Mine waste war: reputation under fire

BY ALEX HARRIS

AT THE OUTSET let me be clear – I have no vested interest in the outcome of the dispute between Rai Coast landowners versus Metallurgical Corporation of China (through its subsidiary Ramu NiCo Management Limited), Mineral Resources Authority of PNG, the Director of Environment, Department of Environment and Conservation, and the Independent State of PNG.

But this case brings to light a significant issue for the extractive industries worldwide.

For mining, oil and gas companies to be welcome in developing nations, for them not to have the problems they do with landowner lawsuits over environmental devastation or injunctions stopping parts of their projects from proceeding, as in the Ramu case, the most basic of logic suggests waste management and safety practices have to change.

It is not good enough to claim they have changed; it is not enough to present sustainability reports with pretty pictures of smiling indigenous children and rainforests and talk of contributions to the environment and community, while using riverine or marine mine waste disposal.

It is a matter of reputational risk to an entire industry, damaging even those companies who use more responsible and sustainable waste disposal methods.

Reputation is built on trust, relationship, values and on people’s expectations of corporate behaviour. The prettier the pictures, the more damage done.

The Scottish Association for Marine Science (SAMS) produced a report on Deep Sea Tailings Disposal (DSTP) also known as Submarine Tailings Disposal (STD) for the PNG government. It was delivered in May, 2010.

The SAMS report was funded by the European Union’s Mining Sector Support Program (MSSP) with the clear intent of supporting DSTP as a means of mine waste disposal. Its survey was to assess impacts only at Misima and Lihir.

The baseline study at Basamuk Bay (pertaining to the Ramu nickel mine) was added to the brief later.

Do not misunderstand this document.

It was commissioned to help establish guidelines for managing DSTP, to create legitimacy for the mining industry’s use of DSTP, and to attract more mining companies to invest in PNG.

They would do so with the certainty of being able to use this cheapest method of mine waste disposal, thereby making PNG a more attractive investment destination.

The report makes no mention of the range of waste treatments and disposal options available today for coastal mines in mountainous equatorial regions. It only mentions DSTP.
The report specifically describes DSTP as an attractive waste disposal option for a gold plant. Do we take that to mean it is only used in gold mining, or that it should only be used in gold mining?

Astrolabe Bay will soon have both the Ramu nickel-cobalt mine and the Yandera copper mine dumping millions of tonnes of mine waste into the sea every year.

With different mining area geology, extractive processes and metals come different compositions in waste, and potentially different implications in terms of toxicity and impacts on the sea floor and within the sea itself.

None of these is touched upon in the report.

The report starts its analysis with historical environmental assessments of a few closed and current DSTP sites. These are direct quotes from the SAMS report:

**Island Copper, Canada (closed)**  ñ Although impacts were apparent, they were acceptable.

**Kitsault, Canada (closed)**  ñ Accumulated metals in a pattern similar to the sediment chemistry, indicating metals had entered the benthic food chain.

**Black Angel, West Greenland (closed)**  ñ Elevated concentrations of lead and zinc were detected in seaweed, blue mussels, and wolf fish liver and kidneys soon after mine operations began.

Since the mines closure, metal contaminated biota (Mytilus edulis) have been documented up to 35 km from the inner part of Qaamarujuk fjord; benthic foraminifera completely disappeared during mining operations; 10 years later, foraminifera species composition still did not indicate recovery of environmental conditions in the area.

**Minahasa Raya, Indonesia (closed)**  ñ Sediment concentrations of arsenic and mercury exceeded water quality criteria. Arsenic and mercury concentrations were also high in benthic species, and concentrations in fish were suggested to pose and unacceptable risk to humans.

**Atlas Copper, Philippines**  ñ Evidence of elevated sedimentation, metal contamination, reduced coral cover, and surfacing tailings.

**Lihir, PNG**  ñ The material being discharged (at a depth of 128 metres) is a mixture of tailing solids (about 5% clay, 93% silt and 2% fine sand), heavy metals, zinc, copper, cadmium, lead and mercury, together with arsenic at 34 degrees C.

Tailings contain a significant amount of heavy metals with the finer particulate material having higher specific concentrations of metals.

Subsurface plumes vary in thickness from 10 to 200 metres and occur to depths of 700 metres with deposition of tailings found up to 4.4 km north of the discharge point.

The presence and dispersion of subsurface plumes will increase the tailings deposition area from that initially predicted. Tailings are contributing a significant amount of material to the immediate marine environment and as far afield as Masahet Island.

The results show clearly that mine tailings deposition east of Lihir has a significant impact on macrofaunal communities at all three sampled depths.
Misima, PNG – Between 1988 and June 1996, Misima Mine discharged more than 42 M tonnes of tailing via the deep sea tailings pipeline. By May 2004, when the mine closed, a total of 90 M tonnes of tailing had been discharged.

The mine at Misima was the first waste disposal system to use ‘very deep’ tailings disposal, with the deep abyssal plain (1000-1500 m) in Bwagaioa Basin as the target area for its final tailings deposition zone.

Although the bulk of the tailings discharge was predicted to remain as a bottom attached density current until reaching the floor of the Bwagaioa Basin, dilute mid-water plumes did break off from the main current, particularly along areas of strong density discontinuities at depths of 250 to 450 m.

Seismic profiling located the main tailings deposition zone between 950 and 1500 m below sea level, covering an area of approximately 20 km². The thickness of the tailings deposited within this area ranges from 1.5 to 75 m deep.

Residual quantities of cyanide were present in the tailing effluent. Before being released into the sea the tailings were diluted to reduce the concentration of residual cyanide and other contaminants to a level acceptable for deep ocean discharge.

Following dilution, cyanide concentrations in the tailings still remained higher than Papua New Guinea’s water quality criteria for seawater. Consequently, Placer Dome was granted a very large area in the sea around the outfall of the pipe, the mixing zone, within which concentrations of cyanide and other chemicals exceeded the water quality criteria.

The mixing zone extended 42 m above the pipe terminus (pipe at depth of 112 m), and 488 m below the pipe. The mixing zone was about 2.5 km wide at the top, tapering down to about a km wide at the bottom.

The Scottish report states that, for DSTP to be considered an option, ‘there must be very little or no risk at the site of impacting amounts of tailings up-welling back into shallow water.

The Coffey Environmental Plan for the Ramu project states that the Bismarck Sea has no upwelling. This is in fact a serious error of fact.

Upwelling in precisely the area intended for dumping has been scientifically documented, as has the undersea seismic activity of this area, and the very fast stratified currents, including the Pacific Equatorial Undercurrent.

Scottish Association for Marine Science (SAMS) report [page 17, Principal environmental issues related to DSTP] quoted in full:

The over-riding impact of deep-sea tailings discharges involves alteration of the physical environment due to the volume of waste material that is discharged, which smothers benthic organisms residing within the trajectory of the tailings density plume and inhabiting the final deposition area.

This is particularly significant for sessile benthic organisms and organisms that move too slowly to escape being smothered. The extent of this impact can be difficult to predict given the lack of knowledge on specific marine benthic organisms.

Secondary effects relate to the toxicity of both particulate metals and metals released from the tailings solids, and the effects of residual process chemicals in the
tailing waste, which may result in acute or chronic effects on the organisms exposed.

Depending on the nature of the deposited tailings waste, the deposition footprint is likely to represent a very different habitat compared to the adjacent un-impacted seabed. Changes in grain size may affect both burrow dwellers and deposit feeders. A reduction in the particulate organic matter content will also reduce the general nutritional value of the solids material.

Overall, the following benthic impacts are likely:
- Alteration of the physical environment (smothering of the benthos).
- Changes in species composition/abundance and biodiversity.
- Increased metal bioaccumulation.

Given this report was intended to support DSTP projects in PNG (and it does indeed attempt to do so at various points) there are perhaps some very good reasons why the government has seen fit not to make it widely available.

I wonder, is the SAMS report included as defence evidence in the Ramu case?

There is a very simple and quick resolution to this case. The mining company could commit to a sustainable land-based tailings disposal method.

One would think MCC’s Australian joint venture partner in this project, Highlands Pacific (ASX:HIG) would have the sense to insist it do so and move on, given the reported delays and cost over runs (although these reported delays and cost over runs claimed in court documents are not so claimed to the Hong Kong and Australian securities exchanges by either party).

A quick glance at the public response in Australia to the revelations this month of Lihir’s use of DSTP should be warning enough.

The intimidation tactics and game playing leading up to this court case have already sullied the reputations of MCC, Highlands Pacific, and the Australian lawyers, up to their elbows in fighting this case with a win at any cost philosophy to the detriment of the local community.

Of significance to the ongoing discussion on PNG Attitude with regard to DSTP is the fact that the majority of current DSTP sites are in the Pacific region (PNG, Indonesia, Philippines) and almost all relied on the one Australian environmental consultant, NSR (now Coffey Natural Systems), to provide their environmental plans.

This same company has also provided the environmental plans for Ramu and Marengo.

There are many other highly credentialed international and Australian environmental consultants available. I wonder if these other companies would find fault in the methodology, processes, and scientific rigor of the NSR/Coffey Natural Systems DSTP environmental plans, or if they would agree?

It should also be noted that the Australian Best Practice Environmental Management in Mining Modules – the industry handbooks on mining for Australian companies – do not include marine tailings placement as a waste disposal methodology.

Australia does not have the mountainous landscape with high levels of seismic activity and rainfall of PNG the supporting reason to use DSTP in the first place but there are many examples of mines in equatorial mountainous areas that successfully manage tailings disposal without DSTP, including nickel laterite mines.
The London Convention on the prevention of Marine Pollution by Dumping is focused on the dumping of waste by vessels at sea, not (yet) land-based activities such as mining.

However, the World Bank’s Extractive Industries Review completed 2004 recommended changes to resources companies environmental practices, including:

Ban the use of riverine tailings and suspend all support for projects with submarine tailings pending outcome of independent studies.

Develop tailings criteria and should revise its cyanide guidelines to be more consistent with UN, EU guidelines and minimize support for mines using toxins, like cyanide, and promote safer substitutes.

The World Bank did not adopt all the recommendations of this review.

If the mining industry were serious about sustainability; if companies like Rio Tinto were as committed to environmental protection as they claim, the mining industry itself would put an immediate stop to the use of riverine and submarine/deep sea tailings disposal.

The report upon which the industry relies to justify DSTP (Ellis et al. 1994) is a tad out of date with regard to knowledge of life on the sea floor, at depth, at seamounts and canyons.

There is one company that states implicitly it does not and will not use riverine or submarine tailings disposal at any of its projects anywhere.

That company is BHP Billiton. It is rather foolish of an entire industry to ignore the history of why that is, don’t you think?

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Alex was born in Papua New Guinea and lived there until she was a late teenager. She has long experience, continuing to the present, with the resources and extractive industry.