MMSD

Mining, Minerals and Sustainable Development

November 2001

No. 210

Worker and Community Health and Safety Informal Experts Meeting: Workshop Report

London, 10 September 2001

Co-hosted by the Environmental Epidemiology Unit (EEU), of the London School of Hygiene and Tropical Medicine's Department of Public Health and Policy (PHP)

This report does not necessarily reflect the views of the MMSD project, Assurance Group or Sponsors Group, or those of IIED or WBCSD.

Mining, Minerals and Sustainable Development is a project of the International Institute for Environment and Development (IIED). The project was made possible by the support of the World Business Council for Sustainable Development (WBCSD). IIED is a company limited by guarantee and incorporated in England. Reg. No. 2188452. VAT Reg. No. GB 440 4948 50. Registered Charity No. 800066

iied

International Institute for Environment and Development

World Business Council for Sustainable Development

London School of Hygiene & Tropical Medicine

Background

This informal experts meeting was co-hosted by MMSD and the Environmental Epidemiology Unit (EEU), of the London School of Hygiene and Tropical Medicine's Department of Public Health and Policy (PHP). It brought together 28 individuals from nine different countries, representing academic institutions, the minerals industry, government departments, trades unions and international organisations. The meeting provided a forum for focused discussions on the critical issues surrounding health and safety of workers and communities, and on practical steps that can be taken forward to improve current practices, whilst considering the comparative experiences of developed and developing countries. The specific objectives of the meeting were:

- To identify the main health and safety issues faced by mine workers and communities during mining operations, and the directly and indirectly related social impacts;
- To discuss the drivers and constraints towards reducing risks and improving health and related social impacts;
- To discuss action that might be taken to improve mining practices and culture, to minimise risks and maximise benefits at local, national and international level, for each actor involved (unions, companies, governments, academics, international organisations and NGOs/CBOs).

Worker and Community Health in the Mining Sector

Carolyn Stephens, London School of Hygiene and Tropical Medicine

The London School of Hygiene and Tropical Medicine was commissioned by MMSD to undertake a literature review on the direct and indirect health impacts within the mining sector.

Methodology

The review drew from PubMed, an international database covering the period from 1965 to 2001, of 923 peer-reviewed articles. The working definition of 'mining' covers the mining cycle and includes exploration, extraction, closure and rehabilitation. The working definition of 'health' and 'safety' is broad and includes concepts of well-being. The studies were divided into 'occupational' and 'community' health in mining communities, and by mineral/metal types (asbestos, coal, gold, uranium, copper, zinc, quartz); by size/scale of mine; by the nature of mines (open-cast, deep) and by health impacts, direct or indirect.

Estimates vary as to the total number of people employed directly and indirectly in mining. According to the World Bank, large-scale mining provides direct employment for about 2-3 million workers and their families worldwide. Figures for small-scale mining (SSM) also vary. The World Bank estimates that around 13 million are directly involved, while ILO's figures are more conservative at 11.5-13 million. UNIDO estimates that 6 million are employed directly in small-scale gold mining, and it is thought that 100 million are dependent on SSM in some way for their livelihood.

Results

Mining and Health

The majority of the studies focus on negative health impacts on both miner and community health, rather than potential positive effects, which might arise from employment and increased wealth. Principal health problems include respiratory diseases (93 studies); Neoplasms/cancers (87 studies); injuries (49 studies); HIV/AIDS (important studies in South Africa), chronic hypertension; mental health, often related to mine closure; and genetic impact (in the case of uranium).

The bulk of the literature focuses on health problems related to the use of the different minerals (e.g. asbestos) rather than health impacts of the different stages of the mining cycle.

Much of the scientific data on the effects of different minerals comes from North America and Europe, where the literature is dominated by studies on coal, mercury, silicon and asbestos. There is an increase in literature on uranium mining, which is controversial in terms of 'hazard visibility', as the health impacts might emerge 20 years after the end of exposure. Gold has been studied mainly within small-scale mining (SSM) with a focus on the effects of mercury which is used in the extraction process.

Occupational Health

Over time, fatalities in large-scale mining (LSM) operations have dropped substantially. For example, in the US, fatalities have dropped from 12,000 per year in 1915 to 50 per year in 1997. Studies show a similar decline in other countries including Nigeria, former GDR, Russia and the US. However, no studies show an improvement in occupational safety over time. Rather they suggest long-term direct and indirect impacts, related to the type of mineral under scrutiny.

For example, the 59 studies carried out on asbestos agree on the linkages between exposure and chronic and acute impacts including reduced respiratory function, pleural plaques, asbestosis, mesotheliomas and lung cancers. Over 250 studies have been carried out on coal. These show a transition from injuries to respiratory impacts ranging from loss of lung function to bronchitis, pneumoconiosis and silicosis. Studies on gold mining reveal mercury intoxication resulting from the extraction process; exposure to silica dusts which leads to lifetime risk of silicosis in 35-47 per cent of gold miners, and long-term risks with some studies indicating increased mortality from lung cancer 20 years after exposure. Studies on uranium, focusing on dusts and radon exposure, suggest that long, low-level exposure is as hazardous as short, intense exposure, with rates of lung cancers two to five times higher for workers exposed to higher levels or longer periods. Evidence also points to possible chromosome damage and reduced testosterone levels.

Size of mines: SSM is associated with higher fatalities. This might be partly due to the fact that SSM tends to be informal, less regulated, and relies more on unskilled and child labour.

Health impacts relate most to injuries and intoxication. Most of the studies on SSM focus on gold mining, many of which reveal between 40 per cent and 70 per cent of workers show mercury intoxication.

Nature of mines: studies of health impacts related to deep mines focus on heating microclimates with resulting heat exposure, hypertension and cardio-vascular problems. Recent work has focused on transport-related pollution. Studies on open cast mines have focused on coal, granite, rock mining and dust exposure, and report evidence of silicosis, oral health hazards and job-specific impacts particularly for drillers, bulldozer operators and drivers. There are, surprisingly, very few studies of noise although it is widely recognised as being a major problem in mining.

Community Health

There are fewer studies available on community health than on occupational health (70 out of 923 studies). The majority focus on fatalities and long-term disability resulting from mining. There is no conclusive scientific evidence as to whether mining is good or bad for community health, contrary to anecdotal accounts of companies or NGOs.

The focus of the studies has mainly been on the impacts of specific minerals and processes of extraction. Direct impacts include contamination of the environment of households or the community environment via extracted products or the mining process.

Studies by Minerals

Gold: more than 15 studies have been carried out, mostly on mercury contamination, and predominantly for small-scale mining. Since the modern 'gold rush' began in the 1980s, 2000 tonnes of mercury have been released into the environment in Latin America. Brazilian studies have focused on the possibility of intoxication via fish consumption. The results are varied, and while they reveal no signs or symptoms of overt mercury intoxication, the levels of fish consumption is of concern, leading to calls for further research. Several other studies have focused on HIV/AIDS particularly in the context of LSM in South Africa.

Asbestos: one review article (Koike, 1992) reports varying results. Mesothelioma has been reported in South Africa, but not in Canada. Results are complicated by asbestos use in the mining areas.

Coal: No significant adverse effects have been found from living near open cast mines, although there is a reported increase in respiratory consultations with GPs.

Copper: A study in Sweden (Bjerre, 1993) found increased blood lead levels in children up to four years of age in copper mining areas. A Peruvian study (Pawson, 2001) found that the nutritional status of children in a community directly associated with mining operations were 'relatively favourable' compared with another community which provided only part-time labour for the mine.

Uranium: In studies of residents living near a uranium mine, who were exposed to low levels of radioactive contamination on a daily basis for many years, the authors concluded that health risks among exposed residents were similar to those among nuclear workers, although other studies do not find this in relation to pregnancy outcomes, (Shields, 1992).
Zinc: Carruthers (1979) found raised blood-cadmium levels and some clinical and biochemical findings (including hypertension and renal tubular damage) indicating toxic effects which could be attributed to the metal.

Smelting: Studies have taken place in USA, Canada, the UK, Mexico, Nicaragua and Scandanavia, and most relate to copper and lead. The focus has been on respiratory illness and cancers for which there are increased risks in those living close to the smelting operations.

Gold amalgamation: There have been 20 studies with varying results. Some report mercury contamination but not always above recognised limits.

Studies on the indirect impacts of mining focus on mental health and the psychosocial context of the migrant labour force who are at greater risk of infectious disease such as HIV/AIDS and TB. Studies of mental health amongst miners and their families after mine closure are northern-based and show elevated levels of depression in disabled mine workers and in their families, although some studies show improved health after mine closure.

Examples of Policy Initiatives

These include:

- *Long-term worker-union-scientist collaborations* focusing on hazard visibility; compensation; improved conditions; and greater transparency;
- *Community initiatives:* international lobbying initiatives for greater responsibility and support for the workers;
- *International agencies:* project-based initiatives for SSM have focused on direct health programmes and indirect impacts on health, as well as legislative change;
- *Major mining company initiatives* have largely focused on HIV programmes in mines but according to NGOs, such programmes have had little impact. Other initiatives include infectious diseases programmes and information programmes.

Conclusions of the Review

- There are few studies of long-term impacts on the health of workers and communities
- or of their perceptions and knowledge;
- Evidence from different studies varies considerably;
- Knowledge of community impacts before and after mining interventions is poor, and there are no studies linking the whole mining and minerals cycle to sustainable development and health.

Ways Forward

There is a need to:

- Develop links between worker and community initiatives;
- Share information transparently;
- Promote sharing between SSM and LSM;
- Link the health of workers and communities to consumer practice and shareholder responsibility;
- Move beyond the traditional occupational health and safety mandate.

Discussion Points

- It was pointed out that the presentation did not devote enough attention to the positive health aspects of some mining projects, such as improved nutrition, health care programmes etc. By bringing employment to communities, mining can, in some cases, help to reduce poverty, which is one of the main causes of low life expectancy in many developing countries.
- Epidemiologists only get involved in assessing the health of a community at a certain point and do not always take the historical context into account, making it difficult to assess with accuracy the effects of mining as against other factors.
- There is little evidence of a multi-disciplinary approach in the studies mentioned. For example, a gender perspective is missing, particularly in the SSM studies. Furthermore, insufficient importance has been placed on the self-perceptions of communities and workers.
- The difficulty of accessing information was acknowledged, especially when most information from South America does not reach scientific journals. In Chile, mining facilities are much better than facilities for workers in other industrial sectors, which is commendable as long as these facilities are sustainable. What if the mine closes? It is difficult to link community and worker health because the insurance systems vary according to whether accidents and health problems are recognised as being occupational problems or not.
- The mining industry has started to improve working conditions, for example by reducing hours and shortening shifts. The effects of this trend are being examined. The industry clearly has a role to play in foreseeing problems and in thinking of solutions.

In reply to the comments, it was acknowledged that the studies undertaken are retrospective (meaning that they need to wait until people are sick and die before they become valuable). If the budget and timeframe for the project had allowed, the review could have used the participatory epidemiology approach, which attempts to look at the validity of industry and community claims. Gender perspectives were not deliberately excluded, but existing studies are mainly based on white men in developed countries, and information on gender, based on comparisons with developing countries, is difficult to find. It was pointed out later by one participant that it is of limited value to extrapolate from industrialised countries to developing countries, where salary levels, workers' rights, social security benefits, the role of

unions and the level of education of workers are so difficult, and have such a bearing on quality of life as a whole.

An International Basis for Improving Safety and Health in Mines

Norman S. Jennings, International Labour Office

This presentation examined the role of the International Labour Office (ILO) in improving the working conditions of those in the mining industry. ILO has worked on mining issues for 15 years, promoting the responsibility of companies towards their workforces. This can only be achieved through commitment from all parties including government, mining companies and workers' unions. The main problem noted by ILO is that there is no legal regulatory framework for safety and health in mines, and existing regulations are not usually enforced. It is hoped that through the MMSD process, the need for sustained action throughout the mining and metals industries to improve occupational safety and health might be highlighted.

The main factors affecting safe behaviour include the design of systems, machinery and equipment; the working environment; and the relationships between enterprise and workers, government and enterprise, unions and government, enterprise and community, and workers and the community.

Seven critical elements were highlighted:

- Technical improvements have led to important changes in health and safety levels in mines.
- The focus has to shift from looking at safety to looking at health.
- Legislation and the role of the regulator need to be emphasised and developed
- Human factors are becoming increasingly important in the mining industry with awareness of core beliefs, ethics etc.
- Risk management and risk assessment have to be understood by the workforce
- Education and training for both management and the workforce are necessary to address this problem.
- SSMs also need to be considered from a community health perspective.

What is needed to tackle these issues are specific strategies for different circumstances, careful data collection and analysis, closer ties between all parties and meaningful social dialogue. The role of ILO is to promote decent work for all (reasonable working hours, reasonable salary, good working conditions, the right to negotiate collectively etc.) through capacity-building. For example, many developing countries and countries in transition need assistance in one or more areas, either generally, or for a specific sector. ILO provides this at all levels, working alone or in conjunction with other agencies, governments or NGOs, and using its own staff or hiring experts. Through research, ILO provides outreach to member

governments, to employers' and workers' organisations, to IGOs, NGOs and civil society, to universities through exchanges and commissioned research, through conferences, publications, the Internet, videos etc. Its strategic objectives are to promote fundamental principles and rights at work, social protection, and social dialogue.

The ILO's work on occupational safety and health is underpinned by a range of instruments, including 31 conventions, 30 recommendations, 34 codes of practice and more than 100 technical publications, as well as a large body of definitions, principles, obligations, duties and rights and technical guidance that reflects the views of labour stakeholders.

Of the 31 conventions, eight are particularly relevant to the mining sector. These deal respectively with workers' rights, Labour Inspection (81, 1947); Working Environment (148, 1977); Occupational Health and Safety (155, 1981); Occupational Health Services (161, 1985); Asbestos (162, 1986); Chemicals (170, 1990); and Safety and Health in Mines (176, 1995). Convention 176, adopted in 1995, and ratified by 17 mining countries, states that the employer shall ensure:

- Adequate training, retraining and instructions;
- Supervision and control on each shift;
- Investigation of all accidents, with remedial action taken and a report made;
- Regular health surveillance of workers;
- Principle employer coordinates safety.

Unlike conventions, codes of practice and handbooks are voluntary and practical. While they are not designed to replace national laws or regulations, or accepted standards, they carry significant weight. Like conventions, they help to provide a framework for action, and a verifiable floor to build on.

Discussion Points

Participants were satisfied with ILO guidelines and codes, which attempt to provide practical guidance that is easy to disseminate and to apply to smaller industries. It was acknowledged that some small companies do not have the resources to set up a health and safety department.

In addition, the importance of independent verification in assessing how safety measures are implemented by companies was also emphasised. Verification cannot be carried out without involving a regulatory authority, government or business. Some participants suggested that voluntary compliance does not get results, but others questioned the adequacy of imposing a regulatory system. There are cases of companies in countries with ineffective regulatory systems which nevertheless behave well, because there are still ways to hold them to account.

In general, participants emphasised that while surveillance and monitoring norms usually exist, capacity to enforce them is weak. For example, in Brazil, some studies conclude that deforestation resulted in mercury contamination, not direct mining activities. Stopping or slowing the rate of deforestation is very hard to control or encourage.

The Role of Government in Addressing Occupational and Community Health

Gustavo Molina, Department of Labor, Santiago, Chile

The total population of Chile in 1999 was over 15 million, 85 per cent of whom live in urban areas, and 45 per cent concentrated in the metropolitan region of Santiago. The per capita income is over US$ 5000, but there is serious inequality in the distribution of wealth. Over 20 per cent of the population live in poverty and 5 per cent in extreme poverty.

Health indicators are among the best in Latin America, with life expectancy of 76 years for those born after 1995. Since 1998 infant mortality is 10 per 1000 live births. The main health problems have shifted from child malnutrition to adult chronic diseases related to quality of life, eating habits and air pollution, traffic accidents, alcohol consumption and working conditions, and the main causes of death for all ages are cardiovascular diseases, cancer and respiratory diseases.

A comprehensive system of insurance against occupational diseases and accidents covers all workers with a contract (60 per cent of the 4.4 million workers), is wholly paid by the employer and provides preventative health care, education, medical care and rehabilitation for all occupation-related illness. It can be administered by the state, by large private organisations called *mutuales*, or by large companies. The system is overseen by the state through the Ministry of Health and Labor, but because of scarce resources and the lack of public health policies, it is poorly managed.

Of close to 80,000 miners in Chile, 60,000 work at the large state concern, Codelco, and the five private mines located in the north, and are covered either by *mutuales* or private insurance. However, small-scale miners normally fall outside the occupational insurance system, and use government hospitals or municipal health centres.

Responsibility for health and safety in Chilean mines falls under four government agencies:

- The Insurance Superintendent Agency (Ministry of Labor) regulates financial and legal aspects of Act 16 744 through its lawyers in Santiago;
- The Labor Inspectorate (Department of Labor) regulates work conditions and contracts with more than 500 inspectors in the country;
- The Department of Occupational Health (Health Department), and occupational health units in the 29 health services set up medical and monitoring programmes to help prevent occupational illnesses and accidents amongst workers in the country;
- The Geology and Mining Service (Ministry of Mining) deals with training and control of mine safety with more than 200 inspectors.

Labour Organisations

The largest, Confederacion Trabajadores del Cobre (CTF), includes workers from the state concern Codelco. Workers from the large private copper mines in northern Chile and the

few remaining coal mines, belong to Confederacion Minera de Chile (CM). The unions belonging to these federations are actively struggling for better wages, though they are much less interested in working conditions. Nevertheless, they are beginning to interact with worker members of the safety committees established by Act 19 744, and are thus dealing with health and safety issues.

Employers' Associations

There are two main employers' associations in the mining sector: The Mining Council which brings together large national and foreign mine operators; and the National Society of Mining, an association of owners of small mines who sell much of their production to large state foundries and refineries.

Negotiations amongst employers and unions are infrequent concerning wages, and are even less so on health and safety issues. Act 16 744 made safety committees between labour and management, and the provision of information on health and safety hazards mandatory. However, these regulations are often violated, and the understanding of most employees of health and safety aspects of their work is very low, particularly in small-scale mining.

While there has been a steady decline in accidents and health problems such as silicosis, deafness due to noise exposure, musculoskeletal disorders due to poor posture and heavy work, exposure to toxic chemicals such as lead, arsenic, mercury and manganese, new health problems have emerged. These can be related to working at high altitudes (3,000m above sea level), and to the current trend for companies to use temporary workers, many of whom live 200 miles or more from the mines. This often involves a twelve-hour journey with shifts of seven days of work followed by seven days off, although some workers might have shifts of 14 days on followed by ten days off. Such working arrangements are associated with a rise in sleep disturbances, digestive problems, musculoskeletal disorders and relationship and family problems.

In mining operations of over 1000 workers, more than 50 per cent are on temporary contracts, and receive inferior treatment, with poorer quality clothing, safety equipment, housing, nutrition and medical care than the company workers. They are often uninsured against occupational diseases or accidents. While temporary work used to be limited to the construction phase of the mining operation or support activities such as restaurant work or cleaning, today there is no clear distinction in the nature of temporary work. The Labour Inspectorate and the Health Department have recently stepped up requirements for employers to have their workers insured under Act 16 744.

Community Health and Mining Facilities

In large mining operations workers live in special residence areas in cities closest to the mines. Their housing conditions, school facilities and access to medical care are better than those of most other Chilean workers and those of small-scale miners. They use the private health systems described above and private medical care is normally provided for their families. In many ways, large-scale mines improve the conditions of communities nearby.

However, air and water pollution and solid waste can be a serious problem if not taken into account in the early stages of mining. Arsenic is present in most copper mines in Chile, together with sulphur dioxide and cyanides in foundries. The main obstacle to dealing with such environmental contamination is the conflict of interest between companies and the local communities. In the last ten years, community organisations with the help of the media, have fought hard for improvements in the local environment.

The Department of Labour, in collaboration with other agencies, has taken a number of steps to address occupational and community health in the mining sector:

- A strict limitation on permits for extended journeys has been imposed, depending on the altitude of the work site and the length of shifts;
- Work to increase knowledge of physical and psychological effects of working at high altitudes, and of making frequent long journeys is being stepped up;
- Efforts are being made to bring working conditions of temporary workers into line with those of permanent staff;
- Epidemiological surveillance systems are being established to protect workers exposed to occupational health and safety hazards;
- The Department is collaborating closely with health authorities to control and prevent environmental hazards.

Health Performance Evaluation within Companies: the Need for Data Uniformity

Dave Barnes, Head of Occupational Health, AngloGold Ltd

Unlike safety, occupational disease has no uniform reporting system in the mining sector. In an aim to prevent occupational disease, benchmarking is needed to determine best practice; occupational exposure limits (OEL) need to be determined and best practice needs to be encouraged. However, the quest for uniformity has been hampered by a series of obstacles:

- *Differences in National Legislation*: ILO's Conventions relating to occupational health and safety are adopted in different ways by national legislators.
- *Low fence differences* (the point of resultant impairment; from no impairment to 100% impairment) between countries, lead to very different actions being taken. For example, in Brazil the ILO classification 1/1 for silicosis results in the worker being removed from work with no compensation, whereas in South Africa, ILO 2/2 leads to compensation, but workers can remain at work. Tuberculosis is compensated in South Africa, but is not considered an occupational disease in other countries.
- *Differences in medical surveillance*. In Australia, regular tests for mine workers are mandatory; in South Africa, initial medical exams and an 'exit' certificate are necessary. In Canada, medical surveillance is not legally required anymore: the state was supposed to carry this out but it was not enforced. The problem is that no medical surveillance means occupational diseases are not visible.

- *What denominators to use for rates*? These vary between rate per hours worked; rate per 100,000 workers; or rate for exposure only (e.g. lead in assay lab). This is particularly problematic for diseases with long latent periods, as they are not immediately visible.
- *The use of mobile workforces* makes it difficult to measure the real impacts of mining activities, and yet, workers on short-term contracts are at higher risk of health hazards than the better-protected permanent staff.
- *No standards in collection of corporate data*. Data between different corporations are not comparable.
- *Occupational disease or injury?* There are currently no standard definitions for disease and injury. For example, deafness might be the result of an injury or alternatively caused by chronic noise exposure. Disease is often defined as the consequence of more than one shift of exposure, but this definition is not adopted across the board.
- *Long latency of occupational disease* makes detection difficult.

Recommendations

1. There needs to be a clear definition of occupational disease: e.g. more than one shift of occupational exposure; and disease included in the ILO list, categorised as follows:
   - Disease caused by agents: chemical, physical or biological
   - Diseases by target systems: respiratory; skin; musculoskeletal;
   - Occupational cancers;
   - Others e.g. miners' nystagmus
2. Low fence definitions need to be agreed, e.g. Silicosis if above ILO 1/1;
3. Impairment should not be necessary for reporting;
4. Causality if link between exposure and disease is more than 30 per cent;
5. No company liability should be implied.

To measure occupational disease impacts, it is important to report the total number of new cases; the amount of lost time; the total days lost; the number of workers permanently relocated, or retired as a consequence of occupational diseases; and the number of deaths resulting from occupational disease. Two sets of measurement are recommended: actual numbers of employees with occupational disease; and the rate per 100,000 employees.

Conclusions

Good progress has been made towards uniformity in accident reporting systems, and similar improvement can be achieved for occupational disease. The International Council for Mining and Metals (ICMM) has put together a health advisory panel to address this issue. MMSD should also support this process.

Discussion Points

In the discussion that followed, participants questioned whether the industry would agree on common parameters for reporting, particularly when legislative frameworks are different

across countries. How can uniformity within companies work without a common regulatory framework?

It was emphasised that this issue has to be considered outside the legislative framework; companies have to agree first and have a common reference. Their main objective is not to change legislation – although this might change accordingly – but to set up common occupational health standards. The rule should be to adhere to the highest standard between national regulations and those of companies.

Participants suggested that if the MMSD process leads to a consensus on the need of data uniformity amongst companies, MMSD could recommend some standards to be developed by, for example, the ILO. Influencing governments with respect to reporting should not be the goal, although this might follow. Companies should not wait for governments to develop standards before developing their own.

HIV/AIDS Impact on Occupational and Community Health

Bethuel Ndubula

The issue of HIV/AIDS has to be set in the context of the cultural taboo in South Africa against open discussion of sex, and the stigma attached to the disease.

In 1985 the Chamber of Mines of South Africa introduced an HIV/AIDS test for foreign workers, and those who were HIV positive were sent back to their countries of origin. Following this, an agreement was signed between the Chamber and the National Union of Mineworkers (NUM) of South Africa to solve the problem of discrimination in testing. NUM's approach was to call for changes allowing miners to stay with their families, and improving awareness of the risks they face in the working environment. In particular, the following recommendations were made:

- To develop housing, thereby improving the living conditions of miners and their families;
- To reduce the number of sex workers in the working environment.
- To inform the mining community of the different risks they face. Ignorance can have huge consequences on behaviour. For example, many mine workers have misunderstood the link between TB and HIV infection, assuming that TB is the cause of HIV/AIDS, and there was therefore little they could do to protect themselves from it. As pointed out in the discussion that followed, the sequence of causality is actually the reverse: people infected with HIV/AIDS are more likely to be exposed to TB because their immune systems are compromised.
- To combine forces in addressing HIV/AIDS, rather than allow the current competition between companies to be seen as the most efficient in tackling the problem.

A number of projects in the area of mining are currently being supported by NUM. These include:

- A project launched by a number of gold mining companies, the provincial government and NUM in collaboration with Family Health International, aimed at fighting sexually transmitted diseases by focusing on high-risk individuals.
- A project funded by the European Union which has found that the STD incidence is higher in townships than within mining communities. An educators programme has also been initiated.
- The power belt project which addresses the primary health needs of the community

Ways Forward to Assist in Health and Safety

Greater responsibility needs to be taken by the mining companies, and health and well-being programmes have to be integrated into a uniform approach, dealing simultaneously with workers and communities.

In the discussion that followed, it was pointed out that in South Africa, HIV/AIDS rates are higher in the general population than within the mining community. This is surprising and highlights that HIV has numerous variables that should all be addressed to tackle the problem.

Community Health: A path Towards Sustainable Development

Roberto Bazzani, International Development Research Centre, Canada

The ECOHEALTH programme of the IDRC aims to improve human health and well-being while simultaneously maintaining healthy ecosystems. The emphasis is on using ecosystem management rather than relying only on health sector interventions. This approach promotes a holistic view of human health and environmental sustainability, and depends on a trans-disciplinary framework and participatory and gender-sensitive methodologies.

In the context of mining activities in the developing world, ECOHEALTH has the following aims:

- To use a holistic model integrating ecological, social and cultural determinants of community health;
- To find sustainable alternatives that promote the health of both humans and the ecosystem, and which depend on the participation of all members of the community;
- To look far beyond occupational hazards;
- To focus on assessing impacts on the general population and on improving community health through better management of the ecosystem;

- To use a multi-stakeholder approach where communities play a central role in building healthier ecosystems, and links are developed between workers and the community, including remote communities.

Morbidity and mortality indicators are usually used to assess health within a population but this is only the apex of the 'pyramid', the final stage of a continuum of health deterioration. There is a need to start at the base of the pyramid, considering early changes in biological, psychological and social parameters which provide information on the well-being of larger populations. It is important to measure the long-term effects of increasing exposure to low levels of pollutants (effects on reproductive, neurological, immune and endocrine systems), but unfortunately, very little literature is devoted to this issue. The challenge is to develop a holistic set of indicators of physical, social and mental well-being, against which the health of the community can be measured.

Community well-being goes beyond classical epidemiology parameters: it is dependent on the well of functioning ecological and social systems. Community health in the framework of sustainable development needs to address an inter-related set of issues far beyond the effects of mining itself. These issues must be identified by all involved stakeholders, and community participation must be ensured from the initial stages of mining operations, using a participatory research approach.

IDRC has supported many projects:

- *Mapping stakeholder concerns in India:* This project mapped the concerns of different stakeholders in government, community and industry sectors, with the aim of identifying areas of common interest. Issues of relevance went far beyond occupational or environmental health, and included the concept of well-being, compensation and land tenure.
- *Mercury exposure in Brazil:* Extraction techniques used in gold mining cause over 130 metric tons of mercury to be spilled annually into the Amazon. Mercury contamination and large-scale destruction of aquatic ecosystems have become the focal point of environmental concerns. Researchers discovered that mining activities actually contributed surprisingly little to the existing global mercury contamination. Instead it could be attributed to the practice of deforestation along the river banks, causing erosion and leaching of mercury naturally present in the soil into the river. The health effects were found to be caused by consumption of contaminated fish. Much of the critical data was uncovered only because of the involvement of the community, and the knowledge gained about local food, fishing and deforestation. In phase II of the project the team will work with communities to find remedial interventions in the context of ecosystem management to halt deforestation and further reduce the intake of mercury to safe levels.
- *Manganese exposure in Mexico:* Since 1953 there has been a notable development of mining activities in the State of Hidalgo, Mexico, the largest manganese producer in the country and the second largest in Latin America. However, increasing concerns have been raised with regard to the ecosystem and human health impacts of this activity. A pilot study, using different biomarkers, showed a statistically significant association between manganese exposure and mental disability. The development of this research proposal

included a broad participatory process involving different stakeholders (community leaders, NGOs, state departments, academics and the mining company involved). The objective of this project are to understand how mining, agriculture, forestry, ranching and socio-economic parameters influence the dynamics of manganese in the environment of the Molango Mining District; to determine the routes of exposure and the relevant social, cultural and economic variables affecting this exposure in the general population; and to assess the manganese dose-response curve (from bio-markers and neuro-psychometric tests), in order to generate sustainable and participatory environment management proposals.

- *Environmental and health impacts of small-scale mining in Ecuador:* This project is investigating pollution generated by approximately 150 small gold refining plants and its impact on the environment and human health in the south-west of Ecuador, in particular in Portovelo and Zaruma, and areas along the basin of the Puyango river. The study, which actively promotes community participation, aims to evaluate not only the local impacts, but also the distant impacts of pollution, about which little is known. A binational project between Ecuador and Peru will use the contaminated river, and therefore it is very important to assess the level of water pollution. Until recently, research has been devoted only to the occupational health aspects of mining, rather than the global, 'ecohealth' aspects.

- *Environmental and social performance indicators in mineral development (Phase II):* This is a collaborative project between the Mining and Energy Research Network of the University of Warwick, UK (Dr Alyson Warhurst); the TERI-Tata Research Institute, Goa, India (Dr Ligia Noronha); and the Instituto Nacional de Estudios Regionales (INER), Universidad de Antioquia, Colombia (Cristina Echervarria). The proposed research builds on research findings of Phase I which covered three areas:
  - the participative development of a conceptual framework for the definition of environmental performance indicators which fully integrate human health and well-being;
  - the identification and validation of a generic set of issues that are of concern to different local stakeholders; and
  - the development of methodological tools to aid the identification of possible performance indicators which communicate to affected stakeholders the extent to which a mineral development project is contributing towards or detracting from their health and well-being.

  The goal of Phase II is to monitor changes in health and well-being at the level of the mining project using the tools developed in Phase I. Over the next two years these tools will be further developed, tested and refined in the Colombian (El Cerrejon) and Indian case studies (Goa Iron mining belt).

Discussion Points

How to Define the Community?

Participants questioned the identity of community. Until this is clarified, and the question of representation addressed, it is difficult for companies, unions or governments to interact with it. Identifying the relevant community actors was seen as very important because, at a local level, communities often lack a voice. NGOs and CBOs who tend to speak on behalf

of communities have their own interests, and furthermore, the sheer variety of communities makes a general definition almost impossible. In South Africa, defining community is complex because gold mines have local communities around them but many of the workers come from neighbouring countries. How does one interact with this larger community, which does not necessarily share the same common cultures or interests, or with the 'temporary' community that is formed around a 'fly in, fly out' mining operation? Where does one draw the line between immediate and remote communities, both of which might be affected by pollution from a mining operation? Following the meeting, one participant wished to highlight the importance of including, in the broadest possible terms, the community beyond the labour force, in discussions of community health and safety. It is often the population surrounding mining operations that suffer most from the negative social and environmental impacts of the mine as they are least protected in terms of adequate national health plans, compensation for appropriated territories and disrupted socio-cultural patterns.

South Africa provides examples of where community is well defined. In some mines tasks are allocated according to the workers' geographical area of origin, on the assumption that certain communities are skilled at particular tasks (Sotos enjoy drilling, Shangas do well work, township boys do administrative stuff). This is not about discrimination but is defined by a cultural environment and is informed by a historical context in which passports defined jobs.

Nevertheless, it was recognised that dealing with communities remains a very difficult task, as they are all different and an approach in one case may not work in another. Any mining project should take the particular needs of the community in question into account at the planning stage of a project. Participants suggested that research should be action-orientated, looking at how to identify emerging community leadership, including marginalised members, and to engage in a capacity building process to ensure the well-being of the community after closure.

Indicators for Assessing Community Health

Community health was raised as an area poorly addressed by companies so far. This is freely acknowledged by companies who point out that, while in occupational health there are codes of practice and indicators – albeit in need of improvement - in community health, there are no agreed indicators. While indicators exist in the social, economic and environmental context, baseline information is required to make these site-specific. They need to be agreed on at the outset of the mining project.

Indicators of community health depend on what is to be achieved. This is difficult for companies to address because they have to measure the requirements of the community at large (e.g. refugee settlements).

It was agreed that the definition of well-being is specific to individual communities, and therefore generic indicators of quality of life should not be imposed on a community. For example, in some parts of Latin America there is little social cohesion. Actors are not

organised and easily identifiable, and each has his/her own agenda. Participants suggested that research should be more focused on community empowerment.
The measurement of community health is new not only for companies but for almost all stakeholders in the mining sector. When measuring occupational health and community health cultural values must be taken into account.

Discussions, chaired by Reg Green

Small-scale Mining Issues

The health and safety aspects of SSM were the main focus of discussion. In Brazil, the task of processing could be more effective for small-scale miners if attention were paid to how much mercury and cyanide are used. There is a general perception amongst workers and managers that the more mercury used in the extraction of gold, the better it is (using mercury is also very cheap). When it was found that the reverse is actually true – that the recovery of gold is better when less mercury is used (e.g. by using retorts instead, which is technically more efficient) – fines for contamination increased astronomically and thus encouraged less mercury use. However, there is a reluctance to use retorts because they are much more expensive, delicate to handle, and are more labour-intensive. This shows while cleaner technologies to decrease toxic exposure and achieve good results are available, they require a social and cultural shift to be accepted.

The point was made that it is difficult to compare the LSM and the SSM sectors, because of the 'illegality' of SSM. However, it leads one to ask to what extent LSM can be used to develop outreach programmes to SSM? This was controversial for some participants who asked whether 30 per cent improvement in the SSM sector would be more profitable than 1 per cent improvement in environmental performance in large operations?

In many countries such as South Africa, SSM is strongly promoted. Mining associations try to facilitate smaller organisations so they can feed information to each other and express their needs, which generally concern education and training.

It was mentioned that SSM is directly linked to poverty; it is a sector that creates jobs. Small-scale miners often turn up to work on the fringes of large mining operations which can play the role of the 'big brother'. There are some good examples of collaboration between LSM and SSM but they are few and far between. It was agreed that focus on health and safety in SSM is important, but should not compromise health and safety improvements in LSM.

Debates were launched around the following questions: Who are the actors in the field of community health? What can be done individually? What should be done collectively? How should existing mechanisms and tools be used?

Financial Incentives for Longer and Unsafe Jobs

Salary is an important factor when talking about safety. In Chile, for example, the salary differential can be a key determinant of the health and safety aspects of the work. On the

one hand, LSM operations owned by the private sector can pay up to $2,000/month, with education and health packages, while smaller mines and public ones pay only $500/month for equivalent work. In the latter situation, it is no surprise to find workers doing long working hours to make a decent income. In most countries in Latin America (apart from Costa Rica and Cuba), education and health care have to be paid for privately. There is also the risk of unemployment.

This point is linked to bonus premiums for unsafe work that workers are ready to accept. In Europe, dangerous work and the associated bonuses were given up after strong union pressure. While union pressure is similarly moving Chile away from such practices, there are still situations where workers are paid for doing dirty or dangerous work. For example, workers can change oven bricks within two days instead of the week it normally takes if they are prepared to be exposed to toxic substances. In South Africa, while workers are discouraged by unions from accepting bonuses, there are reports of such practices. According to some union officials, one message is given at government or management level, but a different message is perceived at the worksite, where productivity is the top priority, and workers are compelled to work hard and for long hours to reach production targets. This is the case in gold mining where safety systems are not in place and profits come before anything else. Workers do not adhere to health and safety standards because they feel they stand in the way of the objectives of management. If the safety reporting system is based on the admonishment model, there will be a tendency to hide accidents. This would also apply to the bonus-for-productivity model. Similarly most hazardous jobs are outsourced, and workers are under pressure not to report accidents.

Nonetheless, it was noted that there are companies who address this issue by making workers ineligible for performance bonuses if safety is not adhered to. In general, while it was noted that considerable effort needs to be made to improve the overall situation, there has been a notable decrease in fatalities in South Africa over the last four years, largely attributable to the team approach.

Developing the Team Approach

Participants discussed how mechanisms, focused research, and the team approach could be adopted internationally? How can lessons learned be implemented and success shared globally?

The group emphasised the importance of building relationships to develop the team approach, which, though difficult, is essential to improving occupational safety and health. An example of this was provided by Chile, where the accident rate has gone down in LSM in both private and public-owned mines, largely as a result of teamwork. In developing countries local authorities are clearly interested in being key partners in discussions leading to the establishment of a possible mining operation: their involvement is a 'certification for operation'. However, it was pointed out following the meeting that the team approach tends to focus on the mining operation itself, and rarely takes the concerns of the broader community into account.

A Need for Transparency and Independence

Two points were stated clearly by participants: one is that there are clear increases in productivity and improvements in health and safety in the mining sector in general; second, there is a need for increasing transparency in the industry in addressing these issues. Transparency and independent evaluation mechanisms should be promoted. Participants thought that the MMSD process, with the involvement and commitment of stakeholders, and with a broad-based advisory group could help in pursuing these objectives. The example of Central and Eastern Europe was given to show that there is still a long way before transparency is accepted as a common fact. A mine was run for two years in Ukraine and killed more than 50 people; however, companies were reluctant to discuss safety because it is cheaper to pay death benefits than to invest in safety.

What Targets to Set?

Targets for improvements in safety and health need to be both meaningful and culturally specific. Furthermore there need to be baseline data so that the targets are measurable.

Meeting productivity targets does not necessarily compromise health and safety standards. Again, the team approach was emphasised as a way of generating key benefits. One of the main objectives for trade unions is to keep health and safety considerations away from competition, and ensure that standards are the same for all.

Finally, participants considered that improving health targets should not only be based on medical concepts. Social contexts are also important to improve safety and health within communities. For example, in the case of malaria, migration plays an important role in the propagation of the disease, and ecological conditions for the development of mosquitoes need to be analysed.

The Problem of Compensation

Participants explained that the compensation system depends on countries. Reparation might be insured through private companies (US, Australia); through the public system or through a combined system. In Canada systematic monitoring does not exist, and only 2 to 5 per cent of people with occupational diseases receive compensation. There is an underlying social context that needs to be addressed.

Recommendations for Moving Forward

In this session participants drew up a list of critical issues for moving forward. However, the objective was not to define a process for moving forward, but to identify points of improvement.

1. To develop constructive relationships based on:
    - Meaningful involvement (beyond engagement)
    - Credibility

- Honesty
- Trust
- Transparency
- Cultural sensitivity
- Recognition
- Validation which should precede agreement
- A multi- and inter-disciplinary approach

2. To define stakeholders and community:
    - Communities cannot be defined specifically because they are highly individual depending on where they are.
    - There is a need to be open about what we mean by 'involved parties'; these must not be restricted to representative stakeholders.
    - From a health's perspective, there is a need to look at workers down the line (e.g. workers who have developed cancer 20 years down the line).

3. To improve occupational and community health:
    - The industry will promote and improve community and worker health and safety.
    - The industry will do no harm – the community will provide net benefit.

4. To recognise years of abuse:
    - To look at reparation of past wrongs in the context of abandoned mines. In terms of community health nothing has been done yet.
    - To reflect on environmental damage still endured by communities today, and to determine how the industry can move on in practice.
    - To take into account community benefits and state benefits.
    - To address environmental damage. However, lack of knowledge on chronic diseases means it is difficult to determine causation, to predict future disease outcomes and to identify how they should be addressed.

5. To take specific and immediate action:
    - To respond to and coordinate better guidelines and codes (e.g. ILO).
    - To better understand health problems and the socio-economic impacts of the industry.
    - To disseminate existing good practices.
    - To develop case studies.

- To inform on MMSD's outcomes. This is the vehicle that could carry the process forward.
- To deal with SSM which is more important than LSM in terms of environmental and occupational health and safety, and the number of people affected. Long-term impacts of LSM should be evaluated more closely. Many studies indicate that permanent exposure to small amounts of toxic substances can have serious impacts, leading to chronic diseases.

6. To look at long-term issues:
    - How to deal with fair trade (e.g. fair trade gold or diamonds, blood diamond issues)?
    - How will consumers look at products with respect to health and safety?
    - How to deal with the behaviour of mining companies in areas of conflict (UN level initiative)?
    - What mechanisms of certification and voluntary initiatives exist to improve health and safety?
    - Where can unions provide best input? Which relationships and questions will unions have to look at? Which institutions/actors will unions look at?
    - Which process/procedure/mechanisms exist for identifying the community that needs to be consulted (who do you speak to? how do you deal with?) and mechanisms for keeping track of long-term health and safety effects
    - What mechanisms exist for capacity building of communities in developing countries?

Annex I. Agenda

8.45 Registration and coffee

9.00 Introduction to MMSD and to the meeting – Luke Danielson and Libby Wood

MORNING SESSIONS – Chair: Reg Green

9.30 Session 1: Worker and community health in the mining sector
A presentation based on a literature review prepared by LSHTM will be made by Carolyn Stephens and Mike Ahern. The presentation will explore health and safety issues, community health and related social impacts, existing initiatives and their effectiveness.

Followed by discussion of findings

10.30 ***Refreshments***

Session 2: Presentations on the experiences and perspectives of different actors of the following:

- positive and negative impacts of mining activities on worker and community health, safety and well being
- current initiatives to reduce the risks and enhance positive impacts
- constraints and opportunities for implementing change
- potential actions

Speaker 1: Norman Jennings, Senior Industrialist, ILO Legal and regulatory framework for progress

Speaker 2: Dave Barnes, Head of Occupational Health, IC*MM*
Health performance evaluation within company: the need for data uniformity

Speaker 3: Gustavo Molina, Head of Work Conditions Unit,
Ministry of Labour in Chile
The role of government in addressing occupational and community health

Speaker 4: Bethuel Ndubula, National Health and Safety Vice Chairperson, National Union of Mineworkers of South Africa
HIV/AIDS impact on occupational and community health

Speaker 5: Roberto Bazzani, Program Officer, Latin America and the Caribbean Regional Office, IDRC
Community health: a path towards sustainable development

Presentations will be followed by discussion

13.00 ***LUNCH***

AFTERNOON SESSIONS – Chair: Reg Green

14.00 Session 3: Open discussion based on previous presentations
Ways forward and the role and responsibilities of different actors will be explored

16.00 ***Refreshments***

16.30 Session 4: Open discussion continued

17.00 Session 5: Conclusions and Ways forward

18.00 Closing remarks

Annex II. List of Participants

Attendee	Organisation	Country
Mike Ahern	London School of Hygiene and Tropical Medicine (LSHTM)	UK
Ben Armstrong	LSHTM: Dept of Public Health and Policy	UK
Dave Barnes	International Council for Mining and Metals (ICMM)	South Africa
Roberto Bazzani	International Development Research Centre (IDRC-CDRI) Canada, Latin America and the Caribbean Regional Office	Uruguay
Adam Biran	LSHTM, Department of Infectious and Tropical Diseases	UK
Sandy Cairncross	LSHTM, Department of Infectious and Tropical Diseases	UK
Luke Danielson	MMSD	UK
Caroline Digby	MMSD	UK
Robert Dover	Universidad de Antioquia	Colombia
Alan Emery	Rio Tinto	UK
Tony Fletcher	LSHTM	UK
Anne-Marie Fleury	MMSD	UK
Gabriela Flores	MMSD	UK
Reg Green	International Federation of Chemical, Energy, Mine and General Workers' Unions (ICEM)	Belgium
Caroline Hunt	LSHTM	UK
Heather Jackson	International Occupational Hygiene Association (IOHA)	UK
Norman Jennings	International Labour Organisation	Switzerland
Andy King	United Steelworkers of America (ICEM)	Canada
Wai Lee Kui	MMSD	UK
Gustavo Molina	Ministry of Labour, Labour Directorate	Chile
Lennox Mekuto	National Union of Mineworkers (NUM)	South Africa
Bethuel Ndubula	National Union of Mineworkers (NUM)	South Africa
Alberto Romero	Empresa Minera Inti Raymi S.A.	Bolivia
Carolyn Stephens	LSHTM	UK
John Stewart	Chamber of Mines of South Africa	South Africa
Jake Werksmann	Federation for International Environmental Law and Development (FIELD)	UK
Kathryn White	Black and White Communications	Canada
Libby Wood	MMSD	UK