The Ramu Nickel Cobalt Mine—a disaster in the making?

The environmental history of the proposed Ramu Nickel Cobalt mine in Papua New Guinea (PNG) is highly instructive – in regard to PNG policy and also in the way that the global mining industry is presenting Submarine Tailings Disposal (STD) to the governments of many developing countries. In many regards, the refutation of the Ramu STD proposal, (in this case by the NGO community) will set a new precedent, in turn demanding far greater environmental accountability by the mining industry in regard to sea disposal.

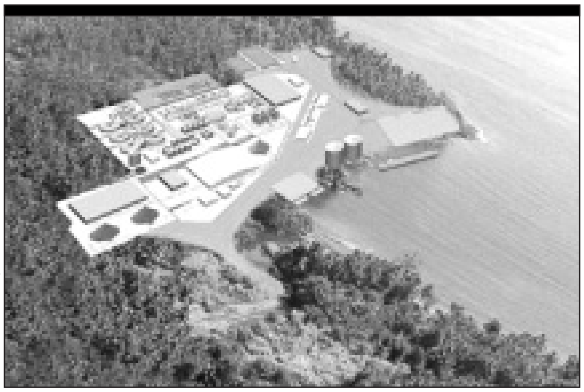

Photo: Natural Systems Research

A virtual image of Highlands Pacific's future plans to turn this paradise into a mine.

Submarine Tailings Disposal, or STD, has recently come into favor in Papua New Guinea where on-land disposal options are problematic. Two mines: Misima Gold Mine (Placer Pacific) in the Milne Bay Archipelago, and Lihir Gold Mine (RTZ), in New Ireland Province, already use this technique. (See: **STD on the Island of Lihr.)** The State of Papua New Guinea is highly dependant on the revenue from mining projects. For this reason the mining sector has traditionally wielded substantial power, and this in turn has had major implications for the acceptance of sub-standard environmental performance.

There are no laws specifically relating to STD in Papua New Guinea. Any discharge into a water body, whether it be a river or the sea, requires a Water Use Permit issued by the Office of Environment and Conservation (OEC) under the Water Resources Act (1982). Such a permit specifies the rate at which material may be discharged into the receiving environment and specifies water quality criteria that must be reached outside a 'mixing zone' specified by OEC.

Ownership of the Ramu Mine

A lateritic nickel deposit was discovered at Kurumbukari, a site, south of the Ramu River, in Madang Province, in the early 1960s. The deposit was owned by a succession of interests before Highlands Gold secured management in 1992. In 1997, Highlands Pacific was established as a new company to manage the Ramu Nickel project with the assets of Highlands Gold on behalf of Ramu Nickel Pty Ltd (wholly owned by Highlands Pacific Ltd) and Nord Australex. In November 1999, Nord sold their share of the project to Highlands Pacific Ltd.

The Ramu Nickel Project, which is expected to cost US$838-million, is now 68.5% owned by Highlands Pacific and 31.5% owned by Orogen Minerals Limited. Highlands Pacific Ltd (HPL) as manager of the Ramu Nickel Joint Venture (RNJV), seeks a joint-venture partner for the development of the Ramu Nickel Project.

Project design

Components of the Ramu Nickel Project include:

- A series of open-cut mine pits and a benefication plant to produce ore slurry at Kurumbukari
- A slurry pipeline approximately 135 km long to transport the ore slurry from the Kurumbukari mine site eastwards to the refinery plant at Basamuk Bay on the Rai Coast
- At Basamuk Bay, a refinery to produce nickel metal and a cobalt salt product using acid pressure leaching technology. An acid plant, a lime plant, a power station, a wharf, a limestone quarry, and an accommodation area will be integral components of the Basamuk refinery complex
- An STD facility at Basamuk Bay for the disposal of **tailings** into the ocean at a depth of 150 m.

Regional concerns with STD

Since 1998, the Ramu Mine has been the subject of considerable controversy in both Papua New Guinea and Australia due to concerns that its STD operation could adversely affect the ecology of Astrolabe Bay. Local people along the Madang coastline are dependant on the ecological health of the region and the wider Astrolabe Bay, which now supports an extensive tuna fishery. For these reasons, the New Guinean National Fisheries Authority wrote in an report that,

"The Ramu Nickel Mine Project is an unsustainable project socially, economically, and environmentally; and cannot be allowed to proceed."[1]

Of particular importance is the unsuitability of Astrolabe Bay for an STD operation, given the dynamic currents that deeply sweep along this coastline. Even in 1998 there was convincing evidence that **upwelling** and other forms of coastal currents had the potential to rapidly bring tailings material into surface waters.[2]

The Environmental Impact Assessment (EIA) process

In September 1999, Highlands Pacific provided the government of Papua New Guinea the *Ramu Nickel Environmental Plan* prepared by Natural Systems Research (NSR) with the aim of securing permits for the project. NSR of Victoria has been involved with the Ramu development since 1981, far longer than any of the mining companies that have worked on the extraction of the nickel deposit. In March 2001, after much local discussion and some controversy, the PNG Office of Environment and Conservation (OEC) approved the Ramu Nickel Environmental plan.

In late 2000, the Evangelical Lutheran Church of Papua New Guinea commissioned the Australia-based Mineral Policy Institute (MPI) to undertake an independent review of aspects of the *Ramu Nickel Environmental Plan*. This was motivated by concerns for the well-being of the Madang community and an underlying desire for both development and environmental protection in Madang Province.

MPI's report examined the potential for ecological damage resulting from the Ramu Nickel Mine's STD system. Through the expert analysis of a team of independent scientists, this document presented an impartial assessment of these risks, considered in the wider context of world-wide experience of STD.

The remainder of this case study focuses upon the findings of this independent report, both in terms of the science of the *Ramu Nickel Environmental Plan* and the motives of its author, Natural Systems Research.

MPI report findings

The primary finding of the MPI Report[3] was that Natural Systems Research (NSR) compiled a well-presented but fatally flawed case for the discharge of mine tailings via a submarine pipe into Astrolabe Bay. The *Ramu Nickel Environmental Plan* (Environmental Plan) attempted to demonstrate that STD was the only option for tailings disposal from Ramu and that it was to the utmost degree environmentally responsible.

NSR wanted readers of the Environmental Plan to believe that tailings would uniformly travel from the STD orifice to the abyssal plains of Vitiaz Strait where they would be safely deposited across 150 km^2 of sea-floor. The Environmental Plan claimed that heavy metals and other toxins would be immobilized by sulphide-producing chemical reactions and diluted by the addition of river sediment. It claimed that the **biota** in the deep-sea floor is biologically poor and therefore unimportant, and that the deep-sea fish fauna is not utilized and would tend to avoid contaminated areas anyway. Lastly, it purported to show that the currents of the region cannot carry the tailings to the surface layers of the ocean—or, for that matter, a long way away from the discharge site. On the basis of NSR's own data, the majority of these claims were either demonstrably false or not supported by their research.

NSR's work on the Environmental Plan was characterized by poor data collection, faulty methodology, selective reporting, misleading diagrams, highly optimistic scenario development, and models that were fatally contradictory. Also, NSR overlooked numerous factors, including some of the field evidence upon which their reports were based. When these factors were accounted for, the risks associated with STD in Astrolabe Bay were significantly increased and included the likelihood of contaminating the local reef system and parts of Astrolabe Bay. Indeed, NSR did not present a convincing scenario for the fate and impact of the tailings material. While it is remotely possible that the discharge of 100-million-tonnes of mine tailings into Astrolabe Bay may have no impact at all, this is exceedingly unlikely. It therefore became apparent that neither NSR nor Highlands Pacific could be certain as to the short– and long-term effects of STD on the ecology of Astrolabe Bay.

The MPI report was able to come to the following conclusions in relation to key subject areas:[4]

The fate of tailings material

A successful STD operation requires that tailings be permanently deposited in a deep-water environment. After deposition, physical oceanographic forces such as **upwelling** or lateral currents must be so slight that tailing fines are not re-suspended or upwelled into the **euphotic zone.**[5] Neither of these conditions exist in Astrolabe Bay.

From the available evidence, it seems likely that the majority of tailings will accumulate in the nearshore canyons and inter-canyon platforms and be transported to the west towards Madang, in the New Guinea Under Current, at about 1 metre per

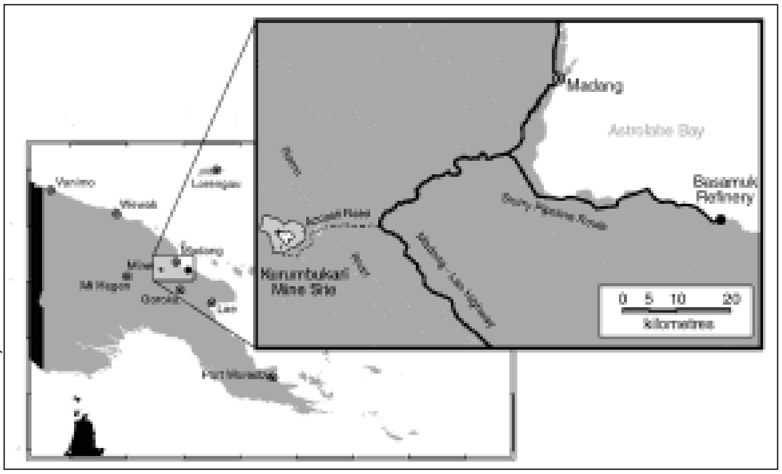

Photo: Natural Systems Research

Map of Madang region

second. A proportion of the tailings will probably be re-suspended and enter the surface levels of the ocean in the vicinity of Basamuk Bay and the wider coastline. An additional quantity will separate from the main tailings flow and form plumes that will travel away from the outfall at the different levels in the water column.[6]

The Environmental Plan contained no useful information on sedimentation rates and sources of sediments in the Vitiaz Basin. The information provided suggested that most of the deep basin sediments are not from the local rivers of Astrolabe or Basamuk Bay. Based upon this, there is little evidence to suggest that mine tailings from the Basamuk Bay tailings outfall would reach the Vitiaz Basin, and there is no evidence whatsoever that natural sediment would dilute tailings, thereby reducing their bulk toxicity.[7]

Of critical importance, NSR's data strongly suggested that upwelling occurs in the vicinity of Basamuk Bay. A substantial current onshore from the depth of the STD outfall has the potential to carry tailings material rapidly to the surface regions of the sea. This upcanyon current, moving *directly onshore* near the seabed at the outfall site was observed by NSR to move at 0.9 cm/sec, or 3/4 km per day but was not commented upon in the Environmental Plan.

If this current brought STD material to the surface, the potential for ecological damage would be greatly increased. Despite this evidence, NSR concluded that upwelling did not occur near Basamuk Bay. This was partly due to their reliance on satellite imagery. Unfortunately the pixel size of these images was too large to observe even if it was upwelling between the outfall site and the coast. Further, their analysis was highly skewed towards the months of the SE Trade winds when upwelling is least likely.[8]

Aside from STD impacts, the dumping of waste rock and soils directly into the coastal bay will probably generate **turbidity** in the surface mixed-layer near shore.[9] This deliberate addition of waste material to the surface-mixed layer of coastal waters is totally unnecessary and environmentally irresponsible.

The toxicity of tailings

The annual addition of five million tonnes of hot tailings-slurry to the 150 m depth zone of the Basamuk Bay slope for over 20 years will create a shelf-edge zone of very unusual seawater chemistry within a radius of about 1km (landward and seaward) of the pipeline orifice. In this mixing zone there will be very high concentrations of ammonia (being oxidized by bacteria to nitrate), sulfate, manganese, and enhanced metal concentrations (nickel, chromium, cobalt, mercury, and cadmium) in the dissolved phase. This turbid water mass will move west or northwest at about one meter per second and will probably be distributed over several of the coastal canyons.[10]

Very high concentrations of ammonia, iron, and manganese will likely occur in the pore water of the tailing plume and seabed deposits. NSR claimed that deposited tailings will be **anoxic** and that metals will be immobilized through their conversion to sulphides. There is no evidence to support this proposition. Some release of all varieties of trace metals in tailings to **oxic** and anoxic pore water and oxic overlying sea-water can be expected. Consequently, **benthic** organisms in the vicinity of the seafloor tailings will accumulate excess metals from tailings pore-water solution and by ingestion of sediment particles.[11]

Biological impacts

As to marine biology, the NSR Environmental Plan suffered from two major problems: a lack of detailed biological assessment of deep-water fauna and a tendency to base evaluations on best-case situations. When the deep-water environment is intended to be the site for the repository and impact of some 100 million-tonnes of tailings, the acquisition of clear, strongly supported, accurate base-line information on deep-water systems is critical. Based on the data in the NSR study, it is not possible to make accurate predictions of the likely effects of toxins that are specific to the Ramu mine project.

Shallow water fisheries:

Sampling of fish in the shallow-water region was very poor, especially for those species that are seasonally abundant, nocturnal, or active predators. For this reason, NSR's shallow-water impact predictions need to be treated with caution. The fish fauna of the shallow waters off Basamuk are largely those characteristic of clear water areas. If sediment levels in coastal waters were to increase substantially, there could well be serious consequences for the fisheries stocks in the area. Given the intention of the developers to dump waste rock and soil directly into Basamuk Bay and the likelihood of upwelling bringing tailings to the surface, significant impacts on the shallow-water fish fauna should be expected.[12]

Deep water fisheries:

NSR's sampling was totally inadequate to represent the deep-water fish community, and as a consequence the fish fauna of Astrolabe and Basamuk Bays remain undescribed. The fact that only 42 fish of 12 species were caught over a total period of 24-hours makes NSR's claim to possess an adequate base-line data set totally ridiculous.[13]

What types of fish live in the area? Do they occur in large numbers? Are there major unidentified deep-water fisheries resources in the area? Is the area an important spawning ground for any species? These are vital questions that remain unanswered.

It is inevitable that tailings plumes will develop along density interfaces, allowing substantial quantities of tailings to separate from the primary flow and spread out horizontally at various depths in the sea. It is also probable that tailings will enter the surface waters through their interaction with shoreward currents, and it is almost certain that deep-sea currents will carry tailings rapidly to the northwest. These scenarios present mechanisms whereby mid-water fish and invertebrates could come into direct contact with tailings material. In the Environmental Plan, NSR made no evaluation of this impact on the fishery or on other marine organisms.

As in many of their reports[14], NSR claims that the impact on the local fisheries will be minimized because fish exhibit 'avoidance behaviour'—they detect pollutants in the water and swim away from them. Supporting these claims the NSR regularly cites a document that they have declined to publicly release.[15] An assessment of the science of 'avoidance behaviour' led the MPI team to conclude that there are no clear data in the scientific literature on the ability of particular species to avoid tailings plumes. Consequently, NSR should have taken a precautionary approach and assumed that fish will come into contact with tailings-plume sediment.

Even the avoidance of tailings plumes may cause ecological problems. Oceanic fish, such as tuna and billfish, are sensitive to turbid waters and actively avoid them. Tuna are a very important commercial species in Papua New Guinea. They are highly migratory, covering large distances, often along predictable migratory routes. Consequently, the potential exists for **turbidity** plumes to disrupt tuna migrations or impact on spawning aggregations or nursery grounds.[16]

As to the poisonous components of the tailings, it is known that ammonia, together with a variety of nitrogenous chemicals and metals in the dissolved and particulate forms, can be acutely and chronically toxic to fish. Estimating the exact concentration of ammonia that will produce toxic effects is difficult, because different species of fish show different tolerance levels. Even at concentrations below those producing acute toxic effects, ammonia can produce sublethal effects, such as reduced growth and gill damage. Sublethal effects, such as reduced growth, have the potential to reduce the health of fish, including their reproductive success and fecundity. Such effects are likely to occur within a kilometer of the tailings outfall and have the potential to occur at much greater distances, depending upon which scenario(s) for tailings dispersion are in operation.

Sea-floor biota:

According to NSR, **benthic** biota is most at risk from the STD operation. NSR predicted that it will be smothered and subject to tailings toxicity over an area of 150 km^2 of Astrolabe Bay. One would therefore expect that this biota was well sampled, especially given that it is one of the few types of deep-water fauna that "can be sampled with anything approaching statistical rigor."[17]

NSR's sampling of the deep-sea floor was extremely poor. Even in the words of the experts used by NSR to identify the collected benthic fauna, the sampling gear used was *"...an inefficient collecting method for benthic invertebrates."*[18] Further, the samples were sieved, resulting in the loss of very small organisms (nematodes, etc.) from the samples. Finally, so little sampling was undertaken that there was no likelihood that the effort could adequately represent the deep-water benthic fauna. In total, only eight sub-samples were taken from five separate samples. Of these only one was taken at a depth greater than 800 m, even though NSR expected most of the sediment to settle at between 1,000 m and 1,600 m water depth.

Taken together, these factors suggest that the conclusions drawn about the benthic fauna of these regions (e.g. that they are biologically poor) and their trophic roles, meaning their place in the food chain (e.g. that they are dominated by deposit-feeding polychaete worms), were without any substantive basis. Further, simply identifying the trophic groups of benthic organisms could shed little light on their role in the food chain, because no attempt was made to sample their potential predators. Consequently, NSR could have no understanding of the composition of the benthic community and no idea of the role of this community in the ecosystem of Astrolabe Bay.[19]

The extent to which sediment-dwelling organisms are at risk from the ingestion of tailings particles remains a concern. As NSR itself admits *"...benthic organisms on the periphery of the depositional zone and recolonising organisms after tailing deposition ceases will be exposed to tailing solids containing elevated concentrations of metals …chromium, nickel and mercury..."*,[20] not to mention extremely high levels of ammonia.

Overall, there remains little doubt that benthic organisms in the vicinity of the seafloor tailings will accumulate excess metals from tailings-pore water solution by ingestion of sediment particles. However the implications of the contamination of sea floor organisms for the health and viability of the local and regional ecosystem remain unknown.

Conclusion

A key deficiency in NSR's work was a refusal to consider uncertainty. The assessment of risk is a vital component of professional environmental-impact assessments. Without fail, NSR entertained only best-case scenarios. NSR consistently ruled out any chance of low-probability events, errors in their data, errors in their predictions, data that does not conform with their low-impact model, or the possibility that parameters important to the success of the STD may change over time. In excess of US$5 million was spent on the Ramu Nickel Environmental Plan. It could be argued that for this sum of money it should have been feasible to carry out a thorough assessment of the STD option, as well as commission a proper assessment of alternatives. These are all activities for which expertise and scientific equipment exist in the Asia-Pacific region.

The Last Word?

As of September 2001, Highlands Pacific is yet to receive sufficient investor support to begin construction of the Ramu Nickel Mine. This is due to several factors: a low global price for nickel, a poor global economic outlook, and the perceived risk associated with mining projects in Papua New Guinea.

This case study is based on text supplied by Philip Shearman, PhD Candidate

1 Quote from the National Fisheries Authority's Recommendations on the Ramu Nickel Mine Environmental Plan submitted to the Department of Environment and Conservation, March 31 1999

2 Environmental risks associated with Submarine Tailings Discharge in Astrolabe Bay, Madang Province, PNG. Mineral Policy Institute, February, 1999.

3 Shearman, P., 2001. A review of risks presented by The Ramu Nickel Project to the ecology of Astrolabe Bay, Papua New Guinea, 2001. Mineral Policy Institute, Sydney.

4 Shearman, P., 2001. op cit.

5 Kline, E. R., 1994. Potential biological consequences of submarine mine-tailings disposal: a literature synthesis. US Dept of the Interior, ORF 36-94.

6 Brunskill, G.J., 2001. Critique of geochemical and sedimentation aspects of the Ramu Nickel Joint Venture Proposal for deep sea tailings disposal in Astrolabe Bay and the Vitiaz Basin, Papua New Guinea. Australian Institute of Marine Science, Townsville, Australia. Report to MPI.

7 Brunskill, G.J., 2001. op. cit.

8 Luick, J.L., 2001. A review of the physical oceanography of Astrolabe Bay and coastal northeast PNG with reference to proposed submarine discharge of mine wastes. National Tidal Facility Australia. Report to MPI.

9 NSR Environmental Consultants (1999). Review of the Coral Reef and Nearshore Environment, Misima Mine PNG, NSR, CR 206/22/v6

10 Brunskill, G.J., 2001. op. cit.

11 Brunskill, G.J., 2001. op. cit.

12 Sheaves, M. 2001. An analysis of the ecology of Astrolabe Bay in relation to the Ramu Nickel Cobalt Mine. School of Marine Biology and Aquaculture, James Cook University, Townsville. Report to MPI.

13 Sheaves, M., 2001. op. cit.

14 See for example NSR's work on Misima and Lihir in PNG, and Gag Island in Indonesia.

15 "Avoidance Behaviour by Fish: A Literature Review". cited by NSR for Placer Pacific. CR 206/15/v3

16 Sheaves, M., 2001. op. cit.

17 Gwyther, D., 1998. Ecological aspects of deepwater submarine tailings placement - a risk weighted perspective. Presented for Dames & Moore, Workshop on Submarine tailings placement, Bandung, Indonesia, 5-6 August, 1988.

18 Ramu Nickel Environmental Plan, 1999. Volume 3, Appendix 3.

19 Sheaves, M., 2001. op. cit.

20 NSR (1999) Ramu Nickel Project, Environmental Plan. Prepared by NSR Environmental Consultants Pty Ltd, Victoria, Australia.

Submarine Tailings Disposal on the Island of Lihir

The Lihir gold mine is in Papua New Guinea—on the island of Lihir, 700 km northeast of Port Moresby. It is majority-owned by Rio Tinto the world's third largest mining company. Production started at Lihir in 1997, and it is expected to operate for 37 years, producing 20 million ounces of gold.[1] Last year, it posted an $80 million profit.[2]

During the life of the mine, 89-million tonnes of cyanide-contaminated **tailings** and 330-million tonnes of waste rock will be dumped into an area of the ocean described as one of the richest in marine bio-diversity on earth.[3]


Photo: S. Divecha

Barge dumping will shift 276 million tons of rock into the ocean

Regina Asiad, a representative of the Lihir village planning committee, says that a few years ago, dugout canoes "overflowing" with fish arrived daily at Lihir's wharf. "Now you might get five or six fish in a boat, or nothing. Strange things happen that we never encountered before. We find dead fish, and sometimes fish we catch taste strange—so people won't eat it. A lot of pigs died after eating stuff on the beach. We wonder about that mine."

"A plume of sediment from the seaside mine extends two kilometres into the Pacific Ocean. Huge piles of rock waste sit on a reclaimed harbour that the local community says was a breeding site for endangered leatherback turtles. A moonscape of orange and grey meets lush tropical rainforest above the mine on the steep slope of an extinct volcano," describes the *Sydney Morning Herald* in April 2002.

Submarine Tailings Disposal at Lihir

The mine disposes of its **tailings** by piping them 125 meters under the sea at Louise Harbour. Waste produced from rock that doesn't contain much gold (overburden) is taken by barge and dumped into the sea near Lihir. Rock containing low amounts of gold is stockpiled in the harbour for later processing.

Both types of waste contain heavy metals, such as copper, arsenic, cadmium, lead, chromium, and mercury all are toxic to fish and to humans. In particular, the STD waste contains 4850 micrograms (µg/l) copper and 1220 µg/l free cyanide.[4] In Papua New Guinea, the standard for these toxic chemicals in seawater is 30µg/l and 10µg/l respectively.

Rio Tinto discharges waste above the standards by designating an area of approximately 2.3 kilometers in a semicircular radius around the dumping area (the outfall). In this area, the PNG government standards will be exceeded. When the waste is discharged from the ship, it is expected to form an upper plume containing mostly dissolved metals and a lower plume with more solid waste.

"Metal-contaminated macroinvertebrates are likely to then form a principal food component in the diet of bottom-dwelling fish, and these fish are also likely to show increased metal uptake via the gut and directly across the gills. Cumulative metals, such as cadmium, lead, mercury and arsenic, may be transferred to higher predatory fish by the processes of biomagnification."[5]

Waste dumped onto the ocean floor smothers marine organisms. Rio Tinto's environment plan claims that no one fishes at depth near Lihir, a claim that is directly contradicted by the local community.

International Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matters

Dumping waste into the sea by barges from Lihir violates several international conventions and treaties set up to prevent the dumping of toxic waste into the ocean.

The London Convention

The International Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matters of 1972, also known as the London Convention, aims to protect the marine environment from all sources of pollution. The London Convention focused on the dumping of various types of waste from artificial structures at, or over, the sea, such as from ships, aircraft, platforms, etc. Its stated aim is to *"... prevent the pollution of the sea by dumping of waste and other matter that is liable to create hazards to human health, to harm living resources and marine life."*[6] Countries that have signed the London Convention include Australia, the USA, the UK, and Papua New Guinea.

The London Convention does not apply to waste dumped into the sea through pipes from land. This form of dumping is excluded—as there are so many other types of piped discharges—such as cooling water, sewage, etc. There are international moves underway currently to manage the impacts on the sea due to waste from land-based sources by the Global Programme of Action for the Protection of the Marine Environment from Land Based Activities (GPA).

In 1996, a protocol was added to the London convention to exclude dumping by Member States. At this time, the Annexes (including lists of materials that cannot be dumped) were also redefined to include industrial waste more generally as: *"waste materials generated by manufacturing or process operations."*[7] Mine tailings are not explicitly mentioned.

Lihir's practice of dumping overburden and waste materials generated by process operations contravenes the provisions of the London Convention against dumping waste from man-made structures into the sea and the Annex defining waste as materials generated by process operations.

According to the Lihir Project Final Environmental Plan created by NSR Consultants, *"Waste rock comprises both barren and mineralised soil and rock. Most of the waste rock is mineralised to some extent but the mineralised portion is neither economically nor technologically recoverable."*[8] It goes on to say, *"Some of the fine material would form a turbid surface plume, particularly during dumping of soft waste,"*[9] and "…even the soft waste will fall rapidly through the water column. However, during dumping the turbulence created by material sliding from the barge into the sea and by the release of entrained air will cause a portion of the fine material to form a surface plume of turbid water." [emphasis added][10]

It was also known that the metals would be dissolved into the surface water, and that the metals will dissolve as they sink to the bottom of the ocean.

"Each time a barge load of acid producing hard waste rock or soft waste is dumped a column shaped halo of acidic waster and filterable metals is expected to form around the descending solids."[11]

South Pacific Treaties and Conventions

International conventions and treaties signed by Pacific countries do not necessarily outlaw STD, but they prohibit the dumping of waste from a barge and/or state principles which the countries may wish to live up to.

For example, PNG and Australia are signatories to the Waigani Convention. Under this convention any country . . . *"which is a Party to the London Convention . . . or the Protocol for the Prevention of Pollution of the South Pacific Region by Dumping, 1986, reaffirms the commitments under those instruments which require it to prohibit dumping of hazardous wastes . . . at sea."*[12] The convention preamble also notes the concern *"about the growing threat to human health and the environment posed by the increasing generation of hazardous wastes and the disposal of such wastes by environmentally unsound methods."*

Other South Pacific treaties which recognise and state the dangers posed to the marine environment by dumping include: the Protocol for the Prevention of Pollution of the South Pacific Region by Dumping—Noumea, November 25, 1986, and Convention for the Protection of the Natural Resources and Environment of the South Pacific Region, Noumea, November 24, 1986.

Export Credit Agencies and Lihir

The Export Finance and Insurance Corporation (EFIC), Australia's export credit agency, provided Lihir with political risk insurance of US$250 million with a number of conditions, including:

"[A]n independent programme to monitor the impacts of the project on the Lihirians (sic) over the period of EFIC's risk insurance."

"Marine communities are monitored before and during operations to ensure that they are not adversely affected by the dumping of waste rocks in the harbour of tailings dispersal in the ocean."

In a July 17, 2001 letter, EFIC stated that it would not provide details of Lihir's monitoring, which had been sent to it by the company, as *"a result of the confidentiality obligations"* it had entered into when it insured the mine.[13] Such confidentiality agreements between government run export credit agencies and private corporations are common.

Other backers of the project include the Union Bank of Switzerland who provided a loan, and the Multilateral Investment Guarantee agency (MIGA), a department of the World Bank, which provided US$76.6 million of political risk insurance. MIGA, based on its own investigations, claims *"the environmental impacts of this project are balanced by the development benefits that are brought to the local community, the province and to the country."*[14]

The U.S. Government export credit agency, called the Overseas Private Investment Corporation (OPIC), refused to provide political risk insurance to Lihir, on environmental grounds. It stated, *"It could not support the project based upon initial concerns about U.S. environmental policy regarding ocean discharge of wastes."*[15]

Lihir Island Impacts

There has been community opposition to the mine since it started. Many people believe that this is likely to increase and that there has been insufficient attention to social impacts.[16] An environmental assessment plan conducted by Kennecott Exploration stated that "male alcohol abuse has already become much more prevalent since exploration activities began with the attendant problems of neglect of gardens and physical abuse of wives."[17]

Clement Nah was moved along with 300 people from the beachside Putput village to make way for the mine and was given a home in the hills nearby. Nah says he puts up with the stench of chemicals, the noise from a generator running 24 hours a day and dust falling over his home. "We did not know any of this was going to happen. I get chest infections and things I never had before. It was so much better in our houses by the sea; that was our life. I wish I never came here." Leonie Kelele, another resident who was forced out, agrees, "Sometimes the smell makes you feel like vomiting. It makes you feel really sick."[18]

Father Clement Taulam of the Lihir Catholic Church spoke publicly about the damage caused by the mine to the people and the island of PNG. He said that the church owned the land that the mine was built on and allowed prospecting and mining to go ahead.

"As a young priest I was here twenty years ago, and at the time we used to go out there with the kids to work the plantations, and the bay used to be a real good one. We had good place spots for fishing over there, to wash and everything. I was surprised when I came here twenty years after with all this development going on," said Father Taulam.

When Taulam returned in 1998 he found that people were scared of their own water sources and that the mine has caused massive social upheaval.

"Some months ago, in August [2000] I believe, there was a leakage in the pipe and some fish were dead and drifted ashore to the island. I was in town at the time and the island people came and talked about it. The people who were responsible didn't speak very much, in fact I was the one who went around the island and told people not to use the sea for a while until we hear further.

"The week after, when I was going around and doing my patrols, people were asking 'Is it safe now to use the sea?' and I kept telling them 'I really don't know—we have to wait.' That incident itself gave me the impression that there were things going on that were not good especially for the lives of the people.

"I do a lot of fishing here, I do bottom fishing, and often when I have caught fish, people have refused to eat it because they are afraid of what may happen, especially with the toxic waste being dumped into the sea."

Social and economic justice issues are also a concern. Gabriel Kondiak heads a committee of islanders that has been negotiating issues of dispute with the mine.

"The mine workers get a small proportion of the wages they would get in Australia and they don't have many of the conditions they should have," says Kondiak.

"The mine has failed to provide the promised business spin-offs. Its benefits go offshore. Most people on Lihir now oppose it. We think it is the next Bougainville."[19]

Written by Simon Divecha for the Mineral Policy Institute.

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