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Global Report on Artisanal & Small-Scale Mining

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Introduction

In many parts of the world, artisanal or small-scale mining (ASM) activities are at least as important as large-scale mining activities, particularly in terms of the numbers of people employed. ASM can play a crucial role in poverty alleviation and rural development; most of those involved are poor and mining represents the most promising, if not the only, income opportunity available. However, the sector is perhaps better known for its high environmental costs and poor health and safety record. Many continue to view it as dirty, unprofitable and fundamentally unsustainable.

Irrespective of one's perspective of whether or not the sector is a net contributor to sustainable development, the fact remains that small-scale and artisanal mining activities will continue for at least as long as poverty continues to necessitate them. It is therefore essential that effort be made to maximise the benefits brought and enabled by small-scale mining, and to mitigate the costs.

According to a recent survey carried out by ILO and MMSD, at present we can reckon with around 13 million people working directly in small mines throughout the world, mainly in developing countries. A large percentage of these miners are women, and regretfully, also children.

The international development community is discussing the ASM sector now for about 30 years. Many changes and progress in issues and research have occurred since then. In the last 10 years the international donor agencies have recognized the close relation of ASM to poverty and the ASM sector is gaining more and more attention. ASM is now in agendas of many national governments and of bilateral and multilateral donor organizations and different assistance programs have been or are carried out. Even one step further actually through the CASM (Collaborative Group on Artisanal & Small-Scale Mining) initiative of the World Bank exists a valuable instrument for donor coordination, experience and information exchange and channelling of funds. There have recently been interesting experiences in the relationship between large and small mines.

This Global Report tries to give a present "photography" of the ASM sector and provides an overview of the sector and a description of its social, environmental and economic issues. The base of information for this report is:

- 18 updated studies in selected countries commissioned by MMSD (Bolivia, Brazil, Ecuador, Peru, Burkina Faso, Ghana, Malawi, Mali, Mozambique, South Africa, Tanzania, Zambia, Zimbabwe, China, India, Indonesia, Papua New Guinea, Philippines)
- Bibliography research
- Different resource persons
- MMSD workshop on artisanal and small-scale mining on the 19-20 November 2001
- The authors' experience especially in Latin America and Africa

The report focuses on the major issues in ASM and how the sector may best contribute to sustainable development; therefore special focus is given to the different practical experiences and case studies that have been carried out by assistance programs to the ASM sector during the last ten years.

The second chapter deals with the different definitions and general problems of the sector. The third chapter presents a brief historical review of the changes of issues and priorities regarding the development policy for ASM within the last thirty years. The subsequent chapter summarizes the 18 country studies and the workshop and identifies regional differences and common issues. The next chapter discusses the conditions of livelihood in ASM communities and the contribution of ASM to sustainable development. Chapter 6 addresses the "traditional issues" of ASM like policy, legal, organizational, prolongation of production lines, environment, health and safety, technical and finance. Chapter 7 deals with ASM relevant aspects of mineral economics. Special attention with case studies is given to the relation between large mining operation and ASM in chapter 8. In chapter 9 different new trends as common environmental solutions, networking in the Internet age and fair traded ASM products are highlighted with case studies.

Definitions and General Problems

Broadly speaking, artisanal and small-scale mining refers to mining by individuals, groups, families or cooperatives with minimal or no mechanisation, often in the informal (illegal) sector of the market. Despite many attempts, a common definition of ASM has yet to be established. In some countries a distinction is made between 'artisanal mining' that is purely manual and on a very small scale, and 'small-scale mining' that is more mechanised and on a larger scale. In some West African countries (Mali, Niger and Burkina Faso), small-scale mining is differentiated from artisanal mining by the presence of permanent, fixed installations established once the existence of an ore body is confirmed. In this report, the terms artisanal and small-scale mining are used interchangeably.

Upon revision of the legal dispositions governing mining activities in different countries, it is possible to group together the criteria used and stratify the mining industry, and in particular, categorize the ASM activities. This categorization does not exclude the simultaneous use of more than one criterion; neither do they condition their application, the existence of specific references in the respective mining law or, the existence of a law for small mining. There are countries that have programs for small mining and not considered in the mining law of the country and there are countries with special laws that apply different treatment to small mining as in the case of Brazil with it's "Garimpo" or " Garimpogen " law. Having made this clarification, the criteria used most are:

1. Production volume
2. Number of persons per productive unit
3. Intensity (volume) of capital employed
4. Labour productivity
5. Size of mine claim
6. Quantity of reserves
7. Sales volume
8. Operational continuity
9. Operational reliability
10. Duration of the mining cycle

(Lit: E. Chaparro: La llamada pequeña minería - un renovado enfoque empresarial, Cepal, 2000.)

Each of these has its advantages and difficulties depending on the country, the type of mining, the minerals produced, political conditions, the number of miners etc., in each country.

While many attempts have been made to define ASM finally until now a common definition of the term has not been found. These definitions made use of the limited investment volume of the operations, the low number of workforce, or the reduced mineral production. The local definitions vary from country to country according to the macroeconomic situation, the geological framework, the mining history and the legal conditions.

Nevertheless ASM is characterized by a number of conditions, which are given below:

- lack or very reduced degree of mechanization, great amount of physically demanding work
- low level of occupational safety and health care
- deficient qualification of the personnel on all level of the operation
- inefficiency in the exploitation and processing of the mineral production (low recovery of values)
- exploitation of marginal and/or very small deposits, which are not economically exploitable by mechanized mining
- low level of productivity
- low level of salaries and income
- periodical operation by local peasants or according to the market price development
- lack of social security
- insufficient consideration of environmental issues
- chronically lack of working and investment capital
- mostly working without legal mining titles

These parameters characterize the ASM as an artisanal activity.

Mostly the development of the sector is in strong relation to the general economic indicators of the country: ASM is poverty related.

Common and Differential Issues of Artisanal -, Semi-industrial - and Industrial Small-Scale Mining

The following illustration visualizes the most common issues of the ASM.

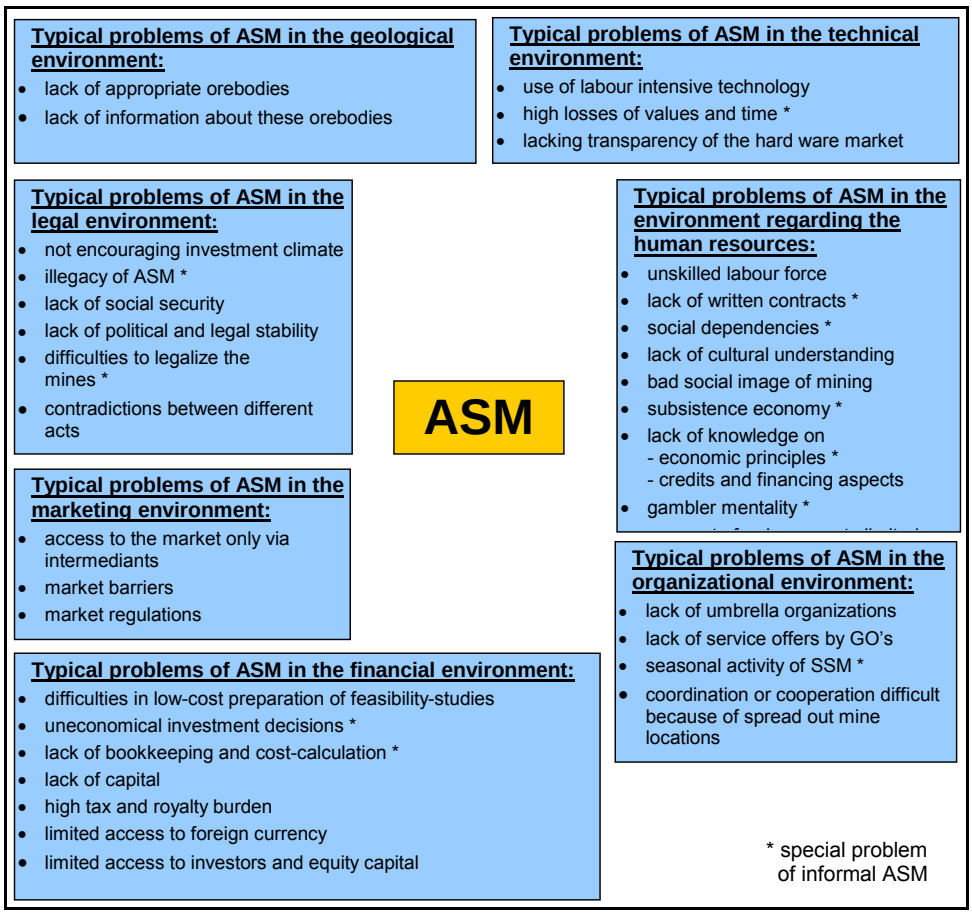

Fig: Typical problems of Artisanal Small-scale Mining (ASM)

Exceptionally small mining operations have a semi-industrial or a fully industrial character. Here the degree of mechanization, internal organization and compliance with international industrial standards is advanced. These operations are most frequently financed and managed by partners from industrialized countries.

Especially in niche products, on small and high-grade mineral deposits, which demand complicated exploitation or concentration techniques and in countries with a positive investment climate this kind of operations are found. This kind of operation generates few problems. Moreover they act as positive examples for the ASM community.

Formal and Informal ASM

In many countries the ASM sector is part of the informal sector. While the legal framework generally on one hand requires from a mining operator:

- The possession of a mining title (concession, claim etc.) or a valid contract with a concession holder

- The compliance of the environmental legislation
- The possession of an environmental operation license
- The registration of the company at the mining authority or other fiscal authorities
- The payment of taxes (royalties, company taxes etc.)
- The enrolment of the staff at the national social security system as well as
- The legal exportation of the products (export license, export tax etc.)

…on the other hand the governments do not have the means to control the compliance of the laws or do not want to recognize the ASM activities, many operations remain informal.

The individual reasons are manifold:

- Lack of knowledge of the legal requirements;
- Local traditional and cultural behaviours;
- Little incentives of the government to operate legally;
- High tax burden;
- Limited access to mining titles;
- Demanding bureaucratic procedures to gain and remain formal operation; and
- Limited danger of sanctions in combination with the possibilities to evade the imposition of the law by corruption;

….are the most common.

In certain cases the lack of political will to create an adequate framework for legalizing ASM can be explained by personal interests related with the possibilities for corruption, money laundering, and similar illegal practices, enabled by the informal status of the ASM sub sector.

The informality of ASM has many negative effects on the social, environmental and fiscal regimes of the relevant region and nation. The following illustration visualizes, as an example, the interdependencies of the mentioned aspects in Madagascar, where a mining production worth of up to estimated 400 Mio. US$ a year in gemstones is illegally exported from the country.

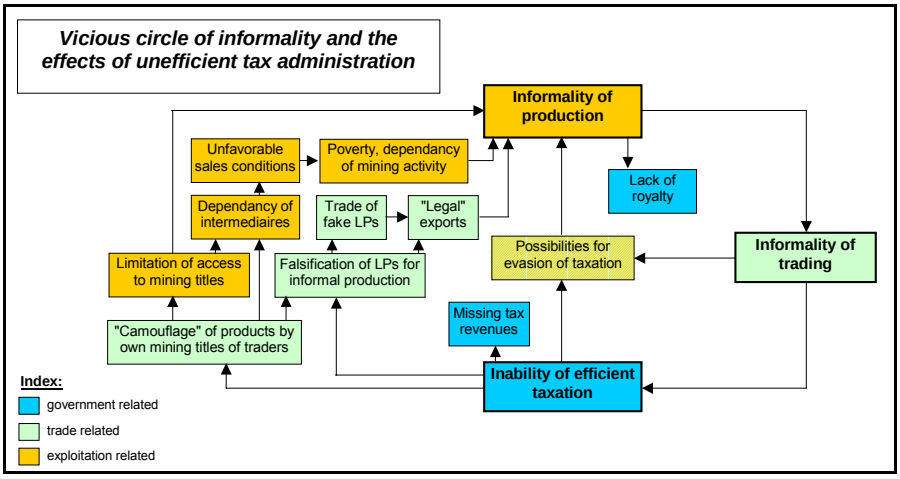

Fig: Vicious circle of informality

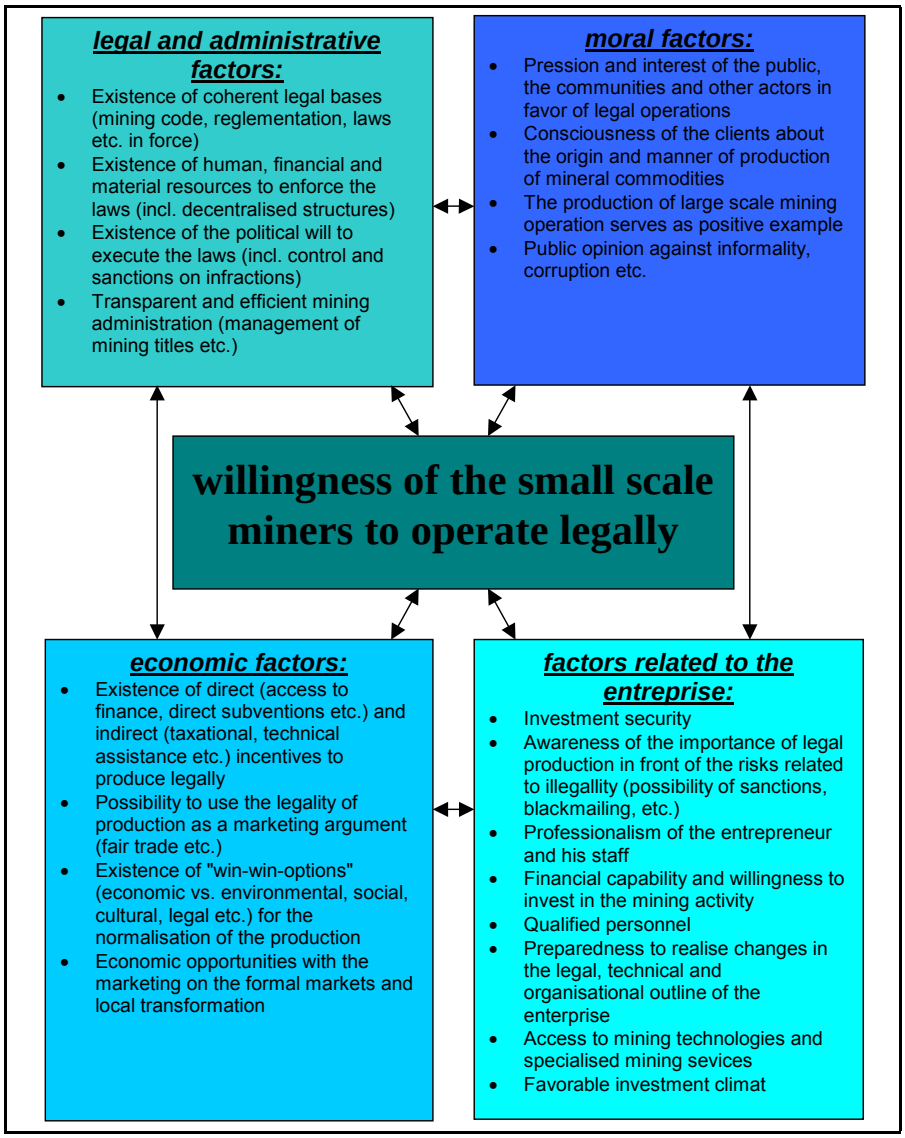

Fig: Different factors influencing the willingness of the small-scale miners to operate legally

Historical Review of ASM-Issues, Research and Assistance Programs

National governments are becoming increasingly aware of the sector's importance as a means of poverty alleviation and a generator of national income. In recent years, a number of governments have formally recognised the sector and attempted to provide facilitating environments. Despite these changes, the implementation of legislation remains problematic at a local level and many miners do not have faith in the ability or commitment of their governments to provide assistance.

The international development community has been concerned with the artisanal and small-scale mining sector for the past 30 years. As understanding of ASM has increased, the approaches taken have changed. The following table summarises this evolution.

Period	Approaches for dealing with ASM
1970's	Definitional issues
1980's	Technical issues
Early 1990's	Towards integration of technical, environmental, legal, social and economic issues
1990's	Special attention on legalisation of ASM sectors
Mid to late 1990's	Relation between large mining companies and ASM Gender and child labour issues
2000's	Community related issues and sustainable livelihoods

The sector has traditionally received a low proportion of aid relative to its contribution to livelihoods. However, in the last 10 years recognition of the sector's close connection to poverty has increased, and as a consequence and in line with a global shift in concern towards poverty alleviation ASM is gaining more attention. It now appears on many bilateral and multilateral donor organisation agendas and different assistance programmes have been, or are currently being, carried out. For example, the German GTZ and BGR programmes in Ghana, Colombia and Zimbabwe, the UK Department for International Development (DFID) programme looking at the model scheme of assistance to small-scale miners and the Swiss SDC with environmental protection programs in Latin-American ASM.

World Bank projects in Bolivia, Burkina Faso, Ecuador, Ghana, Guinea, Madagascar, Mali, Mozambique, Papua New Guinea and Tanzania and UN-Organizations as UNDESA, UNDP, ECA, CEPAL, ESCAP, UNCTAD, UNEP, UNIDO and ILO are important multilateral donor agencies.

The recently formed CASM (Collaborative Group on Artisanal & Small-Scale Mining) initiative of the World Bank and DFID should prove a valuable instrument for donor co-ordination, experience and information exchange and the channelling of funds for these activities. However, there is still little recognition from donor agencies of the sectors potential for sustainable rural development.

A number of major conferences have been held focusing partially or exclusively at improving different aspects of the sector. For example:

- Calcutta 1991, National Institute for Small Mines
- Harare 1993, United Nations, with important guidelines on Small/Medium scale mining
- Washington 1995, World Bank, with a comprehensive strategy towards artisanal mining
- Calcutta 1996, National Institute for Small Mines
- Vienna 1997, UNIDO, Global Mercury Pollution Deriving from Artisanal Gold Mining
- Geneva 1999, Tripartite Meeting on Social and Labour Issues in Small-scale Mines

Moreover, an increasing number of global conferences have specific ASM participation such as the incorporation of ASM issues in the agenda of CAMMA (Mines Ministers of the Americas) and UEMOA (Union Economique Monetaire Ouest-Africaine) meetings.

Large companies are also finding it more productive to adopt more collaborative approaches with small-scale miners and a number of successful relationships have been established, including the Ingwe coal mine in South Africa, the Gold Fields project in Ghana and Placer Dome's programme in Venezuela.

International NGOs such as Intermediate Technology Development Group (ITDG), Conservation International, International Union Association have ASM-related programmes.

Evaluation and Synthesis of the MMSD Country Studies and Workshop on ASM

Artisanal and small-scale mining takes place throughout the world, but is particularly widespread in developing countries in Africa, Asia, Oceania, and Central and South America. MMSD country research studies have been elaborated in the most important ASM countries as Burkina Faso, Ghana, Malawi, Mali, Mozambique, South Africa, Tanzania, Zambia, Zimbabwe, China, India, Indonesia, Papua New Guinea, Philippines, Bolivia, Brazil, Ecuador and Peru.

Other relevant ASM countries are Central African Republic, Congo, Ethiopia, Guinea, Kenya, Madagascar, Namibia, Nigeria, Niger, Sierra Leone, Uganda in Africa, Laos, Malaysia, Myanmar, Thailand and Viet Nam in Asia and Chile, Colombia, Dominican Republic, French Guyana, Guyana, Mexico, Nicaragua, Surinam and Venezuela in Latin America and the Caribbean

Employment

The most recent ILO research undertaken on a global scale estimates that 13 million people are engaged directly in small-scale mining activities throughout the world, mainly in

developing countries, and the livelihoods of a further 80-100 million people are affected by it. There is a lack of clarity over the actual number of people employed in the sector. Many factors make it difficult to ascertain the full extent of employment including: the informality of the sector, the lack of official statistics, the number of seasonal and occasional workers and definitional issues. The significance of this is demonstrated by the MMSD Country Study for China, which estimated that anything between 3 and 15 million people are involved in artisanal and small-scale mining activities in this county.

In spite of these difficulties, there is no doubt that ASM is an important employment-generating sector. The following table provides estimates of the number of people working in the ASM sector in the MMSD research countries:

Country	Total Number of Workers in thousands
Bolivia	72
Brazil	10
Burkina Faso	100 to 200
China	3 000 to 15 000
Ecuador	92
Ghana	200
India	500
Indonesia	109
Malawi	40
Mali	200
Mozambique	60
Peru	30
Philippines	185.4
PNG	50 to 60
South Africa	10
Tanzania	550
Zambia	30
Zimbabwe	350

Taking the total amount of 13 million people into account the 18 MMSD country studies cover more than half of the worldwide ASM population.

Comparing the total country population with the population involved in the ASM sector Bolivia, Burkina Faso, Ghana, Mali, PNG, Tanzania and Zimbabwe are the countries where the ASM sector is socially and economically most relevant.

Artisanal and small-scale mining activities provide an important source of livelihood for women. Children will also be engaged in mining activities, particularly in situations of poverty, or where their families are involved in mining.

Types of Minerals

A broad range of minerals is mined within the sector. In some countries, activities centre on the production of gold. For example, in Ghana and Ecuador, gold constitutes two thirds of

production, in the Philippines 90% and in Peru almost 100%. Alluvial gold mining and mercury amalgamation are particularly common activities.

Many other minerals are also mined. These include bauxite, different gemstones, iron ore, marble and limestone and other construction materials. In India over 40 different minerals are exploited and in China over 20. In China, coal and construction materials dominate with 46% of miners employed in the former and 44% in the latter. These materials are mainly produced for a local market and sold in villages and along the roads. In certain countries, silver, tin, zinc and other base metals are produced on a significant scale. In Bolivia, the numbers involved in base metals mining exceed those involved in the mining of gold.

The mining of precious gems, including diamonds, emeralds and garnets, is an important component of the sector. For example, in Ghana 80% of total diamond production comes from the ASM sector. Precious gems are easily sold, via legal and illegal routes, often ending up in the international markets.

Levels of Production

Its contribution to mineral production is significant: according to the ILO, in recent years artisanal and small-scale mines accounted for approximately 15 to 20% of the world's non-fuel mineral production.

The volume of minerals produced by the sector varies between countries, and between operations within countries. Comparison with the large-scale mining sector provides a useful indication of the scale of production. For example, while a large-scale gold mining operation might process 10,000 tonnes of ore per day, a small-scale operation would process only several tonnes per day or less.

Despite the low levels of production achieved at an individual level, the often large numbers involved means that on a national scale total production can be significant, in some cases equalling or exceeding that produced by large mines. For example, in Indonesia, total production of tin by the small-scale sector is equal to that of large-scale production.

Conclusions

Several conclusions can be drawn from the MMSD research and workshop on artisanal and small-scale mining. Perhaps the most fundamental conclusion is that the ASM sector must be recognised as a significant generator of rural livelihoods that has the potential to alleviate poverty and be a tool for sustainable development.

The extent to which ASM can contribute to poverty reduction as well as to the other goals of sustainable development depends on the nature of the mining. Initiatives aimed at supporting the sector must be seen in the context of the whole community. If exploitation is sudden and short-lived, particular effort should be made in attempts to stabilise the local community. In the case of remote, seasonal operations the main issue is how to integrate the ASM sector into the local community and encourage profits to be invested in other forms of economic activity and services.

As there is a great information gap concerning the ASM sector in general more comprehensive baseline socio-economic data on the sector is required to raise awareness of the importance of the sector and to provide better focus to assistance projects.

Regional differences between the continents exist. In Africa AIDS and sustainable community development, in the Asia/Pacific region multicultural aspects and cultural rights and in the Latin American / Caribbean region environment, indigenous and legal aspects are the key issues.

Assistance projects play an important role and should be initiated by donors, governments or large mining companies. Any assistance to the sector should have the development of the community as the goal (both mining communities and local communities if they are different). The importance of a partnership approach, involving extensive participation of miners and local communities, between the donor(s) and community is imperative for assistance projects to be culturally relevant and have any real impact. Otherwise, the chances that they will be sustainable at the local level once the project is over are minimal.

Projects should be based on an integrated approach that considers organisational, social, economic, legal, technical and environmental issues together.

Donor agencies should view the artisanal and small-scale mining sector as a potential vehicle for poverty alleviation. It should be seen as a key part of rural development programmes and accorded greater priority in spending. ASM assistance projects need to be included in regional and local development programmes. International projects, such as the CASM initiative, aimed at coordinating assistance to the sector should be supported by donors, governments and large mining companies.

Large mining companies should acknowledge the important role that ASM plays in the mining sector and provide support where possible, particularly through fostering partnership approaches.

National governments. Enabling legislative and regulatory frameworks should be put in place in all countries in which small-scale mining activities occur. Governments need to create objective, consistent, transparent and non-discriminatory regulatory mechanisms, which offer easy access to mining titles and legal production channels. Decentralising the control of the sector was identified as a way to ensure that the design and implementation of legislation and regulation reflects the realities of the sector.

Support to Local Development. In order to increase the value retained in the local region, the development of small industries based on products from local mines should be encouraged. The focus should be on complementary rather than additional activities. Governments can assist in this through investment promotion, training and the provision of fiscal incentives for new enterprises.

Financing. Financing ASM operations and making credit available for production improvements is most often identified by miners as a major problem. As most rotating funds have not worked well the financing of ASM projects needs to be tailor-made and

consider non-traditional forms of financing such as own capital resources, joint ventures, risk capital, equity partnerships and the leasing of equipment.

Transboundary dimensions are becoming a more and more important issue for ASM. Pollution, migration and smuggling of gold and precious stones are the most important aspects. The smuggling of high value materials can support war activities (blood diamonds) or even terrorism activities.

Gender. The role of women is a key consideration for community projects and should be considered separately from child labour issues. Assistance projects should focus on ensuring that women receive a fair share of benefits for their efforts, and that their key roles in community development are reflected.

Child labour. Outreach programmes which attempt to reduce the involvement of children in mining through broader community development strategies should be pursued.

Environment, health and safety. Many environmental and health and safety assistance programmes have demonstrated that interventions should be focused on incentives and training rather than on the traditional monitoring and enforcement systems. A key part of this involves illustrating how environment or health protection can produce more benefits than costs.

Solutions have more chance of success if they can be implemented with readily available material that is familiar to the cultural environment of the miners. Adapting and optimising existing technology is preferable to introducing new and sophisticated equipment. Due to the differences between mining operations and local contexts, a single generic technical solution is normally inappropriate.

Disseminating changes is most effective through pilot operations that are implemented successfully and that serve as models for duplication. Education, training, demonstration and surveillance are the key elements of any programme to improve occupational safety and health in ASM.

Fair-trade initiatives for giving small-scale producers in developing countries the opportunity of trading their products under better selling terms and conditions should be developed where possible.

Institutional needs include a better representation of ASM within a Chambers of Commerce or the establishment of a Chamber of Mines should be fostered. Support for the formation of cooperatives, associations or enterprises to support communication, cooperation and coordination between miners should also be provided as opportunities for networking between miners to share information and coordinate activities, should be encouraged.

Livelihood and Sustainable Development

Livelihood

From a livelihoods perspective, artisanal and small-scale mining is often poverty driven and located in rural areas. Miners are generally unskilled and receive low levels of income. Individuals may be involved in artisanal and small-scale mining activities for a number of reasons:

- Gold or diamond rush ASM activities. These are the most conflictive ones in very unstable communities; some examples are Sierra Pelada, Brazil or Nambia, Ecuador. Very little research has been done and there does not exist any well-experienced recommendation how to deal with the problems resulting from gold or diamond rushes.
- Temporary ASM activities, induced by of economic recession. Examples are available from Zimbabwe, Peru, Venezuela and Bolivia (all gold mining). Initially unstable communities with a high fluctuation of population may disappear after some years or evolve into long-term settlements.
- Isolated and remote ASM activities without or with very little involvement in nearby communities.
- Seasonal ASM activities within the agricultural cycle. This seems to be the most common origin of ASM activity and normally stable communities are involved.
- Traditional ASM activities. Examples available in Bolivia, Colombia, Chile, Zimbabwe, Philippines and Indonesia (among others) counting with stable communities.

The main issue is how to ensure that ASM does not harm the community and creates the basis for poverty reduction and sustainable development. How this can be achieved depends on the nature of the mining. For example, if exploitation is sudden (such as in rush activities) and short-lived, particular effort should be made in attempts to stabilise the local community. In the case of remote, seasonal operations the main issue is how to integrate the ASM sector into the local community and encourage profits to be invested in other forms of economic activity and services such as schools and health centres.

The organizational aspects are playing a key role in this context. Once there is a significant progress in these issues the common tools for the ASM sector can be implemented, among others:

- Organizational and legal support
- Access to prospective land
- Training
- Dissemination of best practice
- Support in business management

- Micro credits and other development instruments
- Use of revenues

In the past, most activities to support the ASM sector have been focused on the ASM operations itself, mainly to improve their productivity, legal status or environmental performance. These projects have sometimes benefited only a few selected operations or mining entrepreneurs and not initiated a sustainable development in the whole mining community or the nearby communities. With other words only the ASM sector was approached and not seen in the context of the whole community and the people living in the communities.

There are also a lot of examples, especially from "gold rush" areas, where there has been no benefit at all for the livelihood of the communities during or after the rush activities. In many of those regions tons of gold have been produced but once the gold rush is over, poverty comes back and sometimes even with more problems due to the cultural damage, which happened in these areas.

The main issue is *how to ensure that the ASM does not produce in the long run any harm to the communities but induces positive elements for poverty reduction and sustainable development*. The UN Department for Economic and Social Affairs has recently developed an interesting sustainable livelihood approach for artisanal mining communities, which is currently under pilot implementation in the following African countries: Mali, Ethiopia, Ghana and Guinea. The main policy recommendations for this approach, according to Labonne and Gilman are:

- Mainstreaming poverty eradication into national policy making in all sectors including the mineral sector
- Promoting small-scale mining as a catalyst and an anchor for other productive activities to stimulate the development of complementary and alternative productive ventures necessary for sustainable poverty alleviation
- Placing people first through both pro-poor strategies and participatory methodologies aimed at strengthening the organizational capability of grassroots communities therefore favouring a bottom-up approach
- Reversing the focus from "hands-on state intervention" (which has rarely been successful) to the creation of private enterprises, including for services especially micro enterprises or cooperatives

Case study: Negative Example Gold Mining Cooperative Kantuta-Bolivia

The Gold Mining Cooperative Kantuta in La Paz Department in Bolivia could be seen as a positive example for a gold cooperative with about 30 members, a very good ore body and legalized with their own mining concession. The cooperative started mining in 1984 completely manual without any road access. In the following 10 years a road was built and the operation became bigger with specialized technical staff and mechanized with a generator, compressors, tracks and a processing plant with ball mills, tables, etc. thanks to the effort of the miners and some financial support (credits).

In 1994 the MEDMIN program started working with the cooperative to improve their environmental

performance (mitigation of mercury emission, tailing facilities and environmental licensing). The activities have been implemented without any mayor problems until one day in 1995 problems occurred with the nearby communities. With arms about 100 community members took over the mine and all cooperative members had to leave. For MEDMIN this was a big surprise and nobody had ever thought about such a violent intervention from the community. Today we know that there was no understanding between the miners and the community and a kind of "economic envy" about the gold production on the "land of the community". The communities have their own laws and do not accept state laws, for example the mining code.

The miners intended different ways to recover their mine (political, juridical, consultative and also violent), but all failed. The situation became worse, violent confrontations, injured people, the community kidnapped even a district attorney and the state was not able to enforce the legislation. The mining cooperative lost a lot of money and finally two years later they ceased part of their operation and agreed a kind of joint operation with the community (50% the community, 50% the former cooperative). Instead of 30 members, 130 members were working now in the mine. Within short time organizational problems raised and the operation had to stop again for several intervals. Problems went on and the cooperative never recovered again. By the year 2001 most of the former cooperative members quit definitely and now the mine is run by a few community members lacking of technical knowledge and mining experience.

As lesson learnt for the MEDMIN program a rapid social assessment, which covers the mine operation itself and the nearby communities was introduced from that time on to all projects. As lesson learnt in general we have experienced that it is not enough to have the mine legalized, you also have to ensure community consultation, participation and involvement even in the context of an ASM operation.

Micro-economic Effects, Local Commerce and Workforce

Small-scale mining communities are - with few exceptions - located in far off rural areas. Mining frequently constitutes in these areas the principal or only motor for development, creating complementary opportunities for national micro-, small- and medium size enterprises, providing the required infrastructure to the miners and their families.

Small-scale mining in these areas has a domino effect on the local economy, as most of the revenues are reinvested in the region. In view of the extent of small-scale mining there is a substantial contribution to economic and social development, particularly at the local level. Small-scale mining can generate significant local purchasing power and lead to a demand for locally produced goods and services (food, tools, equipment, housing, infrastructure). Nevertheless, apart of the auto generated demand, appropriate framework conditions are necessary to exploit this potential at full scale.

Even in case of illegal artisanal mining and smuggling out of the products, the income returns to the mining region – be it in form of cash, or goods.

On the other hand, effects on local communities are not always positive. Discoveries of deposits and immigration of small-scale miners may disturb former native or rural areas completely. This is for example the case with many of the Brazilian Garimpos, where aggression and violence between local tribes, settlers and miners occur frequently. Even in non-native areas, a mining boom – or even a slow increase of small-scale mining activity – may significantly impact existing social structures. As real or imaginary income opportunities in small-scale mining (especially gold mining) are more attractive that in traditional activities like agriculture, the discovery of a nearby deposit may conduct to massive desertion of farmland. Disproportion of acquisitive potential may result, when the

mineral commodity (e.g. gold) starts becoming a parallel local currency ("cuesta un gramo").

The experience provided by the Sadiola Gold-Mining Project demonstrates that the artisanal mining sector needs to be approached in a holistic manner that takes into account all socio-economic systems in order for it to become an instrument for development in the fight against poverty. The artisanal mining sector served as an economic anchor point for stimulating the development of complementary, sustainable, revenue generating activities. The revenues generated by the mining communities have allowed for the emergence of small businesses which are well integrated into the local economic structure and which contribute significantly to the sustainable development of the Sadiola region.

Case Study: Diversification of the Local Economy - The Sadiola Project, Mali

When large-scale mining operations by the Anglo Gold Mining Company began in the traditional artisanal gold mining area of Sadiola, a resurgence of artisanal activities was observed. However, the Anglo Gold Mining Company resettlement of the villages of Sadiola and Farabakouta led to the loss of artisanal gold-mining sites for the local communities. To lessen these impacts, the mining company introduced the Sadiola Gold-Mining Project aimed at promoting artisanal mining and diversifying local economic activities through the development of sustainable revenue generating activities. The project affects a gold-mining population of approximately 500 people in the villages of Sadiola, Farabakouta, Medina, and Neteko.

The Sadiola Gold-Mining Project was implemented in several stages. The preparatory stage included a two-pronged approach, one aimed at assisting artisanal mining and one aimed at diversifying the local economy. These included

- public consultation with traditional groups to identify, survey and record target groups
- identification of revenue generating activities
- working with local NGOs in order to identify potential partners
- creation of the Sadiola Mining Cooperative
- geological studies (reserves of 1.5 tons with a grade 0.93 g/ton and 1.86 g/m^3)
- identification and testing of mining equipment
- elaboration and adoption of the programme of operational activities

The operational stage of the project comprised technical assistance to the gold-miners. Economic diversification was mainly achieved through socio-economic group capacity building. This included

- assistance in the creation and organisation of a communal development fund with a monthly budget of approximately US$ 60 000
- reinvestment of profits
- establishment of women's activities such as market gardening, and the fabrication of dyes and soaps
- improvement of mined sites through fruit tree planting and conversion into ponds for fish breeding
- organisation and management of grain banks and communal stores
- financial support to small projects such as bakeries, rural restaurants, woodwork shops, jewellers, and metalwork shops
- support for the construction and organisation of a communal market
- construction and organisation of a rural school and a learning centre for adults
- support for the construction and running of a communal health centre

In terms of artisanal mining activity, positive changes generated by the project include organisational and management capacity building for efficient resource extraction. In terms of community development: revenue generating activities that complement artisanal mining were developed, local entrepreneurship was stimulated, purchasing power in local communities was improved and a decrease of subsistence-related activities was noted.

Public Health Care in Mining Communities

Sanitary situation and public health care in or nearby small-scale mining communities tend to be extremely deficient. This is generally due to the supposedly "temporary" status of these communities. In many cases the discovery of a deposit results in a sudden immigration of miners from other regions in search of new opportunities. Unorganised camps grow sometimes "over night". These remote located camps, due to their temporary characteristics, usually don't qualify for installation of public health care facilities – especially from the viewpoints of public health officers with chronically low governmental

healthcare budgets. Associated problems like crime, prostitution and sexually transmitted diseases quickly follow.

Nevertheless, many of these boomtowns, sooner or later mutate into regular and permanent communities; with lower population than during their initial phase, but populated by the miner's families. Unfortunately it may take decades until these communities get recognized as villages and qualify for public health facilities or sanitation programs, with obvious health consequences. Malaria, cholera, tuberculosis, bilharzia and enteric infections are common.

Missing urban planning also provokes the chaotic intergrowth of working and living areas. Houses are frequently built just on top of the mine entrance, in order to "protect" the property. Grocery stores sell mining chemicals and restaurants offer "complementary services" like burning and buying amalgam (see figure left). This may lead to unexpected phenomena, like in some Peruvian mining villages, where mercury poisoning among women and children is higher than among miners, as the miners have the "privilege" to spend 8 hours daily in the only "non-contaminated" environment, which is the mine.

Fig: Mercury condensing on the wall of a restaurant

Special attention should be given to the widespread of AIDS especially in southern African ASM communities. There is a gap of information and research has to be done.

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Labonne B.: Small-Scale Mining and Energy: Contribution to Poverty Reduction and Perspectives for Technical Cooperation in Africa; a paper presented to the Second Conference of African Ministers Responsible for the Development and Utilization of Mineral and Energy Resources, Durban, South Africa, 17-22 November 1997

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Gender

In contrast to large-scale mining, the involvement of women in small-scale mining activities is generally high. In Guinea, women comprise 75% of those involved in the sector while in Madagascar, Mali and Zimbabwe the figure is 50%, and in Bolivia 40%. In the Gaoua region of Burkina Faso the exploitation and selling of gold has traditionally been a female-only activity. The following table summarises estimates of the number of women and children involved in the sector according to the MMSD commissioned country studies.

Country	# of Women	% of total
Bolivia	25 500	
Brazil		
Burkina Faso	45 000-85 000	
China		
Ecuador		
Ghana	87 000	44
Indonesia	10 900	10
Malawi	4 000	10
Mali	100 000>	50
Mozambique	18 000	30
Peru		
Philippines		
PNG	12 000	20
South Africa	500	5
Tanzania	137500	25
Zambia	9 000	30
Zimbabwe	153000 women and children	

Generally the handling of mechanised equipment and machines is reserved for men. Women's participation in ASM involves not only mining but also the supply of food, drink, tools and equipment, as well as sexual services. Women are also involved in the trading of minerals such as gold and gemstones.

The participation of women can bring direct benefits through better control of family revenues and spending. However, where women participate in ASM in the family context, it is often the male head of household who controls the income derived from mining and women do not necessarily receive a proportionate amount of the income generated. A gender sensitive approach seeking to empower women and increase their participation at all

levels of the ASM industry is necessary. This is particularly true in so far as increasingly women are entering this sector as an alternative to subsistence agriculture, and it has been found that women are more likely to spend their incomes on family maintenance compared to men who may be tempted to spend their income on prostitution, gambling and alcohol. Empowering women in these communities could lead to substantial alleviation of poverty. However, at some stages of the mining process, the participation of women should be avoided, particularly where contact with chemical substances might present a health risk to unborn or breast-feeding babies.

An increase in the number of women participating in artisanal mining activities over time has been noted and is attributed to a number of factors. The ILO describe how 'the impact of structural adjustment programs, low commodity prices or drought on private and public sector employment, trading, farming and inflation has led many people, especially women who relied on subsistence agriculture, to seek new, alternative or additional paid employment for a better quality of life, more usually, just to survive.

In some countries, particularly in Africa, women are involved in mine and processing plant ownership. Frequently the organisational level of these enterprises is superior to those run by male colleagues though women are not given equal opportunities regarding access to financial, technical or legal support. For example, a UNIFEM study found that only 6% of women miners had been able to obtain a loan to invest in their mining operations. This was attributed to women's lack of collaterals for loans and the negative attitudes of (mostly male) bankers towards women engaging in business. The fact that many women lack formal education may further stifle their ability to deal with formal lending institutions.

A number of women's mining associations have been developed which attempt to overcome the barriers to women's advancement within the industry. For example, in Southern Africa, the SADC Women in Mining Trust addresses the needs of women miners and has members in Angola, Botswana, Namibia, Congo DR, Mozambique, Swaziland, Tanzania, Zambia and Zimbabwe. The main objectives of the Trust include: lobbying for support of women in mining both regionally and internationally; identifying the training and technical needs of women miners and conducting training programmes to meet those needs; training women in environmentally sound mining methods; establishing revolving loan funds to increase women miners access to capital; and to network and facilitate the marketing of members products.

The Tanzanian Women Miners Association (TAWOMA) mission is outlined as follows: 'to facilitate women miners to organise and access required financial, technical and marketing services so that they can carry out mining activities that are both economically and commercially viable and environmentally sustainable and thereby raise the standard of living for women miners and their families.' In terms of long-term goals, TAWOMA is working towards establishing a centre for the rental of mining equipment and tools; a lapidary and jewellery production unit; and a skills training centre focussing on environmentally sustainable mining and processing methods, health and safety issues and the rehabilitation of ecologically sensitive mining areas.

Fig: Hand picking of antimonite in Bolivia

Literature

United Nations Economic and Social Council. Developments in Small-Scale Mining. Report of the Secretary General. April 1st, 1996. Available at www.un.org/documents/ecosoc/c7/1996/ec71996-9.htm

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World Bank. Findings – Tanzania: women in the Mining Sector 189, August 2001. p.2 available at www.worldbank.org./

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Child Labour

The discussion about child labour in small-scale mining started some years ago, due to international press reports about child labour in Columbian coalmines, which sensitised the developed world. This led to a ban on Columbian coal, especially by Germany, which also made use of this situation to protect their own highly subsidized coal mining industry.

Since then child labour in ASM is getting a more and more important issues. With the new ILO convention 182 (to eliminate the worse forms of child labour – this includes mining) the ILO through its International Programme on the Elimination of Child Labour (IPEC) focuses on this issue. There have been different surveys and quantitative and qualitative data is available from countries like Guinea, Madagascar, Burkina Faso, Niger, Tanzania, Bolivia, Colombia, Ecuador, Peru, and Philippines. IPEC is actually executing the " Program to Prevent and Progressively Eliminate Child Labour in Small-scale Traditional Mining in South America".

Children start washing gold from 3 years on; from 6 years on they can be seen breaking rocks with hammers or washing ore. Children as young as 9 can be observed underground, and at 12 boys are widespread working underground in many countries and do the same work than adults. In the Cerro Rico in Potosi, Bolivia half of the total amount of 8000 miners are children and adolescents.

The consequences are multiple; among others:

- The children do not go to school at all or irregular
- Problems in the physical and psychological development of the children
- Health problems, for example through the use of mercury or carrying heavy load
- Accidents

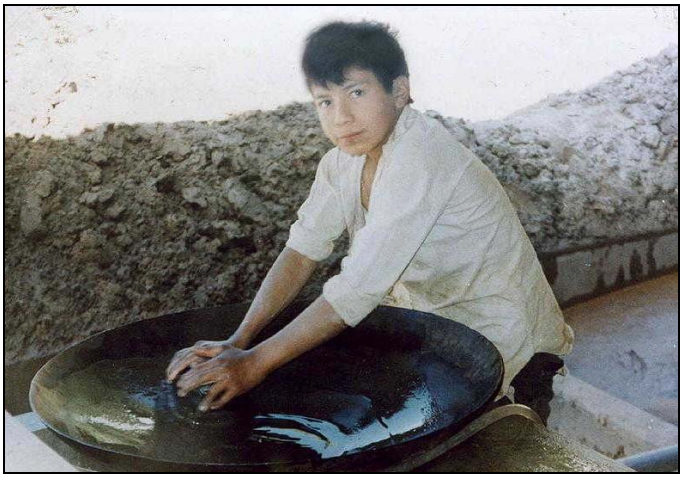

Fig: Eleven year old ecuadorian boy amalgamating gold concentrates

The reasons for child labour in mining are mainly poverty driven and could include:

- Low family incomes in the ASM regions; the families do not have enough income for school material, clothing and food
- Lack of educational infrastructure
- Lack of interest of the parents in the education of their children
- Lack of awareness of the parents for the risks of child labour in mining
- Lack of orientation of the parents concerning the future of their children
- Traditional reasons
- Lack of legislation, enforcement and labour inspection

IPEC's general objectives to combat child labour in small-scale mining includes the following components:

- Prevent children from working in small-scale mines
- Withdraw children from working in small-scale mines

- Improve children's working condition as a first stage towards eliminating child labour
- Improve knowledge of the living and working conditions of the children
- Make children, parents, employers, private and public institutions and the public more aware of the dangers
- Provide working children and their families with viable alternatives
- Improve legislation and enforcement

A model of successful intervention is presented as case study in the following box.

Case Study: Experiences from Santa Filomena/Peru

Santa Filomena is an artisanal gold mining community in the southern Peruvian coast. 500 families with about 1500 persons do their living from artisanal gold mining under very poor conditions. 42% of this population have been reported children and adolescents, many of them working in mining activities.

IPEC is financing a program for the elimination of child labour in artisanal mining in Santa Filomena since 1998, executed by the Peruvian NGO "CooperAcción". The intervention has three different phases, 1998 - 1999, 1999 – 2000 and 2000 – 2002. The program has the following strategies:

1. Analysis of the situation and participative planning
2. Awareness raising, sensitation and change of cultural habits
3. Technical and productive development of the mining activities
4. Generation of family income
5. Promotion of local public services in education and health
6. Support to a process of integrated development within the local population

The results of the first two phases have been the following:

- The local population has identified alternatives for child labour in mining
- The children are withdrawn from carrying mineral
- The community has a future vision and a economic and social development process

Up to now the main impacts in the different strategies are the following:

1. Analysis of the population; creation of "focus groups"
2. Analysis of the occupational health situation; workshops of "self analysis"; dissemination of videos and publications
3. Implementation of a winch to transport mineral from the mine; feasibility studies for mining and processing improvements
4. Bakery for the mothers' club; special support program for new women economic initiatives
5. Donation of school equipment and didactic material; support to the self construction of school rooms and a medical post
6. Workshops on strategic planning for local development; formation of leaders

During the ongoing phase till 2002 these results are being expected

- Progressively all children are withdrawn from working in mining
- Self regulation and different forms of social control prevent child labour in mining

With the following impacts according to the defined strategies:

1. Code of social responsibility
2. Especial school module about child labour
3. Implementation of a mining plan and a small processing plant
4. Implementation of the special support program for new women economic initiatives
5. Reinforcement of the public services in education and health
6. Workshops on strategic planning for local development; formation of leaders

Up to now this is one of the most successful IPEC programs. One of the key success factor is that the program approaches on the whole mining community in an integrated manner as shown by the following lessons learnt:

- The elimination of child labour in artisanal gold mining requires to encourage integrated community

development and cultural changes of the community

- The visibility of the damages of child labour in mining, especially in health aspects, is very difficult to show to the parents but at the same time the most important awareness raising aspect for the severe impact children are suffering due to the risky activities in mining
- The participatory methodology of the intervention helps to increase the possibilities of an integrated development taking the whole community into account and not only the parents of the families
- Due to the lack of information in informal mining activities the realization of a multiple census helps with valuable information not only for the program itself but also to support the community in other development initiatives and measures with public authorities and institutions
- The difficulties of the miners in legalization and the limitation of support for educational and health issues from local authorities needs a complementary promotion at the macro level (legal administrative and political)
- The involvement of objectives, strategies and action that includes women in an active and equitable manner generates a positive impact for the welfare of the children

Lit.: Cooperacción, OIT/IPEC, AECI: Programa de Erradicación del Trabajo Infantil en el Caserío Minero Artesanal Santa Filomena II Fase, Lima 2000

Contribution of ASM to Sustainable Development

While it is difficult to define sustainability for an operation, which exploits a non renewable resource, the Agenda 2000 and the experiences from past and ongoing small scale mining projects help to define the desirable conditions of a small-scale mining sector. They shall include:

- Positive contribution of the ASM activity to the rural and regional development
- Legal operation in harmony with the national mining sector development policies and the existing legal framework
- Operation complying and in concordance with international social standards, such as regarding social security, occupational health and safety, labour regulations (incl. ILO conventions about child labour), access to social infrastructure (schooling, medical etc.) and an acceptable level of income
- Environmentally sound operation
- Non existence of conflicts between the small miners and local communities or degradation of traditional values
- Harmony between the small operations and large scale mining operations
- Exploitation and concentration of the product with high recovery of values including a systematic development of the deposits
- Continuous operation over a longer period of time

Given the great importance of the workforce of ASM in the rural context, the potential of a beneficial contribution of ASM to sustainable development is very high. The following table specifies the main factors that have to materialise on the macro-, meso- and micro level in order to obtain optimum contribution of the ASM to sustainable development.

Level	Economic aspects	Social aspects	Factors important for environment	Political aspects
Macro level, **State**	• Reception of taxes and royalties in an appropriate quantity	• Fair distribution of the micro- and macro-economic mining benefits	• Minimisation or elimination of conflict potential in the case of competition for the exploitation of the respective resources (water, surface of the ground, ground, air, minerals etc.)	• Existence and realisation of a liberal mining and economic policy • Existence of a transparent, consistent and fair judicial system (commercial law, tax law, mining law, environmental law etc.) • Existence of a positive investment climate (stability, orientation towards a free enterprise system, legal security, free access to the market for products, capital investment goods, capital etc.) • Participation of the mining sector in the planning of rural development
Meso level, **Community**	• Existing supply of services important for enterprises	• Participation of the population in mining activities and consideration of local interests during the planning phase	• Existing supply of services important for environment	• Fluent dialogue between the enterprise and the government • Existence of instruments and institutions for the realisation of the political guidelines
Micro level, **Enter-prise**	• Entrepreneurial competence and management knowledge • Knowledge of the situation of the reserves which serves as a sound planning basis • Capitalisation of the enterprise • Economic operation without free financial support or subsidies through third parties • Long-term and	• Qualified and motivated manpower • Existence of an in-company programme for training and up-grading • High degree of occupational safety • Social protection for the miners • Inclusion of mining in the effective national judicial system	• Reasonable and careful use of non-renewable mineral resources (if possible, total exploitation of the deposit with a high degree of recovery; extraction of secondary products; avoidance of uncontrolled exploitation etc.) • Extraction and benefaction with minimal environmental costs	• Existence of a sound planning basis for the utilisation of the mineral, financial, material and human resources • Existence of concepts with regard to the situation after the closure of the mine

Level	Economic aspects	Social aspects	Factors important for environment	Political aspects
	continuous mining activities			

Key Issues

Policy

In order to obtain a straight forward, steady and sustainable development of the small-scale mining sector, which contributes to the rural development and which is integrated into the formal economy of the country the governments are meant to develop a consistent sector policy.

This policy should be based on the following strategic four pillars:

- Poverty alleviation
- Optimisation of the business climate for the small-scale mining sector
- Insurance of sustainability and
- Stabilization of government revenues from the sector

In order to obtain these objectives the governments are advised to apply the following major tools:

1. Delivery of demand oriented extension services (legal, organizational, economic, technical) for the sector
2. Establishment of an incentive scheme for legal ASM operations (including taxation aids for young enterprises, exceptions from import duties, provision of access to financing schemes, free markets and improved export facilities)
3. Integration of all relevant governmental institutions into the sector policy implementation (finance ministry, mining ministry, social issues authorities, provincial and local administration)
4. Transparent and appropriate legal frame
5. Supporting the organization of the private sector
6. Strict control of the compliance of the legal framework and sanctions against infractions

The illustration on the following page resumes the most important policy issues for the promotion of legal ASM activities.

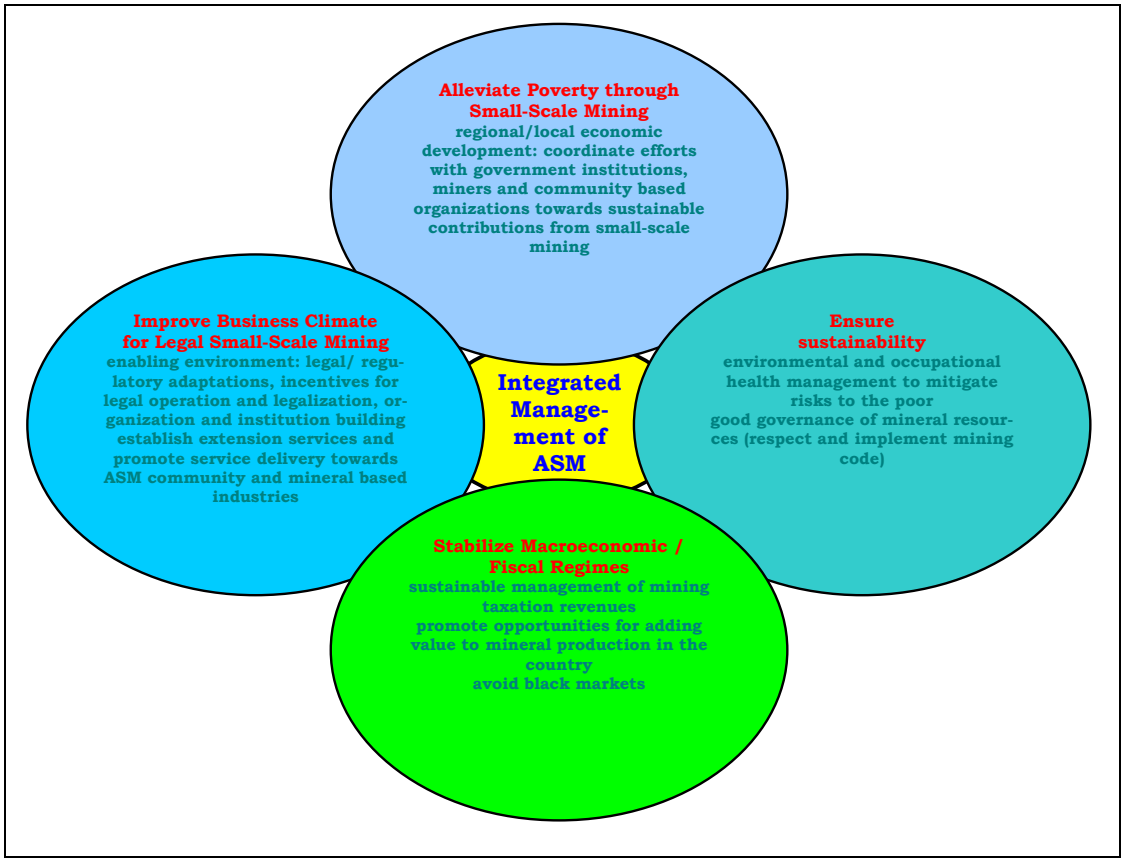

Fig: Four main strategic objectives of the needed governmental policies

Legal, Administrative Issues

Legalisation should also help to ensure that the negative social and environmental effects of the sector are better managed and will enable governments to capture more of the revenues from the sector. In Tanzania, for example, the implementation of a mineral trade liberalisation policy in the late 1980s created to formalise ASM sector increased the legally traded gold production from US$0.55m in 1985 to US$38.78m in 1992.

However, there are a number of reasons why artisanal and small-scale miners continue to operate within the informal sector. They may lack knowledge of legal requirements and this may be compounded by demanding bureaucratic procedures often required to become and remain a formal operation. Where communities have traditionally operated outside of the formal sector, they may also be reluctant to be legalised, particularly where there are no obvious incentives to do so and where legalisation involves paying taxes that they would otherwise not pay. A lack of capacity on the part of governments to enforce penalties and to provide the benefits, which should be associated with legalisation, acts as a further disincentive to miners to be legalised.

Governments often lack political will to legalise sector, especially where rights to land are not recognised. In countries with Value Added Tax (VAT), VAT may actually serve as a hidden incentive for the government to maintain the informal status of miners since they pay VAT on purchases but do not benefit from VAT credits. If smuggling is not an issue and the product ends up in the official domestic market, the final product is again liable for

VAT. The double payment of VAT at the producer and the consumer ends generates a double fiscal income for the government.

In certain cases, the lack of political will to create an adequate enabling framework for legalisation can be explained by personal interests related to the possibilities for corruption, money laundering, and similar illegal practices, enabled by the informal status of the sector. It is also sometimes the case that the government is attempting to attract international mining companies to invest in the country and ASM may be seen as a disincentive.

Once the sector is acknowledged, governments need to develop a consistent and holistic sector policy. In the majority of countries where artisanal and small-scale mining takes place, there is an absence of any form of policy addressing the needs of the sector. There are some exceptions to this, for example in Peru, Colombia, Tanzania and South Africa, where recent reforms in national policy have led to recognition of the sector and to attempts at providing an enabling framework.

Governments main tasks in the ASM sector is seen in the following issues:

- Management of the exploitation of the national mineral resources in a socially acceptable, environmentally sound and sustainable manner
- Promotion of investment into the sector
- Licensing the mining titles and
- Promotion of the legalization and normalization of the ASM operations

Main tools for the governments to exercise these tasks are the mining laws, the concessioning system with the mining cadastre as well as the supervision of the compliance with the laws and national or international technical standards and procedures.

Regarding the legal and administrative issues the governments are advised to create objective, consistent, transparent and non-discriminatory regulatory mechanisms, which offer easy access to mining titles and legal production. This includes good governance by an administrative procedure following transparent, clear and fixed rules. The government's role in the ASM sector shall be limited to normative and control issues.

Operative activities should be outsourced to the private or NGO sector.

In order to strengthen the sector development the governments should introduce and expand competition on all levels (service delivery, commercialisation etc.)

The decentralization of the mining sector administration as a tool to guarantee proximity services is highly recommended. In order to integrate the ASM sector development further into the rural development and to avoid conflicting interests, the mining authorities are advised to coordinate activities with the local administrations and communities.

Case Study: Shutdown of Coal Mines in China

In June 2001 the central government issued a State Council Order to immediately shut down all small coalmines in China. At least one and a half million (but probably closer to two and a half to three million) small-scale coal miners are employed in these mines.

Official statistics on small coalmines estimate over six thousand deaths in coalmines per year. Unofficially, there are probably hundreds if not thousands more unreported deaths. Along with environmental impacts, the poor health and safety record of the coalmines are the official reason for the State Order to close coalmines. Other than the sheer scale of the tragedy, the government has a vested interest in stopping the oversupply of coal from artisanal coalmines, which is undercutting the viability of the larger state coalmines.

Putting this many miners out of work will clearly have massive socio-economic ramifications in areas dependant on coal mining. Many remote areas of China have thousands of previously legitimate coal mining enterprises, which have become illegal operations almost overnight. There have been numerous government attempts to shut down small coalmines in the Central Chinese Hunan province. It has been reported that some mines have been closed down as many as twenty times.

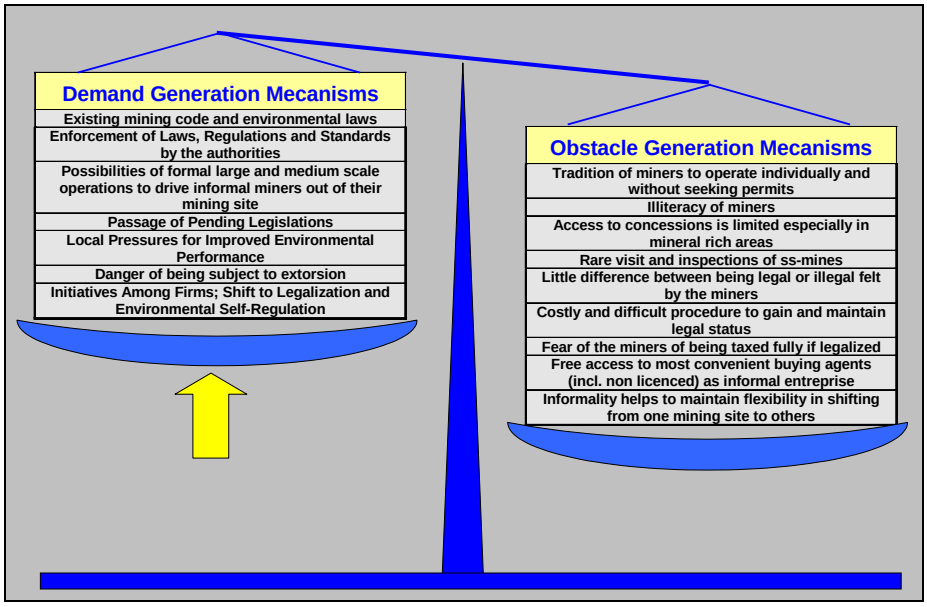

Fig.: The legal balance

A very important and additional issue is the development of instruments and administrative responses to rush developments in the ASM sector. Examples like Serra Pelada (gold) in Brazil, Mt. Kare (gold) in Papua New Guinea, Ilakaka (Sapphire) in Madagascar or Nambija (gold) in Ecuador, were in a couple of weeks hundreds or thousands of people migrated into the area of recent new mineral finds underline the need of appropriate intervention approaches of the government.

Currently most governments lack these tools and experiment with more or less success. The instruments include:

- The creation of small-scale miners reserves
- The creation of special economic zones

- The containment of the entire area
- The creation of central commercialisation facilities supervised by the mining authority, etc.

Organizational

On the government side the authorities present a differentiated organizational structure comprising Ministry, National Mining Authorities and Regional Directions. On the other hand the private ASM sector, normally lacks a structured organization. Governments therefore do not have an adequate counterpart to communicate with.

As entire private sector representation the establishment of a mining sector representation within a chambers of commerce and industry or the establishment of a chamber of mines should be fostered.

The tasks of such a chamber should be:

- To serve as a source of information and aid on all important issues related to the legal, fiscal, institutional and administrative framework of the sector, the access to foreign markets, the activities within the sector (comprising not only mining itself but as well the transformation, marketing and exporting of the products)
- To serve as an agent to provide access to formation and further qualification of the members (on a long term even the establishment of training centres could be considered)
- To lobby for the needs of the sector in front of government and to defend the interest of the members, i.e. proposing adaptations of the legal framework in order to deregulate the markets, facilitate exportation etc.
- To help informal groups of miners to become formalized, to help the formal enterprises to compete with the informal and to more effectively control informal activities in the sector.
- To act as a promotional and image building agent for the relevant sector.

For an investor, client or other kind of representative of the private sector, the Chamber should serve as a door opener towards the sector related members and activities.

For the Government such a chamber should act as a go-between to the private sector, channelling the access to the diverse enterprises. Another important role of the chamber is its acting as a competent partner for the government in sector related issues.

On the level of mining exploitation the support to the formation of groups of miners, whether in cooperatives, associations or enterprises should be one focus of the mining policy. These groups will on a later stage serve as important go-betweens to address the individual miners.

While the international experience shows, that major socio-cultural reasons inhibit the development of efficient cooperatives for mining itself, in the fields of financing, marketing, pooling of equipment or the collection of by-products there are many encouraging examples of cooperatives and associations from the small-scale mining sector.

Finally the local administrations should be encouraged to establish formalized or informal structures to support the communication, cooperation and coordination aiming at a more effective and efficient, harmonized management of the local resources.

Case Study Shamva Mining Centre

Project outline

Shamva Mining Centre (SMC) was established in 1989 as a joint initiative between the Ministry of Mines, ITDG, the Small-scale Miners Association of Zimbabwe (SSMAZ) and donors. The objectives of the project were to:

- Provide a commercially viable and sustainable custom milling facility for small-scale gold miners in the Shamva area and improve incomes of miners;
- Create jobs;
- Train miners in health, safety and sustainable mining methods;
- Share and disseminate lessons and experiences on the project locally and internationally.

At its inception, the centre was expected to serve about 43 miners within a 50 km radius of the centre. By 1995 however, the services provided at the centre had proved so effective and popular that more than 150 miners were using the centre. The catchment area of the centre had extended to a radius of 200km.

Training was provided (and continues to be provided) to small-scale miners to improve their skills in mining methods, geology, mine pegging, environmental management, health and safety, business planning and management.

Key success factors

The SMC project was successful because it addressed a real need of small-scale miners through improvement of their access to processing technology. Custom milling services provided at the centre made a difference to the livelihoods of small-scale miners by increasing their incomes. In some cases, miner's incomes increased by as much as 30%.

There is a ready market for gold, the mineral processed at the centre. The fees paid by miners to have their ore processed are directly related to the final price at which their gold is bought by the Reserve Bank. Fees are therefore set at a rate that is affordable to miners while at the same time they are competitive to give the centre a profit. The project was a collaborative initiative from all key stakeholders, viz., small-scale miners, government, ITDG and donors. The government gave its full support to the project because it offered a real solution to the needs of small-scale miners and increased gold deliveries to the Reserve Bank.

Problems encountered

Problems encountered at SMC reveal the difficulties involved in balancing commercial and development objectives. By the early 1990s, it became evident that the capacity of the ball mill

installed at the centre was not adequate to meet the growing needs of miners. The mill had capacity to process one ton of ore per hour, which was too little compared to quantity of ore supplied to the centre. As a result, miners had to wait between three to six weeks to have their ore processed.

In an attempt to address this problem, the SSMAZ executive committee decided that a miner had to bring in at least ten tons to the centre before the ore could be processed. Those bringing less would only have their ore milled during slack periods. This arrangement effectively excluded the very small-scale miner from benefiting from the facility.

Above all, the single biggest problem encountered at SMC were the poor business decisions made by the SSMAZ executive committee concerning the operations of the centre. In January 1999, the committee decided that it had built sufficient capacity to run the centre without external assistance. No experienced and competent manager was appointed to take over from the ITDG manager. By June 1999, the centre had run into serious cash flow problems. In January 2001 the committee decided to lease the centre to a local miner in Shamva. The centre is operating well below capacity and milling services provided are far less efficient than was the case prior to the take over of the centre by SSMAZ.

Lessons learnt

- There is need for development agencies to rethink whether it is always necessary to hand over commercial projects to producers associations. Clearly, SMC's performance has suffered since the take over by the SSMAZ. Producers may well be better off to leave the management of commercial projects to experienced and qualified managers while they enjoy an efficient and competitively priced service. Great care has to be taken in working with associations to ensure that a few powerful people in the association do not monopolise benefits created for individual gain.
- Technology unlocks the potential of small-scale miners to run viable mines. Access to processing facilities at SMC has enabled miners to increase productivity and improve the viability of their mines until management problems emerged in January 1999.
- Small-scale miners, like any other entrepreneurs, require a complete package of business development services to thrive and grow. In addition to technology, they require skills in business planning and management, mining methods, sustainable environmental management and access to credit and profitable markets.

Lit: Drechsler, B.: Small-scale Mining & Sustainable Development within the SADC Region – MMSD Research, 2001

Prolongation of production lines and promotion of adding value

In order to create and strengthen the local market for ASM products the adding of value in the country by further transformation of the productions by prolonged production lines should be promoted. This seems realistic for a great number of commodities:

ASM product	Possible transformation in the country
Gold	jewellery, coins, medals
Gemstones	cutting and polishing, jewellery
Coal	coke
Dimension stones	tiles and slab production
Non metallic minerals	rough ceramics production, mineral colour paint production etc.

Therefore the right motivating environment has to be created. Currently in many countries the mining laws or other legal instruments do not support the development of small industries based on local mining production. This is especially valid for the production of informal ASM, which is difficult to integrate into the formal economy.

Prolongation of production lines nevertheless should focus the creation of complementary activities through matchmaking with other groups, and not, as frequently proposed, as an additional activity of the miners themselves. For example, most experiments to teach miners jewellery failed.

Aiming to contribute to the eradication of the black markets for the ASM production the government should find a way to include the informal production into the formal market. For this the following case study from the Bolivian jewellery industry may serve as model.

Case Study:

In Bolivia there are a lot of informal and semiformal miners exploiting gold ores. While most of the miners operate on legally granted concessions, most of the production is neither declared nor paid for (royalties and taxes incl. VAT). On the other hand the country has a notable jewellery industry with long tradition. Because of the difficulties with the informal production, most of the jewelleries had to import gold from the world market as raw material to aliment their production. Time and cost intensive procedures for the import and tax reimbursement (VAT) forced many jewellers into the informality or to close down their operation. With the objective to re-strengthen the competition of the Bolivian jewellery industry on the export market the Government of Bolivia reacted and put in place a system of "auto declaration" for the gold bought from the informal market. Currently the jeweller is taxed normally and as the exported jewellery is exempted of the VAT the government simply accepts the local market value (which is equivalent to the international market value) of the gold from the informal market as deductible costs. By this means the government strengthened the creation of added value in the country and the competition of the Bolivian industry on the international market as well the contribution to the formalization of at least a part of the production chain.

A similar system seems to be advisable for many other ASM countries.

Furthermore the governments should stimulate the transformation directly in the country by investment promotion, formation and qualification of personnel, taxation and fiscal incentives for new enterprises. This will secure a growing added value to be generated in the country.

Environment

The environmental costs of ASM are in general higher than those of other types of mines; this means that ASM is dirtier per unit of output than medium, large and modern mining operations. Another problem of ASM are the great individual number of polluters, normally concentrated in a determined region, which causes significant local impacts. The difficulties are great to control, monitor and enforce environmental violations due to lack of resources and the inaccessible nature of the sector.

The ASM produces negative impacts on the physical and social environment during the different stages of mining (exploration, exploitation, processing and closure). The most important environmental problems are the following:

- Mercury pollution
- Cyanide pollution
- Direct dumping of tailings and effluents into rivers
- Improperly constructed tailings dams
- Acid rock drainage
- Improper closure
- River damage in alluvial areas
- River siltation
- Erosion damage and deforestation
- Landscape destruction
- Garbage and solid waste
- Tropical diseases (malaria)
- Induction of subsequent colonization
- Cultural damage due to invasion of sensitive tribal land
- Uncontrolled ASM activities in protected areas

There are multiple causes for the severe environmental impacts in ASM. The following list shows the most relevant ones:

- Lack of knowledge, education and training (technical and environmental)
- Inefficient technology and limited techniques
- Inefficient administrative management
- Errors in human control
- Economic limitations
- Lack of access to better techniques
- Lack of information about good practice
- Lack of control and enforcement
- Non adequate environmental legislation

Given these numerous reasons, it seems clear that only solutions which are "win-win" or at least "win - do not loose" are likely to have success. Taking into account that the ASM is very heterogeneous there are many cases where effective interventions can be realized. These should be focused on incentives and training rather than on traditional monitoring and enforcement systems. Benefits need to be demonstrated and standards must not be

unrealistic. If possible it should be worked together with larger mines, for example with respect to the use of tailings and processing facilities.

Environmental problems cannot be solved by technically oriented approaches alone. The implementation of technical 'solutions' always require detailed knowledge of the cultural, social, economic and organisational context of the miners. Environmental problems require technical solutions that are culturally relevant, and an integral approach is needed for changes to be implemented. The use of the simple double tin retort in Papua New Guinea illustrates such an approach.

Case Study: The Tin-Fish-Tin Retort in PNG

Sporadic gold mining in the Milne Bay province of Papua New Guinea dates back to 1896. A common feature shared by all the areas in Milne Bay is that customary patterns of land tenure are officially recognised, which means that people actually mine their own land.

On Misima Island in the Milne Bay province a large-scale gold mine has been operating since 1989. Plans drawn up to assist the community after mine closure include agricultural income generating activities. However, the limited availability of agricultural land, remote location and distance from markets does not make this a viable solution. Small-scale mining on the other hand, has the potential to extend benefits across the community beyond the scope of traditional landowners.

An outreach programme was initiated in 2001 with the PNG Department of Mining and AUSAid to help develop the existing economic infrastructure and support alluvial gold miners on Misima Island. Efforts were aimed at improving methods of gold recovery as well as addressing environmental and health issues. A series of workshops were held to explain the dangers of mercury and teach various methods of burning amalgam. Locally adapted solutions were sought, particularly the 'tin-fish-tin' retort method. The cost of traditional manufactured retorts lies beyond the reach of most miners' pockets. Since tinned fish is consumed in vast quantities in PNG, the used tins are a sensible low-cost material readily available for use as a simple retort. The use of fish tins is therefore an appropriate alternative.

People were also taught how to recycle mercury, save money and reduce health risks associated with using mercury. Up until that time, evidence of people burning amalgam cakes in their huts, or on the blades of knives that were subsequently used to prepare food, or sitting downwind in smoke fumes to keep warm had been documented. The issue of environmental degradation arising from these practices was also widely communicated, and people were made aware of how this could affect their ability to garden and feed themselves and future generations.

Fig: Nitric Acid fumes from gold refinery in Ecuador

Fig: Destruction of Tipuani valley (Bolivia) due to alluvial gold mining

Fig: Acid mine drainage, Poopo (Bolivia)

A number of lessons have been learnt in the last years; numerous assistance programs for environmental protection in ASM have been carried out. The Bolivian experiences by the MEDMIN program demonstrate that in ASM advances can be made in protecting the environment, even under harsh conditions. In the following box are resumed the main "lessons learnt" which could be useful and beneficial also for other countries.

Case Study: Lessons learnt from MEDMIN Program

- It is necessary to apply an integral focus, considering organizational, social, economic, legal, technical and environmental issues.
- It is essential to guarantee social, economic and environmental benefits for the miners; these "win-win-options" are basic conditions to ensure success.
- It is imperative to demonstrate to the miners that environment or health protection can produce more benefits than costs.
- Health and/or safety are important issues for the miners and should be on the agenda of any project concerning small-scale miners.
- It is necessary to guarantee extensive participation of the miners, also in the proceedings of decision-making.
- Prior to any technical implementation it is crucial to create "an atmosphere of friendship and trust" with the miners, initiating campaigns of sensitisation, information, education and awareness raising by means of audio-visuals, posters, informative pamphlets, seminars, workshops, also taking into account the issues of interest for the miners.
- Government collaboration can be helpful, but it is no guarantee for success; at times it could even be counterproductive (poor image, lack of control and/or application of the law, corruption, lack of acceptance on the part of the beneficiaries).
- As the environment issue is controversial among those involved, one should always try to find better ways to come to an understanding and negotiate to attain favourable solutions.
- Involve the population affected by mining pollution to work together with the miners.
- It is essential to develop an integrated technical/environmental concept; only implementing isolated equipment (retorts, centrifuges, etc.) will not bring about the desired results.
- Optimum functioning of the equipment must be assured before implementation in the mining operations. Equipment failure could easily wipe out the trust that has taken a long time to instil.
- It is preferable to first adapt and optimise the already existing simple technology before introducing new and sophisticated equipment. Equipment produced locally at a low cost with reasonable efficiency, have the best possibilities of being implemented. Instead of searching for sophisticated technology, it makes more sense to use the technology that has greater acceptance.
- Due to the specific characteristics of each mining operation (type of deposit, mineralisation, size, hydrography, socio-economic-cultural characteristics) a general technical solution is normally inappropriate. Individual solutions always have to be adopted, considering tailor-made technical packages.
- When making technological changes it is imperative to execute on-site tasks guided by well-trained technicians, mechanics and engineers.
- Implemented technological changes still require prolonged and intensive supervision apart from monitoring to ensure long lasting usage.
- Wide dissemination of technological changes is most effective through pilot operations that are implemented successfully and that serve as models for duplication.
- Miners must pay for their project: "It cost me, I use it and I take care of it".

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Occupational Health and Safety

Occupational health and personal safety issues are frequently addressed when discussing artisanal small-scale mining. Reliable data or official statistics about accidents or occupational diseases however are mostly unavailable.

The five major **health risks** in small-scale mining and processing, according to ILO (Jennings, 1999), are:

- Exposure to dust (silicosis);
- Exposure to mercury and other chemicals;
- Effects of noise and vibration;
- Effects of poor ventilation (heat, humidity, lack of oxygen);
- Effects of over-exertion, inadequate work space and inappropriate equipment.

The five most frequently cited ***causes of accidents*** in small-scale mines, according to ILO (Jennings, 1999), were:

- Rock falls; subsidence;
- Lack of ventilation;
- Misuse of explosives;
- Lack of knowledge; lack of training; violation of regulations;
- Obsolete and poorly maintained equipment

Inappropriate working conditions, as shown in the typical set-up of the figure, suggest that likelihood of accidents in small-scale mining should be significantly higher than in formal medium- or large-scale mines. Practice however shows, that this isn't always the case (especially in non-coal small-scale mining). The nature of small-scale mining (self-employment, low mechanization, low productivity) means that some of the accident related risks may have lower incidence than in formal medium- or large-scale mines. In small-scale coal mining, the relevance of accidents (methane and coal dust explosions) however is significantly higher.

For self-employed artisanal miners, the use of safety equipment depends almost exclusively on their own consciousness. Artisanal mine workers employed by small-scale mining concession holders, usually have to supply their own safety equipment – if any. Even basic safety equipment, like helmet, safety boots, working gloves and dust mask, however represent a significant investment for most of the miners, which, as it does not contribute directly to their daily income, has inferior priority for small-scale miners.

The main reasons for these risks are:

- Lack of resources
- Lack of or non-application of safety regulations
- Lack of awareness
- Illiteracy
- Lack of training
- Inadequate equipment and
- Remote location

The main reasons for occupational health and safety deficiencies in small-scale mining can be resumed as follows:

1. Economic situation: Most small-scale mines are working under marginal economic conditions, providing daily living for their owners or workers. As even basic safety measures have a certain cost (in cash or kind) small-scale miner's common economic understanding tends to economize al not revenue related cost items.
2. Safety regulations for medium- or large-scale mining are not generally applicable to small-scale mines without prior analysis and adapting. Exaggerated safety requirements tend to discourage small-scale miners, inspiring them to simply ignore all safety advices as "utopic".
3. Enforcement of mine safety requirements is frequently understood by authorities as their role to identify guilty parties in case of accidents and to apply corresponding sanctions. Fear of sanctions is the main cause for not reporting accidents or diseases, and constitutes an obstacle for suggesting improvements.
4. Unawareness of risks, especially concerning risks of chronic occupational diseases (dust, vibrations, nitrous gases, mercury, cyanide, etc) due to missing or inadequately implemented education and training. Education and training programs need to be designed according to the social, cultural and ethnic characteristics of the small-scale miners communities
5. Fast track mechanization without implementing complementary safety measures. While purely manual operations have – apart of the arduous work – relatively low safety and health risks, any mechanized working requires the correct application of the technology. Risks increase dramatically when implementing for example: blasting without training, pneumatic drilling without dust control, electrification in coal mines,

mechanical transportation in order to access deeper stopes without improved ventilation, etc.

6. Education, training, demonstration and surveillance are the key elements of any program to improve occupational safety and health in small-scale mining. Both mineworkers and owners/concession-holders must be helped to realize that accident prevention and improved occupational health are worth obtaining and keeping. In the short term, safety and health has a cost, in the mid- or long-term it produces revenues.

Technical

Technical issues play a mayor role in ASM and SSM, which – especially in the past – has lead to a series of misunderstandings.

As a matter of fact, most ASM-problems are somehow related with technical issues, and many of the problems can only be resolved by appropriate technical solutions. An obvious example is the frequently mentioned mercury emissions from artisanal gold mining, which require end-of-pipe technology (retorts, filters, traps) or modifications of mineral processing circuits. The misleading conclusion, frequently drawn from this apparent "cause-effect" relation, is that technique-related ASM problems can be solved by a technique-oriented approach.

The implementation of technical changes, modifications and improvements require in almost any case detailed knowledge of the cultural, social, economic and organizational context of the miners. In almost any cases, technical solutions can only be implemented, by changing some of the framework-conditions, for which an interdisciplinary approach is crucial. This finding can be resumed as, "Technical problems require technical solutions, but an integral approach for implementation".

The second frequent misunderstanding has its origin in one of the usual definitions of ASM, as "mining activity realized manually or with low mechanization and simple machinery". A general concept among decision makers not familiar with ASM reality, is, that "improving simple techniques is simple" – which definitely is not the case. We definitely don't face mayor technical limits to design next-generation spacecrafts (sufficient funding provided of course), but we may face serious problems trying to design an alternative to simple stone-mortar amalgamation-mills, which can be easily self-constructed by artisanal miners with a zero-budget.

Fig.: "quimbalete", Peruvian amalgamation-mill.

While brain trusts of engineers are designing mining machinery for industrialized small-, medium and large-scale mining, ASM is usually no attractive target group for developing specific mining equipment. Conventional mining equipment is therefore frequently modified by the miners to fit their needs; unfortunately in most cases suppressing security features (like water supply for drill hammers). Nevertheless a surprisingly great variety of technical solutions for ASM is available, developed locally during decades and centuries of ASM activity; techniques usually only known locally, with no diffusion into other mining regions.

While universities with geologic, mining or metallurgical faculties in some developing and mining oriented countries seem to be abundant, in most cases their curriculum is only marginally – if any – related with ASM issues ("Any metallurgical engineer in South America knows how to design a 10m autogenous mill, but it is hard to find any who knows how to use a gold pan" [Wotruba 2001])

Local techniques have frequently undergone an evolutionary optimisation process during decades. That means, that improving existing techniques isn't always that easy, as the common engineer might expect.
In mineral processing this fact usually causes recovery rates of artisanal miners to be generally underestimated[1]. Artisanal miners, underreporting their production, usually back up this point of view.

Types of mining operations
ASM operations can be subdivided in the same way, as conventional mining, according to type of deposit:

- Underground mining (hardrock and coal)
- Open pit mining (hardrock and coal)
- Placer mining

[1] It seems sometimes hard for university-degree metallurgists to accept, that illiterate artisanal miners with rudimentary equipment may be able to achieve recovery rates of up to 95%.

Type of mineral resource

- Base metals and polimetalic
- Precious metals
- Coal
- Non metalics, industrial minerals and construction material
- Gemstones

And process step

- Prospecting
- Exploration and exploitation (in ASM usually not separated)
- Mineral processing

Although this is by no way a new finding, it should be kept in mind, as frequently ASM is understood as a synonym for artisanal gold mining. Individual technical for each sub sector are too manifold, to be discussed individually in this report.

Guidelines for technical solutions

Cheap and simple techniques, even if their efficiency is sub optimal, have a higher potential for dissemination than technically optimised but sophisticated processes. Technical and environmental innovations, even if they are not literally "innovations" but results of technology transfer from other ASM regions and/or adaptations to local conditions, should be developed and tested in a participative way, involving artisanal miners. It is usually preferable to improve or optimise existing technologies than introducing new processes, although this isn't always possible.

Any measure successfully implemented, no matter how insignificant it may appear, will create confidence among the miners, and open the doors for further changes. Any "flop" will be eternally remembered by the miners, sustaining their argument "engineers don't know".

Technical solutions have to be compatible with the economic potential of the target group. Solutions have to be replicable without external aid. Measures always need to be accompanied by education and training of the target groups.

Special attention should be given to understanding the socio-cultural and socio-economic structures and organizational interrelations of different local stakeholders, like miners, concession holders, land owners, processing plants, mineral traders, supply shops, etc., as well as religion, customs, superstitions, etc., of the different groups involved. Generally, these factors are much more difficult to change than just technical processes. It is necessary to consider integrated solutions (environmental protection, production, health, energy, etc).

Proposals to improve artisanal miners techniques require time to get widely accepted. It is absolutely not infrequent, to find exact working replicas of technology from the 16th or 17th century in ASM regions. To try to implement state-of-the-art technology means to

realize a journey in a "time machine", jumping between several centuries within a few years. Projects that cannot provide a reasonable time to realize the necessary cultural adaptation should better not focus technical issues; there are enough other issues to solve in ASM!

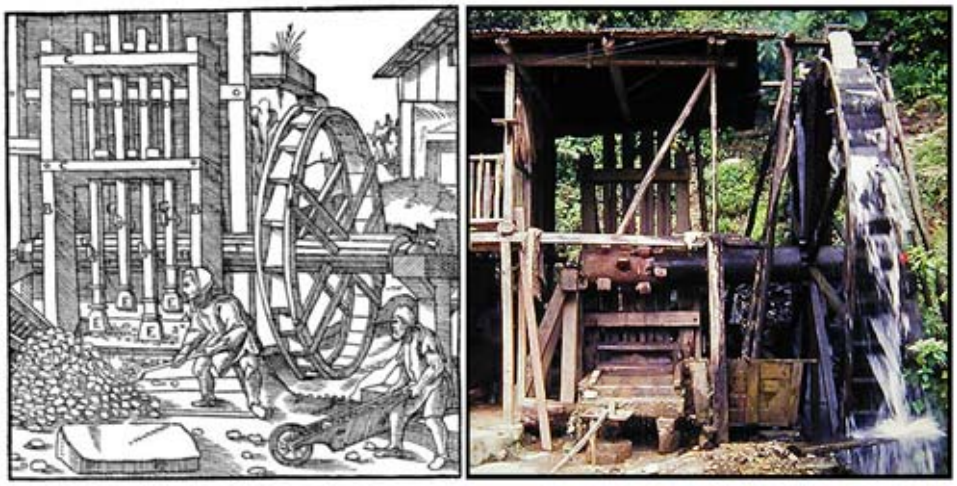


Fig.: Compare Agricola's stamp mill design with actual Columbian stamp mill: Even the number of stamps is the same!

In any case it is of vital importance to surpass "pilot" stages and to start massive diffusion during the lifetime of a project. Externally financed pilot projects always have a chance to be technically successful – at least if no mistakes were made – but they don't give any guarantee for later diffusion and replica by own initiative from artisanal miners.

New or modified techniques only have a chance to widespread, if they are at some moment accepted by the artisanal miners as "their own" solution. As soon, as miners start by own initiative to make "unauthorized copies" of the new solutions, you know that you won.

Case Study: Mobile Processing Plants

Mobile processing plants are often used as a possibility for the dissemination of technological innovations. They were used in different kinds of ASM metal mining. Despite numerous such project approaches the authors do not know of any successful and durable use of mobile plants. The reasons are:

- No deposit is similar to the other (with exception of some alluvial deposits)
- The processing plant must be adjusted to the mining technique, i.e., should the situation arise, the plant has to adjust as well to a new mining technique, a fact that does not lead to acceptance
- Mobile plants are designed for a certain throughput. If for technical reasons this throughput has fallen below or above the norm, the processing results are not satisfactory. Not every mine can reach the throughput defined by the mobile plants
- Because of their transportability, mobile plants must be built in a very compact way. In consequence the single components often have quite a complicated technical design. For this reason the single components constitute a completely new technology for the miners of the relevant region, with all the negative consequences this implies, e.g.
  - Difficulties in handling and adjustment
  - No local production and servicing
  - More investment
- Because of the bad infrastructure in small-scale mining regions the use of mobile plants is limited to few operations
- Different organisation, technical standard and financial possibilities of the operations make an

individual adaptation of the technique to the operation necessary. In the case of mobile plants the processing plants must be adapted to the technique to being introduced. Only in exceptional cases is this operable and does not at all correspond to the principles of a cautious introduction of improved technology

- As mobile plants are to be used in several operations, nobody really feels responsible for them. This also touches the question of the ownership of the plant and the investment and maintenance costs involved
- As mobile plants cover the whole flow sheet, they normally involve high initial investment
- Because of the different deposit and mining conditions, mobile plants mostly can't be transplanted as often as it would be desirable for the dissemination of the technique. The adaptation and adjustment of the plant to a new location normally requires a lot of time until the plant really may be presented. Thus, and due to the time necessary for putting up and dismantling the plant, a lot of time is lost during which the plant is not available for teaching purposes
- It is generally extremely difficult for the miners, to entrust the raw material they gained through hard labour to an unknown plant which, first of all, has to be adjusted and optimised and who's process result they cannot estimate. Generally it is easier for them if the presented technique constitutes a progressive improvement of their own plants or respectively if only some components are changed.

For all these reasons mobile plants must be looked at somewhat critically.

Finance, Credit

Most of the small enterprises would like to semi-mechanize and to upgrade production capacities or to develop new reserves. All the mentioned measures require investment capital. Generally the ASM sector tends to demand better access to financing. But in practice, access to credits and formal banking is difficult for ASM miners, and they face serious problems dealing with formal financing.

Taking into account the particularities in the mining sector with its inherent risks – and especially the ASM sector where low utility expectations don't outweigh the risk – the financing institutions consider the sector as of considerable risk and deny negotiation with a rather mobile and partly informal clientele, scattered in rural areas and lacking bankable guarantees. Therefore, if any financing institution is willing to deal with the small-scale miners, generally the interest rates have to be rather high. This has negative drawbacks on the viability of the projects.

Therefore the financing of SSM projects should be tailor-made and consider – instead of regular credits – financing through:

- Own capital resources (as discussed by Nick Hunter in his presentation in Harare: Small/Medium Mining as Business: Slow Build or Fast Track)
- Joint ventures
- Equity participation
- Risk capital (such as in exploration funds or mining development banks) the
- Leasing of equipment,

For the credit financing – if occasionally considered as an appropriate tool by international donor projects or governments for technology transfer or dissemination of the innovations

regarding mining and mineral processing tools – the following approaches and experiences from international ASM-promotion projects should be taken into account:

- Finance means not only credit, but also savings. Self-financing or savings should be included into the finance program.
- The sustainability of the financial service must be considered from the very beginning. All parties involved must understand the meaning and implications of "sustainability". Features of a sustainable financing program are:
  - The lender is independent in its loan decision and bears the full lending risk.
  - Interest rates for final borrowers must at least cover cost of inflation, operation and loan losses.
  - An adequate financial technology for lending to small enterprises starts with smaller loan amounts and later, goes to larger loans.
- Significant outreach, or a high number of clients, is important for achieving development impact, as well as for making the program economically viable through economies of scale.
- Potential financial intermediaries should be screened based on the existing guidelines of donors. Measures for institution building are a must since in general no financial institution in ASM-countries is ready to lend to small enterprises, less to the mining sector. Funds for these measures have to be provided.
- Subsidies to ASM should not be given in the form of a subsidized loan, but in form of training or other technical support.
- Regular control and supervision of the financial institution as well as guidance is required.

Eventually, a credit scheme should not be instrumentalised for the one-time delivery of equipment, but focus on financing a business over a long period.

Case Study: Negative experiences from Bolivia

In Bolivia there are two credit lines for the ASM sector: MEDMIN Foundation and APEMIN Project. MEDMIN counts on a credit fund (US $ 200.000,-) managed jointly with CEPAS (Episcopal Commission for Bolivia), which contributes 50% of the credit. The beneficiaries are individuals or legal entities, which CEPAS (Episcopal Commission) and its Approval Committee considers fills the requisites qualifying them as small miners or mining cooperatives.

A year and a half after launching, the requisites demanded by CEPAS, have made access to the fund extremely difficult, especially for the mining cooperatives which is the group that most requires the credit. They were asked to provide the following documents, which they could not provide: proof of market (sales contracts for the period of the loan), mortgage guarantee (a house in one of the three principle cities) and a technical assistance contract for the project for at least the loan repayment period. These requirements by CEPAS originate from bad experience with mining credits in past years. This has had the effect of making CEPAS extremely wary in granting credits. This however, makes it extremely for small mining to accede to these credits.

The other institution that gives support with credits to small mining is APEMIN. It is important to compare this line of credit with that of MEDMIN. It should be pointed out that the APEMIN credits also go through the CEPAS channels.

The following is an analysis of the APEMIN Credits and some comparative figures:

	MEDMIN	APEMIN
Interest rate	17%	17%
Size of fund	US $ 200.000,-	US $ 216.000,-
Beneficiaries	Small mining and Coops.	Small mining and small borrowers for activities derived from mining.
Destiny of credits	Technical assistance, Equipment, environment.	Working capital
Applications received	34	17
Applications approved	2	14
Credits disbursed	1	13
Maximum assigned	20,000	31,500

According to CEPAS internal report, credits from APEMIN reach the sum of US $ 215.982,-.

As we can see, the panorama is totally different between both credit lines. It can be seen that both the approved credits and those granted by APEMIN-CEPAS are well above the MEDMIN-CEPAS credits. In the case of the APEMIN credits, CEPAS only administer and request the guarantees, which are nowhere near as rigid as the MEDMIN-CEPAS requirements where also CEPAS funds are at risk. Additionally, MEDMIN-CEPAS credits have a strong environmental component that increases the risk that the funds be diverted to other ends due to a lack of environmental conscience on the part of the miners.

A report of August 31, 2001, shows conclusively that CEPAS was right in demanding so many guarantees of the mining sector. According to this report, of the 13 credits disbursed, only 4 companies and cooperatives have amortized their debts and 9 of them are running up interest. Amongst the more serious cases, there is one in arrears and two with judgements. But the most worrying cases are the uncollectibles. According to CEPAS, it is difficult to predict how work will evolve with credits. Small mining has requested subsidising the prices of its products, as it cannot honour its obligations. The 24% of uncollectible APEMIN credits, as time passes may convert to 50% or more.

ASM Mineral Economics

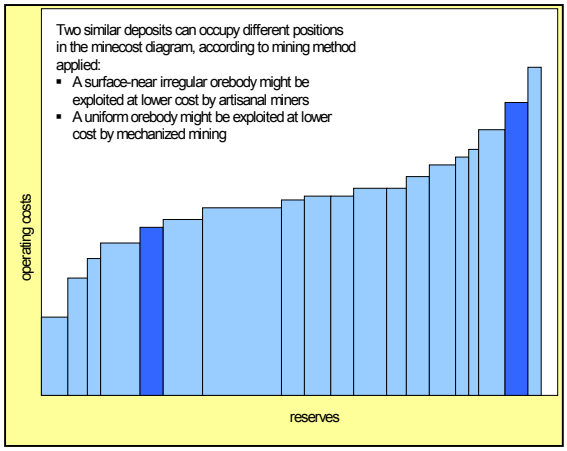
Utilization of Mineral Resources

Deposits of potential interest for small-scale artisanal miners have certain common characteristics. Mineral deposits in general are characterized by three factors (2 native factors and 1 derived):

- Quality (all characteristics influencing revenues)
- Bonitaet (all characteristics influencing costs)
- Quantity (reserves/resources according to relation revenue-cost)

Quality factors (grade, purity, heat value of coal, etc.) in general do not have a significant influence on the appropriateness of a deposit for small-scale mining in general. On the market side the price depends on the quality of the commodity, and is (or should be) the same for large or small producers. Low grade however can be a limiting factor for artisanal miners, as their processing technology usually isn't capable to process low grade ores.

Bonitaet-factors however are crucial for appropriateness for small-scale mining. We can generalize, that all factors that encourage mechanization and economy of scale (uniformity of deposit, width of ore bodies, depth, overburden, etc.) are mostly adverse for small-scale mining. Contrary, adverse conditions for medium or large-scale mining (irregular ore bodies, steep dipping seams, etc.) create a niche for economically viable small-scale mining.



In a particular *reserves / operation cost – diagram* for a commodity, the position of a deposit appropriate for small-scale mining can appear in two different locations: at the high-end of operation costs when considered as industrialized mining, and at the low end when evaluated for small-scale mining. The opposite would occur, when evaluating a "large-scale" deposit (i.e. porphyry copper) under small-scale mining conditions.

Although artisanal small-scale miners don't manage sophisticated concepts of reserve and resource classification systems, their basic concept don't differ significantly from industrialized mining, as the next section will demonstrate.

Economic Strategies of ASM Miners

Time and money are interchangeable. Artisanal small-scale mining is characterized by abundant time and chronic lack of money. Hunter's question in Harare 1993: "Slow build or Fast Track?" can therefore be answered, that experience in the last decades showed

widely, that only a slow-build approach is feasible for artisanal small-scale mining operations.

Concept of reserves: Artisanal small-scale mines usually don't have reserves. The lack of investment capital doesn't allow for necessary geologic studies or exploration prior to operation of the mine. Whenever possible, small-scale miners start right away with production, based on their geologic experience. But the criteria for selecting mineable "reserves" for artisanal small-scale miners is similar to the criteria applied in industrialized mining: any ore above the cut-off-grade that provides a living for their families is mineable.

High grading – often referred to as depredation of deposits by small-scale miners – isn't a much different concept than strict net present value optimisation in many industrialized mining operations.

On the other hand, total recovery of small-scale mining is often not significantly below industrial levels, due to intensive and repetitive scavenging.

Repetitive scavenging of artisanal small-scale mining

Mine transport is usually a bottleneck in small-scale mines. High grading due to hand selection of the mineral right in the stope is frequently applied to minimize transportation costs, leaving lower grade ore as mine fill. Frequently in subsequent production cycles, these minefill ore is exploited again, as for a subsequent mine operator this material - due to lower production costs (no drilling and blasting required) - may become economically attractive. Any mineral that provides a living (is above cut-off) will be sooner or later exploited.

The next typical bottleneck is the processing plant. Further selection usually takes place before feeding the mineral into the plant. Lower grade mineral and mine tailings will be dumped. But none of this mineral is usually wasted. These dumps are frequently reworked again and again by women or children (pallaqueras, pailliris, cancheras, chichiqueros etc.) until "nothing is left". Whatever the opinion regarding women's or children's work might be, this activity is done because it provides a living to the involved – and apparently the economically most attractive (or only possible) activity for them. At the same time total resource recovery increases.

Small-scale processing plants are usually at a low technologic level. Recovery in a single processing step may be low. This leads to the widespread misunderstanding, that artisanal small-scale miners are wasting mineral resources, recovering only - let's say 40 or 50% - of the value matter. This misunderstanding arises from an individual view of the different singular non-integrated processing steps. Usually, in gold mining, the first step is amalgamation. Frequently amalgamable gold is less that 50 %. The amalgamation tailing nevertheless are usually accumulated and later sold or processed in cyanidation plants. Artisanal cyanidation isn't very efficient either; let's say they recover 70% of the left gold. But – the cyanidation tailings are usually stored in tailings dumps for later reprocessing when oxidisation liberated the gold.

Step	Total recovery per step	Accumulative recovery
Amalgamation	50%	50%
1st cyanide leaching	70% of 50% = 35%	85%
2nd cyanide leaching	70% of 15% = 11%	96%

The whole process cycle (from the mine to the final dump) may take months or even years. But time and money are interchangeable and artisanal miner's capital in mainly "time".

Macroeconomic Effects, Taxation and Foreign Income

At macroeconomic level, the production of high-value metals (gold), gemstones and minerals from small-scale mines can make a major contribution to foreign exchange earnings. As gold for instance is more or less a standard "currency" the produced value is equivalent to extra foreign income. This is particularly the case for artisanal small-scale mining, where no considerations of "repatriation of utilities" of foreign investors are taken into account, as the "investors" are the very own local miners. In this case the value of artisanally produced gold can be considered as a net contribution to foreign income, as freely convertible "currency" is produced with pure local input. It does not really matter if payment is received if form of converted currency ("dollars") or in form of imported goods ("refrigerators"). In any case the livelihood and wealth of the involved communities, and herewith the wealth of the national economy are beneficiary.

In case of informal artisanal small-scale mining in countries which have VAT taxation implemented, the informal status of the miners might even constitute an non-outspoken incentive for the government to maintain this situation. The informal status of the miners makes them VAT-end user, as they cannot benefit from any fiscal credit or drawback from goods bought from their suppliers. If smuggling is not an issue and the product ends up in the official domestic market, the final product is again taxed with the entire VAT. The double interruption of the VAT-chain at the producer (small-scale miner) and the consumer generates double fiscal income.

Influence of Smuggling, Money Laundry and Guerrilla Activities

Significant increases or decreases of official export statistics from small-scale mines occur, when changes to purchasing arrangements or taxation schemes are made, or when the overall political framework conditions are changing, - even though physical production does not change at all.

Illicit marketing is primarily the result of inadequate government policies. In countries where commercialisation is not based on free market mechanisms and where sales are not transparent, smuggling is usually the first choice for miners and/or merchants, and much of the benefits to the government are lost. Nevertheless it has to be pointed out, that smuggling or illegal trading usually happens with some adjacent country where market conditions are more favourable; but, as developing countries are usually surrounded by developing countries, the regional positive effect of artisanal small-scale mining will not be lost – just a different developing country with a more open policy is able to take advantage from it's neighbours.

It has to be pointed out, even extensive smuggling does not significantly reduce the local development effect (on community level) small-scale mining has, or even a positive overall macroeconomic effect due to additional foreign income, as mentioned in the preceding chapter.

Additionally emphasis has to be made on the finding, that smuggling usually is **not** performed by the artisanal small-scale miners themselves, but by intermediate or mayor illegal traders. Therefore smuggling isn't a problem related with the miners, but with the product itself! According to the considerable capital requirements to perform efficient smuggling, the traders usually do not belong to the typical "artisanal" social strata.

Especially artisanal gold and gemstone mining are frequently and involuntarily used as a vehicle for money laundering or financing guerrilla activities. A common practice of money laundering is to buy gold from informal artisanal small-scale miners with "narcodollars" and to declare it as part of the production of a formal mine. Again it has to be pointed out, that not the artisanal miners, but the product of their activity are the subject of these illegal practices. The usually existing links between money laundering, guerrilla activities and civil wars ("bloody diamonds") cause in some counties the complete "outing" of the small-scale mining sub sector – an effect that contributes to maintain the system, forcing the miners into the illegal and informal status.

Overview: Costs and Benefits of Artisanal Small-scale Mining

The following table shows the different cost-benefit aspects of ASM:

Costs	Benefits

Geologic – Mining costs
– Exploitation of a non-renewable resource
– Losses e.g.
  – irrational working of high grade material
  – incomplete exploitation
  – processing methods
  – transport
	Geologic – Mining benefits
	+ possibility of exploiting smaller deposits
	+ ASM achieves successful prospecting without high cost
	+ Working of abandoned pillars, tailings etc.
	+ Small scale miners discover important deposits in remote areas

Effects on the Environment
– environmental risks, emissions and damage to:
  – earth
  – soil
  – water (underground and surface)
  – air
  – flora and fauna
  – energy sources
  – ecosystems	

Social costs – precarious working conditions – negative health consequences (sickness, accidents) – infra-human living conditions – complicated dependency relations – child labour – unbalanced development between men and women – violation of resident and indigenous community rights – changes in the system of ethical values and it's consequences – insufficient social security	**Social benefits** + labour qualification + source of income (in money) + job creation

Macro-economic costs
– conflicts
  – due to land and water usage
  – with governing bodies (judicial conflicts)
  – with large scale mining
  – with the indigenous population
  – with landscape protection objectives (national parks, protected areas)
– Smuggling –illegality (products & profit)
– no tax generation
– costs of controlling the sector
– continuous costs resulting from social causes
– uncontrolled development due to lack of planned exploitation
	Macro-economic benefits
	+ mobilization of natural resources
	+ tax collection
	+ active effect for the balance of payments
	+ buffer for the labour market in cases of programs for structural adaptation
	+ provides personnel reserves for large scale mining
	+ contribution to regional economic development by
	  + cash circulation (social product)
	  + investment
	  + demand for products and services
	  + mobility
	  + structural consequences (alternative to agriculture)
	+ avoids rural exodus
	+ infrastructure development (road building, schools, energy supply) by small scale mining and

Costs	Benefits
	neighbouring population + comparative financial advantages (products with a high labour coefficient in countries with high labour availability) + relative stable product supply even with market fluctuations + contributes to product diversity and exports + substitutes imports

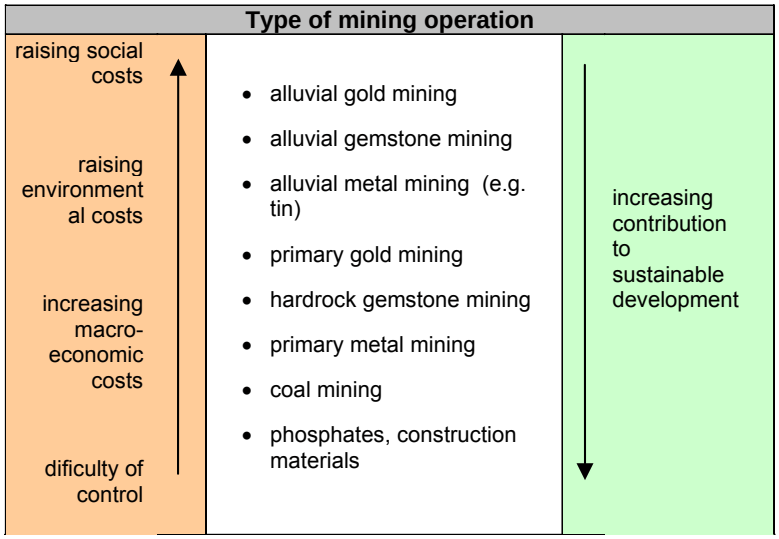


Fig: Cost-benefit for different typical ASM operations

Relation between Large Mining Operations and ASM

Within the framework of growing social sensitivity and the efforts to apply policies of sustainable development, large mining companies have developed in the last years a new outlook towards communities that are located within the areas of influence of their mining projects and which are frequently inhabited by artisanal miners.

The existence of artisanal mining within the area of a formal mining project should be considered as a social-political risk that warrants special attention. When artisanal miners are not taken into consideration within the general context of a mining project, the project with all its investment may have serious problems during the development of its activities.

Experience with relations between formal and artisanal mining

Described below, are some of the experiences obtained from relationships between formal and artisanal mining.

Case Study: Las Cristinas-Venezuela

Placer Dome, in it's Las Cristinas project in Venezuela, has developed it's own procedures (Las Rojas) with artisanal miners in it's concession. By means of an extended process of dialog, an atmosphere of confidence between the company and artisanal miners has been established. It was possible to legally organize the miners, and through technical assistance and innovative concepts of joint efforts, improve the production and income of the artisan miners. Placer Dome was able to establish harmonious relations, not only with the miners, but also with the communities surrounding the concession. This corporate effort is recognized internationally, as being the best example of relations between company and informal mining. The cooperation to the miners and the community still went on when the project already had been shut down. A lot of literature about this case is available.

Lit.: Morris, Davidson: Building partnerships with artisanal miners on Las Cristinas: The Minera Las Cristinas experience in southern Venezuela. Mining Environmental Management, March 1998

Case Study: The Ozizwenzi Kwa Zulu Natal Project in South Africa

Ozizwenzi Kwa Zulu Natal is an extremely poor area with many open quarries and large mining company operations. Illegal clay and coal operations were operating in the region to produce bricks made using simple kilns fired by the mined coal. Each miner worked as an independent contractor by renting an 'allotment' and selling bricks to the local community used to build dwellings in the area. An estimated 200,000 bricks were sold each month through these operations and secured the employment of approximately 400 people.

While these facilities sustained the local community, adverse environmental and health and safety impacts were introduced because mining activities were taking place within the immediate precinct of the village. The bricks were found to be of sub-standard quality and a number of fatalities occurred from buildings collapsing and people being buried alive. Other legal irregularities included the use of child labour, and neither labour relations legislation nor basic conditions of employment were observed.

To develop the brick industry and capitalise on the entrepreneurial ability that existed in this region, in 1998 the Department of Minerals and Energy (DME) decided to assist the project by registering a

trust, the Blaaubosch Trust, comprising 110 beneficiaries and a board of 15 trustees. Once the trust had been established it signed an agreement with the NSC (National Steering Committee, funded by the government to provide technical and managerial assistance to small-scale miners) to develop a business plan, which effectively placed ownership of the company in the hands of the 110 beneficiaries. Several problems prevented the plan from going ahead: a sufficiently qualified person to run the plant and to assist with skills transfer could not be found in the area, and the trustees also found it difficult to meet any of the financial requirements.

The business plan was presented to a large financing corporation for funding, which it subsequently approved, provided an equity partner could be found. Several potential partners were interviewed and a large-scale brick operation, Corobrick, eventually agreed to become the equity partner. Corobrick agreed to buy all of the bricks, provided a specified production and cost level was met. They also provided key management personnel to oversee the process.

Case Study: San Simón – Bolivia

A formal mine exploration operation by the Bolivian – Canadian consortium Excalibur/Eaglecrest, is in progress in the San Simon mountain range (Bolivian frontier with Brazil). Upon commencement of exploration work, simultaneously, artisanal miners became active, initially they were only "locals" and subsequently, artisanal gold miners from other parts of Bolivia and Brazil. Finally, approximately 500 artisanal miners invaded the concession. These miners worked in an irrational manner in the richest parts of the deposit and were responsible for contaminating the environment with about 15 tons of mercury per year. These artisanal miners have organized themselves under the name of " San Simon de Mategua Mining Company".
There is no control of any kind on behalf of the Bolivian authorities in the region; neither is there on a national, departmental, or municipal level, to enforce the application of Bolivian Legislation. The municipal authorities for the area are in the Baures community about one hour's flight away by small plane.
In order to continue its activities peacefully in the region, Excalibur entered into a dialog with the trespassers' company, and as from 1996, there is a signed agreement between both parties. The following are the salient points of the agreement:

- Excalibur agreed to suspend the legal proceedings initiated against the small miners
- The small miners agreed to formalize the legal constitution of their company with the help of Excalibur.
- The small miners agreed not to place obstacles in the way of the exploration work
- The small miners agreed not to permit more miners in their company
- Excalibur authorized mineral exploitation by the artisan miners for their own benefit under certain conditions (defined areas, limited daily movement of gold bearing minerals, no usage of heavy equipment etc.)
- Excalibur agreed to pay the miners 1.5% of their net smelter returns, if they commenced large-scale production.
- Excalibur agrees to hire labour from the Company when it starts large-scale work.
- Excalibur contributes materials for the building of a school and a sanitary installation
- Excalibur helps the company to locate and obtain a mine concession

Excalibur has complied with the agreement to date, the company only partially. However, relations of mutual respect are maintained between parties that assure their coexistence.
In order to avoid mercury contamination, tripartite efforts have commenced between Excalibur, the

Company and the Bolivian Foundation MEDMIN.

Case Study: Junior Companies – Bolivia

Before the gold mining crisis (BRE X and the drop in gold prices), several junior companies (principally Canadian) were operating as Joint Ventures with Gold Mining Cooperatives in Bolivia. The cooperatives provided the concession and the junior pledged itself to invest in exploration and/or capital for a more rational exploitation. Unfortunately, there was almost always deficient communication between parties. The mining cooperatives frequently thought that when "the gringo" invests, they would no longer need to work and that all they had to do was to charge for their concession (normally 20% of the production). Frequently, the junior company had no interest in working, but intended to use the mineral deposit for speculation in the stock exchanges. The small-scale miners never understood this situation.

In some exploration projects, the junior companies promised to purchase the concessions from the cooperatives, providing that the exploration work proved positive. The sums offered (some millions of US$) are a lot of money for mining cooperatives and many left off working normally to dream that they would soon be "millionaires". There was not sufficient communication on the part of the junior companies to clarify that very few exploration projects get to be successful projects.

Small miners do not differentiate between large and junior companies. As a result of this misunderstanding, the small-scale mining sector has lost all confidence in international companies. In the future, mining companies with good intentions to negotiate and cooperate with artisanal miners will have difficulty in creating an atmosphere of confidence.

Case Study: Nicaragua

In Nicaragua, several problems exist between artisanal miners and formal mining companies, principally due to legal situations (lack of mine concessions for the artisanal miner). In several locations, artisanal miners deliver their mineral production to a company for subsequent processing. This is normally the best solution, especially when transport costs are not too high, in this manner the frequent technical and environmental problems arising from primitive concentrating plants are avoided. However, the miners believe that the major profits are to be obtained from processing and they feel cheated by the company. In a certain region of Nicaragua, the opposite occurred, the artisanal miners had "their people" in the company's laboratory that manipulated the analysis results in favour of the miners. The company paid in excess to the miners for their mineral for a long time. This situation brought about even more difficulties in establishing relations of confidence between the company and artisanal miners.

Possible actions and recommendations for the establishment of good relations between large-scale mining and the ASM sector

Some general recommendations are presented for the establishment of good relations:

- The mining company should respect the interests and affairs of the artisanal miners by creating an atmosphere of "partnership".
- A mining company should create an honest atmosphere with the ASM sector, one of real expectations through an open informative policy that is appropriate and real. The artisanal miners must understand that a mining company cannot solve all their problems.

- A mining company has to understand how artisanal mining functions in aspects such as, technical, socio-economic, cultural, and spiritual, and take into account the following questions, amongst others:

    - How many artisanal miners are there
    - How long have they worked in the area as artisanal miners
    - Where are they from, the same area or are they "immigrants"
    - What is the importance of mining to their subsistence
    - How important is mining to the community
    - What are the relations between the artisanal miners and the rest of the community
    - What legitimacy do the artisanal miners have, for example, within the national, local and regional context.
- The company, including junior companies, should start the dialog and the process of Consultation/coordination/information/agreements with the artisanal miners as early as possible, preferably during the exploration phase. Artisanal miners should be actively involved in the exploration phase.
- Consultations should be made, not only with the artisanal miner's leaders, but also with the other members. The leaders frequently have different interests and the other members of the group do not always accept agreements negotiated by the leaders after they have been changed. Agreements, wherever possible, should be signed by every one of the artisanal miners composing the group.
- If the artisanal miners are composed of indigenous groups with some mining tradition, they will require a much more sensitive treatment than with those of the "gold rush" type.
- Frequently, indigenous groups have a different understanding of the law, or have their own laws that are not always compatible with Government laws, particularly with respect to natural resources. The company must take into account this reality and search for routes of understanding.
- Due to their informal nature, artisanal miners do not normally maintain good relations with central government. The company must evaluate as to whether it is convenient to involve the government or not in their negotiations with artisanal miners.

If a mining company decides to assist the artisanal mining, it is recommendable to take into account the following fields of action or areas of cooperation:

- Management or environmental measures
- Occupational health and work safety
- Emergency assistance and mine rescue
- Providing training and technical advice
- Buying services, tools and equipment from local community
- Assistance in the purchase and storage of explosives
- Create small concentrating plants
- Provide mineral processing services by the company's plant
- Laboratory services for sample analysis
- Share geological information

- Administrative and organizational training
- Advice on commercialisation
- Legal and formalization assistance
- Mediation between artisan miners and government and/or assistance programs

New Trends and Issues

Collective Solutions for Environmental Problems

During the last decade the concern for environmental problems is steadily increasing. As a result, environmental laws have been formulated and governmental environment institutions have been founded. The implementation of these new laws has been mostly uncomplicated in the large- and medium mining enterprises. However many countries have not yet been able to include the ASM sector into their formal legal environmental system. Instead, the environmental authorities, being unable to handle the multiple tasks, push the ASM even into an illegal situation due to the no-compliance of the environmental legislation. Sometimes the miners intentionally evade the governmental controlling systems and by doing so, make it even more difficult for the government to fulfil their control duties.

New concepts must be developed in the area of environmental management of ASM to combat the administrative overstress of the controlling authorities regarding control of individual enterprises. Only collective solutions for the ASM have the possibility of minimizing costs and applicability.

Solutions for the ASM sector can hardly be found on an individual level. While organization of the sector is a pre-requisite for substantial changes, incentives for environmental compliance can be based on collective solutions as shown in the following 2 case studies.

Case Study: ECO+ Concept

Initial situation

The environmental legislation in Ecuador in 1994 required an Environmental Impact Assessment (EIA) including an Environment Management Plan for any kind of exploitation of mineral raw materials. Nevertheless the applying laws and regulations, oriented towards a non-existing large-scale mining sector, did not take into account the inferior possibilities of small-scale and artisanal mining, thus giving way to conflicts with the small-scale mining sector.

The elaboration of an EIA requires an interdisciplinary cooperation of various specialists and therefore generates considerable costs. Since the costs of a seriously elaborated study generally exceed the possibilities of the small-scale miner, one of the following evading strategies were adopted:

1. The small-scale miner ignores the relevant regulations, doesn't present his EIA and endangers his recently acquired formal status.
2. The small-scale miner contracts low-cost low-quality consultants, who try to cover all environmental, technical and social aspects as a one-man-team. Usually the authorities do not approve these EIA's, causing useless expenses and endangering the formal status of the miner.

All participants were aware of the unsatisfying situation.

Proposal "Plan ECO+"

Technical and environmental assistance to the small-scale-miners in the region of Zaruma in Southern Ecuador was given by a Swiss funded development project through a local NGO.

Based on an active dialogue with miners and mining-environmental authorities a new concept to resolve the actual conflicts was developed by the project. The strategy consisted in cost sharing and responsibility sharing by collective environmental assessment and was denominated "Plan ECO+" (Estudios Colectivos de Impacto y Manejo Ambiental).

The Plan ECO+ is based on the basic and undefeatable principle and conclusive assumption:

+ small-scale mining enterprises with
+ identical technical characteristics,
+ in an ecologically homogenous zone,

= cause identical environmental impacts,

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= and therefore require identical environmental management plans.

This opened the possibility to include all technically similar enterprises in a certain zone in only one, collective but regional EIA. The following idea was presented to the Mining Ministry: *To recognize and accept collective environmental impact studies in combination with individual declarations of the miners to fulfil the environmental recommendations included in the study, as a substitute for an individual study for each of them.*

This proposal was thoroughly studied and finally accepted in form of a ministerial decreet with pilot character and implemented between 1996 and 1999. The miners implemented more than 200 individual environmental measures during this period.

When the Swiss funded project ended, the experimental concept of "collective environmental studies – ECO+" got incorporated in the regular mining-environmental legislation as "joint environmental studies". Several other countries – since then – have implemented or are evaluating actually the applicability of similar models.

Case Study: Water Contamination in Potosí, Collective Tailings Dam

Mining activity is still very intense and important in the Cerro Rico of Potosí: there are approximately 8,000 artisanal and small-scale miners producing an average of 1,500 tons/day. This production is concentrated in around 40 processing plants using flotation, which are located in and around the city of Potosí. The flotation effluents, which are more than 1,200 tons/day, are released with no environmental precaution directly into the La Rivera river, which is a tributary of the Pilcomayo River, affecting downstream communities and causing serious contamination problems on a national and international level.

In order to give a solution to this problem, MEDMIN has proposed in the year 1996, after a broad consultation process and different studies (socio-economic, pre-feasibility, feasibility study and an integrated financial, institutional, administrative and economic concept), the construction of a collective tailings dam, where the tailings from all the plants of Potosí can be retained. The decanted water will be recycled in its totality so that there will be no emissions of contaminated water anymore. This project, known as "The San Antonio Tailings Dam, Potosí", requires for its implementation approximately 4,5 million U.S. dollars.

The German Financial Cooperation (KfW) is now financing an integrated water project in Potosí (approx. US $ Mio 15), which includes the final design and construction of the San Antonio tailings dam, sewage canal system and sewage water treatment plant, so the water pollution problem in Potosí will be solved in an integrated manner. The construction of the dam should start by the end of 2002.

Based on positive experiences with collective solutions for environmental issues of ASM, more research should be done to identify potential applications of collective solutions in complementary areas, for example collective mining titles.

Literature:

Priester, M., Hruschka F.: New approaches to improve the environmental management of small-scale mining. Natural Resources and Development, 1996.

Fundación MEDMIN: Impactos Económicos y Ambientales de la Liberalización del Comercio: Una Aplicación al Sector Minero, La Paz, in press

Networking and Communication

The basic idea of networking is, to work together, to share information and to coordinate activities among "network-members" with common interests. In this sense, networking is nothing new. In any case, networking has to do with communication. The exponential growth of communication possibilities (which might be seen as cause or effect of globalisation) during the last years nevertheless, has caused mayor changes. Internet and communication satellites are, without any doubt, the mayor issues that have changed the life of most institutions and individuals during the last decade. But did it have any effect – positive or negative – on artisanal or small-scale miners?

As the "Wild West" gold rushes of the 19th century make evident, networking among small-scale miners does not necessarily depend on communication technology. Same phenomena happened in Brazil in the 80's (Serra Pelada) and are happening in minor scale on a daily basis in all ASM regions and countries.

Without any doubt, Internet has changed the way institutions and individuals are working today in the field of ASM. Just one decade ago, most stakeholders depended mainly on one-way information, provided by specialized journals or organizations (AGID, SMI), direct communication was scarce due to the limited number of qualified "network-members" in the same country, and international communication was either time consuming (snail mail) or too expensive (phone, fax or travel) for most stakeholders in developing countries. This panorama has changed fundamentally.

Nearly any information worldwide can now be downloaded immediately from WebPages and email enables relatively affordable communication between stakeholders in different countries. The apparently new way of communication was born: "networking" via Internet.

Two main types of networks can be distinguished:

- Informal decentralized networks, as e.g. the personal list of contacts, anyone is addressing on a regular basis. This type network does not require any further discussion.
- Formal centralized networks, consisting of network-members who's data stored with their consents in a centralized database

Formal centralized networks related to ASM with international participation however are relatively scarce, compared to other disciplines. The authors have knowledge of the following few examples:

Network Name	Topics	Since	Homepage	Main interactive features	Unmoderated Listserver	Public member list	Number of members (end '01)	Selection criteria for members
Hg-net	ASM related mercury issues	1997	yes	Listserver Documents	yes	yes	~ 100	no
Facome	Mercury, ASM, Amazon basin	1999	yes	Listserver Documents	yes	yes	~ 100	yes
MMSD	ASM, mining, sustainable development	2000	yes	Listserver	no	no	unknown	unknown
Redmin era	Mining, ASM	2000	yes	Submission to bulletin	no - bulletin	no (subscriber list)	unknown	no
CASM	ASM	2001	yes	Documents (to be implemented)	---.	no (database of resource persons)	unknown	yes (different categories)

While networks in other disciplines tend to converge or to form larger clusters by reciprocal links or forming "rings", this tendency could not yet be widely observed among ASM related networks.

Effects on ASM communities

The "new" networking capabilities still have an only indirect effect on ASM communities. Members of the networks are – with some exceptions – institutions and individuals offering technical assistance to small-scale miners or responsible for the ASM sector. Improved access to information will be able to improve the quality of services offered by the network-members.

The main reasons for the missing participation of artisanal and small-scale miners in the networks are obvious: insufficient communication infrastructure in rural areas and computer-illiteracy among miners. Nevertheless, new communication techniques might change this panorama within the next few years. Advanced satellite availability enables mining communities in remote areas to install Internet connections for only a few 100 USD. Younger generation miners in some countries are becoming increasingly familiar

with computers. Public Internet access (Internet cafés, cabinas internet) gets more and more popular in small rural townships, and will – within the next decade – extend into ASM villages and camps. (Satellite TV has already become extremely popular in many ASM regions)

While satellite telephones are getting affordable and offer new possibilities for industrialized small-scale mines, AM and FM radio transmission is still the most popular means of communication for most ASM communities. These radios must also be considered networks. They enable in some cases to mobilize whole provinces within a matter of hours.

The communication facilities provides in the context of globalisation will enable artisanal and small-scale miners to build up or strengthen their own informal decentralized networks. Formal centralized networks in ASM regions might become an issue within a few years. New concepts for ASM networking have to be developed.

Fair Traded ASM Products

The mining of gold and precious stones throughout the world today is noticeably characterized by high social and ecological costs. Especially the environmental scandals associated with gold mining, such as the gold tailings dam that burst at the Baia Mare mine in Rumania, with its spills of cyanide and heavy-metal sludge contaminating the Tisza and Donau river systems, or the sad ties that connect diamond mining with the rebel armies of West African states, have naturally created uncertainty in the trade and among end-users.

Anyone who buys jewellery today can no longer be sure that the purchase made does not in some way either support child labour or slave-like working conditions in a struggling developing country, or even contributes to the wanton destruction and annihilation of a war.

This situation has been seen as a challenge for certain artisanal and small- scale mining operations. Aroused by the need for a reaction against these prevailing conditions, a number of small-mining experts, gem specialists and goldsmiths have formed an initiative, which, under the patronage of the Fair Trade e.V. (a German based NGO) and with local NGO participation, has set out to establish the practice of fair-trading in business dealings associated with precious metals and gems.

By using the principles of fair-trading, small-scale producers in developing countries are to be given the opportunity of trading their products under better selling terms and conditions.

The prerequisites and criteria for fair trade with small-scale mining products have been worked out and are strict, and these include the following aspects the operation has to fulfil to be eligible:

- Candidates are to be legally constituted small-scale producers operating within a democratically organized trade framework (e.g. in the form of a cooperative society or association etc.)
- Their approach to mining is to reflect a responsible attitude towards the environment
- A social conscience and commitment to ILO conventions including child labour in regard to the welfare of workers and their families

These artisanal and small producers can profit from fair trade in two ways:

1. By improving the selling conditions for the raw-products, wherever possible through direct sale to the end-user and therefore excluding any unnecessary intermediary transactions by middlemen.

2. By the producers' participation (the mining people and workers engaged in mining processing) in the profits margin achieved from the market value of the products (2nd payment, bonus).

The miners have to invest the additional payments in improving their social and environmental performance. These investments should support the miners to overcome the grip of poverty and the difficult social conditions with which they have to cope.

At the moment, the following product operations are all being examined and supervised by Fair Trade e.V.:

- Diamonds from Lesotho (a women's cooperative)
- Gold from Bolivian cooperatives
- Metals of the platinum group from South Africa (small-mine cooperative, working through the old stock-piles of a major mine)
- Precious coloured gems (garnet, tourmaline, sapphire, aquamarine etc.) from Tanzania and Madagascar
- Grinding workshops in certified companies in India and Amsterdam
- Jewellery in Bolivia

All these operations are advised by ASM-experts or well known organisations working with the ASM sector.

This system offers both the customer and the mine operators a variety of advantages:

- Through the extra-charge the buyer is supporting the development of the "sustained mining" being catalysed by advising consultants and services monitoring the mines.
- The buyer has access to producers, whose products usually don't reach markets through the usual formal trading process, creating income for underprivileged small-miners living in economically weak rural areas.

- For the gold and diamonds that are produced, the buyer receives a serious and genuinely founded quality guarantee that is based on the on-site presence and monitoring of the production and existing social realities. This is also to be valued as a key-advantage, because it can be expected that many producers in eager anticipation of higher buying prices for their products will have the tendency to want to drop the environmental impact and welfare levels of their mining operations below our own, and the levels set down as international standards.
- The buyer receives factually well-founded and current information about the producer and the welfare conditions at the mine.
- The fact that well-known institutions are supporting this group of producers with donor funding is an added guarantee of environmental and social conformity. Moreover, with this system, the demands that were made in the past to improve the environmental and welfare aspects of production through the use of public funds, is now in fact being financially generated by the end-user.
- This system gives these small-scale miners a financial incentive for them to improving the productivity of the mines on their own accord.
- The small-mine, which normally produces markets products in erratic quantities, has now a steady demand to contend with, and this allows for a safer degree of regular planning.
- Internationally agreed quality standards that have been worked out with Fair Trade e.V. now come into effect.

Case Study "Fair Traded Gold Jewellery from Bolivian Cooperatives"

The MEDMIN Foundation with support from projekt-consult GmbH and the Swiss Agency for Development and Cooperation (SDC) have been working for more than 7 years with gold mining cooperatives in the Bolivian Andes introducing environmental and technological improvements through a wide range of different specific projects.

At the moment a pilot project for fair traded gold jewellery has started with the following additional organizations involved:

- The "Cotapata Gold Mining Cooperative" which is the first cooperative in Bolivia that fulfils the Fair Trade e.V. criteria and has signed an agreement
- A small environmental sound smelter
- A jewellery producer and exporter from La Paz with a special product line for the fair traded gold

The gold produced by the Cotapata Cooperative will be smelted into bullion at the smelter and then delivered to the jeweller who crafts the gold into the 18 ct jewellery. The cooperative is immediately paid according to the gold price quoted on the London precious metals market. After the jewellery has been sold, the cooperative and the jewellery receive a bonus from the margin yielded between the finishing and trading stages, which for the miners means that the reward for their work increases by around 15 - 20%. The MEDMIN foundation will be responsible for the supervision of the project and has to ensure that the bonus to the cooperative will be invested in social and environmental performance of the cooperative.

Up to now the main constrains of the project seems the to be access to market. It is planned by next year to promote this project through the Bolivian – Swiss Trade Cooperation Program. This means among others special "coaching" in jewellery design, facilitation of jewellery fair participation, specialized marketing and match making with European jewellery companies.

Additional to the already above mentioned this fair trade offers the following advantages:

- The experience and the knowledge gained from 7 years of practical work with the miners is used to advantage
- The end user are contributing through the extra charge to sustainable development in Bolivian small - scale mining communities
- The MEDMIN Foundation has a new instrument to finance their environmental mission with the target group through a commission charged for the supervision and the direct environmental investment of the cooperative's bonus. This contributes to MEDMIN's institutional sustainability
- The fair trade gold jewellery is an eco-efficient high added value product which contributes to Bolivian trade and export diversification
- There is a vertical production integration of gold mined by small scale miners
- There is a potential of south-south ASM cooperation for example through gold jewellery with diamonds or precious coloured stones from African small mines.