

# Mining in Canada: The Bigger Picture

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Catherine Coumans Ph.D., MiningWatch Canada

Maligayang pagdating sa Canada sa inyong lahat !

I am sure you have learned a lot about the mines you have visited, I will put some of that information into a broader context of mining issues in Canada and discuss how these issues may be of concern to you in the Philippines. I will focus in this presentation on the following main issues:

- ❖ Dealing with mine waste – The problem, Submarine Tailings Disposal, Canadian regulations
- ❖ Dealing with mine closure – Abandoned mines; Never a sustainable closure of a producing mine
- ❖ Indigenous issues and mining – Flawed Impact and Benefit Agreements

## ❖ Dealing with Mine Waste

**Statistics on mine waste volume:**

- The Canadian government has estimated that the Canadian mineral industry creates 1 million tonnes of waste rock, and 950,000 tonnes of tailings per day<sup>1</sup>
- This amounts to 650 million tonnes of mine waste per year.<sup>2</sup>
- This is more than 20 times the amount of municipal solid waste generated by all homes, industries, commercial properties, and institutions in Canada combined.<sup>3</sup>

**Acid Mine Drainage** – The problem with this huge volume of waste is that virtually all mines in Canada produce waste that is acid generating (Acid Mine Drainage). Sulphides in the waste rock and tailings oxidize when they are exposed to air and then produce acidic runoff when they are exposed to water. This acid drainage commonly leaches out environmentally toxic levels of heavy metals that are naturally occurring in the mine waste (mercury, lead, arsenic, copper etc.). Both the acid and metal levels associated with Acid Mine Drainage are considered environmentally toxic. In 1993, Canada had an estimated total 1.8 billion tonnes of sulphide tailings with the potential to cause Acid Mine Drainage.<sup>4</sup> This amount of sulphide tailings will be higher now.

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<sup>1</sup> Government of Canada. The State of Canada's Environment, Ottawa: Minister of Supply and Services, 1991, pp.11-19.

<sup>2</sup> Ibid.

<sup>3</sup> “Looking Beneath the Surface: An Assessment of the Value of Public Support for the Metal Mining Industry in Canada” by Mark Winfield, Catherine Coumans, Joan Kuyek, François Meloche, Amy Taylor. October 2002, p. 3.

<sup>4</sup> G. Feasby and R.K. Jones, Report on the results of a workshop on Mine Reclamation – Toronto, Ontario, March 10-11, 1994. (Ottawa, Natural Resources Canada, 1994). p. 10.

**NOTE:** Consultants for the Ekati mine you visited predicted there was no potential for Acid Mine Drainage at Ekati. As you likely know now, Acid Mine Drainage has been detected flowing from the base of the kimberlite dumps.<sup>5</sup>

**Perpetual Care and Maintenance** – Once Acid Mine Drainage has started, it cannot be stopped. The process can literally go on for thousands of years. This means that for virtually every producing mine in Canada, we are looking at a typical mine life of only some 15- 20 years, while maintenance of waste impoundments and treatment of acid mine drainage will likely go on “in perpetuity” (forever). Non-acidic toxic metal leaching in mine effluent is also a major, but still under recognized problem. A toxic level of metals can leach out in mine effluent (fluids) even at neutral pH and also in alkaline mine effluent.

- Who will take care of perpetual impoundment maintenance and treatment of toxic effluent forever?
- Who will pay for this perpetual impoundment maintenance and treatment of toxic effluent forever?

These are questions that we have not yet answered in Canada.

As we will see in the next section, most mines in Canada now are abandoned mines where the tax payer will end up paying for the reclamation and possible perpetual treatment costs. There are no guarantees that currently active mines will not one day become the financial burden of the tax payer.

*Any mine that needs perpetual care and maintenance after production ends is NOT successfully closed and is NOT “sustainable”.*

**NOTE:** While you were in Vancouver, you were very near the abandoned Britannia Mine – which you did not visit. The Britannia Mine is known as one of the worst point sources of metals pollution in North America. Every day some 50 million litres of metals and acidic water flows from the site into the sea at Howe Sound where aquatic life is severely impacted. The Government of British Columbia will end up paying at least 30-45 million dollars for the clean up of this mine.

**Submarine Tailings Disposal** – One way the Canadian mining industry would like to “solve” the problem of Acid Mine Drainage, and “dissolve” its own responsibility for perpetual care and maintenance of tailings, is by dumping mine waste into the sea (Submarine Tailings Disposal) in Canada and especially in island nations like the Philippines.

**Some facts on Submarine Tailings Disposal (STD) and Canadian Regulations that Ban STD:**

- Submarine Tailings Disposal is effectively banned in Canada as a result of provisions under Canada’s Fisheries Act (section 36) and the Metal Mining Effluent Regulations (MMERs) that prohibit the release of mine effluent (liquid waste) into waters “frequented by fish” when that effluent is considered “deleterious” (harmful) to fish. This includes any effluent that contains more than a monthly average of 15 mg/l of Total Suspended Solids (TSS). As tailings contain on the order of 200,000 – 600,000 mg/l TSS, STD is effectively banned.<sup>6</sup>

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<sup>5</sup> Submission to Environment Canada, Analysis of the “Environmental Review of the Diamond Mining Sector” From MiningWatch Canada. July 18, 2003

<sup>6</sup> Coumans, Catherine. 2002. “Canadian Legislation on Submarine Tailings Disposal” in STD Toolkit. MiningWatch Canada and Project Underground.

- Island Copper Mine started in 1971 and was the first mine in the world to use STD. As the mine was already in operation before the first version of the MMERs were enacted in 1977, Island Copper was allowed to keep operating.<sup>7</sup>
- There has only been one exemption to the effective ban on STD. In 1979 the Canadian government enacted the Alice Arm Tailings Deposition Regulations, which allowed the Kitsault Mine in British Columbia to discharge unconfined tailings into the sea. This decision caused a national controversy and raised difficulties for the government of the day.<sup>8</sup> The Kitsault Mine operated for a year and closed in 1982. Environment Canada has since revoked the Alice Arm Tailings Deposition Regulations. There have been no other exemptions to the effective ban on STD in Canada in more than 20 years – although the industry has continued to push for exemptions.

### **Some Facts on the Island Copper Mine<sup>9</sup>:**

In 1996, Environment Canada hired Golder Associates to do an assessment of the impact of Submarine Tailings Disposal at the Island Copper Mine. For quotes from the Golder report see **Appendix A**. The following is a summary of findings from the Golder report and other Environment Canada sources.

- No baseline studies were conducted regarding marine flora and fauna prior to the disposal. Bioassay tests of effluents from a pilot plant were conducted.
- Tailings spread much more widely and covered a much larger area of the sea bottom than was predicted by mathematical models prior to deposition.
- There was a much greater level of turbidity at all sea levels than predicted.
- The habitat of the sea bottom was changed from rocky substrate to soft bottom sediment displacing original macroinvertebrates such as prawns. Benthic smothering occurred over a large area of the sea bottom. Colonization of the tailings post mining has been slow and has resulted in a loss of biodiversity and a change in the species that inhabit the sea bottom in the area of the tailings.
- Data on bioaccumulation is incomplete as tissue metals monitoring was inadequate. Nonetheless, arsenic levels exceeding Canadian Food and Drug Act (FDA) levels were reported for *Humilaria kenerlyi* (deep water clam), butter clam, prawn, and Dungeness crab. Increases in the levels of copper in local mussels was also observed.<sup>10</sup>

It is important to realize that the problems that occurred at Island Copper are typical of STD systems. Even STD systems that dispose at greater depths encounter many of the same problems encountered at Island Copper.<sup>11</sup> Specifically deep sea disposal systems cause: benthic smothering (smothering of creatures on the sea floor), turbidity at various sea levels as a result of plume shearing and pipe breaks, the potential for wider than predicted spread of tailings in the sea as a result of ocean currents, upwelling, tsunamis or earthquakes at sea, and the potential for bioaccumulation in marine species through ingestion of tailings, metal leaching and vertical migration of species through various ocean layers

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<sup>7</sup> Ibid.

<sup>8</sup> Ibid.; Letter from Patrick Finlay, Chief Mining, Minerals and Metals Division to Congressman Edmundo O. Reyes, Jr. May 21, 1999.

<sup>9</sup> Report on Assessment of Metal Mine Submarine Tailings Discharge to Marine Environments. Golder Associates Ltd. April 4, 1996. Report submitted to Environment Canada, Environmental Protection Branch; Marshall, I.B. 1982. Mining, Land Use and the Environment. Environment Canada. Page 181.

<sup>10</sup> Ibid.

<sup>11</sup> Coumans, Catherine. 2002. “The Case Against Submarine Tailings Disposal” in Mining Environmental Management. A publication of the Mining Journal.

## **Differences between Canada and the Philippines:**

As you have undoubtedly noticed in your travels, Canada has a huge land mass. While the massive production of mine waste by the mining industry is a problem in Canada, it will be an even greater problem in the Philippines where land is needed for people and food production. The mining industry sees the solution to its waste production problem in dumping waste into the sea. But Filipinos need to weigh carefully the long term value of a healthy marine ecosystem for the future of the Philippines, against the short term benefits of a 15-20 year mine.

## **❖ Dealing with Mine Closure**

### **Some Facts About Mine Closure in Canada:**

- There are more than 10,000 abandoned mines in Canada. This means mines where there is no longer an owner who will take responsibility for reclamation and mine closure.<sup>12</sup>
- Estimates of the cost of clean up of these mines, just to the federal government, is 1 billion dollars.<sup>13</sup> This does not include the clean up costs that will be borne by provincial governments.
- In 1994 the Mining Association of Canada has estimated the total cost of abandoned mine reclamation in Canada at 6 billion dollars.<sup>14</sup>

### **There Has Never Been a Successful, Sustainable, Closure of a Producing Mine in Canada**

In a successful, sustainable, closure of a formerly producing mine, the owners must, minimally:

- remove all buildings and structures
- ensure public safety at the site
- ensure the stability of tailings and waste impoundments so that no ground or surface water will be affected post-closure
- leave behind a site that requires no perpetual care and maintenance

Under these minimal conditions, we have not yet had a successful closure of a producing mine in Canada. In this description I am not addressing the fact that mine owners who will leave behind a non-sustainable site should guarantee, and put up sufficient funds, in the form of a realizable bond, for care and maintenance in perpetuity! Some provinces are starting to try to close abandoned mines now. But the costs, for perhaps hundreds of years in some cases, will be primarily borne by the public, by taxpayers.

### **Giant Mine in Yellowknife**

While you were in Yellowknife, it is too bad you were not taken to see the Giant Mine in that town. The Giant Mine started mining gold in 1948. In 1992 the most recent owner went bankrupt and the federal government became responsible for the property. There are very serious arsenic problems at the mine. About 220 million tonnes of highly poisonous arsenic trioxide (a minute amount will kill a person) is buried underground (there is enough arsenic trioxide there to kill the entire population of the

<sup>12</sup> MacKasey, W.O. 2000. *Abandoned Mines in Canada*. WOM Geological Associates Inc. Sudbury, Ontario.

<sup>13</sup> MiningWatch Canada. 2000. *Mining's Toxic Orphans: A plan for action on federal contaminated and unsafe mine sites*. Ottawa.

<sup>14</sup> Ibid.

earth) and threatens ground and surface water for kilometres around the mine. There is also arsenic in the tailings from the mine in concentrations of some 4,800 ppm.<sup>15</sup> Surface water in Kam Lake contains up to 1,570 ppm of arsenic while Canadian drinking water standards set a limit of 25 ppm.<sup>16</sup> The Canadian government expects to pay between 50 million and 400 million dollars, just to deal with the arsenic trioxide that is underground, and most of the solutions on the table will require ongoing care and maintenance .

### **Considerations for the Philippines**

- What are the closure requirements under Philippine Law?
- Has there ever been a successful, sustainable, closure of a mine in the Philippines?
- How can the Filipino people pay for abandoned and toxic mines when the Canadian government cannot even find the funds for this work in Canada?
- The United States Geological Survey estimate the costs of reclamation of the mess in Marinduque that Placer Dome left behind at \$60-100 million US. Who will pay for that?<sup>17</sup>

### **❖ Indigenous issues and Mining in Canada**

*“Aboriginal people across Canada and around the world are witnessing an incredible change on their lands. Mining and related activities, forestry and hydroelectric development are just a few of the changes that we have seen, but they are among the most destructive.”<sup>18</sup>*

*“Treaties don’t stop people from coming on our land to look for resources. What if we don’t want a mine at all? The mining company says it’s their right to make money. It’s our right to make protests and blockades.”*

It is estimated that 60% of all mining in Canada takes place on Aboriginal land. In many cases, Canada’s Aboriginal people have been hardest hit by the social and environmental impacts of mining. Land claims, environmental assessment and impact-benefit agreements have been inadequate to date in addressing the impacts on Aboriginal communities.<sup>19</sup>

*“In our community we are identifying the abandoned mines now for the sake of our future generations, so they will know where the pollution is and where not to drink the water.”*

### **Some of the Problems with Impact and Benefit Agreements (IBAs)**

- In all but one case, mining companies are insisting that the conditions of the IBA remain secret. This does not allow broad scrutiny of the agreement in advance for its fairness, or, after the

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<sup>15</sup> “Looking Beneath the Surface: An Assessment of the Value of Public Support for the Metal Mining Industry in Canada” by Mark Winfield, Catherine Coumans, Joan Kuyek, François Meloche, Amy Taylor. Oct. 2002, p.3, p. 98.

<sup>16</sup> Ibid.

<sup>17</sup> Personal Communication with USGS team leader.

<sup>18</sup> All Quotes are from Aboriginal leaders recorded in “Between a Rock and a Hard Place: Aboriginal Communities and Mining.” Ottawa, Ontario, September 10-12, 1999. Conference Results. MiningWatch Canada and the Innu Nation.

<sup>19</sup> “Between a Rock and a Hard Place: Aboriginal Communities and Mining.” p. 10

fact, for the degree to which it is being implemented, not does it allow a community to refer to what another community received in negotiations.

- In the instances where we partially know what was negotiated, we find that as communities learn more about the impacts, and the profits, of mining, they are not satisfied that they are being adequately compensated. The Raglan Agreement (the only public IBA) contains profit sharing provisions, but as it now turns out, the mine has yet to record a profit and it will likely only operate another 5 years. It would have been better if the people had received an amount for every ounce of precious metal mined.
- Too often, Aboriginal people note that while they have an IBA the provisions in the agreement are not being delivered.
- As with any agreement, the ability Aboriginal people have to negotiate a good deal depends on the leverage they can bring to bear in the negotiations. In Canada, Aboriginal communities that have not yet settled land claims have greater leverage they can bring to bear than those who have already settled land claims, as the government is anxious to get land claims settled.

*“We have had an IBA for three years and not one benefit has been implemented so far. All we have is acid mine drainage.”*

*“We got our IBAs so we thought it would be good but the implementation I constantly a problem. We had a promise of jobs but now the company says the people are not educated enough to take the jobs.”*

**NOTE:** At Ekati, it has come out that the four indigenous communities each got one million dollars. There is increasing anger over this small amount as the indigenous groups are learning just how much money is being made in that diamond mine.

## APPENDIX A

# Notes on Island Copper and Canadian Regulations

Catherine Coumans, Ph.D.

Island Copper was a large open pit Cu-Mo mine. It used an STD (Submarine Tailings Disposal) system into Rupert Inlet in British Columbia, Canada from 1971-1995. Approximately 350 million tonnes were dumped into Rupert Inlet during this time. It was the world's first STD system.

In 1977, Environment Canada implemented the Metal Mining Liquid Effluent Regulations (MMLERs) under section 36 of the Fisheries Act. The MMLERs set limits on the percentage of certain metals allowed in mine effluent to be discharged into waters "frequented by fish." The MMLERs also mandated that the amount of Total Suspended Solids (TSS) released in mine effluent per month may not exceed an average of 25 milligrams per litre. The MMLERs have effectively prohibited the release of tailings into water "frequented by fish" – and thereby Submarine Tailings Disposal – as tailings usually have a TSS measure of at least 200,000 to 600,000 mg/l. The MMLERs would have shut Island Copper down when they were implemented in 1977, but in consideration of the fact that Island Copper was already in operation the mine was granted a special exempt status. In 2002, Environment Canada implemented updated MMLER regulations called the Metal Mining Effluent Regulations (MMER). These regulations have further reduced the allowable limit of TSS into waters frequented by fish to 15 mg/l on average per month, further strengthening the prohibition on STD in Canada.

There has only been one exemption to the effective ban on STD. In 1979 the Canadian government enacted the Alice Arm Tailings Deposition Regulations which allowed the Kitsault Mine in British Columbia to discharge unconfined tailings into the sea. This decision caused a national controversy and raised difficulties for the government of the day.<sup>20</sup> The Kitsault Mine operated for a year and closed in 1982. Environment Canada has since revoked the Alice Arm Tailings Deposition Regulations. There have been no other exemptions to the ban on STD – although the industry has continued to push for exemptions.

### Summary of findings on the Island Copper Mine

- No baseline studies were conducted regarding marine flora and fauna prior to the disposal. Bioassay tests of effluents from a pilot plant were conducted.
- Tailings spread much more widely and covered a much larger area of the sea bottom than was predicted by mathematical models prior to deposition.
- There was a much greater level of turbidity at all sea levels than predicted.
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<sup>20</sup> Ibid.; Letter from Patrick Finlay, Chief Mining, Minerals and Metals Division to Congressman Edmundo O. Reyes, Jr. May 21, 1999.

- Data on bioaccumulation is incomplete as tissue metals monitoring was inadequate. Nonetheless, arsenic levels exceeding Canadian Food and Drug Act (FDA) levels were reported for *Humilaria kennerlyi* (deep water clam), butter clam, prawn, and Dungeness crab. Increases in the levels of copper in local mussels was also observed.

### Sample of quotes from texts produced or commissioned by Environment Canada

- "...a marine disposal system was proposed on the basis of predictions that the tailings solids discharged directly into Rupert Inlet would remain below 100 meters and flow down the inlet's sloping bed to settle on the bottom. Further the tailings would not be subject to spreading as the high current velocities would remain above the 60 meter level."

"There has been, however, another and entirely unanticipated effect. Widespread deposition of the tailings has occurred in the shallower, more biologically productive areas of the system, caused, it is believed, by tidal currents along the floor of Rupert Inlet. Contrary to expectation, high concentrations of suspended sediments have been observed at all depths accompanied by substantial increases in surface and subsurface turbidity. The dispersion of the solid effluents has far exceeded the original predictions to cause ...heavy sediment deposition on much on much of the original substrate and resident biota in some intertidal and shallow subtidal areas."

"Simultaneously, deep water benthos is being obliterated by the sediments on a much wider scale."

"Increases in levels of copper have already been found in the tissues of local mussels..."

(Source: Marshall, I.B. 1982. Mining, Land Use and the Environment. Environment Canada. Page 181.)

- "...the deposition area over the lifetime of the 25 year life of the mine is estimated to be about 1,600 acres occupying approximately one-tenth of the volume of the inlet." p.32

"By 1975, the total area of mine sediment deposition determined by grab sampling and SCUBA observations was estimated to represent roughly 9,500 acres. By 1996, the total area of tailings deposition was estimated to be 9,600 acres (...) with maximum tailings thickness in the central trough of the fjord of approximately 50 meters..." p.35

"The considerable accumulations of tailings on the seafloor of Rupert Inlet have changed the bathymetry of the inlet and this in turn may alter the circulation patterns and the nature of ocean currents." p.43

"On the basis of Island Copper Mine, Kitsault Mine and Black Angel Mine, STDs have resulted in dispersal of tailings to a greater extent than predicted. This applies to dispersal in both the deep water receiving environment (i.e. bottom of fjord) and in shallow waters." p.106

"By August 1973, increased surface turbidity levels were observed throughout Rupert Inlet and Quatsino Narrows and in portions of Holberg Inlet and Quatsino Sound." p.35

"...physical oceanographic processes can vary significantly in time and space. Baseline oceanographic measurements at Island Copper Mine did not adequately address this potential and as

a consequence the available data did not include the prediction of deep water intrusions and the resultant periodic turbidity boils at Hankin Point.” p.107

“...dispersion of tailings by deep water renewal events along the Quatsino Narrows-Hankin Point axis, have changed the original rocky substrate off Hankin Point (both deep and intertidal) to a soft bottom sediment. This change in habitat has undoubtedly displaced the original macroinvertebrates (e.g., prawns).” p.108

“...initiation of recovery may proceed relatively quickly following a smothering event with opportunistic species becoming established within the first few years. Full recovery is not expected to replicate the original (i.e. pre-operation) community or species list because the habitat has been changed.” p.110

“On the basis of reported data over the operation of the mine, only arsenic exceeded the FDA tolerance limit for seafood, generally by less than three times the tolerance limit.” p.109

“ Mean arsenic levels in *Humilarya kennerlyi* at Hankin Point exceeded the current FDA tolerance limit of 3.5 ppm during 1979-1989...” p.109

“Arsenic levels in butter clam exceeded the FDA limit (by less than 1.5 times the limit) in Quatsino Sound and Rupert Inlet approximately 10 years during the sampling period of 1971-1994...” p.109

“In prawn, arsenic levels exceeded the FDA limit from 1981 to 1989 (sampling period 1981 to 1992) in Quatsino Sound, Rupert Inlet and Holberg Inlet, with exceedences of less than twice the FDA . It is noted that sampling was inconsistent in later years.” p.109

“Arsenic levels in Dungeness crab exceeded the FDA limit in Quatsino Sound from 1971 through 1994, with levels rarely exceeding three times the FDA limit. Some exceedences were noted in Rupert Inlet and Holberg Inlets...” p.109

(Source: Report on Assessment of Metal Mine Submarine Tailings Discharge to Marine Environments. Golder Associates Ltd. April 4, 1996. Report submitted to Environment Canada, Environmental Protection Branch.)