores a major flaw of formalization.

One can write volumes about the promise of formalization for the development of capital, but unless there is a greater source of capital somewhere in the vicinity, the only hope a small-scale licensee has of increasing his wealth is to turn toward the majors. Once this happens, the whole principle of relying on small-scale mining as a local, independent, entrepreneurial activity that builds the wealth of the nation by adding value from the labour force all the way up the supply chain, is undermined. An industrial-scale mine would improve the local gold recovery, but it would also disrupt the tea farming that serves as the underlying basis for the local economy.

On the other hand, an efficient, community-run, small-scale operation like the one in Bushenyi could easily coexist with an agricultural economy and yield sustainable profits. These profits could be used to provide basic services and lift the community out of poverty.

For this to happen, licensees like Mr. Muruli need startup financing for a proper feasibility study, designing efficient, safe, environmentally sensitive mechanized process, and purchasing equipment.

Thus, two lessons can be drawn from Uganda's effort to formalize small mining. First, formalization requires knowledge, just as Schumacher (1973) points out that "The real achievement [for development policy] lies in the accumulation of precise knowledge." Without knowing what or who is out there, it is not possible to design a plan that meets the needs of miners. Second, formalization does not work unless it is accompanied by capitalization. For the gold mining sector, the purpose of formalization is to create incentives for small-scale enterprise, and ultimately discourage gold rushes and itinerant artisanal mining. But however small, formal operations need external inputs of capital in order to progress from glorified artisanal activities to legitimate small-scale businesses.

5.4 Planning for Intervention

5.4.1 Individual and Systemic Intervention

There are two basic varieties of technology transfer in mining communities: individual and systemic (Veiga and Meech, 1999). Individual interventions do not presuppose any structural change to the ASM economy. Different types of individual solutions include working with miners to improve mineral processing techniques, for instance to eliminate whole ore amalgamation, the practice of using copper-amalgamating plates, spreading mercury over riffles during the sluicing process, or the addition of mercury to ball mills such as occurs in Indonesia. Other kinds of individual solutions include introducing retorts to capture mercury during roasting of amalgam, and collaborating with goldshop owners to install filters for use during smelting. An example of an individual approach is employed by the World Wildlife Fund's Gold Mining Pollution Abatement project in the Guianas, where a small field staff — often just one person—works directly with miners to introduce specific technologies. Similarly, UNIDO conducts training programs for miners on how to use retorts or alter their grinding and sluicing methods to improve recovery rates (Spiegel and Veiga, 2005; Spiegel et. al., 2006).

By contrast, systemic solutions attempt to trigger adjustments to the political-economy of a mining area by introducing centralized processing, amalgamation centres, and other communal strategies for changing structural arrangements — microfinancing being a chief example of a "soft" systemic approach. Within the international community, much of the hope for systemic change has been placed on centralized processing or amalgamation centres. Bringing miners to a single location to process their ores, amalgamate concentrate, or burn amalgam, offers several potential benefits, not the least of which is the reduction of field experts needed to travel to every processing site in a goldfield. However, all solutions must be site specific, and there is no silver bullet to suit all cases.

5.4.2 The Trials of Centralization

This centralized approach has been tried in several places, beginning with Playa Blanca on the Caroni River in Venezuela's Bolivar State. In 1991, after the Venezuelan government banned amalgamation aboard river dredges, the state-owned company, CVG, and other private investors opened amalgamation centres where gravity concentrates were amalgamated by a crew of five people. The amalgam was retorted in a separate building, and operators could process 200-300 kilograms of concentrates per day, resulting in about one kilogram of gold. Most miners were not charged for the service, and the process was designed for them to be able to observe the path of their gold at all times. The winning statistic: 99 percent of the mercury used was recovered (Veiga and Beinhoff, 1997).

The potential benefits of processing centres for miners are fairly obvious. They enable better gold recovery and marketing, while reducing risks to human health and the environment. Communal amalgamating also limits relations with mercury dealers, who frequently possess inordinate economic power in mining areas. Moreover, processing centres can be expanded to offer support with organizational development, community building, accounting, micro-financing, and formalization.

But processing centres are not a universally applicable solution to the dilemmas of intervention. Imagining a systemic solution always involves a big question about whether

miners will share the rationality presupposed by the economic thinking. This is especially true for central processing, whose virtues are limited by four factors.

First, in remote areas, the rationality breaks down if there is no efficient way for miners to haul many tonnes of ore much beyond the mine. In these cases, the target of investment ought to be transportation infrastructure, not processing centres.

Second, amalgamation services may be offered free to miners, but the operations are not free of costs for labour, equipment, maintenance, and administration. When centres operate with an aid rather than a business model, there is no net to ensure their survival beyond the project cycle. Few miners possess the capital needed to maintain a processing centre. Unless the miners themselves are able to manage this enterprise, centralization will always demand either international development commitments, or a company that wants to operate the centre as a commercial enterprise. As soon as a company takes over, the profits for miners go down, and the economic wisdom of the intervention assumes a different metric.

Third, supposing a centre is successful and miners start bringing their ores to the same place: can four or five people continue to process everything for dozens of operations? Because most miners are not generally wage workers but are compensated for production, until the ore is processed there is no pay. Expecting them to accept downtime is unrealistic. In other words, success can actually be the cause of failure. For example, the Shamva Mining Centre in Zimbabwe managed to increase processing capacity by installing a centralized ball mill. But only a few years into the lifetime of the project, miners were waiting three to six weeks to have their ores processed. The executive committee tried to resolve the problem by establishing a minimum number of tonnes per participant. This eliminated the most poorly equipped artisanal miner — the very target of the project (MMSD, 2002a). Indeed, it has not been uncommon for miners to be exploited by the millers, who often captured a disproportionate percentage of proceeds in a pattern repeated in Zimbabwe, Ecuador, Indonesia, and Venezuela (Darmutji, 2003; Veiga, 2004; Veiga et. al., 2005).

Fourth, if the project is renewed but there is a gap of one or two years in the funding, as is common for development assistance, sending miners back to process on their own will erase whatever good will was originally summoned to bring them to the centre. The obstacle facing systemic interventions is getting miners to transform customary practices. Centralized processing requires a group of people accustomed to operating individually to merge into a single system. This can happen, but if there is no consent, there is no success.

5.4.3 The TDU

One way development agencies have sought to resolve the complexities of centralized interventions, is by bringing the processing centres to the miners. In 1999, the ILO called for mobile training units, a kind of collapsible laboratory staffed by experts traveling from site to site to demonstrate how miners can achieve better results by improving their amalgamation methods. This approach of bringing the intervention to the miners rather than bringing miners to the intervention, was finally endorsed and tested by the UNIDO Global Mercury Project in 2005 under the rebranded title of a Transportable Demonstration Unit, or TDU. Unlike a central processing centre, the TDU has no mandate to increase the volume of gold being processed, but rather focuses on smaller-scale interventions such as boosting recovery rates by improving gravity concentration and amalgamation techniques.

The TDU was intended to operate like a humanitarian intervention of the sort one sees the International Committee of the Red Cross implementing in conflict zones. TDU operators targeted high risk pollution hot spots, and set up shop somewhere accessible enough to attract miners. The concept is pleasing because it seems to offer an efficiency lacking in processing centres, particularly in terms of flexibility for dealing with the education of transient mining populations. However, the TDU is beset by many of the same problems as processing centres; it is only as effective as its implementing organization, and lasts only as long as its funding. Meanwhile, obtaining the materials for the TDU and finding local organizations with the right combination of engineering, economic, and public health backgrounds is not easy. In its most effective projects, the TDUs sponsored by UNIDO only operated for a few months before exhausting project resources. These proved to be useful pilots, but cannot be heralded as sustainable solutions.

5.4.4 Vulnerable Areas Intervention Criteria

Because no two mining sites are alike, there is no way to develop a project formula that allows intervention to be developed by extrapolating from previous experience. Microeconomic data have to be collected in any community where a project is being considered. In general, there is not much in the way of accounting systems, so to get reliable information a researcher has to be able to shadow miners during their work days and in their homes. How much do they earn? What are the impacts of seasonal variability such as rainy season, or economic shocks that affect mining conditions? How consistent is production? Are miners transient? (See Appendix I "Vulnerable Areas Criteria.")

This question of transience occupies a major role in the pre-assessment phase of projects. The loose designation that is "artisanal and small-scale mining" encompasses a great many things, from well-financed operations using missile dredges to vacuum floors of rivers, to small gangs of men, women, and children burrowing in 30 metre holes and crushing ores by hand. Before addressing any other issue, international organizations planning intervention must determine whether the phenomenon is a gold rush or a form of community mining. In gold rush situations, few miners are likely to withdraw even temporarily from production to receive training and education to improve mining methods. Moreover, if it is a rush by the time the bureaucratic instruments are in place for intervention, the peak will have finished, whereas with community mining — where gold is part of a long-term economic base — there is a chance to promote sustainable mining.

Artisanal miners are very good at finding where gold is located, but generally lack the education, expertise, or capital to exploit deposits efficiently. As a result, they are continuously opening new areas and extending their impact on regional ecological security. What's more, roving miners are virtually untraceable making it impossible for international development agencies to work with them sustainably. You cannot assist a community that cannot be found. Thus in terms of where development funds should go, the first rule of thumb must be to differentiate between artisanal gold rushes and community mining.

If institutional strengthening and formalization are the macro-efforts to overcoming the anthropological deficit, improving the methodology for selecting project sites is an important step toward collecting better microeconomic data. Mercury pollution is nearly ubiquitous in artisanal mining areas, as are technology deficits, public health, and other environmental crises. Yet no two sites are identical, nor is the need for intervention equally critical. While there is need for intervention in thousands of communities worldwide — interventions in the form of education, capacity building, technology transfer, and community development — the urgency in terms of mercury pollution is not equal in every place. In addition to improving data collection, establishing effective criteria for identifying vulnerable areas will help break the overemphasis on diagnosis and analysis which mires artisanal mining development projects in endless assessments and protocol. Determining the need for intervention, and defining the form that intervention takes is a matter of learning to identify needs quickly enough that assessment phases do not absorb precious project time and resources. As the economist Jeffrey Sachs (2005) writes, "The diagnosis should not unduly delay the treatment."

In its study on the International Waters division of the Global Environment Facility, the GEF Office of Monitoring & Evaluation (2004) concluded that projects which *combine Strategic Action Programs and Transboundary Diagnostic Analysis* are more likely to succeed, more likely to maintain stakeholder confidence, and more likely to endure. The message from this report is clear: the aim of assessments is to determine the environmental and political-economic conditions of gold miners, while simultaneously generating the rationale and prescriptions for intervention. In effect, this means closing the gap between assessment and implementation.

The idea of a rapid needs assessment is itself not new. In 1993, the World Health Organization developed the Rapid Assessment of Pollution Sources (RAPS), a method for estimating the quantity and type of contaminants arising within a particular area from both point and diffuse sources. This methodology was modified more recently by the GEF's Global International Waters Assessment. This is a principle of intervention also ascending in development economics, where controversial figures like Sachs advocate a kind of "clinical

economics." This is essentially what the medical community calls "differential diagnosis," involving a mapping of the factors converging in a single place to create poverty and hardship.[8]

As opposed to a traditional assessment, the purpose of vulnerable areas criteria is to evaluate the feasibility of intervention. The site selection methodology establishes contact with miners and community leaders, conducts basic mapping exercises, reviews any past experiences with development projects the community might have, and evaluates relationships with local partners to determine the feasibility of intervention. This does not entail complex technological analysis. Instead, the objective is to observe obvious environmental hazards, determine political-economic conditions relevant to mining activities and mercury trading, and obtain geographical coordinates for mapping the transboundary flows of mercury.

A similar approach for assessing artisanal gold mining areas could include estimates of:

- Annual gold production
- Aquatic, terrestrial, and atmospheric mercury releases[9]
- Influence on Watershed
- Direct and indirect impact on communities
- Mining practices
- Number and identity of miners
- Local community economic conditions, including duration of gold rush
- Legal framework for ASM and barriers to formalization
- The political-economy of the mercury trade
- Options for containment, reclamation, and restoration

The purpose of these rapid assessments is not only to identify potential sites for intervention, but to evaluate the underlying causes of artisanal gold mining in the respective regions.

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[8] Sachs identifies seven key areas: Poverty Traps; Economic Policy Framework; Fiscal Framework; Physical Geography; Governance Patterns; Cultural Barriers; Geopolitics.

[9] Established by the amount of Hg purchased per month.

Initial stages of fieldwork involves gathering basic geographic and demographic data, evaluating gold processing and mercury amalgamation practices, as well analyzing economic, legal, and public health infrastructure. The value of these seemingly obvious and trivial data — for example how easy or difficult it is to reach a mining site — cannot be overemphasized. Similarly, tracing watercourses, learning how climate influences mining, and examining the type of ecosystem of a particular mining area all shape the direction and viability of an intervention.

Given the declining field presence of international organizations, if a site is too remote to access reliably it stands little chance of receiving effective support from the consultant format. Likewise, understanding seasonal variability is vital for planning training events with miners and affiliated advocacy groups. For instance, if the water table rises significantly during rainy season, there is a good chance miners will abandon the site temporarily. This of course depends on the level of technology possessed by miners, and their ability to pump water from mines. (Indeed, financing pumps might be the first step to technology transfer, if there is evidence it will liberate miners to work more months out of the year.)

Further, the formal status of miners can determine whether intervention is possible. Illegality is a project killer, as is conflict over property rights (unless resolving such conflicts is the intended mission of the project). Finally, major health issues such as malaria and HIV/AIDS, and access to sanitation and clean water are all factors capable of derailing even the most well-intentioned development work. High rates of disease or water scarcity are bound to grip the attention of miners far more than mercury pollution if communities are in the midst of pandemics, drought, or famine. There is no ethical justification for providing miners retorts when they need water, or ball mills where children are being orphaned by AIDS. In such cases, the solution is holistic intervention, where mining policy gets folded into public health strategies, and becomes part of larger economic development efforts to eliminate the scourges of extreme poverty.

In addition to basic geographic, demographic, and health data, rapid assessments need to include a rough census of the target population, starting with how many miners there actually are. Many times, consultants rely on their eyes to estimate population, a totally unreliable method which produces vastly different accounts, and estimates of miners differing by literally tens-of-thousands; people's eyes simply see different scenes unfolding before them. Census information is critical: it can be the first step to deducing the number of women and children working in the mines, and gauging the movement of miners from year to year, and season to season. It also creates a context for more detailed data about the composition of households, including how many people there are, how their income is derived, ethnic and religious identity, and how they organize themselves.

By gathering this data, fieldworkers will learn early how to bring communities into the process of project development, and thus be able to assess their receptivity to intervention. In effect, data gathering becomes part of the practice of building collective efficacy. Digging deeper into more technical questions around gold processing, chemical use, and the economics of the supply chain — which in effect means miners reveal information that could be either proprietary or evidence of illegality — requires consent.

In order to evaluate the scope of intervention, project designers need data on whether ores are alluvial or hardrock, what mining, mineral processing, and amalgamation techniques are used (e.g., is it concentrates or whole ore?), and how amalgam is decomposed and tailings discarded. This provides the basis for an estimate of how much gold is produced, which in turn indicates how mercury (as well as cyanide and other chemicals) is used, and how much is lost to the environment.

Beyond evaluating technical methods, it may be possible to identify economic conditions which justify some kind of brief intervention aimed at altering the supply chain and bringing more money directly into the hands of miners. Market adjustments were the intended second objective of centralizing amalgamation, next to improving recovery and reducing pollution. But the form of an intervention should be dictated by the data collected with respect to: (1) how many grams of gold each miner is producing; (2) how gold is distributed from mines;

(3) who the buyers are; (4) the local price of mercury; (5) how much mercury is being used; and (6) the type of local cooperation.

These elements — geographic, administrative, health, technical, and economic — are enough to derive a preliminary assessment which defines critical risks, target populations, and chances for success. Based on these factors, intervention strategies can go in many directions. A project might work closely with women, or focus on technical training, establishing micro-credit, community and organizational development, or helping miners bring their gold more directly to market. Whatever the combination of activities, they should emerge from benchmark data established by field surveys, and be governed by the principle that benefits increase by becoming deep and attentive rather than overextending into projects that are broad and unfocused.

5.4.5 Global Inventory: Contact and Constituent Analysis

In both policy and knowledge institutions the study and practice of ASM is a relatively immature subject. Many facts are still being established, the public being made aware, and the philosophy of social and environmental change still emerging. The data used to project mercury pollution — especially the number of miners and the amount of gold produced — are always changing.

Getting the data right serves an instrumental role in intervention by keeping the profile of the issue public, and giving the professionals in the field a consistent reference point to anchor their work. But data alone is insufficient cause for people to transform a way of thinking or a common behaviour. Data has to mean something, otherwise it gets lost in the endless cycling of information around the world. This is a critical lesson of the climate change experience. Kyoto failed in its binding targets, but the establishment of an independent body, divorced from policy, mandated to publish reports about the state of the climate proved an effective instrument for outlasting climate change dissidence.

While the vulnerable areas criteria help in the micro-process of establishing contact, they do little to address the macro-level problem of knowing where to look for mining activity, and

having the means to identify critical regions. Certain parts of the world have received mercury projects, and in these places there is much accumulated knowledge of where to target intervention activities. But in many regions, namely West-, Central-, and Northeast Africa, as well as South- and Central Asia, there are few known records about where, how much, or how many people are involved in artisanal gold mining.

There are thousands of so-called hot spots, places contaminated by mercury that are now hidden by vegetation that covers abandoned mine sites, where the probability of methylation is enhanced by increased organic matter (Veiga and Hinton, 2002). To date, there are no systematic data about the location of these hot spots, nor is there a global inventory or map highlighting where international projects should be focusing.

The knowledge provided by an inventory can be used to identify hot spots for management and remediation; estimate landscape and social impacts; quantify emissions of mercury to the environment spatially, temporally, and historically; and monitor contemporary and future activities (Telmer, 2004). Not only would this systematize the observation of mercury, it would monitor lesser known ecological impacts of water siltation, modifications to hydrologic regimes, deforestation, loss of organic layer of soil, and illegal land occupancy — all key issues affecting miners and mining areas.

The scientific merits of this inventory have immediate benefits for policy development. Specifically, it provides the baseline data needed to negotiate protocols to regional conventions. And by delivering a mapping of where and how mining is prevalent, the inventory makes it possible to evaluate the rise and fall of gold extraction activities, and to track the stocks and flows of the murky global mercury trade.

Through the use of satellite imagery, it is possible to identify affected areas, monitor present-day mining, and reconstruct historical mining activity (Telmer et. al., 2006a). The database formed by these spectral images can be used by governmental and intergovernmental agencies to estimate mercury fluxes into aquatic systems, and determine priorities for assisting with land-use planning and reclamation.

An inventory could start with a census of sites in Latin America, Africa, and Southeast Asia. This census would allow the delineation of focus areas best suited to developing a monitoring system. Image availability is a major consideration for this stage of development, meaning it is important to select areas with high risks, high environmental impact, and high rates of current and historical activity. Once the study areas are defined, satellite images need to be collected twice per year for two years, and processed to quantify mercury pollution, suspended mineral loads of rivers, deforestation, and the mass wasting of landscapes from mining activities.

By designing the system with the proper level of precision, it is possible to create models that reduce the need for fieldwork, and allow for extrapolation from region to region, making it possible to take the inventory from two or three initial sites to a global level. After developing the models for extracting relevant information from satellite imagery, the process will be automated, and a database containing key parameters can be created for any region. These parameters could include temporal evolution of mining activities; mineral rights, land title, and historical occupancy; deforestation and the impact of forest fires; area of affected arable soil; quantification and history of river siltation; history of landslides and mine collapses; estimation of sites contaminated by mercury; radius of influence of siltation and mercury mobility with suspended sediments in water; and potential impact on riparian communities (Telmer, 2004).

5.5 The Operational Dimension

5.5.1 Aim Deep not Wide

Artisanal mining is the kind of issue that drives those who encounter it to become proponents of the something-must-be-done camp. Yet the obstacles — financial, anthropological, bureaucratic — make advocacy more difficult than perhaps it should be. Meanwhile, the global decline of peace and security, surge of disease, and other biospheric threats leave little room to advocate for niche issues in a world suffering from compassion fatigue. Despite these hardships, miners do not need more conferences, workshops, or reports issued in their

names. They need measured, streamlined, efficient, and effective aid which supports their real needs, and helps bridge the gap between extreme poverty and sustainable development. The task facing the international policy community starts with establishing commitments and timelines that are both attainable and far-reaching. In this case, the way to scale-up is by scaling back.

Indeed, it is sometimes enviable for international environmental projects to advance their agendas on a global scale by setting out to meet the needs of constituents in every affected area. But as the GEF Office of Monitoring & Evaluation (2004) points out, in many cases "a problem with project design...is excessive ambition and complexity."

Artisanal mining is a complex, diffuse, phenomenon; it spans many countries, in many conflict and hardship areas, often deep in the bush. An effort of global proportions is unlikely to succeed without a dedicated headquarters, in the same way the International Maritime Organisation is the focal point for the Global Environment Facility's successful project on bio-invasive species in ballast water, or Globallast (IMO, 2006). However, the essential difference between ASM and an issue like invasive species in ballast water is that the IMO is able to define policy objectives and monitor commitments through its existing congress. Further, although Globallast is creating a global framework, monitoring ballast water is limited to an identifiable number of ports.

By contrast, artisanal mining advocates can scarcely begin to estimate how many gold mining sites might exist worldwide. Thus, the first operational principle of intervention is that projects need to be narrowly focused. Rather than dozens of countries, the scope should include sustained involvement of no less than five years working in only a few countries. If this appears to be a step back given that UNIDO is just finishing projects in six countries for a five year period, consider that in the final analysis UNIDO may be successful in only three of its countries, with the successes remaining modest: trainings, regulatory tinkering, and temporary transportable demonstration units for technology transfer. This hardly measures as a sustained presence. At the same time, UNIDO has also conducted numerous short missions in Mozambique, Venezuela, Guinea, and Suriname. These brief consultations of 7-

10 days can benefit high level authorities, leaders of mining association, and the academic and NGO communities, by providing an awareness-raising service and guidance for future actions. However, they do little to build the capacity needed to sustain long-term activities. The chief lesson learned from the Global Mercury Project is important: successful implementation corresponds to the level of on the ground participation. The projects that achieved the most success received the most continuous work by Assistant Country Focal Points and project consultants. This is the same lesson the HIV/AIDS advocacy community is discovering in its effort to introduce public health intervention; to grow to a massive scale, you must start small. The outcome of this equation is that net benefits are greater when project resources are distributed discretely. Casting a shorter net yields optimal results.

5.5.2 Linked Interventions

An earlier section of this paper made reference to a proposal by the International Labour Organization that for interventions to be effective they need to be holistic, or "linked." The concept of a linked intervention is that all the elements needed for sustainability are treated together as part of the same basket of human and ecological needs.

Since no one organization possesses the interdisciplinary infrastructure for holistic intervention, most linkages must fall into the category of the so-called partnerships promoted by the Millennium Goals. There are three basic forms of partnership: inter-agency (e.g., UNIDO with WHO); between intergovernmental agencies and governments; and public-private. In addition, there are two other kinds of partnerships which could operate at a more general level — less so about providing particular activities, and more about structuring the delivery of intervention. These are bio-regional partnerships and educational partnerships.

5.5.3 Interagency Partnerships

To begin, at the interagency level partnerships provide specialized expertise and can help bridge resource and personnel gaps. The African minerals policy sector is moving toward interagency partnerships to improve presence in the field, by linking the minerals department of the policy-centric UN Economic Commission for Africa with the UNDP to take advantage of its administrative capacity and take projects from the normative level to the field (A. Pedro, UNECA, 2006 – Pers. Comm.). Likewise, linking with Poverty Reduction and

Country Assistance strategies taps into important sources of funding at the World Bank, bilateral agencies, and the UN. It also helps that poverty reduction is a good ideological match for artisanal mining policy. Indeed, in most developing countries environmental discussions are about poverty. This recommendation that mining policy focus on durable poverty reduction and sustainable livelihoods (not to be confused with "alternative livelihoods," an opposing philosophy aimed at shifting people out of mining), broadens the scope of artisanal mining projects by seeking a place for small-scale minerals development within poverty reduction strategies.

5.5.4 Public-Public Partnerships

While dividing labour across intergovernmental agencies is one form of partnership, another strategy is to negotiate deeper relationships between these agencies and different levels of government inside a country. District and municipal offices are generally underutilized in mining policy development, even though they frequently have greater legitimacy than officials from national geological or health authorities. But even at the federal level there are opportunities for partnerships that often go unnoticed, such as linking artisanal mining to poverty development through the kind of decentralization programs gaining popularity in parts of Africa. Ideologically, this is another good fit, since the focus of decentralization is on local, small-scale, organizational development. Here the minerals development sector has been much slower to recognize the potential advantages of decentralization, than the agricultural development community in its emphasis on rural development.

Uganda, to take one example, is pursuing a policy of decentralization which aims to develop greater capacity, capital, and access to markets at the local and community level. Just as in Ethiopia, many of the progressive policy opportunities for the mining sector are coming from agricultural economics and rural development.

Prior to 1986, when the Government of Uganda adopted the liberalization agenda encouraged by the World Bank and International Monetary Fund, there existed a strong agricultural cooperative movement, particularly amongst coffee growers. Cooperatives purchased products from growers, then passed the coffee up to the labour union. The coffee

was finally bought by the Coffee Board, which fixed prices inside the country and controlled the export market. This system persisted through the Amin regime, until the privatization movement became the rule of the day, with independent, often foreign companies purchasing directly from individual farmers. Without support from any level of government, organization amongst growers broke down, and companies were able to exploit lack of coordination and purchase coffee and other products for lower and lower prices.

Presently, the Government of Uganda is attempting to revive the cooperative movement. Coffee growers and other farmers are being helped to form associations, with the hope that these groups will be able to access foreign markets without intermediaries. This decentralization initiative is being directed and financed by the Ministry of Trade. Similarly, the Mines Department has created a Mines Chamber charged with organizing small-scale miners. But according to officials from the Geological Survey, the Chamber exists only on paper and has neither funding nor staff.

Decentralization is not as empowered in the minerals sector as in agriculture, in part because mineral rich countries are under intense pressure from lending agencies to privatize the sector and open markets to large-scale foreign investment. But in effect, the philosophy for small-scale mining development exists, but there is no will or financing to put it into action. In some places there is even the statutory mandate for decentralization, but the program needs an international partner to bring it legitimacy, and help bring small-scale development onto the page alongside industrial-scale investment.

5.5.6 Public-Private Partnerships

A third species of partnership is collaboration between development agencies and mining companies. The incursion of private large-scale gold concessions by artisanal miners is a persistent risk for mining companies, who are subject to intense public scrutiny over questions about their social license to operate. Traditionally, gold mining companies have resolved conflicts with artisanal miners by resorting to state sanctioned intimidation, force, and violence. This approach fails to deter local miners, and creates high direct and indirect costs for companies, who risk loss of local and international legitimacy; loss of profit; and

loss of confidence. While disengagement from local miners appears appealing, turning a blind eye to conflict with ASM is impractical, and ultimately fails to mitigate risk.

Indeed, once miners have entered an area en masse, there is little to prevent them from invading open pit and even underground mines in search of rich tailings or a bag of friendly ore. This is a nightmare scenario for any company. Once miners are comfortable entering the site, there are few options besides force.

Typically, mining companies and many governments refer to artisanal miners as "illegal." This lack of legal recognition prevents any state agency, international organization, or company from initiating either pollution or poverty reduction programs. People cannot be helped if their existence remains officially unrecognized. As a first step toward mitigating conflict, local populations must be provided the means to become rights-bearing miners. But rights merely establish the requisite conditions necessary for transforming often volatile gold mining centres into sustainable mining operations — into places that are building capital at the base of the local economy. By working with governments, mining companies can help create conditions for recognizing the rights of artisanal miners. This objective is in the economic interests of companies: providing resources for educating miners helps bring them into compliance with national and international environmental and human rights norms, taking pressure of companies who are often held responsible for social and ecological ills created by ASM.

Developing partnerships between industrial and small-scale gold miners is not a new idea. The ILO called for such initiatives in 1999, and before being consumed by Barrick, Placer Dome ran such a program at its Las Cristinas mine in Venezuela. For both miners and mining companies, loss of profit, threat of violence and growing financial risk create an insecure environment. All relevant interests, including companies, miners, communities, and governments, need a replicable solution.

The long-term objective of public-private partnerships with gold mining companies is an industry-wide policy shift toward recognizing the rights of artisanal miners. This can be

accomplished by developing peaceful coexistence plans aimed at lifting miners out of poverty, reducing their impact on the environment, and eliminating human rights abuses. Companies can participate in the legitimation of artisanal miners by conceding marginal parts of concessions, contributing resources, and creating conditions for more focused mining. This can occur by improving recovery rates and keeping miners working efficiently, safely, and environmentally in one place.

Once pilot programs have been conducted in a number of locations, the results of these projects should be examined in an industry-wide policy format similar to the Cyanide Management Code. But for any solution to work it must be governments, not companies, who are the leaders. In countries where governments are collecting and diverting royalties from foreign mining companies into local economic development funds, such as in Ghana, this type of initiative is an ideal prototype for the mines ministries to be serious co-financiers of engagement projects by unlocking these royalties for investment in small-scale enterprise.

5.5.7 Bio-Regional Partnerships

Artisanal gold mining is a regional rather than a national issue. Miners flow easily across frontiers. In the past, policies to limit the expansion of mining in one area has driven migration to other parts of the region, where restrictions may be fewer or less enforceable. For example, when Brazil created artisanal mining reserves in the Amazon, this helped limit mining in Brazil in part by encouraging miners to migrate into Venezuela and the Guianas, where there is virtually no rural law enforcement (Veiga, 1997a). In order to obtain some control of the issue, there must be harmonization through international law to build regional policy consistency.

In spite of some benefits, partnerships often spread responsibility without defining accountability. The ad-hoc partnerships model provides little hope for sustaining region-wide policy initiatives. For projects of a more global reach, regional networks based on integrated watershed offer effective institutional partnerships for facilitating this expansion, as well as access to the people, resources, and political forums needed to integrate artisanal mining issues into regional policies. This kind of bioregionalism —integrating both

watersheds and bureaucracies — is consistent with the GEF's pursuit of multi-country actions to introduce sustainable development for large systems which cover most of the Earth. It also recalls the March 2005 Report of the UN Secretary-General, which calls for greater investment in regional infrastructure and institutions: "International donors should support regional cooperation...and developing countries should make such cooperation an integral part of their national strategies."

There are already numerous examples of integrated watershed programs, such as the Mekong River Commission, Guinea Current Large Marine Ecosystem, and the Nile Basin Initiative (NBI). Thus far, no regional environmental policy organization includes mercury pollution from ASM in its priorities, a meaningful oversight given how much mining activity and mercury use is concentrated in riparian zones of developing countries.

Rather than review all the potential regional networks that could be valuable partners, it is useful to examine one example from East Africa. The NBI consists of nine countries: Egypt, the Sudan, the DRC, Uganda, Tanzania, Rwanda, Kenya, Burundi, and Ethiopia (Eritrea is an observer). It has two primary branches: the Shared Vision Program (SVP) and Subsidiary Action Program (SAP) (Close-Brooks, 2005). The SAP deals with large infrastructure programs, while the SVP deals with "softer" initiatives like education, capacity building, and policy. One of the seven divisions of the SVP is the NTEAP — the Nile Transboundary Environmental Action Program. Within the NTEAP, there is a Water Quality program which has identified 10-12 primary contaminants of the Nile. Mercury is one of these contaminants, but no work has yet been done to identify sources of mercury pollution to the Nile Basin (J. Omwenga, NBI, 2006 – Pers. Comm.).

In practice, creating the justification for collaboration always has to precede bioregional partnerships. Without robust data, there is little regional policy outfits can do to include mercury and mining in their portfolios. Paradoxically, without this data they have no justification for collecting the data. While mercury and ASM is a natural fit for the NBI, there is a data gap which must be first be filled before any substantive collaborative agreements can be reached. Collecting this data requires fieldwork to conduct regional

artisanal gold mining and mercury inventories. The data collected can then be incorporated as GIS layers of regional watershed maps, introduced to the Secretariat of the NBI, and incorporated into the Strategic Environmental Framework. The SEF is a consensus building policy process designed to ramp-up over the course of several years to become a binding regional convention. In turn, this convention is intended to create a permanent mandate for governments of the region to address all the priorities addressed by the SEF, one of which ought to be mercury.

A significant downside to this kind of bioregionalism is that it can limit the scope of projects to those sites and initiatives which fit under existing bureaucratic mandates. For example, Ethiopia's biggest area for artisanal gold mining is in the southern part of the country, the Shakisso District of the Oromiya Region, where it is believed there are as many as 100,000 artisanal miners currently operating. The area supports both primary and placer gold mining, as well as superficial tantalum mining; miners are known to use mercury (Tadesse, 2003). By these measures, Shakisso should be a prime target area for intervention. Yet, the Shakisso watershed drains into the Dawa River, which flows into the Ganale, and to Somalia. This means the region does not fall under the mandate of the Nile Basin Initiative, and the NBI cannot support a project in this region. The underlying point is that while bioregionalism can potentially integrate artisanal mining issues into regional policy, it can also create additional bureaucratic burdens and constraints. Bioregional projects funded by environmental donors can have fairly strict ecological priorities, which may not always permit the kind of linked interventions to reduce mercury pollution in the places where action is most needed.

5.5.8 Educational Partnerships

"One of the greatest difficulties in reducing emissions and recognizing dangerous sites," writes Veiga (1997b), "is the scarcity of people who can transfer knowledge about the issues. A multi-disciplinary approach is needed which can handle field observations as a preliminary step for rapid evaluation of the extent of pollution."

Traditionally, international programs have attempted to transfer knowledge by cherry-picking selected sites and concentrating resources in those particular areas. But transferring technology is a secondary activity that ought to follow consensus building and formalization; there is no point to introducing new technologies without evidence they can be used sustainably. The error comes through focusing on the technology rather than knowledge itself. The goal of intervention is knowledge transfer, for which technology is a tool.

Yet disseminating this knowledge at all is problematic, given how badly the students outnumber the teachers. One way to begin addressing this knowledge gap is through the creation of a centre for teaching and exchange. Together with universities, donor agencies could finance an institute for artisanal mining education. This centre would accomplish two things: First, it would be a place for graduate students to prepare for fieldwork by training in engineering, sustainable development, economics, public health, and language. Second, it would provide fellowship opportunities for country nationals to learn the skills needed to carry the torch without international support. Graduates of this program would move on to regional centres, where they would coordinate work with communities, and also serve as training centres for experimental mining (Veiga, 1997c). These programs could offer diplomas for miners, certified by university extension services.

A knowledge centre would provide an intellectual, if not a political, base for development activities. This poses many fewer bureaucratic hurdles than creating a secretariat housed inside a political institution. Not only would this improve the quality of education miners and development workers receive, but it would provide a forum for advancing scientific knowledge in the field. Inasmuch as the social-science considerations of how aid is best delivered to miners are part of an emerging discipline, there are also key scientific questions that, if resolved, would unify academic research and advance the application of scientific knowledge.

For example, a major scientific issue requiring deeper analysis is the fate of mercury vapour in the environment. Mercury vapour from burning amalgam is poisoning miners and people in neighboring communities, but the specific science of how mercury that is burned at low

elevations (as opposed to a high smokestack from a coal power plant) is affected by wind currents, and how far it settles into the environment, how it methylates and bioaccumulates, remains a matter of intense debate (Telmer et. al., 2006a). Academic politics being what they are, researchers holding opposing views of the fate of mercury vapour can and do divide the attention and resources of the scientific community. A development studies institute whose focus is sustainable small-scale mining, would help promote scientific consensus in the research community; more energy could be directed away from theoretical polemics, and devoted to applied studies such as medical questions about how to flush methylmercury from the body; interdisciplinary work on how to restore spoiled environments; toxicological analyses of the outcome of combining mercury and cyanide; and economic questions about how to regulate mercury trading, or project global boom and bust cycles of gold rushing.

5.6 Summary of Policies and Actions

The purpose of this chapter is not to find alternatives to the United Nations or other international institutions, but to make them work better. There are currently 10-15 million artisanal miners worldwide, and 50-100 million people involved in the global ASM sector (Swain et. al., 2007). ASM is the world's second biggest source of anthropogenic mercury pollution, accounting for as much as one-third of the global total (Greer et. al., 2006). The WorldWatch Institute's 2006 State-of-the-World Report calls for the environmental community to direct more attention, and more funding to activities in the ASM sector. The WorldWatch report follows in a long line of declarations and commitments by the international community to develop actions that will reduce the amount of mercury released and emitted to the environment each year.

Recent collective efforts such as the Madison Declaration (2007) to gather scientific consensus on key issues and support vital policy goals, are a step toward strengthening international resolve to define and implement effective policy. However, there remains no international body whose mandate it is to coordinate action for ASM and mercury. One idea often circulated is for mercury to be added as a protocol to the Stockholm Convention on Persistent Organic Pollutants (POPs), a reasonable proposal given the propensity of metallic mercury to be transformed to organic mercury once it enters the environment. International

mercury abatement practice needs an organizational centre, yet there is so far no signal from the United Nations Environment Program, which houses the POPs secretariat, that it intends to build consensus on this matter. In order to be debated, this proposal must be tabled by a member-country at a meeting of the Governing Council.

Still, it is not self-evident that adding mercury to POPs would benefit a campaign to work with artisanal miners. Since POPs deals strictly with organic pollutants, it could be that only methylmercury would be added to the so-called dirty dozen pollutants. Given that exposure to metallic mercury vapour is the primary concern for miners, it could end-up that a POPs protocol addresses only the role of mercury in fish, effectively ignoring much of the immediate humanitarian dimension of poisoning from metallic mercury vapour released from burning amalgam. While the two issues of mercury vapour and methylmercury pollution can be linked, the ecocentric priorities of UNEP could very well result in the omission of related occupational exposure issues from the purview of a protocol or convention.

Questions about the potential role the Stockholm Convention could play in defining and implementing ASM/mercury policy, and mercury policy at large, merit further examination beyond the scope of this dissertation. The policy recommendations assembled below fall into seven general categories; these reflect near-term activities that can be accomplished within extant institutional and financial parameters. The summary of policy recommendations in Table 2 also includes longer-term political objectives not specifically addressed in earlier chapters. These recommendations, such as implementing the Millennium Development Goals or the Convention on Biodiversity, reflect political considerations occupying a wider context than the specific focus of this dissertation permit. The near-term project goals are as follows:

1. Clear Principles of Project Development

Policy: *Develop a focused global project which focuses on no more than 2-3 countries.*

Rationale: *More diffuse projects increase overhead without improving results. The administrative capacity does not exist to manage more than two or three countries effectively. Artisanal mining is remote and scattered. It is most effective to go deep into a country, expanding to more locations within one country, rather than skimming the surface of many.*

Action: *Build in rather than out, based on the UN's most successful outcomes; continue working in areas where progress is occurring, and mercury pollution is most profound.*

2. A Global Contact and Constituent Study

Policy: *Build a system based on fieldwork and satellite imagery for documenting and monitoring artisanal mining at regional and global scales.*

Rationale: *An inventory is the starting point for defining the global priorities of international organizations, locating hot spots needing immediate attention and remediation, monitoring environmental impacts of mining, and planning long-term intervention strategies.*

Actions: *Develop an inventory of sites with artisanal mining activities by:*

- Creating remote sensing tools to evaluate the impact of sediments, mercury, and other parameters on aquatic and terrestrial systems.
- Developing a GIS system to evaluate the movements of miners.
- Identifying suitable regional boundaries, presumably defined by watershed, such as the Guinea Current for West Africa, Mekong for SE Asia, Black Sea for Central Asia, Nile Basin for NE Africa, etc., with eye toward harmonizing boundaries with GEF international waters projects.
- Developing contacts in each of the target regions.
- Conducting literature review focused on target regions to avoid duplication of work.
- Fieldwork to collect data in mining sites, and identify government, NGO, and private partners.
- Develop tools to assist in reclamation and mitigation strategies for mercury contaminated sites.

- Packaging data for use by governments and agencies worldwide.

3. Vulnerable Areas Criteria

Policy: *Develop a survey for mining sites that covers geographical data; methods of mining and amalgamation; pathways of mercury into aquatic environments; human exposure; socio-economic characteristics of mining communities; gold production; and the legal and political status of miners. These parameters are combined in a heuristic procedure to draw conclusions about whether intervention should be prioritized in a particular area.*

Rationale: *Mercury pollution is a symptom of economic deprivation. Intervention will only be sustainable if it is appropriate to the particular area.*

Action: *Conduct survey in target communities that are potential recipient of intervention.*

4. Projects for Coexistence Between LSM and ASM

Policy: *Develop 2-3 pilot sites demonstrating a rights-based approach to resolving conflicts between large- and small-scale miners.*

Rationale: *There is a natural synergy between companies and development agencies on this issue. Artisanal mining presents deep risks to companies, who need partners to coordinate development programs they are otherwise incapable of doing. International organizations are missing a long-term presence on the ground. Companies intend to remain active in regions for up to three decades, offering a format for consistent field presence (presuming large and small miners can peacefully coexist).*

Action: *A **12-Step Engagement Plan** for engaging gold mining companies to work towards the peaceful and equitable coexistence of large- and small-scale gold miners (Appendix III).*

5. Bioregional Integration

Policy: *Integrate mercury pollution data into strategic environmental frameworks.*

Rationale: *The Strategic Environmental Framework is an initial step toward regional conventions securing a permanent political mandate for governments of the region.*

Action 1: *Collect regional data on mercury pollution that can serve as baseline for inclusion of mercury in strategic environmental frameworks.*

Action 2: *Apply to small-grants programs for advance funding to assess mercury pollution in potential target sites and help build regional inventory.*

6. Addressing the Role of Formalization

Policy: *For economic development projects to contribute to the formulation of a formal mining system, whether through legislation, registration, or organization.*

Rationale: *Formalization is the foundation for innovation. Interventions aimed at technology transfer begin with piecing together a formal system. This provides the microeconomic data necessary for guiding projects, and distributes the property rights needed to create capital It is the basis for micro-financing.*

Action: *Build on existing trust and reduce administrative costs by adapting existing informal economies into formal framework, so that law and administration reflects ground truth.*

7. Intervention as Education

Policy: *Concentrate on knowledge transfer rather than technology transfer.*

Rationale: *Meeting the needs of miners is in the end a function of delivering educational services. Artisanal mining is too diffuse to reach all miners. No matter what the intervention activities, the objective is to introduce knowledge that will gradually transform the way miners operate. Centralizing educational initiatives atones for the absence of a political centre for development programs.*

Action: *Establish an institute for sustainable small-scale mining, where graduate students are trained for prolonged fieldwork, which offers fellowships to country nationals, and coordinates regional training facilities offering diploma programs in sustainable extraction to artisanal miners.*

Table 2 – Summary of Policy Recommendations

Foundations of Intervention	**A.** Develop long-term projects focusing on a small number of countries and conduct less intense and short-term projects in countries where there is limited knowledge and capacity. **B.** Continue working in areas where success has been highest, and government support is strong. **C.** Invest in-country work strengthening civil society groups capable of carrying the mantle of project work. **D.** Concentrate on knowledge transfer rather than technology transfer.
Formalization	**A.** Ensure projects include formalization component to integrate miners in legal mainstream through legislation, registration, and organization. **B.** Build trust and consent, and reduce administrative costs by adapting existing informal economies into formal framework, so that law and administration reflects the reality on the ground.
Inventory	**A.** Develop a survey for mining sites that covers geographical data; methods of mining and amalgamation; pathways of mercury into aquatic environments; human exposure; socio-economic characteristics of mining communities; gold production; and the legal and political status of miners. **B.** Build a system based on satellite imagery for documenting and monitoring artisanal mining at regional and global scales.
Partnerships	**A.** Develop 2-3 pilots demonstrating a rights-based approach to resolving conflicts between large- and small-scale miners. **B.** Integrate mercury pollution data into strategic environmental frameworks. **C.** Collect regional data on mercury pollution that can serve as baseline for inclusion of mercury in strategic environmental frameworks. **D.** Target small-grants programs of regional policy bodies to assess mercury pollution in potential target sites and help build regional inventory. **E.** Establish an Institute for Sustainable Small-Scale Mining, a centre where students are trained for prolonged fieldwork; which offers fellowships to country nationals; and coordinates regional training facilities offering diploma programs in sustainable extraction to miners.
Trade & The Supply Chain	**A.** Create incentives for miners to conserve mercury by introducing short-term interventions in the marketplace, long-term mercury retirement strategies, and expansion of fieldwork with miners. **B.** Simultaneously implement educational programs targeting poor amalgamation practices, introduce alternative mining technologies, and permanently retire large mercury stockpiles; assembly of International Mercury Management Code; harmonizing trade law to meet standard established by the European Union.
Long-Term Policy Objectives	**A.** Reduce by 50 percent mercury pollution from ASM by 2015. **B.** Examine the potential benefits of adding methylmercury to the Stockholm Convention register of Persistent Organic Pollutants (POPs). **C.** Continue implementation of Millennium Development Goals to alleviate conditions of extreme poverty in mining communities. **D.** End child labour in mining by bringing countries into compliance with ILO Convention 182 on the Worst Forms of Child Labour. **E.** Promote gender-sensitive education which ensures women are not exposing infants to mercury during and after pregnancy. **F.** Implement the Convention on Biological Diversity to ensure protection of riparian areas as buffers to prevent drainage into watershed.

5.7 Moral Commitment

International environmental intervention — like all foreign aid — is part of a political process. To speak of the needs of miners only in theoretical and technocratic terms presumes a kind of sober rationality that scarcely exists in policy settings, or for that matter in any area of human affairs. Notwithstanding the endless shuffling of paper across the vast global bureaucracies that govern environmental policy, most decisions and actions depend less on the strength of reports, assessments, and plans, than on the instincts and moral commitment of the individuals involved in making and implementing policy.

There is at times a conceit among environmental professionals that environmental policy is somehow a politically neutral phenomenon, based exclusively on sound science and pure intentions. This lends environmental initiatives an air of moral authority, often based on little more than a sentimental impression that anybody in the business of saving the earth must be doing good. The test of legitimacy for any international intervention must be whether an action benefits local communities, that is, people. Indeed, this is the intention behind characterizing principles of intervention as "political ethics" for meeting the needs of miners. Much of the modern industries of environmental professionalism and economic development assistance are distracted by all things grand: big grants, achieving great reductions in pollution levels, even winning big awards.

To be sure, these can be important factors in the prevention of environmental crises. It is hard to imagine substantive progress without attracting positive attention to the issues, raising considerable funds, setting meaningful targets. Moreover, the resources needed to confront mercury pollution from ASM are relatively modest, all things considered. The projected resources for changing the tide in the global AIDS crisis is $27 billion (Epstein, 2007). By contrast, it would take just a fraction of this to implement mercury abatement programs in ASM communities around the world.

And yet, there is a tendency to concentrate on the potential for scoring big points and even bigger windfalls within the international donor community. This runs the risk of

disintegrating into a kind of sterile grandiosity, drawing more money into increasingly ineffective bureaus, and losing sight of the individuals for whom those resources were originally intended. Breathing life into critical global environmental issues is a function of what political theorists call legitimacy (Jouvenel, 1993), and sociologists refer to as "collective efficacy" (Epstein, 2007). Jouvenel also dubbed this "government by folkways," where in the absence of an administrative corps or state apparatus the execution of political decisions depends solely on the cooperation of the public and moral cohesion. Epstein prefers to articulate this as the "sense of solidarity, compassion, and mutual aid that brings people together to solve a common problem that individuals can't solve on their own."

The Mines Commissioner of Uganda expressed this point aptly during a consultation in 2006. He had wanted to know whether Busia, a small ASM area in Southeastern Uganda where miners use mercury, might be considered a future project site for the GEF and UN. Responding to the concern that the site might not be large enough to attract the bigger donors, the Commissioner observed: "Even 200 people are important."

This basic perspective, a reminder of the responsibility to the dignity of every individual, is easily lost when working inside international institutions. Working even on the periphery of the international civil service has a way of exciting the desire for attention, glory, and heroism of the humblest person. Instead of responding to an external need created by ecological threat or economic distress, the title of "expert" can lead to a swelled chest and, eventually, subtle contempt for the mundane details that comprise the bulk of any development work. It was partly for this reason that Kapuscinksi (1992a), who rarely had a bad word to say about anybody, reserved uncharacteristic disdain for UN officers. "People from the United Nations form a club unto themselves. Many of them are pretentious: they look on everything and everyone from a global perspective, which means, simply, that they look down. They repeat the word 'global' in every sentence, which makes it difficult to settle everyday human problems with them."

At the end of the day, international environmental intervention — whether in the form of a convention, protocol, or project — is a publicly financed operation. Implementing agencies

exist to deliver services in response to the needs of miners, not justify their own reason for existence. But the move towards projects over protocols sometimes obscures this relationship between intervention and public policy. Indeed a small project — successful or a failure — rarely attracts the attention of policymakers, much less the general population. As a result, the sense of consequence, urgency, and public service is easily lost, replaced by a different set of motives. In the decentralized subcontracting system, it is not always clear who is accountable, nor what achievements are desired. Rather than being about public service, the consulting system encourages an inversion of priorities, where international civil servants consider the needs of miners only after attending to their own contractual needs.

It could be contended that reasoning of this sort applies a moral stringency to what amounts to a minor issue in contemporary world affairs. How worthwhile is it to assign such moral or ethical particularity to something that can hardly be considered more than a drop in the bucket? But the perception of how critical an issue is largely irrelevant. With any matter of ecological security or human dignity, establishing consistent ethical guideposts helps reinforce the aid worker's desire to act, and counter the inclination toward disillusion.

From the moment one wanders into a gold rush, it is hard not be flooded by a great sense of human and ecological need. Seeing waters turbid from dredging the river bed; standing with miners as they burn mercury; examining blisters on the hands of child diggers; watching as women carry fifty-pound pans of ore on their heads, their babies strapped to their backs; observing the deforestation, the contamination, the humiliation — these experiences arouse the will to help things be better than they are. Yet once the scale of a global issue like mercury pollution comes into focus, and the impenetrability and inflexibility of the world's bureaucracies become apparent, it is also difficult not to be gripped by a crooked sense of the impotence of righteousness. "When all we see beyond our borders is chaos, the temptations of disgust become irresistible. If we could see a pattern in the chaos, or a chance of bringing some order here or there, the rationale for intervention and long-term ethical engagement would become plausible again" (Ignatieff, 1997).

Indeed mercury's microscopy veils deep threats to human health and the environment. In the larger picture, mercury is symbolic of the way industrial civilization is contaminating itself. A pandemic where the global population faces mini-Minamatas through exposure to methylmercury in fish is an extreme scenario. A more moderate, no less urgent, projection is the gradual increase of children born with impaired mental functions from mercury passing through the placenta, especially in mining communities. Physiological responsibility for the mercury illnesses of children is a heavy psychological burden for women. Mercury is not simply going to be eliminated from industrial process, nor are retorts and other technologies alone going to be saviors. What the world needs, what miners need, is not just better health programs or environmental advocacy, but preventive solutions that result in less exposure to mercury. Sustaining this effort is about neither clever ideology nor innovative operational planning, but the moral commitment to view all life, human and ecological, as deserving of dignity.

6 CONCLUSION

This research was undertaken in order to advance policies for managing global mercury pollution from artisanal gold mining activities in the developing world. ASM is the source of one-third to one-quarter of all anthropogenic mercury pollution released to environment. The fieldwork presented in this dissertation occurred in one dozen countries, and involved examination of the relevant public, private, and civil sectors associated with this global issue. The product is a political strategy and an accompanying policy framework aimed at international institutions addressing ASM and mercury pollution.

The following conclusions were derived from the research:

Regarding Mercury Pollution

- There is international consensus that mercury pollution poses clear dangers to human health and the environment. In response to this social and ecological need, a social science is emerging aimed at developing effective policy solutions.
- As with any emerging natural or social-scientific paradigm, there is not yet a clear sense of values or ethical priorities, nor a consistent policy framework guided by a coherent philosophy.
- Global mercury policies have traditionally underemphasized the role of artisanal mining activities in mercury trading and global mercury pollution.
- In the debates over mercury trade policy, without field-based intervention efforts restrictions on supply could function like a regressive tax on miners, for whom mercury is an essential economic ingredient.

Regarding Right Authority

- The world's international policy institutions are not structurally prepared to manage mercury pollution from ASM. A decline in field-based activities by UN organizations, combined with competition from other global priorities, limits the capacity for effective and sustainable international intervention.

- To achieve meaningful reductions in mercury pollution from ASM requires both structural innovations in international institutions and shifting the terms of the existing debate. Inasmuch as this shifting of the debate is about the rhetoric of intervention, it is ultimately concerned with changing the focus of policy making from a reactive mode to one of prevention, and acknowledging that environmental issues cannot be extricated from poverty alleviation.

Regarding Ecocentric and Technocentric Priorities

- There are two equally strong ethical imperatives involved in this issue: mercury pollution is a clear and present danger, and mercury is also a central ingredient of production for one of the world's most impoverished economic groups. Political ethics are needed to guide questions about how to harmonize the ecocentric goals of mercury abatement with the anthropocentric ones of poverty alleviation.
- Modern ASM activities are primarily driven by poverty. Mercury has been discharged from ASM for centuries, however rising poverty coupled with population growth has expanded the problem exponentially over the last 30 years, particularly in the developing world.

Regarding The Myth of Alternative Livelihoods

- Because of the interdependence of ASM and poverty and the profitability of gold mining compared to other economic options, it is unreasonable to expect gold miners to pursue other employment. Artisanal gold miners cannot simply be shifted into "alternative livelihoods" because gold is already the alternative.

Regarding Conflict Between ASM and LSM

- Multinational gold mining companies are increasingly experiencing conflicts over property rights with artisanal miners. Companies cannot presume that such conflicts can be easily eliminated by governments or by the use of force. For as long as poverty persists, so will ASM. Instead, companies must find ways to coexist peacefully with miners, and even to contribute to the development of the ASM sector.

Regarding A New Approach to Intervention

- A new approach to intervention is needed — one based not on assessment and monitoring of mercury pollution, but stressing the interdependent principles of formalization, capitalization, and education.
- Formalization is a concept often misunderstood as the creation of laws and regulations to manage ASM. On the contrary, formalization is about adapting into law the existing informal arrangements created by miners, and recognizing the presence of property rights created by actively working gold claims. Formal recognition of property rights and land title are the precondition for building capital, and utilizing minerals development as a vehicle for strengthening and diversifying local economies.
- International organizations can improve the benefits of donor-based projects to miners by concentrating on the principles of intervention, as well as by improving the methods of planning. Intervention would benefit from systematic criteria for selecting project sites based on environmental, social, political, economic, and geographic factors.
- The international community needs to be conservative and synergistic in its strategies by maximizing resources. This includes forging deeper linkages among institutions with overlapping mandates, and concentrating activities more deeply in fewer locations.
- Given the limitations of donor support, resources are better spent developing in-country capacity than financing more international bureaucracy.
- In addition to putting in place the right policies, effective policy implementation corresponds to the moral commitment of fieldworkers, in particular the commitment to see that resources allocated to ASM/mercury are delivered efficiently and quickly to the field.

7 CLAIM FOR ORIGINALITY OF RESEARCH

This dissertation contributes to the descriptive component of building a comprehensive theory and practice of mercury pollution abatement from ASM in the developing world. Much of this effort stems from the need to establish ASM as a critical component of global mercury policy, which historically has undervalued the importance of this sector. As such, the research exhibited here helps define the importance of addressing ASM in all mercury policy debates, and establish artisanal mining areas as the key intervention priority for the international mercury community.

In this respect, this dissertation delivers several new contributions to the field, including:

- Original policy recommendations to guide donor-based international interventions in artisanal mining areas.
- These recommendations are based on a new philosophical approach to intervention, marking the first time a policy strategy and political philosophy for reducing mercury pollution from ASM have appeared in a comprehensive format.
- A systematic approach for evaluating project sites during project planning stages, based on ecological, social, economic, and political criteria.
- The first political ethics written exclusively for the international institutions mandated to address mercury pollution issues from ASM activities.
- Original analytical work examining the way ASM has been overlooked in mercury policy discourse, and establishing the inseparable links among ASM, poverty, and mercury pollution.

8 SUGGESTIONS FOR FUTURE WORK

This dissertation represents a step forward in the articulation of consistent ideological and operational principles for donor-funded international programs dealing with mercury abatement from artisanal gold mining. The hope is for further researchers to take up other pressing areas in this emerging field, in order to close several important knowledge gaps related to policy, economics, and the behaviour of mercury in the environment.

Based on the findings of this dissertation, subsequent research on this topic should address the following issues:

- Examine the potential role the Stockholm Convention could play in defining and implementing ASM/mercury policy and mercury policy at large.
- Enrich the database of past and present conflicts between large-scale and small-scale mining, using it to further develop knowledge about the dynamics and potential solutions to these conflicts.
- Develop an inventory of sites with artisanal mining activities by building a system based on fieldwork and satellite imagery for documenting and monitoring artisanal mining at regional and global scales.
- Advance the methods of conducting rapid site assessments to determine suitable intervention activities that can be implemented expeditiously.
- Explore educational methods to disseminate best practices in small-scale gold mining to rural and remote mining communities, including the development of a centre of excellence at a prominent university.
- Conduct further research into the economics of formalization, addressing specifically the question of costs and benefits of ASM, and contrasting the economic costs and benefits of ASM with those of large-scale mining.
- Study the potential role of international customary law and agreements, particularly the Millennium Development Goals, Convention on Biological Diversity, and ILO Child Labour laws.

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Appendix I: Vulnerable Areas Criteria for Intervention

Name of Site/Village: _____
District Name: _____
Village Chief/Head: _____
Population of Village: _____
Name of Closest Watercourse: _____
Closest Major City: _____
Name of Surveyor: _____
Date Survey was Administered: _____

I. *Geography*

A. What are the GPS coordinates for the site? _____

B. What type of Watercourse is the site connected to?
a) River b) Creek c) Ephemeral Stream d) Wetlands e) Lake

C. Into what International Watercourse do these local waters flow?
a) Trans-boundary River b) Ocean c) Lake D) Wetlands

D. Characterize the type of ecological zone
a) Forest b) Savannah c) Desert d) Alpine

E. When are rainy and dry seasons?
a) Rainy Season ____ b) Dry Season ____

F. How easily can the site be reached from the capital (car, boat, plane, or all of above)?
a) 1-5 hours b) 5-10 hours c) 1 day d) 2 days e) 3 days

G. Is the site accessible by road year round?
a) Yes b) No

II. Characteristics *of Mining Community*

A. How many miners are working in the site?
a) <100 b) 100 - 500 c) 500 - 1000 d) 1000 - 5000 e) > 5000
Exact Number (if known): _____

B. How much gold is the community producing per *month?*
grams/day/miner_____
a) < 3 kg b) 3 – 15 kg c) 15 – 30 kg d) 30 – 150 kg e) > 150 kg

C. How many people are directly & indirectly involved with artisanal mining in this site?
a) <1000 b) 1000 - 5000 c) 5000 - 10,000 d) 10,000 - 30,000 e) >30,000

Exact Number (if known): _____

A. How many gold buyers are there in the area? _____

B. How much are the buyers paying miners for their gold?
US Dollars/Gram: _____

C. What are the buyers doing with the gold?
a) just melting b) melting & making jewelry

D. Are the Miners:
a) A Permanent Community b) Gold Rushers from other parts of the country
c) Gold Rushers from outside the country

E. How many years has there been mining in this area?
a) 1-5 years b) 5-10 years c) 10-20 years d) 20-50 years e) 50-200 yrs
Exact Number (if known): _____

F. Are the miners:
a) full-time/year round b) part-time/seasonal

G. If they mine seasonally, what months are they most active? _____

H. Is mining the main economic activity for people in the area?
a) Yes b) No

I. If there are other economic activities, what are they? _____

J. What percentage of miners are women and children?
a) <10% b) 10-30% c) 30-50% d) 50-70% e) >70%

III. Gold *Processing*

A. Evaluate the type of ore miners are processing:
a) alluvial/colluvial b) hard rock

B. What type of amalgamation process is being used?
a) whole ore/copper plate b) whole ore/ball mills c) just concentrates in barrel/drum d) just concentrates in pans e) no amalgamation

C. How do miners separate amalgam?
a) roasting over open fire b) roasting with blow torch c) retort d) leaching with nitric acid

D. Where is amalgam burned?
a) next to mine site b) in the home c) away from the village

E. How close to a watercourse is amalgam being burned?
a) next to it b) 10-50 meters c) 50-100 meters d) >100 meters

F. What happens to the amalgamation tailings?
a) dump it in the river b) left in the mine site c) mixed with cyanide
d) dumped with other tailings e) sold to somebody else

G. Describe the type of mining method used:
a) Shafts & Drifts (hard rock) b) Hydraulic Monitor (Colluvial)
c) Dredge (Alluvial)

H. What type of grinding equipment is used:
a) Hammer Mill b) Ball Mill c) Stamp Mill d) Manual Grinding e)Chilean Mill f) Quimbalete

I. What type of concentration process is used:
a) none b) sluice c) centrifuge d) other_____

J. Are miners using chemicals other than mercury?
a) cyanide b) bleach c) acids d) hydroxides

K. Have villagers received any previous training in mining methods from international organizations?
a) yes _____(name of organization, date of training) b) no

IV. Mercury

A. How much mercury is the community buying per month? ____(kg)

B. What is the price of mercury per kilogram? _____ (US $)

C. Who is supplying the mercury? _____
a) gold dealer b) equipment suppliers c) shop owners d) others ____

VI. *Mining Rights & Legal Status*

A. Are miners characterized by local officials as:
a) legal b) illegal

B. Do miners have title on their claims?
a) Yes b) No

C. What is the authority for the title?

a) local government b) state/provincial government c) federal government

D. Are the miners operating on a concession titled to a mining company?
a) Yes/No b) name of company

E. Describe the type of organization miners have in this area:
a) none, miners work alone or in small groups/family b) a cooperative
c) labour union d) mining association

F. How many miners are part of this organization? _____

G. Do miners typically work:
a) For themselves b) For a boss who owns the claim

VII. Economic *Development*

A. What is the primary source of drinking water?
a) Piped Water b) Well c) River/Lake/Stream d) Rainwater

A1. Is drinking water treated before use?
a) Yes b) No

B. What are the primary food sources?
a) fish from local streams/rivers b) wild or domesticated meat
c) market fish/meat d) locally grown produce e) canned goods

C. How reliant are people on eating fish from the river?
a) eat every day b) eat regularly c) eat occasionally d) never eat

D. What type of sanitation system is there?
a) indoor plumbing b) household latrines/outhouses c) nothing

E. What diseases are typical in the area?
a) Malaria b) HIV/AIDS c) Typhoid d) Dysentery e) Yellow Fever f) others___

F. Are there any local health facilities?
a) doctor or nurse living in village b) hospital c) health center d) pharmacy e) other____ f) none

G. Are there schools?
a) none b) primary c) secondary d) post-secondary

H. What is the state of the roads in the area?
a) Good b) Passable c) Extremely Bad d) No Roads

I. What are the primary sources of power?

a) individual generators b) municipal electrical grid (hydro/fossil fuel)
c) power supplied by mining company d) wood or coal

J. What is the approximate average annual income of a household?
_____(USD)

VIII. Sociology

A. How many people are there in an average household? _____

B. Approximately how many households are engaged in artisanal mining?
_____

C. What is the ethnic composition of the area?
a) name of ethnic group and percentage of total population: _____

D. What are the primary religions in this area? _____

E. Are there signs of ethnic conflict or civil war in this area?
a) Yes b) No
If yes, explain situation: _____

F. How is the village/community organized?
a) only by household b) municipal government c) tribal government

Appendix II: Countries with Documented Artisanal Gold Mining

(Adapted from Veiga and Baker, 2004)

West Africa	Ghana, Benin, Togo, Nigeria, Gambia, Senegal, Mali, Mauritania, Liberia, Sierra Leone, Burkina Faso, Ivory Coast, Cameroon, Guinea
Central Africa	Niger, Chad, Cameroon, Central African Republic, DRC, Rwanda, Burundi
Northeast Africa	Uganda, Ethiopia, Sudan, Kenya, Malawi, Tanzania
Southern Africa	South Africa, Mozambique, Lesotho, Zambia, Zimbabwe, Madagascar
Guiana Shield	Venezuela, Guyana, Suriname, French Guiana
Amazonia	Colombia, Peru, Brazil
Andes	Peru, Ecuador, Bolivia, Chile
Central America/Caribbean	Costa Rica, Panama, Honduras, Nicaragua, Mexico, Dominican Republic
East Asia	China, Mongolia
Southeast Asia	Indonesia, Malaysia, PNG, Philippines
South Asia	India, Burma, Laos, Cambodia, Vietnam
Central Asia	Kyrgyzstan, Uzbekistan, Tajikistan, Khazakstan, Azerbaijan, Iran

Appendix III: 12-Step Policy Plan for LSM-ASM Conflict

1. Work with companies on engagement policies recognizing rights of miners.
2. Clarify government policies for how miners can be legalized and formalized.
3. Assemble company, minerals commission, and local community leaders to develop consensus process.
4. Work with community leaders to bring active mining cooperatives and associations under a single umbrella.
5. Examine informal property boundaries and mining associations to determine how existing extra-legal organization can be adapted into law, and legal mineral claims established for artisanal miners.
6. Analyze recovery rates of miners to establish how processing can be improved to yield higher profit. Determine suitable technical assistance program for mercury management, mineral processing, and mining engineering.
7. Assess economics of the gold supply chain. This will demonstrate how much miners are actually receiving for their gold; how to improve market access; and whether its is viable to buy gold at premium from miners.
8. Work with Fair Trade Labeling Organization, Association for Responsible Mining, and jewelry manufacturers to certify gold as Fair Trade.
9. Identify governmental and non-governmental counterparts to develop basic services, including sanitation, clean water, and on-site medical center.
10. Link with embassies for rural development funding and non-governmental organizations to develop long-term plan for introducing non-gold economic alternatives livelihoods to community.
11. Assemble industry roundtable through Mining Chamber to develop consistent industry-wide policy on dealing with illegal mining.
12. Bring industry into international efforts to reduce global mercury supply by permanently retiring existing mercury stockpiles and preventing new byproduct mercury production from entering the open market.