Extractive Industries Review
Project Visit to Papua New Guinea

Lihir Gold Mine, Kubutu Petroleum Development Project,
Misima Gold Mine, and Port Moresby, Papua New Guinea

August 2-11, 2002

Extractive Industries Review
Jl. Dukuh Patra V / 52, Guningan, Jakarta, Indonesia T/F: + 62 21 831 0574
2121 Pennsylvania Avenue, NW, Washington DC, USA T: + 1 202 473 6043 F: + 1 202 614 1605
www.eireview.org

OBJECTIVES AND APPROACH

The Extractive Industries Review project visit to Papua New Guinea from August 2-11, 2002, was conducted by the Eminent Person to the Extractive Industries Review (EIR), Dr. Emil Salim, and two EIR consultants, Ms. Mardi Minangsari and Ms. Rini Ariani Sulaiman. The team visited two gold mines, at Lihir and Misima, and one petroleum production project, at Kutubu, with the objective to observe and understand the environmental and social impacts of extractive industry projects in Papua New Guinea and use the information gathered as inputs to the EIR process.

The team visited the project sites on Lihir Island, the Kutubu Oil Field and Misima Island, respectively, where tours of the field operations and processing facilities were provided by the companies involved. The EIR team spent, approximately, forty hours on Lihir Island and the Kutubu Highland, and less than twenty-four hours on Misima Island. The team also visited Port Moresby, the capital of Papua New Guinea, to meet and interview representatives from industry, government agencies, donor agencies, impacted communities, business associations and civil society.

Unfortunately, the team spent limited time on each site, and were not able to interview independent members of the communities, other than the few selected by the relevant companies. The team had little information regarding the main environmental and social issues relating to each project prior to the visit; for example, no prior independent data or monitoring reports were available to verify the impact of the mining and petroleum companies reviewed. Internet research provided additional information, such as documents compiled by civil society organizations. Detailed reports and pertinent data were requested while preparing the report, but were not available.

Currently, the World Bank Group (WBG) is not supporting or funding any mining projects in Papua New Guinea. However, the Lihir Gold Mine received a MIGA insurance guarantee in 1995, which was cancelled in 2001. The Kutubu and Misima projects have never benefited directly from WBG funding, but were selected for the project visit based on ‘Best International Practice’ in project planning and implementation in mitigating social impacts. The Lihir Gold Mine commenced production in 1997, and is expected to continue until 2014. By contrast, mining activity has ceased at Misima and the mine is undergoing closure, due to be completed in two years.

This report presents some background information on each project and describes the environmental and social issues encountered at each site. This is followed by concluding comments and recommendations for future field trips. Details on activities conducted during the trip, and the main contacts from the project sites visited, are listed in the appendices.

LIHIR

Background

Lihir Gold Mine is located on Lihir Island, approximately 900 km north east of Port Moresby, in Papua New Guinea. The Lihir Management Company (LMC), a wholly-owned, subsidiary of Rio Tinto, are responsible for the day-to-day operation of the mine. Exploration in the area began in 1985, with construction commencing in 1995, and the first gold produced in 1997. Lihir Island is 22 km long and 15 km at its widest points, covering a total area of 200 km^2. The mine, and its related infrastructure, occupy approximately 3.6% (about 7 km^2) of the total land area of the island. Operational areas, including the plant and stockpiles, are located along the Luise Harbour shoreline.

Annual rainfall averages around 3.7 m/y and the topography is a rugged terrace system rising from sea level to its highest point, at 600m above sea level. Flat land comprises only 15% of the landmass. Lihir Island is situated within an area of intensive earthquake activity (the Pacific Rim of Fire), and is surrounded by narrow, fringing coral reef, less than 100m wide, beyond which steep submarine slopes descend to a depth of 2,000m, between five and fifteen km offshore.

The operation is an open-cut mine located entirely within an ancient volcano, the Luise Caldera, on the east coast of Lihir Island. It supplies high-grade ore for immediate processing, as well as the low-grade ore that is being stockpiled for future use. The gold is extracted using cyanide, through the carbon-in-pulp process whereby the cyanide/gold mix is precipitated on carbon columns. Mining activity will generate, approximately, 84 million tons of tailings and 300 million tons of waste rock over the seventeen year life of the mine. Open- pit mining is anticipated to continue until 2014.

Waste rock is discharged at least 1km from the shore from bottom opening barges into steep submarine canyons, where the material descends onto the sea floor at a depth ranging from 900m to 2km. The leftover material, tailings, comprises of crushed rock particles, residual solution, cyanide and dissolved metals, and is discharged into the ocean via Deep Sea Tailing Placement (DSTP), or Submarine Tailing Discharge (STD), through an underwater pipeline with a diameter of 1.2m at a depth of 125m. From the outlet of the pipeline, the tailing flows as a dense slurry, mixing with the sediment dumped from the barges as it descends to the ocean floor.

Based on the Environmental Impact Assessment, or Environmental Plan, developed prior to the mining operation, the company implemented an Environmental Management and Monitoring Program (EMMP) covering a range of environmental requirements. The monitoring program is conducted regularly to assess the impact of mine on the marine environment (e.g. water chemistry, biota, coral reefs) and on the island's flora and fauna (e.g. local scrub fowls known as megapodes, turtles and fauna biodiversity) as well as assessing noise levels at various locations close to the mine. LMC asserted they have always remained in compliance with all legal limits imposed on the project.

Prior to the mine operation, the island was relatively isolated from the rest of PNG. Infrastructure and public services to Lihir, and the neighboring islands, were limited. The only source of education was provided by missionaries. Only a few roads were constructed around the island and a small airstrip connected Lihir to the mainland. Presently, the island has a major airport and a ring road connecting villages on the islands, built jointly by LMC and the PNG government. A township outfitted with school and health care services was built for the expatriate staff at Londolovit, formerly a government-owned coconut plantation.

The population of Lihir Island numbered 6,000 before the mining operation, and 11,100 by 2001. This large increase was a result of internal migration as Lihirians returned home, from other parts of PNG, to work in the mine and benefit from the improved infrastructure and services surrounding it. The surrounding villages are located within the narrow coastal terrace, where agricultural activities are conducted. Traditionally, the inhabitants lived on subsistence farming; commercial fishing does not exist, although there is an abundant fish supply. As in other parts of PNG, the land in Lihir is owned by family members belonging to several clan groups. The current processing plant is located to the South of the caldera in an area formerly occupied by villagers from a few hamlets. Prior to construction, LMC relocated 48 landowner families from the designated Special Mining Lease Area to Putput, and other villages around the island. New houses were built at the selected locations.

Observations and Findings at Lihir

Environmental Impacts

Potential negative environmental impacts relating to a mine operation would commonly result from the inappropriate disposal of waste materials that contaminate water, soil and air. The most significant waste issues at the Lihir mine are the stockpiling of lower-grade ore over a long period of time, the ocean disposal of waste rock and contaminated tailings, and the visible sub-surface plumes (suspended sediment).

During the tour of the mine and its operating facilities, the team was able to identify visible harbor plumes for several kilometers within the Luise Harbor, which were a significant environmental and social aesthetic issue. The sub-surface plumes are produced from waste rock dumping and discharges from the outlet of the settling pond which was constructed by the shoreline of Luise Harbor. Monitoring data from 2001 showed elevated sedimentation rates on the reefs close to the mine due to surface run-off from the mining activities, but these were within the limits predicted in the Environmental Plan. LMC's environmental superintendent informed the EIR team that they would be redesigning the settling ponds to reduce, and control, the surface plumes.

The team also saw stockpiles of low-grade ore along the road and shoreline. These are a potential source of acid rock drainage (ARD) and subsequent leaching of heavy metals into the soil, as it will take at least 10 years before gold is recovered from the stockpile, following the closure of the open-pit mine. To prevent ARD from contaminating the soil

and water, the company has covered the stockpiles with polypropylene sheets in addition to covering the settling ponds constructed close to the shoreline. However, without access to any data relating to the stockpile, the team was not able to assess the effectiveness of the cover in reducing ARD, or sediment discharges.

Ocean disposal of mine tailings via Deep Sea Tailing Placement (DSTP) will undoubtedly have short and long-term impacts on the ecology of Luise Harbor. The key environmental issues of unavoidable marine tailings placement being the physical smothering of the ocean floor and development of dilute sub-surface tailing plumes. The marine tailings may also produce other adverse environmental impacts, such as the bio-accumulation of metals and soluble contaminants having a toxic effect on marine biota and fishing resources. The company acknowledged that the ocean disposal system has been smothering organisms living on the deep ocean floor. This issue will be investigated by LMC's environmental section, in consultation with deep-sea experts from the Museum of Victoria, Melbourne, Australia. LMC claims the tailings are deposited on the sea bed at depth between 900 meters and 2 km, well below the productive upper layer of the ocean (known as the euphotic zone). They concluded that the chances of affecting marine life living at that depth was extremely remote.

LMC claimed the decision to use the ocean, rather than land, disposal method took several factors into consideration, based on their social, environmental and economic assessments. These included the shortage of available land for agriculture and housing for the Lihirian community, habitat destruction which would affect plants and animals, the seismic activity of the area, high rainfall, water quality management issues and other economic considerations.

Data on water quality was available in the company literature. According to LMC, the concentrations of silver, aluminum, arsenic, cadmium, copper, chromium, iron, manganese, nickel, lead, zinc, mercury and cyanide, found within the marine mixing zone of Luise Harbour, were monitored periodically and levels found to be so low they could not be quantified. Only arsenic was found at 1.4 parts per billion (ppb), well below the 50 ppb standard imposed by authorities in PNG and the Australian and New Zealand Environmental and Conservation Council (ANZECC). The team was informed that monitoring programs are conducted by external, independent third parties, such as the Australian Commonwealth Industry Research Organization (CSIRO), the James Cook University and Deakin Universities in Australia, and that such studies would be completed sometime in 2002. The PNG Office of the Environment and Conservation (OEC) has been assigned the task of administering and monitoring the EMMP program, but the EIR team did not have an opportunity to meet any officials from the OEC office to verify their role, and responsibility, in monitoring Lihir Mine operations.

Social Impacts

During the site visit, the team visited Putput Village and the town of Londolovit. Interviews with representatives of the landowners association, business associations, the Nimamar Development Authority and LMC's community relations staff, were conducted at LMC's office, in Londolovit.

Prior to the commencement of the mining operation, all community compensation agreements were written in a single document called the Integrated Benefit Package (IBP) which was signed between the National Government, New Ireland Provincial Government, Nimamar Local Government (NLLG), the Lihir Mining Area Landowner's Association (LMALA) and LMC. LMC agreed to provide funds worth US$22 million for the development of the social and technical infrastructure on Lihir Island, with an average annual compensation package, including other payments, of approximately $1 million per year. The compensation agreement is based on four main concerns throughout the life of the mine: destruction, development, security and rehabilitation. The implementation and effectiveness of the agreement is currently being reviewed. The IBP includes compensation for the damage to, and loss of, land, village relocation, royalties for landowners and trust funds, mine closure and funds for future generations for Lihirians. Under the IBP, 20 % of the royalties go to landowners in the Special Mining Area, 30% goes towards Lihirian community development (supposedly administered by Nimamar Development Authority (NDA), a local government body) and 50% goes to the provincial government.

It is apparent that the mine has brought significant contributions to the economic development of Lihir Island. The community of Lihir enjoy better infrastructure, health facilities, and educational opportunities since the development of the mine. The company has contributed over US$10 million over the last five years toward village infrastructures including new housing, provision of water and power supplies, and meeting halls and churches.

The majority of landowners have benefited from rental fees on their lands; indeed, by the end of 2000, a total of US $1.7 million in royalties was paid to landowners. However, "benefit sharing" among members of the clans has not been satisfactory. Some landowners who received proceeds from the compensation fund have failed to share them equitably with their clansmen, therefore failing to improve the collective living standard of the community. As a result, social tensions prevail on the island as major conflicts occasionally occur between the haves and have-nots. There has been a notable increase in alcohol consumption within the community, which has led to an increase in alcohol-related crime and other problems, such as an increase in the breakdown of marriages and traditional relationships. Indeed, reports suggest the erosion of traditional community values, demonstrated by a loss of respect for elders and changes in the customary patterns of mutual support and exchange. The majority of landowners have abandoned farming and their children have lost interest in subsistence farming.

The arrival of workers and job seekers from other regions of PNG has added to the social tensions, placing further demands on the infrastructure, public services and natural resources of the small island. LMC claims it has enforced a strict local hire policy giving preference to suitably qualified Lihirians, followed by the people from New Ireland Province, other Papuans, and expatriates respectively. However, many Lihirians are still not satisfied that this has been fully enforced and claim they should be the primary beneficiary of all mining revenues, infrastructure benefits and employment opportunities.

In 2001, Lihirians accounted for 38% of the total workforce (962), followed by 52% of Papuans from other provinces, and 10% of expatriate workers. Unemployment remains prevalent among locals and newcomers.

Some community members have voiced their concerns over the long-term environmental impact of the mine and the prospects for the sustainable development of the island beyond the life of the mine. In response, LMC has conducted some social monitoring and research to understand the basis of the community's environmental concerns and to develop a culturally appropriate, environmental education program for the community. The current review of the IBP will set the framework for Lihir's sustainable development during, and after, the mine's life. LMC has worked with the community elders, local government (NLLG), the police, and PNG judiciary to address the alcohol-related law and order issues. However, there is a need to break the cycle of corporate dependency since Lihirians have come to expect the company to provide for all their needs.

Landowners have created an umbrella firm, with local shareholders and outside parties, called the Lakaka Group of Companies (LGL) to provide goods and services with the mining company. Members of the small business associations under the umbrella company have been given preference over non-Lihirians firms. Sixty formally, structured businesses, owned and operated by locals, were awarded construction contracts totaling US$50 million by the end of 1996, but this has declined since the construction phase was completed. Contracts issued to the local businesses by LGL in 2001 amounted to $5.4 million.

LMC has set up the Business Development Office (BDO) who support the local SMEs in developing sustainable commercial opportunities by providing interest-free loans. It has assisted 120 local businesses since its introduction. Other businesses, outside the Lakaka Group, have not been satisfied with the limited opportunities provided by LMC.

B. KUTUBU

Background

Papua New Guinea's first oil production commenced in 1992, based on the development of the Kutubu, Moran and Gobe oilfields, located in the vicinity of Lake Kutubu, 2,000m above sea level, in the Southern Highland Province. From the central processing facility in the highlands, the oil is transported via a 266 km pipeline along the Kikori river watershed to the Marine Terminal platform and single point mooring buoy, located in the Gulf of Papua. Crude oil is then transported abroad by supertankers. In the 1990s, Kutubu's production averaged around 100,000 barrels of oil per day, declining to 58,000 barrels per day by 2001. When oil production ceases in 2012, the operator is expected to switch to gas production, provided there is a market for it. Most of the liquid gas coming up from the well is returned to the reservoir via re-injection for future harvest, but a small quantity is used in power generation for the plant and the campsites.

Chevron Niugini Limited (CNGL) manages the operation of the Kutubu Petroleum Project on behalf of a joint venture of several oil companies including: Chevron Niugini, Ampolex PNG, Merlin Pacific Oil, Merlin Mitsubishi, Oilsearch, Orogen Minerals, Merlin Pacific Oil, Southern Highlands Petroleum; Barracuda, Cue PNG Oil, Mountain West Exploration, and the PNG government–owned, Petroleum Resources of Gobe and Esso Highlands.

Prior to production, the joint venture built roads, laid pipeline and installed an industrial infrastructure that includes a base camp for approximately 450 personnel, two other camps for 50 each, and a hospital along the length of the pipeline corridor. Presently, the project employs a total of 539 personnel of which 83% are PNG nationals, 0.9 % American citizens and 19% are from other countries. Employees are flown in and out by chartered flights through the Moro airport located at the north shore of the Lake Kutubu.

The petroleum production and exploration area is surrounded by 2.3 million hectares of the Kikori River Basin, which stretches from the alpine grass highlands and the mangrove wetlands on the coast. With rainfall averages of more than 5000 mm/year, the area encompasses one of the largest remaining tracts of undisturbed tropical rainforest in the Southern Hemisphere. The biodiversity of flora and fauna is impressive, with more than 700 species of birds, 15,000 species of flowering plants, and 300 species of fish found in the area, some of which are endemic species. As required by PNG law, the Environmental Management and Monitoring Plan of the Kutubu Project, was aimed at protecting the sensitive biodiversity of the area.

The Kikori Basin is a home to, approximately, 16,000 inhabitants from 13 language groups living in 88 villages scattered between the two provinces. It was a relatively isolated area, with limited contact from missionaries and the government prior to the oil development. The members of the Foe, Fasoe and Kikori language groups make up the majority of the impacted communities. The cash economy is a recent trend for these rural communities who previously relied on subsistence farming, supplemented by hunting and gathering activities.

Observation and Findings at Kutubu

Environmental Impacts

In 1992, the Kutubu Wildlife Management Authority was founded in collaboration with the Department of Environment and Conservation, landowners and the joint venture company, who, at the time, also declared Kutubu a protected area. The plan stipulated several environmental and social conditions including: the need for a policy of minimal disturbance to the tropical rainforest; the prevention of accidental spills into Lake Kutubu; burial of the pipeline to protect flora and fauna; the re-injection of all produced water into the reservoir; and a 24 hour emergency response plan for oil spills. In addition, the joint venture agreed to conduct regular assessments on the socio-economic, cultural and archaeological impacts of the project.

In 1994, Chevron Niugini initiated an agreement with the World Wildlife Fund for Nature United States of America (WWF-US) and the Office of Environment and Conservation to

develop the Kikori Integrated Development Project (KICDP). This is a collaborative biodiversity protection effort aimed at preserving Papua New Guinea's unique ecology and wildlife while increasing the long-term social and economic benefits through the sustainable development of natural resources. To achieve these goals, KICDP developed programs that encompass biodiversity surveys, raising community awareness through educational activities, management of natural resources, promotion of ecological and socially sensitive community-based enterprises, and eco-tourism. The results of the surveys have confirmed the impressive biodiversity of the area. It has helped identify specific areas of significance and developed community-managed conservation areas. It also helped the landowners to respect and appreciate the environment and manage their natural resources sustainably.

The project was developed in a previously pristine environment with a high biodiversity. Relatively intact tropical rainforest, along Kikori River watershed, has been dissected by 266 km pipeline that pumps oil from the wells to the marine terminal in the Gulf of Papua. However, based on previous biodiversity surveys, the WWF and the joint venture claim no negative impacts were observed of the oil development project. On the contrary, the major environmental threat to the ecosystem is posed by illegal logging activities. Infrastructure roads developed by the joint venture have opened the area to large scale illegal logging activities that will cause extensive damage to the environment and dependent local communities. The joint venture and WWF are collaborating under the Kikori Integrated Conservation and Community Development Project (KICDP) to reduce the threat of this 'open access' by working with local communities on conservation efforts. KICDP is the first collaborative effort. It is a unique and significant attempt at biodiversity protection undertaken by a petroleum consortium and an environmental NGO.

Social Impacts

To mitigate the social impacts of the project, the joint venture established a Community Affairs (CA) section which aims to work with the community on a variety of social issues, including landowner relations, government relations, local business development, land access management and industrial relations. From 2002, all community development initiatives, originally carried out by the CA in the Southern Highland and Gulf Provinces of PNG, are managed by the Community Development Initiatives (CDI) Foundation. Its objective is to facilitate long-term social development beyond the life of petroleum production and to integrate social development with the community outreach efforts of KICDP. CDI envisions fostering communities with a strong sense of self-reliance, who actively participate in the development planning process at the local government level.

Support for capacity building will be provided to all stakeholders through assessments of critical needs and skill training. Although CDI is funded by the joint venture, it is a separate organization with its own staff and facilities to manage programs in health, education, agriculture, rural development, sustainable use of natural resources, and capacity building. CDI's programs are initially targeting rural communities impacted by the petroleum development in the two provinces. It is assisting approximately 115,000 people living in more than 80 villages from the linguo-cultural groups of Faso, Foe,

Samberigi, Kairi (Damu), Ikobi (Kasere, Ikobi Kairi), Prorome (Kibiri), Kerewa (Goaibari) and Hulis.

Since production first started at Kutubu, PNG national, provincial and local governments have received benefits from the project in the form of income tax, duty, equity dividends, royalties, and a special support grant (SSG). Landowners have also benefited directly from land rental compensation, equity dividends and royalties. As in the case of the Lihir project, the benefits of the Kutubu development have not been equally shared amongst locals. Traditional ways of sharing wealth have not been followed and the resulting social divides have created a sharp conflict between the haves and have-nots. There are major disagreements between locals on how the payment of royalties should be shared which has resulted in conflicts between members of different clans in the vicinity of the Kutubu project.

Prior to the petroleum development, access to the area was limited and government services were almost absent. Following the Kutubu development, the government's presence was still not significant due to limited budget and resources. As a result, the government has imparted its role and responsibility for community development to the company.

In general, the communities have reaped some benefits from the new development in the form of improved services and infrastructure, while landowners have benefited directly from cash and non-cash compensations. The community in Kutubu now has access to better water and a power supply, health facilities, roads, and schools. From 1991 to 2001, direct cash benefits to landowners amounted to Kina 158 million and non-cash benefits to Kina 415 million. At the same time, the project has attracted people from other provinces in search of employment and better health and educational facilities. As with the Lihir mine, these newcomers seeking jobs with the company and the benefits of local development, are not welcomed by local communities.

C. MISIMA

Background

Misima Mine is located on Misima Island, within the Louisiade Archipelago, in Milne Bay Province, approximately 600 km east of PNG's capital Port Moresby. The island is 40 km long and 10 km wide at its widest point. The topography varies from rolling hills to steep slopes, with a dividing mountain range that rises to 1,035m above sea level. The Misima mine occupies the South-East end of the island, 7km from Bwagaoia, the District Headquarters. The climate is tropical, with an annual rainfall ranging from 2,6 to 3,1 m and the area is a relatively active seismic zone, with frequent earthquakes.

Placer Dome Asia Pacific manages the mining operation on behalf of Misima Mines Limited (MML). Eighty percent of the company is owned by Placer Dome Incorporated, and the remaining twenty percent by Orogens Limited. The mining operation commenced

in 1989 and has produced 3.37 million ozs of gold and 16,95 oz of silver during the twelve years of the mine's life. Since mining activity ceased, in mid-2001, the plant has been processing stockpiled low-grade ore. It is expected this processing will continue until the last quarter of 2004 and that the final deconstruction of facilities will be completed mid-2005. In the meantime, MML's operation focuses on implementing the approved Mine Closure Plan (2002) in an attempt to achieve the goal of 'leaving behind a better future' for the Misimans.

The mine employed conventional truck and shovel mining methods, supplying high-grade ore to the processing plant and stockpiling low-grade ore for later use. Similar to the Lihir Gold Mine, a conventional carbon in pulp process is used in Misima, whereby the cyanide/gold mix is precipitated on carbon columns. MML is also using the ocean disposal method of Deep Sea Tailing Placement (DSTP) whereby the tailings are treated before being discharged into the sea via a submarine pipeline to an outfall at a depth of 112 m. From the outfall, the tailings travel further down the submarine slope, to be deposited at depths of up to 1,500m within Bwagaoia basin.

A large volume of waste rock has been used to backfill the open pits formed by the mining operation. Only a few remaining pits are currently left as open voids. During the initial mine development, some oxide mine waste was reportedly dumped offshore, although this practice was discontinued in 1994. Waste rock, that could potentially lead to acid rock drainage and leaching of heavy metals into the soil, was selectively placed and encapsulated within engineered land waste rock dumps. Topsoil and oxidized waste rock was either placed directly over as a cover, or placed in stockpiles for future use. The rehabilitation of various open pits and waste dumps began in the mid-1990s.

There were approximately 14,000 inhabitants on Misima in 2001, living in 16 villages located on the coastal areas of the island. Prior to the mining activity, the majority of Misimans were dependent on subsistence farming and trade with neighboring islands. The bulk of their food was home grown, supplemented by occasional game. Some pelagic and reef fishing was practiced by the local community, but no deep-sea or commercial fishing was prevalent. Mining has transformed the community into a consumer economy and many people have discontinued farming as a result.

Observations and Findings at Misima

Environmental Impacts

Misima is the first gold mine to utilize Deep Sea Tailing Placement (DSTP) outside Canada, where the exploration of DSTP as a tailing disposal option was first documented. Environmental assessments and monitoring at Misima are being widely used as role models for other mines in PNG, and the region in general. Over the twelve years of the mining operation, extensive assessments and monitoring have been conducted on water quality, ocean floor sedimentation and marine biota. Sediments measuring less than 1,5m thick are evident in a 20km² area on the slope floor of the basin. A small area of 0.1 km² has tailings 30 to 75m thick and a larger area is covered with thinner deposits (less than

0,1m thick) on the floor of the basin. The deposition has physically smothered the deep ocean benthic biota.

During the tour of the mine, and its operating facilities, the team examined two existing mine pits filled with run-off water, a sediment pond, stockpiles of low-grade ore, rehabilitated dumpsites and a mixing/de-aeration tank where the tailings are diluted prior to being disposed in the ocean. Sub-surface plumes were not visible at the time. The results of independent monitoring reports were not available for the team to review. The PNG government has no specific policy or regulation on DSTP. MML was granted the water-use permit that specifies ambient seawater standards are met at the boundary of the 'mixing zone' (the sub-surface water body at the tailing outfall). This is 1.2 km distant from the mixing/de-aeration tank, to a depth of 70m below the surface of the sea. Within the mixing zone, the concentrations of potential contaminants may exceed the ambient water quality criteria.

Two environmental incidents involving the DSTP have been reported. The first occurred in July 1997 and was caused by a submarine landslide, which broke the pipeline at a depth of 55m. Operations were stopped briefly before the system was replaced in 1998. When they resumed with the approval of the PNG government, a new outfall was used at a depth of 55m. MML stated that there were no significant environmental impacts when the tailings were discharged at this depth. Based on monitoring results, they moved down the slope as a bottom-attached density current and did not rise to the surface of the ocean.

In December 2001, a second incident took place. The mill operators discovered a spilt in the outlet pipe approximately 10m long, at the depth of 14m, around 90m from the shoreline. The escaped tailing formed a density current that flowed along the ocean bottom down into the depths. MML claimed the water quality for cyanide and other metals was within acceptable standards, and the surrounding coral reef and fish life were largely unaffected. After another temporary shut down, the operation continued in the short-term with the tailings system operating in 'reverse'. This meant the tailings were disposed via the seawater inlet line at a depth of 60m instead of 100m. It took three months to repair the damage and the system has since returned to normal operation. MML's water monitoring program found no evidence of significant levels of cyanide in the water column.

As predicted in the environmental plan, the dumping of soft rock wastes into the ocean have elevated turbidity and physically impacted on the fringing coral reef on the South coast of Misima Island. Monitoring results showed three zones impacted by MML's activities: the severe zone, the transitional zones, and the minor zone, that cover 1, 3 and 5 km, respectively, on either side of the mine. A high mortality rate of corals and associated fauna, and a high mortality rate and/or migration of reef-fish, was observed in the severe zone. Impacts on the deep water fish around Misima Island are unknown, since no studies have been conducted to confirm the theory of 'avoidance behavior', the ability of fish to detect and avoid potential contaminants in the water column.

MML adoption of a submarine tailings disposal method can be seen as environmentally responsible considering the physical and social conditions on Misima Island. As seen in the submarine tailings disposal of other mining operations, the re-colonization of the ocean floor, at depths of 1,000 to 1,500m, is expected to occur at slower rate due to the lower temperatures that exist at those depths. Monitoring results have confirmed that the thickest tailing deposits are already colonized by microscopic organisms.

As a part of the mine closure process, MML conducted a semi-quantitative risk assessment to quantify potential hazards, and analyze the possible risk treatment control measures relating to the biophysical and socio-economic components of mine closure. The exercise was directed towards identifying and ranking the high and extreme risks using worst case scenario planning.

Regarding biophysical aspects, the main hazards identified included the physical instability of the dump sites, erosion and sedimentation, geo-chemical stability (acid rock drainage and leaching of heavy metals) and contaminated sites. Regarding socio-economic aspects, the main concerns were associated with the sustainability of utilities (electricity, water, communications), social progress (health, education, law and order), infrastructure (wharf, roads, airstrip), business development, food and sanitation, and the management of trust funds following the closure of the mine.

In preparation for mine closure, MML consulted the local community on the preferred options for final land use, with the aim of establishing a stable, biologically diverse and resilient ecosystem, productive for future generations, either as forest or garden land. As of December 2001, the re-vegetation program of the disturbed area covered approximately 52% of the operational area of the mine.

Social Impacts

MML has undertaken several biophysical and socio-economic studies towards the development and implementation of a sustainable mine closure plan. In 1999, the Sustainable Plan Advisory Committee (SPAC) was formed, followed by the development and publication of a consultation document, Sustainability (Mine Closure) Plan 2000. This document was widely circulated, with inputs from stakeholders, including landowners, community groups, private sector, government, NGOs and aid agencies, being incorporated into the final Mine Closure Plan. Misima Mines Closure Committee (MMCC) was formed in 2001, in partnership with various levels of government and landowner representatives, to integrate the sustainability plan into a comprehensive action plan acceptable to all stakeholders.

During the site visit, the EIR team spent very little time with community representatives. Brief discussions were held with the officials of the Louisiade Local Level Government and with representatives from the landowners association, EMEL Limited, in Bwagaoia. A visit to the Bwagaoia hospital concluded the tour of the Misima community.

Over the years, MML provided Misimans with better infrastructure, health services and educational opportunities. For example, a company-sponsored vaccination program has

been successful in eradicating filariasis, improving life expectancy and the health of babies on Misima and the neighboring islands. All major economic activities on the island were supported and dependent on the mines. Small businesses developed to provide catering services, transport, construction and other services to MML. Additional business development activities, such as the investments of the Kalopu Trust Fund by the landowners association (EMEL Limited), and the Samarai Muruai Agriculture Rehabilitation Center Training (SMART), were established to stimulate economic activity beyond the presence of the mines. In line with the mine closure plan, the workforce was reduced from 800 to 344 employees in 2001. By the end of that year, 86% percent of the workforce were Misimans, 4% other PNG citizens, and 10% expatriates.

From discussions with community representatives, it was apparent to the EIR team that the main concern to the community was the potential decline in the quality and quantity of public services following closure of the mine. Since beginning its operations on the island, MML took responsibility for providing these basic services to the community and a failure to maintain them, for example electricity lines, would cause major disruptions to the water supply, health services, educational facilities, and communications. The cost of diesel generator maintenance would have to be paid for from the limited, or non-existent, local government budget. Alternative sources of funding have been identified, such as the Kalopu and Future Generation Trust Funds, currently valued at K16 million. However, it was reported that the funds are currently held by a court, pending decision on a legal challenge mounted by a group of non-landowners who claim they are entitled to part of the Kalopu trust funds.

The community has considered returning to traditional subsistence farming, in addition to cash crops, to sustain the island's economy. In response to the food security issue on Misima, and other islands in the Samarai Murua District, MML has established the SMART Center for sustainable agriculture and business development, close to Lagua. The program includes training and research into the development of planting materials, such as a hybrid coconut seed garden, cocoa for budwood production, and vanilla. In addition, it is also producing cold-pressed coconut oil and developing the market for various other products. A few Misimans have expressed concern that these sustainable agriculture activities should have been initiated some time ago so the crops would have been ready for harvest by the time the mining company left.

CONCLUSION AND RECOMMENDATIONS

The first EIR project visit to Papua New Guinea identified some of the main environmental, social and economic issues relevant to extractive industry developments. The team was not able to assess the projects in the context of the particular role of the World Bank Group (WBG) in the mining and petroleum sector of Papua New Guinea; none of the projects benefited from direct WBG investment, bar the Lihir gold mine, where MIGA extended an insurance guarantee early in the project cycle, from 1995-2001. Nevertheless, the project visit highlighted the challenges of extracting natural resources in a country of limited governance, of high biodiversity and environmental interest, and with an agrarian-based, largely 'cashless society' at the community level. The Lihir, Kutubu and Misima areas were all relatively isolated and underdeveloped prior to the arrival of the extractive industries. These three sites have since experienced sudden economic growth. Mining and oil projects have had significant social and economic impacts on the national, provincial and local government of Papua New Guinea, however, local communities often felt that they have not benefited from these projects and that they have to put up with the adverse environmental and socio-economic impacts.

Environment

The main environmental issues identified at Lihir and Misima mines were the impacts of ocean disposed rock waste and tailings that, respectively, have damaged the fringing coral reefs and smothered benthic organisms deep on the ocean floor. Environmental and social impacts were taken into consideration when the companies operating the Lihir and Misima mines evaluated the disposal options, on land or in the ocean. For small islands, with limited land resources, ocean disposal was potentially the best option allowing land productivity to be maintained throughout the life of the mine. However, there is uncertainty on the impact to the benthic community on the ocean floor.

In the short term, it is likely that biological production has been significantly reduced due to massive sedimentation on the ocean floor. What is not known, is the extent to which these deposits pose a threat to marine biodiversity in the long-term. Case studies of mining operations utilizing this method, have shown re-colonization of benthic communities following closure. However, the rate of re-colonization is site specific and, therefore, difficult to assess. Long-term monitoring after mine closure is necessary to investigate the recovery of the benthic community on the ocean floor. This disposal method should only be considered if some strict criteria are met. Currently, PNG is lacking specific policy, or regulation, regarding the ocean disposal of mine wastes. All ocean discharges are regulated by water use permit only.

The dumping of soft rock waste into the ocean has elevated turbidity and physically impacted the fringing coral reef on Misima Island. Mild to severe damage to the corals, and associated fauna and flora have been reported as a result. Because of the length of time it takes for coral to recover, a study of the impact of the sedimentation on the reefs is essential post-mine closure. Regulations have to be developed for long-term impacts and acceptable limits of damage to the marine environment. This is especially important in the South-East Asia region, where there is such high coral biodiversity.

At Kutubu, the main environmental issue relating to the petroleum development was the 'open access' the project had generated to a region of pristine tropical rainforest with high biodiversity. Infrastructure roads developed by the joint venture company have opened the area up to large scale illegal logging that will caused extensive damage to the environment and dependent local communities. However, the joint venture has made a positive contribution to conservation by collaborating with the World Wildlife Fund, in an effort to reduce this threat to the environment. They have also established the unique Kikori Integrated Development Project (KICDP) to protect the biodiversity of the area by working with the local communities.

Socio-economic

The sudden shift from a cashless to a consumer economy have had significant impacts on the communities of Lihir, Kutubu and Misima. Several main socio-economic issues, common to the three projects, have been identified during this visit. The benefits of oil and mining projects have not been equitably shared amongst individuals in the local community. Traditional ways of sharing wealth have been ignored and the resulting social disparities have created a sharp conflict amongst the haves and have-nots. Major disagreements have erupted on how royalty payments should be shared and utilized. While compensation funds have led to an increase in consumption, individuals have made little provision for the future, such as investing in their children's education, and collective living standards have not improved.

Huge cash-flows into a cashless economy have also transformed the lifestyle and traditions of the community. Increased in alcohol consumption has exacerbated alcohol-related crime on Lihir, but this problem was not identified in Kutubu or Misima. The three projects have naturally attracted migrants from other provinces in search for employment and better health and education services. The consequent increase in the local population has put additional pressure on the infrastructure and public services. This is especially significant for small islands such as Lihir and Misima, where there is limited land availability. Newcomers are not welcomed by the community, especially if they are better qualified for employment with the extractive industry projects.

Decisions regarding the utilization of project revenues are not transparent. Government funds, which should have been allocated for the development of infrastructure and social services, are often not available for the impacted communities. At all three projects visited by the EIR team, the company has taken over the role and responsibility of the government in providing public services to the communities in these remote areas. This cycle of corporate dependency will be difficult to break once the projects come to a close.

The communities of Lihir, Kutubu and Misima appeared to be very dependent on the extractive industries surrounding them. Since the opening of the mine at Misima, the local community have enjoyed improved infrastructure, health services and educational opportunities as the mine company invested at the local level. If the government does not step in after mine closure, the community will suffer considerably due to the rapid decline in basic services. Misimans are likely to face this difficult issue in the coming years as the

mining operation closes down. The crucial question is, therefore, how the quality of life of local communities can be sustained after mine closure. Presently, communities are bracing themselves for a return to farming for food production and are growing cash crops in anticipation of mine closure. Training on innovative farming techniques, and the cultivation of new cash crops supported by MML, may have come a little too late to benefit Misimans in the short-term. There is a need to encourage alternative sources of income in the early phase of the project cycle to limit the dependency on the mine and sustain the economy post-mine closure.

The closure phase of the Misima mine could provide many valuable lessons in the development of other mining projects, for example, at Lihir. It is essential mine closure is addressed in the project planning stage, along with baseline surveys, and all stakeholders should be clearly identified, and involved. Provincial, district and local level government is necessary to integrate the sustainable development of the area, with the regional development plan.

The EIR team had certain information on the main environmental and social issues regarding each project prior to the site visit. However, independent reports from third parties were not available to verify information presented to the team by the mining and oil companies. Due to limited time at each site in Papua New Guinea, it was not possible to conduct independent interviews with members of the community impacted by the project. For subsequent project visits, the EIR will undertake a more extensive literature review of the projects prior to the trip, including reviewing independent monitoring reports. If possible, more time will be spent at each project site in order to conduct independent interviews with members of the community.

APPENDICES

CONTACTS

Lihir Gold Mine
Mr. Geoff Day
Manager Community & Environment
Lihir Management Company Ltd.
P.O. Box 789
7th Floor Pacific Place
Port Moresby,
Papua New Guinea
Ph: (675) 986-5291
Fax: (675) 986-5293
Email: gmd@lihir.com.pg

KUTUBU Petroleum Development Project
Mr. Dennis Flemming
Manager of Sustainable Development
Chevron Niugini Ltd.
P.O. Box 842
Port Moresby
Papua New Guinea
Ph: 675 322 5513
Fax: 675 322 5566
Email: dflm@chevrontexaco. com

Misima Gold Mine
Mr. Noel Foley
General Manager
Misima Mines Limited
P.O.Box 38
Bwagaoia
Misima Island MBP
Papua New Guinea
Ph: 675-323-1366
Fax: 675-323-1526
Email: noel_foley@placerdome.com

Extractive Industries Review
Project Visit to Papua New Guinea
Agenda
August 2-11, 2002

Friday 02 August

Minangsari Mardi and Ariani Sulaiman traveled from Jakarta to Port Moresby via Singapore and Brisbane.

Saturday 03 August

Arrived in Port Moresby in the afternoon. Overnight at Crowne Plaza Hotel.

Sunday 04 August

Dr. Salim arrived and joined the EIR team in Port Moresby from Tokyo in the morning. The team visited Lihir Gold Ltd. Mine on Lihir Island, New Ireland Province accompanied by Dr. Graeme Hancock, Project Director of World Bank Technical Assistance in Mining Sector for the Department of Mining. The team departed Port Moresby on a scheduled Air Niugini flight at 15:40 and arrived in Lihir at 17:50. Lihir Gold Ltd (LGL) provided accommodation.

Monday 05 August

Visited the mining pit, ore processing, stockpile, drainage system, and disposal sites in the morning accompanied by LMC's project engineer and safety officer. At Putput Environmental Office, Mr. Blair Sands, the Environmental Superintendent presented environmental impact of the mining operation and disposal methods. It was followed by a series of meetings with several LMC managers and local stakeholders. Mr. Geoff Day, Superintendent for Environment, Community and Health Division, and his staff presented their overview of the Community and Environment Dept. We also met with the local stakeholders in the afternoon. Mr. Samison Rapis (Sianios Village) represented the landowner association (the Lihir Mining Area Landowners Association or LMALA. Some members of the Lihir Small Business Association came to discuss their issues and concerns, followed by elected members of the local government authority (Nimamar Local Level Government (NLLG)). Mr. Agustine Tukas the chairman of the Nimamar was also the spokesperson for the group.

Tuesday 06 August

The team departed Lihir for Port Moresby in the morning and met with Mr. Kuma Aua, Secretary for Mining, and Mr Steve Nion, Deputy Secretary, at Crowne Plaza Hotel for lunch. It was followed by a separate meeting with the Secretary for Petroleum and Energy, Mr. Joseph Gabut and senior staff at the Department of Petroleum and Energy office.

During lunch, the team held discussions with Professor Ross Garnaut, Chairman of LMC and professor at the Asia Pacific School of Economics and Management, Australia National University.

At 15:30, the team departed for Kutubu Oil Project (Moro airport). At the airport, Mr. Dennis Flemming, manager of Sustainable Development for Chevron Niugini Ltd, arrived and accompanied the team throughout the site visit. Accommodation was provided at the Ridge Camp, approx. 35 minutes from the airport by bus.

Wednesday 07 August

In the morning, the team visited the Central Production Facility (CPF) which is at the start of a 265km pipeline linking the oilfields and export terminal in the Gulf of Papua. The team was accompanied by Ms. Prima Kapi and James Dawson from Chevron's Community Affairs Department during a visit to Sisibia Village, located in the vicinity of an oil well. Following lunch, Mr. Max Kuduk, Program Director of WWF Kikori Integrated Conservation Development Project, and his staff presented their overview of conservation activities in the region. Subsequently, Mr. Dennis Flemming and his staff presented the Community Development Initiative (CDI) activities that focus on capacity building for the local community and government agencies.

Thursday 08 August

At 07:00, the team departed Kutubu for Port Moresby. On arrival, the team were met by Dr. Graeme Hancock, Mr. Arthur Hood (Vice President of Business and Sustainable Development, Placer Dome Asia Pacific/ Misima Mines Limited (MML) and his staff from the Community Affairs Department. A representative from the Mining Department, who monitors the Mining Closure activity, was also present. The entire party of seven departed on a Placer Niugini charter flight to Misima before noon.

After lunch, Mr. Noel Foley, the General Manager of MML, presented an introduction of the mining operation. Mr. Laurie Martin followed with an overview of the mine closure plan and activities. Dr. Billy Selve preceded with a presentation on Filariasis reasearch and the MML's Mass Drug Administration Program funded by MML. Ms. Tanya Zeriga gave the last presentation on activities related to mine closure and land rehabilitation .

Since mining has ceased, the operation is currently geared towards processing low-grade stockpiles and mine rehabilitation. The team went to see the reconstructed terraces and areas sown with pasture and native trees, and the site of two dams (formerly excavated mine pits).

Friday 09 August

In the morning, the team toured SMART (Samarai-Murua District Agricultural Training Center) in Lagua and the community hospital in Bwagaoia. This was followed by meetings with members of the District Administration (LLG) authority in Bwagaoia and

Landowers Association (Emel)/MSPAC in a church at ----Village. At noon the team departed for Port Moresby.

In Port Moresby, the team met with Mr. Andrew Parker, World Bank Liaison Office and the new Country Manager for PNG, and Mr. Mahesh Sharma at Holiday Inn Hotel where the World Bank activities in PNG were briefly discussed. The new Country Assistance Strategy is being prepared and will be available shortly.

At 15:30, the team met with AusAID Counselors, Mr. Steve Hogg and Dr. Robert Christie, at the Australian High Commissioner's office. They presented an overview of AusAID activities and the donor community in PNG. Australia focuses on funding educational and health programs.

This was followed by a meeting with PNG's NGO representatives at the Indonesian Embassy's meeting room. Ms. Matilda Koma and Philip Ugu from NGO Environmental Watch Group and Mr. Jaru Bisa from PNG Eco Forestry Forum presented a strong letter critical of the field visit conducted by the team.

In the evening, a dinner was organized by Mr. Greg Anderson, Executive Director of PNG Chamber of Mines and Petroleum Council, at the Crowne Plaza Hotel. Twelve members of the chamber, representing industry and the Department of Petroleum, attended the function.

Saturday 10 August

Cancelled departure on Air New Guinea. Overnight stay at the Holiday Inn hotel in Port Moresby

Sunday 11 August

Departed for Jakarta, via Singapore, with Air Niu Guinea and Garuda.