The Effects of Mining on the Environment

By: Trefor Armstrong

For: Mr. Ruttan

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Preface

Mining is the extraction of materials from the earth. Withdrawal of minerals and metals from the earth has been performed since early civilization, as man used stone, ceramics and metals located on the Earth's surface to make tools and weapons (Mining). Although mankind has mined century after century, there is not a great deal of documented history until quite recently. In the last two centuries, mining has progressed immensely from the days of the California Gold Rush and the Klondike Gold Rush. Visions of a mining prospector, dressed in overalls carrying a rock hammer and pick axe have been morphed into the modern day educated miner who wears pinstriped suits and carries a laptop computer and Blackberry smart phone. The mining industry has become modernized through the use of technology in order to produce the amount of minerals and metals to meet the increasing demands of our world (Wright IN2).

The purpose of this report is to examine mining companies and their current practices of extracting and processing minerals and metals and determine whether they are operating in an environmentally and socially responsible manner. Many well-organized environmental groups have been encouraged by growing public support. These groups are known to challenge the mining executives and the companies they represent (Smith). It is important to look at the rights of indigenous people and to be sure their best interests are forefront in the communities where the mining operations set up. This report will focus on the activists' view and mining company's view pertaining to environmental issues and cultural degradation.

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Summary

This report intends to discuss the global effects of mining on the environment. It includes the history of mining as well as methods used to mine minerals and metals from the Earth. A background to the global issue, and when and how it has progressed is examined. Two experts in the field of mining were researched and an interview with a graduate mining student from Queen's University is included. The role of control is touched upon, and followed by three case studies. Overviews of international organizations as well as Canadian organizations which have a direct effect on global mining sustainability were reviewed. Religious and spiritual views often come into play when a mining company decides upon a future site and must be taken into consideration when discussing the global effects mining has on the environment.

The information supporting this report is collected from various sources such as books, internet web sites, newspapers, university text books, magazine articles and documents. Research evidence is used to support the conclusion of the study.

1.Background

According to Professor Anthony Hodge, the values of society have dramatically changed over the last century. Tension exists between the values expressed in society and those values of the mining industry. Many issues around sustainability have emerged (Hodge).

As North America moved into the industrial age in the 18th century, gold was discovered in Georgia and North Carolina, coal was becoming accepted as a fuel, and the copper rush was well under way. Reports of gold discoveries in California in 1848 and 1849 changed everything. There was a national and world-wide explosion as prospectors moved west in search of gold and wealth. With mining, came the development of camps that would last for weeks or even months. Silver, iron and gold mines were born creating one mining rush after another. Those who did not wish to participate in the actual mining process could be a part of the operation by risking a portion of their savings in mining stocks. Mining provided an economy with the creation of jobs, businesses, investments, transportation, economic and urban development and a cause for settlement. Mining produced wealth, power and fame for North America (Smith 2). Although mining provided prosperity, it also left its mark in North America:

> All this development did not take place without disturbance – environmental, personal, economic, political, and social. Mining left behind gutted mountains, dredged-out streams, despoiled vegetation, open pits, polluted creeks, barren hillsides and meadows, a littered landscape, abandoned camps, and burned-out miners and the entrepreneurs who came to mine the miners. All for what? For the wealth of gold and silver, for the industrial power of copper, lead, and iron, and for the energy from coal. (Mine 210, 3)

The miners of the 1900s concentrated on the profits from mining and ignored the impact they were having on the environment and these attitudes influenced mining for many years to come (Smith, 4).

Theodore Roosevelt, President of the United States from 1901 to 1909, explained:

> We have become rich because of the lavish use of our natural resources and we have just reason to be proud of our growth. But the time has come to inquire seriously what will happen when our forests are gone, when the coal, the iron, the oil, and the gas are exhausted, when the soil has been further impoverished and washed into the streams, polluting the rivers. (Smith, 81)

The mining sector has not acted environmentally responsibly over the last two centuries but it may not be fair to judge past procedures by today's standards. The mining industry does have a moral obligation to protect the environment in order to conserve our planet for future generations and in the 1960's corporations began to admit blame for creating environmental damage (Smith, 152).

Environmental issues pertaining to mining companies are constantly brought to our attention in the news media. The public is advised that many mines are destructive and the mining executives can predict catastrophes such as erosion, sinkholes, loss of biodiversity and the contamination of surface and ground water because of the chemicals used during the processing of the minerals (Kids Mongabay). Activist groups also insist mines are harming the communities around them because of the leaching of chemicals into the household water supplies (MiningWatch). The media reports cultural degradation such as the destruction of cemeteries and sacred sites. There have been biased newspaper pictures of barefooted children

standing in the middle of a tailings river and haunting photographs of indigenous people being pushed around by armed mining employees. (Whittington A8). There have been reports in Canada of birds that fly to their death in the huge oil sands tailing ponds in Fort McMurray (Ross). Mining companies appear to be bullies who acquire land in an unorthodox manner, bring their oversized machines and totally destroy whatever is in their way of making money (Kunzig). The mining executives have been portrayed to be without conscience and completely insensitive about the well being of the community they have taken over. Activist organizations report to the public that the mining executives do not care about the state of the people or land when they exit the operation and head on to their next money-making project (Mining). To the public who may be influenced by the media, it is a gray area as to whether or not there is proper environmental legislation to control the operations of a mining company or if indeed the countries they are operating in provide any codes or regulations to govern the operation of mining (MiningWatch).

In order to understand the effects that global mining has on the environment, one must be familiar with the steps involved in developing a mine. A geologist will explore the land to determine a location that has an abundance of minerals to be mined. Then the geologist will do a mathematical formula to estimate the size and grade of the deposit. Ultimately, he or she will decide whether or not it would be profitable to develop a mine. If the analysis shows that the product is worth recovering, development then begins for mining buildings and processing plants. The operation of the mine to recover minerals begins and continues until the mine's production is no longer (financially) profitable. At this point in the life of the mine, reclamation begins in order to make the land useable in the future (Mining).

There are two methods used to mine minerals. The first is surface mining which is more common and is done by stripping the land's surface and layers of bedrock in order to reach the minerals. The following are types of surface mining:

Open-pit mining – recovery of the materials from an open pit in the ground

Quarrying – gathering building materials from an open pit mine

Strip Mining – stripping the surface layers off to reveal ore/seams underneath

Mountaintop Removal – taking the top of a mountain off to reach deposits at depth.

The second method used to mine minerals is sub-surface mining which is done by excavating shafts into the earth to reach the minerals. The following are types of sub-surface mining:

Drift Mining – shafts are horizontal

Slope Mining – shafts are sloped diagonally

Shaft Mining – shafts are vertical

Once the minerals have been extracted from the ground, they need to be processed. This is a procedure when the minerals are separated from what is called the waste material. Processing is accomplished by crushing, grinding and washing the materials (Mining).

Unfortunately, in the past, mining companies have not been held accountable and responsible for their activities. This has given cause for many activist groups to express their concerns in the media. One important and respected activist organization is MiningWatch Canada which is comprised of 17 different organizations that do research in order to support the communities where mining occurs. Their work deals with mining in Canada as well as countries

where Canadian mining companies operate. This group has determined that there are seven myths concerning mining companies. (MiningWatch).

The first myth they present is the fact that they feel mining companies are more interested in making huge salaries for the investors rather than focusing on the extraction of minerals. Junior mining companies are more interested in having investors purchase large shares that they later sell at the appropriate time (MiningWatch).

The second myth is that mining has a small footprint. They explain this cannot be true as the cleanup once a mine has been closed is huge. There is the mine, usually a mill, tailings (the rock that is ground up with the ore and mixed with chemicals), waste rock, roads, and even railroads and power lines. The waste rocks and tailings are toxic and leach heavy metals and acid into the water and soil resulting in contamination. Mining companies are major users of clean water as it is used extensively for the processing of ore and the management of tailings. The mine will start with clean water and the final result is contaminated water. MiningWatch Canada also claims the mining companies are major contributors to climate change due to the excessive use of energy in order to extract and refine (MiningWatch).

The third myth is that communities are eager to have mining. Not all communities do wish to have mining in their areas but the mining companies are so aggressive in their dealings that they often win in negotiations. These large companies can afford to do promotional work, lobby for changes to laws and regulations to their advantage, hire leaders from within the community to do small contract jobs and offer future incomes to the community (MiningWatch).

The fourth myth is that the government will protect the community and there are laws and regulations in place to do this. The claim involved here is that there are laws in place for the

provision of mines, yet the government does not oversee the operation to be sure the proper measures are being taken. An example of this myth is a mine closure that leaves behind toxic tailings which are impossible for the community to clean up (MiningWatch).

The fifth myth is "that the economic benefits from mining justify the disruption" (MiningWatch). MiningWatch claims that mines only last 10 to 15 years and the communities that have come to rely on them (now) are deserted and become ghost towns. Mining companies avoid taxation by showing a loss in their income, therefore, they pay fewer taxes provincially and federally. The mining industry receives financial assistance through subsidies and this does not include the remediating of abandoned mines that are left behind (MiningWatch).

The sixth myth is "that we need more raw materials" (MiningWatch). MiningWatch advocates that we need to recycle our metals because they can be reused and their strength remains the same as in the primary source metal. They believe that recycling would create more jobs, decrease the cost of maintaining landfill sites and in the end would drastically change the mining industry (MiningWatch).

The seventh myth is "that mining is okay somewhere else but not here" (MiningWatch). This comment refers to the fact that they believe mining makes a contribution to climate change and the pollution and the growth of cities. They feel that mines infringe on the rights of residents in the nearby cities and contaminate their soil and water. The mining companies need to find a way to mine safely and cleanly (MiningWatch).

In a world without mining, what would our way of life be like? Mining has become essential to our lifestyle. Without the mining industry we could not build anything, we could not have access to new technologies, we could not fuel machinery, we could not produce clothing

which comes from oil byproducts and expansion of the industrial world would virtually come to a halt (Armstrong). According to an article written by Ali Cummings, a Queen's University student:

> Mining and mineral processing clearly go hand in hand. Mining extracts the ore from the earth and mineral processing extracts from it the substances we use every day. Most people do not realize just how important mining and mineral processing are to the world. When I consider everything I do on a day-to-day basis – studying, cooking, driving, curling, turning on lights – it is shocking how little I think about the objects I use and where they came from. Everything I do has a mining and processing connection. Without pots and pans, vehicles, computers, stationery, light bulbs, etc., I would have a much harder time doing these things. Mining increases our quality of life dramatically. (Cummings 44)

Ali also feels there is an ongoing challenge for mining companies when it comes to the issue of the environment. She states that the public feels that mining companies are simply out to make money and do not care about the effects on the environment. She explains that this is an attitude which must be changed. It is important for everyone involved with mining to find the best way to access the minerals with the least amount of impact on our earth (Cummings 44).

In order to understand these global situations one must take into account the mining company's views and their justifications. There are various regulations to monitor their operations throughout the world. One of the most prominent organizations of the mining sector is The International Council on Mining and Metals (ICMM) which is headed by a group of CEO's from 19 of the largest mining companies and members from 30 associations that represent many of the world's largest mining organizations. This group is committed to

responsible production of the minerals and metals that the world requires. ICMM is quite aware of the troubles regarding global mining and is already working to improve the techniques of mining in order to leave as little disruption as possible (International Council).

2. Renowned Experts

An expert in the field of mining is Doctor Stephen Lucas. He has earned a Ph.D. from Brown University, a B. Sc. in geological engineering from Queen's University, was a research scientist with Geological Survey of Canada in 1988, managed policy and regulatory issues and recently holds the role as Assistant Deputy Minister, Minerals and Metals Sector, with Natural Resources Canada as well as being a member of the transitional board of directors for the Canada Mining Innovation Council (CMIC) (Zlotnikov 32). In an interview with CIM (Canada Institute of Mining) Magazine, Doctor Stephen Lucas stated that "By number, about 57 per cent of the world's exploration or mining companies are based out of Canada. It has evolved such that, numerically, Canadian business expertise is the globally dominant force in mining" (Zlotnikov 33). Doctor Lucas feels that there will be a global demand for the need of minerals as developing countries increase their use of metals in areas of building infrastructure, automobiles and other applications:

> In the meantime, some of these deposits are going to be harder to find, as a lot of the easier deposits around the globe have already been found. The challenge is to discover the ones that are more deeply hidden and perhaps more challenging to extract. So there is a call for innovative technologies to look for these harder to find deposits. (Zlotnikov 33)

> Increasing expectations from public and governments in terms of reducing the environmental foot print of mines will continue to drive the development of new technologies, processes and approaches. There will be clear benefits to early adopters and nations that support the research and innovation needing to bring these on-stream. We think Canada is well positioned for that. (Zlotnikov 33)

In an interview, Doctor Lucas suggested that we need to focus on improving collaborative efforts in the area of green mining, working towards improving and meeting the environmental standards. He believes that Canada is a leader in corporate social responsibility (Zlotnikov 34).

Tony Hodge, President of the International Council on Mining and Minerals (ICMM), has been a professional engineer for over 35 years and is an expert on sustainable development. Hodge earned a B.A. SCs in 1972 and a M.A. Sc. in 1976 from the University of British Columbia in Geological Engineering. He was awarded his PH.D in 1995 from McGill University based on his work in the area of sustainability. He is currently Queen's University's first Professor in Mining and Sustainability (Kinross). In the last decade he has served as an Associate with the International Institute for Sustainable Development out of Winnipeg and is the Past President of the Mineral Economics and Management Society (MEMS). In 1997 he founded and is still the President of Anthony Hodge Consultants Incorporated. From 1989 until 1992 Hodge served as President of Friends of the Earth Canada and participated in the Prime Minister's National Round Table on the Environment and the Economy (NRTEE) from 1992 until 1996. During 2001 and 2002 he headed the North American Mining, Minerals and Sustainable Development project to work on solutions which would make the mining industry more sustainable. In 2004 he published a report entitled "Out of Respect – the Tahltan Mining and the Seven Questions to Sustainability", that was based on his sustainability study. In 2003 he produced a publication which reviewed the best practices of mine closure in North America. Hodge served as a Senior Advisor to Canada's Nuclear Waste Management Organization from 2003 until 2005 at which time he developed a strategy for long-term management of nuclear fuel. While he served as a member of the Independent Peer Review Panel in 2006, he also chaired the Faro Mine Closure Assessment Team. Hodge currently sits as Chair of the Advisory Panel,

reviewing Newmont Mining Corporations' Community Relationships. As President of ICMM, Hodge is currently preparing to speak at a seminar on Mining, organized by the United Nations Commission for Sustainable Development where he plans to show five documentaries illustrating sustainability issues which affect the mining industry globally (Hodge). As Canada's leading authority on sustainable development and with his continuous work in the area of mining sustainability, Hodge is certainly making a difference in awareness in regard to global mining policies for environmental issues. He promotes the need for mining companies to work effectively with government and local communities in order to improve in these areas (International Council on Mining and Metals).

3. Role of Control

Although minerals and metals have been extracted and processed since our existence, activist groups have recently brought to the public's attention the fact that we need to develop awareness as to how today's mining company operates if we wish to preserve our planet. There are many mining-related organizations that have begun working together towards achieving common goals of overall improving the performance in the mining and metals industry (Ednie 43).

It is necessary to determine who has the role of control that allows the mining corporation to be competitive, but at the same time act with social and environmental responsibility.

> Never before have the objectives of the international community and the business world been so aligned. Common goals, such as building markets, combating corruption, safeguarding the environment and ensuring social inclusion, have resulted in unprecedented partnerships and openness among business, government, civil society, labour and the United Nations. Many businesses recognize the need to collaborate with international actors in the current global context where social, political and economic challenges (and opportunities) – whether occurring at home or in other regions – affect companies as never before." (Whelan)

The UN Global Compact Leaders Summit 2010 will join leaders from around the world to discuss the best practices for sustainability.

Sustainability development is commonly defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Iisd2010). To ensure that the mining companies work in a sustainable and ethical way and

minimize their negative impact on the environment, they need to work very closely with each other, communities and the governments. Priority should go to the recent publication Sustainability Reporting Guidelines and Mining and Metals Sector Supplement, 2010, published by the Global Reporting Initiative, (Appendix: 1) and companies need to do their part by adhering to the guidelines (Global Reporting Initiative). In 1988, Brian Mulroney stated, *"*The Round Table will be providing leadership in the new way we must think of the relationship between the environment and the economy and the new way we must act*"* (Who We Are). The United Nations holds a great deal of control over the standardization of mining policies. The United Nations Department of Economic and Social Affairs have identified three priority areas (Mining). The plan is to:

1. Address the environmental, economic, health and social impacts and benefits of mining throughout their life cycle, including workers' health and safety.
2. Enhance the participation of stakeholders, including local and indigenous communities and women.
3. Foster sustainable mining practices through the provision of financial, technical and capacity-building support to developing countries and countries with economies. (Mining)

The Division for Sustainable Development is an organization that falls within the United Nations and promotes sustainable development. They have documented that public participation in decision-making is important to achieve sustainable development and responsibility. They feel that partnerships contribute to the implementation of internationally sustainable development goals. The Division for Sustainable Development has identified specific roles and responsibilities for nine major groups of civil society: "women, children and

youth, indigenous people, non-governmental organizations, local authorities, workers and trade unions, business and industry, scientific and technological communities, and farmers" (Mining).

4. Religious and Spiritual Views

Land and natural resources are often important to communities and indigenous peoples. The proposed mining site may be the center of their spiritual, cultural and social identity. The struggle of ownership over this sacred land could initiate a huge conflict between a mining company and indigenous people. Protocols must be put into place to prevent such conflicts when indigenous people live near or have interests close to mining operations. (Caldwell)

"Long before there was religion, in the sense we know it today, there was mining" (Caldwell). The first mine was located in Bomvu Ridge, Swaziland about 40 000 B.C. where a deposit, specularite was mined. Although the Bible states nothing about mining, it is evident that the people of Christianity, Judaism and Islamism, benefited from mining as there are stories of their bronze, gold, silver and copper commodities (Woodhouse). In Saleem Ali's book, he states that there is a natural history of human consumption of materials from the earth and that it is not likely that eliminating the consumption of materials is the answer to a future global inequality. He proposes that we accept our need to consume responsibly in order to alleviate global poverty (Ali). The Bible does not mention about how to directly go about mining, nor does the Bible provide information as to the ethics and moral guidelines of mining (Woodhouse). Mining companies have brought controversial evidence to proclaim that God is in favour of mining. Miners defending their cause have quoted the passage from the bible, "Every valley shall be filled in, every mountain and hill shall be made low" (Maimon). In opposition, religious experts recite the same quote, but see it differently, saying the mining community has mistranslated the Bible (Caldwell). "Then the glory of the Lord shall be revealed, and all mankind shall see it together; for the mouth of the Lord has spoken." (Religion).

Ken Thornberg wrote in his book, Saving God's Green Earth, that in the last century the church has allowed the value of environmentally caring for our planet diminish. The Bible states that we are obligated to be the stewards of the Earth, yet it does not have recommendations about how to mine nor does it inform how religious perspectives guide any decisions regarding mining and reclamation of the land afterwards (Caldwell).

There are many examples of clashes between mining companies and religious and spiritual beliefs. In 2006, the Royal Canadian Mounted Police (RCMP) arrested 67 year old Lillian Moyer for opposing a copper-gold mine operation in Iskut British Columbia. Moyer believed that the open pit mining would destroy the hunting grounds and fisheries for the First Nations people. The British Columbia Supreme Court decided in favour of BCMetals. The RCMP escorted or arrested the protesters after they were allowed to make their speeches. The First Nations felt that BCMetals had skipped through loopholes in the government and was going ahead and mining anyway. To make things worse, the government would not allow the First Nations people, once arrested, to visit their sacred land (Mining Watch). A second example of a clash between the mining world and religious beliefs is the incident at Telegraph Creek. The Elders of Tibetan tribe intended to keep their sacred land for their children. The Tibetans held a protest by building road blockades and staging a hunger strike on the Chinese, who were mining a mountain which the Tibetan Buddhists considered sacred. The Tibetans always knew that the mountain was rich in minerals, but never touched it because it was so sacred. The Karze government had sold the mountain jointly to a mining company and a construction company and gave the local residents 20,000 yuan in return (Caldwell).

Mining must be sensitive to community relations and religious-based arguments about resource development and resource preservation. Religious and spiritual views are certainly

another factor to take into account when dealing with stakeholders of a mining operation (Caldwell).

5. Zimbabwe

Murowa is a smaller diamond mine owned by Rio Tinto, and is located at Mazyihwa, South Central Zimbabwe, about 40 kilometres from the asbestos mining town of Zvishavane in the Midlands province (Appendix: 2). The mine type is rare as it is made of natural kimberlite pipes, which are in the shapes of a giant carrots. Kimberlite is the result of potassic volcanic rock which sometimes contains diamonds(Appendix: 3). They are the most important source to mine diamonds today and are deep in the mantle of Earth's crust. This site was discovered by Rio Tinto geologists in 1997 and mining production commenced in 2004. The mine began to wind down in 2009 (Kimberlite Pipe).

Prior to construction of the mine, 1400 families had to be relocated. The families were sent to government-owned farms in Shashe, Masvingo. This was over 200 km from the homes they had lived in their whole lives. The families had to walk that distance and carry their own belongings. The relocated families feel that Rio Tinto has breached the agreement and has not completed their end of the deal. They believe that Rio Tinto still owes them more money as they suffered a more significant loss (Sigauke).

Rio Tinto was aware of the illegal diamond trading in Sierra Leone and Angola and was one of the leaders in developing the international Kimberley Process Certification Scheme to prevent the illegal diamonds from entering the mainstream of the diamond market. The Kimberley Process requires that all international rough diamond shipments have a forgery-proof certificate issued by the government of the exporting country. With the governments, industry leaders and civil representatives all working together, they have ensured that about 98% of the world diamond trading is ethical. Recently, Rio Tinto has partnered with Wal-Mart to produce

jewellery that is the result of sustainable business. Wal-Mart's initiative is to produce a jewellery line that has the highest environmental and social standards (Clayton).

Rio Tinto developed the Business Excellence Model in the company's commitment to the responsible growth of the Indian diamond industry. Many of the diamonds are sent to India for cutting and polishing. Rio Tinto provided support to the Indian diamond industry by improving their performance in the areas of social responsibility, health, safety, the environment and quality control. The Business Excellence Model also assures diamond customers that the manufacturing business meet international standards that are ethical and responsible (Clayton).

Rio Tinto is a company with high standards and its' code of ethics is globally involved in a number of programs to reassure their way of doing business is responsible and ethical. The mine at Murowa is a combination of open pit and underground construction. Murowa Diamonds has helped to build the sustainability of the community by improving and managing the water resources (Clayton).

Murowa Diamonds employs approximately 180 people and 150 full-time contractors who provide mining and village services. The company has recognized the importance of helping the community and improved farms and livestock, helped establish new businesses and assisted existing businesses and realized the importance of education in developing countries. Murowa Diamonds set up additional water and helped the local community to set up their own micro-irrigation system which is designed to reduce water waste. Nine market gardens adjacent to small dams are now operating. The mine worked with the government to set up a series of farmer training programs to help increase the local farming of the resettled area. The native peoples were taught skills such as crop growing, soil, water and pest management. The mine donated bulls to the farms for the purpose of breeding with the cows in order to obtain a better price at

market. Murowa Diamonds built a school and improved the education by providing textbooks and other educational supplies and attracting qualified teaching staff which resulted in students having a higher passing record. The mine operates in an area where HIV/AIDS is very prominent and Rio Tinto have put in place programs for mining staff to educate the community and make them more aware. When hiring, Murowa Diamonds gives preference to Zimbabweans (International Organization).

To develop the Murowa mine, 142 familes had to be relocated to six farms that Rio Tinto purchased in Shashe, about 150 kilometres east of Murowa. They worked to create a better environment in Shashe with opportunities for the families. Rio Tinto paid the expenses of moving, improved the infrastructure in the community, built a health clinic and primary school. Farmer training programs were established and skills were improved so greatly that the Murowa Diamond Mine earned two national awards in recognition for their good corporate citizenship and social responsibility. Rio Tinto also won the mining sector award in recognition of a mining concern that showed care for the community, its employees and the environment. Rio Tinto has passed on their resettlement scheme to the government and they plan to support Shashe until 2014 (International Organization).

There is a growing interest in the biodiversity and Rio Tinto partnered with Bird Life International and has supported a programme at the Murowa Diamond Mine. The programme has been received well in the schools and the local and mining community. It was encouraged through the Murowa Bird Watch Event sponsored by Rio Tinto that included a bird walk to identify and specialize in the birds at the mine and its surroundings (Environmental).

6. Papua New Guinea

Lihir Gold Limited's (LGL) project in Papua New Guinea is one of the world's largest gold mine and processing facilities. It is situated in the Lihir islands, 800 kilometers off Port Moresby in New Ireland (Appendix: 4). The ore body was discovered in 1982 by Kennecott Explorations Australia and their partner Niugini Mining Limited. There are three mines in the project: Minifie, Lienetz, and Kapit. These three ore bodies are known as the Ladolam gold deposits. Construction of the mines started in 1995, and the first gold poured was two years later. Today the mine has produced seven million ounces of gold (Armstrong).

The activist organization, MiningWatch Canada, is opposed to submarine tailing disposal (STD) and stated the following:

> It is one of the most colossal gold mining projects in the world, on an island near a pristine coral reef. The gold is locked in a geo-thermally active volcano. Extraction will involve lowering the water table, using the sea to cool the fiery ore then discharging the water back into the marine environment — all of this to within 100 meters of the coast from a pit that will eventually reach 300 meters below sea level. The mine is expected to last 15 years. The waste rock and tailings — some 400 million tons — will be dumped directly into the ocean. Submarine tailings disposal is not allowed in Canada. Even the company acknowledges that the mine water, geothermal water and leachate from the stockpiled ore will destroy 7 km of coral reef and a major nesting zone for the Melenesian scrub fowl. (Kuyek)

Some of what the activists say holds some truth, but some of their information is not factual. An example is that the activists say the Luise volcano has geothermic activity and is active, but in fact, the volcano only has a leftover geothermal activity, found in the form of hot springs and fumaroles (Appendix: 4). The other inaccurate information is that the mine is not expected to last

15 years but, the original plan was to last from 1997 to 2021 (24 years). Recent observations have shown that the mine could stay active past the year 2030. The mining views are as follows.

The mine is located in an old inactive volcano that had a seaward collapse into the Pacific Ocean. The caldera collapse was caused by the volcano emptying the magnum in a volcanic eruption:

> A caldera collapse is usually triggered by the emptying of the magma chamber beneath the volcano, often as the result of a large eruption. If enough magma is erupted, the emptied chamber will not be able to support the weight of the volcanic edifice (the mountain) above. Fractures will form around the edge of the chamber, usually in a roughly circular shape. These ring fractures may in fact serve as volcanic vents. As the magma chamber empties, the center of the volcano within the ring fractures begins to collapse. The collapse may occur as the result of a single massive eruption, or it may occur in stages as the result of a series of eruptions. The total amount of collapse may be hundreds or thousands of meters (Caldera).

The caldera collapse caused the intrusive rocks to heat up and cool down rapidly, forming small amounts of pyrite crystals. The magma erupted out of the volcano leaving the rocks to cool, but then more magma was pushed back up to the rocks as the volcano collapsed. Currently, gold is the only profitable mineral in the mine, but other minerals such as early porphyry and late stage epithermal have been recognized (Armstrong).

The mine is one ore body that is divided into three open pits, the Minifie, Lienetz and Kapit mines. The Minifie pit started digging in 1997 and is nearly finished. The Lienetz pit is Lihir's current concern, as it is the main source for Lihir's ore in the pending years. The Kapit pit will start to commence when Lienetz has finished. The final plan for the mine is, "2

kilometres by 1.4 kilometres, with a final depth of over 200 metres below sea level. Material moved from the pit was more than 50 million tonnes in 2008" (Kidd). The final plan is to combine all three mines and have 800,000 ounces of gold per year. The mine life plans are to terminate in 2021, but with the processing of lower grades, the mine could continue past 2030. In 2008 LGL went through a plant upgrade. "In 2008 LGL approved a major expansion of the Lihir Island process plant to increase annual gold processing capacity to approximately one million ounces per year" (Kidd). This project gave the processing plant a new autoclave, which sterilizes equipment using steam. The new autoclave is double the size of the existing three and at best this new autoclave will raise gold production by 240,000 ounces per year for the rest of the mine's life (Armstrong).

The LGL island's mine is located in a volcanic caldera which still has geothermic energy. LGL uses that energy to power their mine:

> The Lihir Island project is located in an inactive volcanic caldera, which retains remnant geothermal energy in the form of steam. Initially the steam was vented to cool the ore body and enable safe mining, but since 2003, LGL has harnessed this steam to generate power for the operation. Current geothermal capacity at Lihir Island is 56 Megawatts, approximately 75% of the operation's power needs. (Kidd)

Lihir Island is a unique site as it is located on an active geothermal system. There is a deep reservoir which is covered by trapped steam. As the mine digs deeper the water has to be drained and the steam released (Appendix: 5). Wells are dug to drain the reservoir below the mine. This is dangerous because the water temperature is so close to boiling it could blow out. To solve these problems shorter wells were dug first to relieve the steam from the reservoir (Kidd).

In 2003, the first of three power generation stations were installed; a 6 megawatt plant comprising of four wells. In 2005, a 30 megawatt plant was set up using four intermediate deep wells. These wells were originally designed for the sole intention of depressurization, but due to their high productivity they were selected for the purpose of powering the plant's turbines. As the mine deepens, these wells will likely decrease in pressure. As that occurs, wells will have to be buried and new ones added to the system. Finally, in 2007, the third plant came online. This was a 20 megawatt plant that brought the site's total power generation to 56 megawatts. The power production on site from clean steam powered resources accounts for roughly 75 percent of the site's needs. As a result, there is a reduction in power costs of over $US20 million (Armstrong).

LGL's relationships with the Lihir people have been amicable from the start of the planning stages. The Papua New Guinea government and local communities have had discussions with LGL to determine the best choices for all parties. Construction began in 1995, with the relocation of 300 villagers. New and improved homes were built for the villagers. A road was built around the whole outer edge of the island, connecting the mine, township,mission station and 20 coastal villages. LGL has developed plans to help the Lihir people, thus creating the Lihir Development Sustainable Plan (LDSP). The LDSP comprises of an education plan, town planning program, community health program and social programs. The health program is for the Lihir people of the island, the village of Sianos, and a Malaria prevention program. The social programs include women's rights, youth and sports groups (Bainton).

7. Columbia

Cerro Matoso is BHP Billiton's nickel mine located near the town of Montelibano in Northern Columbia (Appendix: 6). It is the world's second largest producer of ferronickel and a

leader in the low cost of smelting. Nickel is a main element to produce stainless steel and is one of the most durable, recyclable materials (Kloppers). The mine is capable of producing 50,000 tonnes of nickel per year in the form of ferronickel. Mining at Cerro Matoso began in 1980, and the production of nickel started in 1982 jointly under the Columbian Government, BHP Billiton and Hanna Mining. Ten years later, BHP Billiton owned 99.94% of the mine. The mine employees share 0.06% of the mine. Cerro Matoso has approximately 42 years left if production continues at the same rate. The company's goal is to mine, process, and market the materials in an environmental and social manner (Kloppers).

The Activist group, MiningWatch Canada reports of meetings between civil society organizations and churches in Latin America. These groups merged together to discuss the environmental and social injustice which communities are dealing with as a result of the mining corporations. There is conflict between the mining companies and the community as the local people feel that the mining companies consider they have the right to carry out mining operations anywhere that minerals are found. The local communities believe that their rights are being violated and they feel that mining companies are not straight forward when trying to gain the support of the community. The local people are concerned about their water supplies, the forced displacement of communities and the risk to the ecosystems and community health. The community feel there are more negative impacts from mining than there are good outcomes (MiningWatch).

It is important to note that the workers' union at the Cerro Matoso mine did strike for one month in 2008 in order to benefit 600 workers with an 8% wage increase, safer working conditions and open-ended contracts for sub-contracted temporary workers (IMF News Brief). Amnesty International mentions unrest of indigenous people in Columbia (Tackaberry).

In 2003, Cerro Matoso was aware of the impact a mine could have on the environment and they worked towards reducing the stack dust emissions, water consumption, and solid waste. An energy management system was implemented including a Columbian contractor to measure emissions. Cerro Matoso has increased the use of recycled water in order to reduce the use of raw water consumption. Water that was recycled from ponds meant less water would be taken from the Ure River. In addition, runoff water from the mine is collected in the dam and then redirected to the water pond for reuse. Cerro Matoso has worked at reducing the waste on site in order to prevent environmental harm. A waste management program was developed by Cerro Matoso and is now an important part of the Montelibano community life as they became involved in the operation and profits. The solid wastes are handled by a community company which operates on the site sorting and selling scrap metal, cardboard, paper, glass, timber, plastic, and organic wastes. A compost programme turns organic waste into pig feed, solid wastes are recycled and the employees are educated in this area. A major benefit of the recycling is that it creates about 40 jobs for the indigenous people (Kloppers).

Plans for land rehabilitation are in place which promote a topsoil recovery project and revegetation which includes planting hectares of grass which grows well in the area and animals prefer to graze on. There is provision for a long-term conservation project to preserve the environment surrounding the mine (Pointon).

Cerro Matoso is known for contributing to community development and has worked with private businesses as well as the government in planning and funding activities. A programme to initiate the Integral Centre of Formation in Dressmaking was located in Montelibano, providing local dressmakers with training and skills to provide employment. A project promoting tree farming and timber marketing will also add value and employment to the community. The

mining company continually supports education by teaming with the governments and by providing learning centre equipped with computer rooms, laboratories and libraries (Pointon).

BHP Billiton has in place a Global Ethics Panel which is made up of internal and external members in order to give a mixed knowledge with regard to the business conduct of the mine. This group meets three times a year to review issues of concern. The company's Code of Business Conduct states that they have in place methods of dealing with bribery or any corruption that could arise by dealing with the Business Conduct Advisory Service (Pointon).

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8. Organizations

There are many organizations that deal with the operation of a mining company, however, often they do not enforce, but merely suggest protocol to follow. The onus is left up to the mining executives regarding how they go about business and develop relationships within the community they operate until there is an issue that may be brought to light in the media. There

are organizations which set policies for their own country to follow at home and when developing abroad and there are governments that set laws for the country where the mining is being completed. Where mining is carried out in developing areas, in particular West Africa, there is no mining enforcement of regulations or legislation with regard to environmental footprint development. As a result, environmental and community considerations in regards to mining can be totally ignored (Indigenous).

The list of organizations that influence the mining sector is enormous. A few of the more common and prominent organizations are described below.

The **United Nations Environment Programme (UNEP)** mission is to provide leadership and encourage partnership in caring for the environment by inspiring, informing, and enabling nations and peoples to improve their quality of life without compromising that of future generations (Indigenous). The United Nations Environment Programme is aware that the mining industry of the past did cause harm to the environment and society but that attitude is changing and there is an interest from the mining companies' governments, communities and organizations to operate in a more responsible manner. The UNEP works with all of the stakeholders to plan and operate the mines in a way that will cause the least harm to the environment and they also support national strategies on the handling of abandoned mine sites and prevent new sites from becoming abandoned. They realize that mining is important as it is the source of the world's essential raw materials and results in economic and social development in undeveloped countries (Indigenous).

The **United Nations Global Compact (UNGC)** has made headlines as they promote proper business practices in regard to human rights and stakeholders. This group is committed to creating policies for businesses to align their operations using principles that are acceptable in

the areas of human rights, labour, environment and anti-corruption (Whelan). By companies following the policies set out by this global organization, commerce, technology and finance will progress so the society and the economy will benefit. The United Nations Global Compact is known to be the largest corporate sustainability initiative in the world as it is made up of over 7,700 corporate participants and stakeholders from over 130 countries (Whelan).

The **Earth Charter Initiative** is an organization that is dedicated to promoting the transition to sustainable ways of globally operating while being respectful to the community and human rights in a non-violent and peaceful approach. It is a diverse global network of people, organizations, governments and institutions that participate in promoting the values and well being of the planet. The Earth Charter is used as a reference document when developing standards for codes of ethics, legislative processes, as a community growth tool, and as an educations support for sustainable development (Earth).

The **Global Reporting Initiate (GRI)** is a not for profit organization located in Amsterdam, the Netherlands. This organization is a collaborating group for the G3 Guidelines which includes the United Nations Environmental Programme, the United Nations Global Compact and The Earth Charter Initiative. On Sunday March 6, 2010, the International Council on Mining and Metals (ICMM) and the Global Reporting Initiative (Global) jointly launched their new reporting guidance at the Prospectors and Developers Association of Canada Conference held in Toronto, Ontario. The plan is to be used worldwide to guide the mining and metal industry. To be of high standing and very significant to the industry, their reports are developed through consensus and participants come from global businesses, governments, industries and professional institutions. This highly respected group takes the world mining issues very seriously and it produced the final copy of the Sustainability Reporting Guidelines

and Mining and Metals Sector Supplement (Appendix: 1) to share with the world. This report provides guidance and protocol when it comes to the control, use and management of land, national economic and social development, community and stakeholder engagement, labour relations, environmental management and relationships with artisanal and small-scale mining (Global).

The **United Nations Division for Sustainable Development** has also recognized that the mining of minerals and metals has become essential to our modern lives and that mining is the best method to extract these commodities from the earth. There is an increasing demand for these resources creating a greater need for water and power in order to extract the minerals, resulting in greater pollution. This issue holds true whether mining is at the corporate, small scale or artisanal level. The result of mining is a negative impact on the environment and the local community. Mining is much required in our world and this group works to help benefit from the development of mining while addressing the environment, indigenous peoples and fostering sustainable mining practices by providing technical, financial and construction support to developing countries as well as countries with an economy. In fact, this May 2010, mining will be a focus at the United Nations Commission on Sustainable Development (Global).

The **International Council on Mining and Metals (ICMM)** is an organization that was founded in the year 2001 to represent the largest global mining companies in order to improve the industry in sustainability. This organization is comprised of 19 mining companies as well as 30 national and regional mining associations and global commodity associations. With their five values of care, respect, integrity, accountability and collaboration they guide the mining industry in good practice approaches. Their role is to improve mining performance under their Sustainable Performance Framework, a policy set by the Council. The working Council is made

up of CEO's from each ICMM member company and their role is to have a strategic plan with priorities and decide upon policy (International Council).

The **Centre for Excellence in Mining Innovation (CEMI)** is an organization that works with many large mining companies, governments, suppliers, universities and consultants by performing research projects on behalf of the mining companies. By conducting research at the universities they hope to make contact with the upcoming students and expose them to the mining operations and build contacts. CEMI also has a focus on funding research projects by recruiting dollars from the industry as well as the government (Ednie 41).

COREM is a nonprofit research consortium that aims to improve the competitiveness of the mining industry and improve mineral processing. The focus of the group is to research areas such as process efficiency cost reduction, reduction in energy and environmental benefits (Ednie 42). Ginny Flood, director general, strategic policy and planning, Minerals, Metals and Materials Policy Branch, Minerals and Metals Sector, Natural Resources Canada states, "Building on sustainable development work such as that undertaken by COREM, Canada hopes to shine in green mining research. "NRCan's Green Mining Initiative (GMI) is intended to help the industry remain a global leader by strengthening its competitiveness, environment performance and social responsibility" (Ednie 43).

The **Greenhouse Gas Protocol** is an organization around the world that works with businesses, governments, and environmental groups from around the world to build new and more effective programs to reduce the climate change. They provide support from hundreds of greenhouse gas inventories prepared by individual companies. They also offer developing countries a management tool to help their businesses compete in the global market and assist

those governments to make informed decisions when it comes to climate change. The Greenhouse Gas Protocol is a partnership of the World Resources Institute and the World Business Council for Sustainable Development ((Ednie 44).

The **World Resources Institute** has been established for over 25 years and is an environmental "think tank" that researches for practical ways to protect the earth and improve people's lives. The focus of this organization is to work on climate policy, ecosystem services, environmental governance, green markets, and sustainable transport which have all moved into most global political, social and business discussions. Their concern is that it takes time to be understood by world leaders, time for the public to become involved, more time for science and technology to act in response and time for policies to be formed and put in place (World Recourse).

The World Business Council for Sustainable Development is a global association of CEO's representing about 200 companies that deal with business and sustainable development. This Council provides a table for companies to discuss and share knowledge, experiences and advocate ways of dealing with governments and other organizations. The members come from more than 30 countries. The World Business Council for Sustainable Development's mandate is to provide leadership in business on advocating for sustainable development, participate in policy making, and demonstrate and contribute to the sustainable future for developing nations and others in transition (World Business).

The National Round Table on the Environment and the Economy (NRTEE) is a Canadian organization that focuses on taking leadership in the way we think about the environment and the economy. This group was created in 1988 as more Canadians and

governments showed concern about climate change, air quality and water availability. The members of NRTEE are appointed by the Canadian Minister of the Environment and they are accountable to Parliament. The organization meets four times a year to review research, approve reports and set new priorities to act upon. The appointed group is currently made up of 17 members with credentials from various areas of business so that there is a very good cross section. As recently as February 25, 2010, the organization released their document titled Progress Through Process: Achieving Sustainable Development Together which was a joint effort with the Public Policy Forum (PPF) to bring together the public, stakeholders and government to create awareness that if Canada is to move forward in sustainable development while preserving the environment, then all levels of government and public groups must break down deep-rooted thoughts and adopt a more collaborative approach. The thought is that if government backs the process and shares in decision making responsibilities the stakeholder groups must take on more responsibility for researching and implementing decisions. Policy and advisory organizations can play an important role by providing neutral spaces where opposite views can be discussed. The report states that the new governance methods must include key interest groups in order to have legitimacy, allow for ongoing exchange of ideas to create trust and allow the participants to take responsibility for solving difficulties. Sustainable development means that economic, social and environmental goals can be all pursued together to meet the needs of the present without compromising the needs of future generations (National).

The **International Labour Organization** was founded in 1919 and in 1946 became the first specialized agency of the United Nations, with today's headquarters in Geneva. On its 50th anniversary in 1969, the International Labour Organization was awarded the Nobel Peace Award. The organization looks at issues in regard to small scale mining and involves local

agencies to strengthen institutions and oversee the labour standards and protect the people in developing world countries. They ensure the labour standards are respected in practice as well as in principle. They feel that the route out of poverty is work. The International Labour Organization has a unique structure in which employers' and workers' representatives have and equal voice with governments in forming policies and programmes (International Labour).

Engineers Without Borders is a respected Canadian organization made up of engineering students, professionals and companies who wish to be involved in creating opportunities for rural Africans to make positive changes in their poverty stricken lives. Engineers Without Borders volunteer to work in Africa with governments, development organizations as well as the private sector to identify and provide solutions to poverty. The group focuses on the needs in the rural communities and works to provide clean water, infrastructure, and increase farming products and support the business in the community. In Canada, they work to make change by communicating with the Canadian government and encourage aid to these communities that need it most (Engineers).

9. Canada's Role

Canada has a very long record in mining and mineral processing. According to Dr. Stephen Lucas, about 57 percent of the world's exploration or mining companies are based out of Canada. He states that the Canadian business expertise is the globally dominant force in mining (Lucas 33). As told by Gavin Graham, Director of Investment, BMO Asset Management, the Canadian mining industry is a very big percentage of our Canadian Stock Market. Between mining and energy, he estimates that about half of the total Canadian stock market is associated

to minerals. Canada's reputation is very established in the mining around the world. In fact, Queen's University, which is renowned for their Mining Engineering program throughout the world, explains on their web site that Mining is the foundation of industrial civilization (Queen's University). With that in mind, one could say we are certainly leaders as Canadian mining have up to 360 operational projects around the world.

MiningWatch Canada (MWC) is an activist organization based in Ottawa since April 1999. The group's aim is to ensure that mining practices follow the goals of sustainable communities and ecological health, that mining companies benefit the skills base of a community, and they advocate policies to improve the efficiency and reduce risks in a mining community while imposing terms and conditions for development of an operation. The organization has been put in place to rally to "change public policy and mining practices to ensure the health of individuals, communities, and ecosystems in Canada and around the world" (MiningWatch). This activist group was a response to what the public felt were government failures in allowing destructive mining practices in Canada. Mining Watch is supportive of mining in Canada and globally, but monitors and analyses the operation and then, if the organization feels necessary, advocates in support of the environment, social justice, Aboriginal and labour organizations across Canada. The group is respected by the mining companies and large and small companies take heed to public interest and response to threats to public health, water and air quality, fish and wildlife habitat communities that MiningWatch deem as irresponsible practice. If MiningWatch Canada is accurate in their statements and have done appropriate research to back up their beliefs, then we indeed need to focus on the activities of mining companies. There are rumours of people being exposed to the toxic waste from the tailings and becoming ill. Community people who cannot afford to visit a doctor or perhaps a

doctor is not accessible, are not treated for such illness. The people must use contaminated water for cooking, bathing and washing (Mining Watch). Many of these claims do require looking into, but on the same note, many activists do not have accurate research to back up their what they say. It has been said many times that mining is simply a money making business that not only prospers the mining company but the government who also take a share of the revenues (MiningWatch).

Mining Watch Canada is concerned about the impact Canada's mining operations has in other countries as well as Canada. It was this concern that led Liberal MP John McKay to propose legislation, known as Bill C-300 the Corporate Accountability of Mining, Oil and Gas Corporations in Developing Countries Act that would give the federal government the power to investigate complaints that Canadian Mining operations overseas were not in compliance with international human rights and environmental standards. Bill C-300 states that if a company were not living up to the set standards endorsed by the Prospectors and Developers Association of Canada (PDAC), the Mining Association of Canada, and the Government of Canada, then the operation would be denied access to Canadian taxpayer support. If complaints were brought against a mining company, then they would be investigated by the Canadian Minister of Foreign Affairs as well as the Minister of International Trade. If the investigation found the company to be violating the standards, then they would lose their eligibility for government services until they corrected the situation. At the recent Prospectors and Developers Association of Canada's recent convention in March 2010 in Toronto, this topic seemed to be a main focus and the PDAC launched a campaign against Bill C-300, even though a recent testimony on the Bill in the House of Commons provided evidence that Canadian mining companies are causing serious environmental and social harm in areas of the world due to environmental damage (Heaven). On

the other hand, PDAC, the Mining Association of Canada and the Government of Canada all agree that Canadian mining companies are operating in countries that do not have regulations to govern the environmental and human rights violations. This means that the indigenous peoples of a country where a Canadian mining company is operating do not have a means or a legal system that they can turn to for assistance. Recently the United Nations has appointed a representative to look at this controversial dilemma. John Ruggie says there is increasing interest at international levels for these countries to take regulatory action in order to prevent abuse from overseas countries (Coumans Catharine Mining) . The mining sector of Canada feels that Bill C-300 will seriously harm them if it is made law (Heaven). Gordon Peeling, President of the Mining Association of Canada, does not agree with Bill C-300 as the governing parties would be from an unelected chamber of Parliament and he also feels strong that anti-mining organizations would use this law to blemish the reputation of Canadian mining companies. Robert Wisner, who is a lawyer specializing in foreign investment protection pointed out that, "All it takes is one person writing a letter to initiate a ministerial investigation according to rules that are impossibly vague. A political official will become police, judge, jury and maybe even executioner" (Heaven).

A newspaper article titled "Mining Companies Deny Abuses" was printed on November 27, 2009 in the Toronto Star. Large mining companies defended themselves against Bill C-300 by saying the legislation is only in response to activist organizations who became involved with companies who had allegations against them of human rights violations and environmental degradation overseas. This would pose great risk to mining companies as the bill would be an attraction for individuals to make false allegations from anywhere in the world and this would clearly harm the Canadian mining industry. It is felt that some of the non-governmental

organizations could be merely making headlines to promote possibilities of funding. Canadian Mining companies have gone as far as to threaten to set up their Head Offices in another country if Bill C-300 is passed (Whittington). Without a doubt there is room for mining companies to improve, but to generalize and say they are not operating in a responsible manner may be totally unfair.

Another newspaper article printed in the Toronto Star on November 24, 2009 was titled "MPs Told of Gang Rapes at Mine." Oddly enough, the article was not just about rapes at a mine nor was it paying attention to the children in the picture that was featured. This is proof showing biased views of the media. If one article is so questionable, how can the public believe in what they hear and read from the media? This article did mention occurrences of women being raped by five guards at a time as they patrolled the mining property. There is no mention of why the incidences were not brought to the attention of the mining company for investigation before it was highlighted in Canadian Parliament. To the mining company's knowledge, there had been no cases of sexual assault reported to mine management. The mining company's point of view was that anyone containing information related to a serious crime should definitely report it to be properly investigated involving the law. This article goes on to explain how Canada is home to many of the world's largest mining companies and how Bill C-300 is the first attempt to ever control how business in this sector is done abroad. The Bill's guidelines would be based on international human rights and environmental norms set by the World Bank. Based on these guidelines a Canadian resident, whether in Canada or abroad, is able to voice a complaint to Ottawa. The government would next conduct an eight month investigation based on the allegation of operating irresponsibility and the results would then be made public. If the company were found negligent, then they would be denied government financial support

provided through the Export Development Corporation and the Canada Pension Plan Investment Board. Up until this point, the government has asked mining companies to use voluntary guidelines for corporate social responsibility and have provided a Counsellor to assist them with issues. Activists feel that the government's approach is that they are not concerned or interested. On the other side, the critics believe Bill C-300 to be heavy-handed and the result could force some companies to leave Canada. Robert Wisner said,

> "The bill lacks guarantees for even a minimum level of procedural fairness for the companies that will be accused of wrongdoing. This uncertainly and lack of procedural fairness will deter even the most responsible Canadian companies from investing abroad." (Whittington)

If this Bill is approved, Canada would certainly be a leader in Corporate Social Responsibility practices and be a model globally for other countries to follow.

Ontario's Mining Act recently underwent revision in January 2010, which has resulted in mixed responses. Mining Watch warns the public that it is important to note the changes have been implemented in the wording involving "Aboriginal consultation." First Nation organizations feel that the word "consultation" is not strong enough as they feel the Act implies that they do not have the right to say "no" to mining projects developing within their communities that they feel are not in their interest (MiningWatch). Recently, a 5,000 square km area found about 500 km northeast of Thunder Bay has become known as the Ring of Fire and a focus of the media. Four years ago as prospectors were searching the Marten Falls area for diamonds, they stumbled upon a massive deposit of copper, nickel and platinum and later an enormous deposit of chromite up to 40 metres thick in some areas making it a world-class deposit. The Ring of Fire happens to

be on Marten Falls' First Nations land where there is an almost 100% unemployment rate. The spinoffs from a mining operation would be enormous as a railway would be built, roads constructed, a processing plant would be required, an airport, and of course the potential for jobs would be endless for generations to come. Chief Cornelius Wabasse, of the Webequie First Nation and Moonias will be negotiating for their people over the next six months to take ownership of a revamped airport, environmental impact studies, an improved memorandum of understanding with the government, winter road extensions and a guarantee of training and jobs (Talaga). As stated in the Aboriginal Peoples and Mining in Canada: Consultation, Participation and Prospects for Change discussion paper, some forty years ago, Canada's Aboriginal Peoples First Nations, Inuit and Métis, had no say in decision-making about mining activities on or near their ancestral lands. (William Hipwell).

Canadian mining companies have recently brought many changes to the industry, whether mining in Canada or globally. At home they are known to implement programs such as Rio Tinto's public bike sharing system in Montreal where a Montrealer can simply pick a bike and travel on it to another station within the city (Theriault) or Fort McMurray's Be Clean Be Green recycling program (Wood Buffalo). When Canadian companies begin operations in poor countries, they have found that indigenous peoples move closer to the mine in hopes of benefiting. An example would be IAMGOLD's Sadiola project in Mali, West Africa where the local population increased to 20,000 from 1,000 people. At many of the operation sites, foundations have been set up for local development to meet the needs of the local residents and often companies are actively battling against HIV/AIDS. Canadian mining companies enrich the local economy through job creation, taxes, and the purchase of local goods and services, community programs, health and education assistance, scholarships, infrastructure projects, and

charitable donations. The companies are also known to form partnerships with local non-governmental organizations to help in poverty situations by providing housing, education and health care (Bergen).

When it comes to developing a mining operation in a foreign country, the Canadian company must be sure they have the legal rights to do so and the foreign government is not able to change its mind and take that right away. Government licensing is the first step, followed by environmental assessments, with international standards being met in order to obtain the funding from the World Bank. The next step is to secure the social license to operate by proving that the operation will meet its corporate social responsibilities to the local community, government and stakeholders. It is best to consult early in the development and continuously to be sure the local needs and concerns are being met. The welfare of the local community is important as the mining operation often employs them and deals with their businesses daily. A challenge for the Canadian mining operation might be when at times the federal government claims the benefits for that country and the locals do not profit. Canadian mining companies that begin production in another company always run the political risk of the government changing the rules and asking for a larger portion of the benefits. This is even a greater risk when the local people have been trained to work highly skilled and technical jobs. Essentially, the government could take over the mining project and the experienced workforce could run it on their own. Before negotiating business in a foreign country, it would be wise to question the power of the relationship with the host country. Canadian companies go outside of Canada to mine in high-risk areas because the wealth of minerals outweighs the risk. Due to the risks from unstable politics, these are the areas that will likely lack infrastructure which is costly to install (Zlotnikov).

According to Nancy White, Barrick Gold's Director of Communications for Responsible Mining:

> More technical expertise will be required to meet the environmental guidelines and greater efforts will have to be made to meet social responsibility commitments. But Canada's reputation for ethical, responsible operation and the industry's focus on long-term investment will help ensure Canadian mining companies continue to make a positive difference not just within our borders but all across the globe. (Zlotnikov)

10. Possible Solutions

"Mining is the foundation of industrial civilization. Other than raw agricultural products, the raw ingredients for everything else in our modern lives comes from mining; from the minerals in your toothpaste to the plastic case and gold circuits in your computer, to the metal frame of your automobile and even the road itself, to the salt on your dinner table and the silver chain around your neck." (Mining Queen's). There are definitely issues concerning the global

role of the mining operations and how governments, the public and stakeholders respond to mining within their country.

Perhaps it has been very beneficial to have numerous activist organizations to keep watch upon one of the most important and most unknown industries in the world. Today's policymakers recognize that there is a strong need to put in place awareness to environmental and social issues to promote the growth of sustainability and alleviate poverty. The World Wildlife Fund (WWF) global network goal is all for mankind to live in harmony with nature. The organization is concerned about the current requirements humans have on the planet. The alarm is in regard to our consumption and production patterns. The WWF states that if the UK's current consumption and production habits were replicated throughout the world, then we would require three Earth's in order to provide the resources to keep up. The American lifestyle would require five planet Earths. This estimation shows us that the current consumption habits are significantly out of step with the natural resources. Given the fact that most developing countries are challenged by the standards of the Western countries, this projects a global future challenge (World Wildlife).

The National Round Table's recent document Progress Through the Process is a collaborative effort to unite the mining world. David McLaughlin, President and CEO of The National Round Table on the Environment and the Economy and David Mitchell, President and CEO of the Public Policy Forum agree that:

> The notion of sustainable development which burst into public consciousness a generation ago was welcomed with great optimism by governments and peoples around the globe. It was based on the idea that environmental protection and economic

> prosperity could and should be pursued in tandem to safeguard the needs of future generations. It was easier said than done. Too much attention was paid to seeking the 'perfect' solution; to little was paid to considering how best to get there. Now, too often, views have hardened into positions, interests have become barricades, and rhetoric has replaced dialogue. However it happened, the goals of sustainable development have become difficult to achieve – for all of us. We need to get back to basics including figuring out how to talk to one another – how to leverage the need and desire for debate and discussion into accepted and effective processes for sustainable government governance. (National Round)

This document suggests optimistic views and provides a future when governments can balance and solve problems together. The report explains that sustainability is very complex as it involves climate change, biodiversity and air quality. The document points out how forestry was once opposed to but Canada has become a world leader in forestry sustainability, therefore, there is no reason we cannot do the same with the mining sector. The key is that governments and stakeholders must have a common and practical focus in order to move forward. The report endorsed that if the people involved realize that the future has changes that are to occur over a long term, then it is easier to adjust to the changes. Partnerships between business, governments and the communities engaging meaningful conversations are essential to being accountable. The message is that governments must make responsible decisions based on past experiences and stand by them in order to bring progress. Governments must put in place fair and legitimate rules. Even though the process will likely take longer and be more costly, the public must be included to erase suspicion and encourage support of the mining operation and confirm an accountable government (National Round).

An article in the Toronto Star on November 22, 2009 stated that mining company spokesmen for Canadian mining companies feel they are the target of false allegations that are a result of poorly run or corrupt governments where mines are located. Gordon Peeling, the CEO of the Mining Association of Canada, which represents the interests of Canada's largest mining companies stated, "The biggest challenge out there is a lack of governance capacity in developing countries. If companies had the capacity to protect civil rights and live up to their international obligations with appropriate justice systems, etc. we wouldn't have much to talk about" (Popplewell). A perfect example of allegations and bribery dominating the media today is in regards to the Canadian Blackfire Exploration mine operating out of Mexico. This operation has been under scrutiny since allegations from a Mexican activist told of agreements between the company and the mayor of the nearby town who has been using bribery to hold off attacks upon the mine and its employees. Similarly, Rio Tinto executives operating in China have been tried and accused of taking bribes which have harmed the nation's economic interests and security.

Canadian organizations such as CMIC, CEMI, and COREM agree that research is the key to improving the mining techniques and job opportunities throughout the world. It will be important to fund research projects with the support of the mining sector as well as government. The government has already teamed up in a number of projects with the industry, but more needs to be done. A continued focus on collaboration and networking sounds simple but there are many parties involved that it will not happen overnight (Ednie 43). In order to obtain global leadership in mining technology and innovation to support a responsible mining industry, CMIC has linked with many organizations. The same organizations have stepped forward to collaborate and work towards a common goal. In the past seven months these organizations have

signed a Memorandum of Understanding with the Canadian Institute of Mining and in return CIM will provide administrative, accounting and communications services to promote their common interests. They have collaborated and obtained funding, support and advice from the government on key initiatives. CMIC has continued to invite Canadian Universities with mining or geosciences programs to join their organization. They have official endorsement from Canadian organizations such as the Mining Association of Canada (MAC), Canadian Institute of Mining (CIM), Prospectors and Developers Association of Canada (PADC), and the Canadian Association of Mining Equipment and Services for Export (CAMESE) (Blancarte 77). The unification of these groups in Canada will only enhance our strength as leaders in the global mining industry.

The International Council on Mining and Metals (ICMM) established in 2001 to improve performance in the mining and metals industry and has worked with the Global Reporting Initiate to compose a new reporting guide touching on controversial issues. Much of mining is carried out in areas of the world that are rich in resources and the industry must behave in a sustainable way minimizing the impact. Emphasis is on the need to work effectively with governments and local communities and to improve good practice with a focus on water, mine closure and biodiversity. The ICMM members have decided not to mine in World Heritage properties. Water management must be a priority to deal with as water issues have increased in the last five years due to drought conditions, the growing population and climate change that has affected many countries and ICMM is tapping in to the many global studies currently being done on water. Mining operations must all come to a finish and it is essential for proper planning (International Council). At one point in history mine operators were allowed to simply walk away from the disasters they created in the wake of their operations, however, things have

changed a great deal and the importance of reclamation has been recognized. With increased public and government scrutiny, long term planning has become more important than ever, and governments have enacted policies to ensure proper handling of depleted mine lands. Often prior to 1990 there were no provisions for reclamation. During the reclamation stage of the mine, the land is returned to an equivalent land state before the operation's activities and quite often the result is better than before, where previous low lying wetland sites have been transformed into forested parkland areas. (Armstrong). As well, planning and financing must take into consideration the site's lifetime of activity and social considerations in regards to the community and their resources, education, and knowledge of the process. It is recognized that future improvements are necessary in the good practice of biodiversity and to take a role in educating the governments and public about the positives of a mining operation and ICMM has published documents to assist their members in their commitments. ICMM has a socio-economic development program which is intended for the mining operation to make a positive contribution to poverty in the community. A mining operation's positive impact includes employment, infrastructure, and community development such as education and healthcare programs which are needed and benefit the local people while the mine is in operation as well as after its closure. In November of 2005 ICMM along with the World Bank published the Community Development Toolkit to give guidance to mining companies, governments, and communities on the stages of the mining project cycle. To preserve the reputation of mining, it is necessary for companies to build community relationships and leave a positive impact through the developing of partnerships, strategies with long term objectives, and decisions that include participation of all stakeholders. The United Nations has put an emphasis on corporate responsibility and advocate mining companies should be committed to the respect of customs,

cultures and values when bringing sustainable development to a country. ICMM has published documents to assist companies in dealing with human rights challenges. Mining often must operate in areas that are home to indigenous communities which through the history of mining has caused mistrust over the land and the rights of the indigenous peoples. ICMM has also done a study and published a paper in 2005 promoting better relationships with the communities involved. In November 2005, ICMM and the World Conservation Union hosted two Round Table conferences on Indigenous Peoples issues to improve management of relationships at the operational level. In more recent years there has been progress to improve the industry's action plan in regards to disasters. Being prepared and able to act in an emergency at the operation as well as educating those who live nearby the mine has proven to be more effective for coping in unforeseen situations. Again, ICMM jointly with the United Nations Environment Programme published a report outlining good practice and emergency procedures. Most importantly, ICMM members have asked the United Nations to work with them to make governments accountable by implementing anti-corruption legislation (International Council).

Conclusion

Mining seems to be the beginning of all and yet one of the most misunderstood business sectors. In order to preserve our way of life, we require minerals and metals, and to do this, we need to work together. Sustainable development is defined as "any construction that can be maintained over time without damaging the environment" (sustainable).

It is obvious that the effect of a mining footprint on the environment is a very complex and ongoing issue in the world. It is fair to say that mining companies have evolved greatly within the last 10 years in the approach to providing responsible, ethical and sustainable development that minimizes negative impact on the environment. Large mining companies of today seem to be working towards this common goal.

The United Nations Global Compact Leaders Summit 2010 scheduled for June 24-25, plans to connect sustainability issues and actions. Leaders from around the globe will come together to share best practices with the goal of creating universal business principles (Whelan).

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Appendices

Appendix 1: (GRI Metals Sector)

The following recommendations have been highlighted within the document: the Sustainability Reporting Guidelines and Mining and Metals Sector Supplements written by the Global Reporting Initiative (GRI).

- That a percentage of the materials used be recycled in order to help reduce the global demand for virgin materials. This will help to conserve our mineral resource base.
- Energy consumption has a direct impact on the cost and supply. The environmental footprint is determined by the source of energy and if less energy is used then there is less of an impact. The consumption of fossil fuels contributes to greenhouse gas. Intermediate energy can be purchased from solar, wind, geothermal, hydro energy, biomass based energy and hydrogen based intermediate energy.
- Use energy more efficiently to fight against climate change.
- Better use of water such as reducing the use so as not to lower the water table of the community, increase recycled water use in order to reduce consumption, treatment and disposal.
- Discharge effluents or process water to a treatment facility reduces pollution levels and lowers the organization's financial costs.
- Monitor activities in the area to not to upset the protected such as biodiversity (terrestrial, freshwater or maritime ecosystem) areas outside of the mine operation.

- Ensure the surrounding natural environment and resources and communities. Protect the IUNCN Red List species and national conservation list of species that are at risk for extinction.
- Identify and reduce emissions of greenhouse gases from all sources – generation of electricity, heat or steam, combustion processes, physical or chemical processing.
- Reduce waste such as waste oils, office, canteen and camp, scrap steel, tires and construction waste, will lower costs for processing and disposal.
- Reduce spills of chemicals, oils and fuels, tailings and slime that can have negative impacts on the surrounding environment.
- Identify discharge and runoff that may affect aquatic habitats and have a significant impact on the availability of water resources for the community.

The supplement report on Human Rights protocol states:

- Abolish child labour falls under socially responsible conduct. Identify operations at risk for young workers (under age 18) to be exposed to hazardous work is considered a human rights issue and the mining company must identify their approach and policy in international reports.
- Operations need to eliminate forced or compulsory labour. Depending on the country or geographical area, forced labour has occurred in the past. ie. Slave labour, prison labour, bonded labour, and debts that can be paid off through labour.

The report on Social Impact of Operations states:

- The report ensures that a variety of different levels of staff (including some senior staff) be hired from the local community so that the mining organization will understand the local needs, so that there is a diverse management and also members of the community will financially benefit from the employment.
- Mining operations need to assess and make reports on the impact their operation will have on the community prior to starting up, while in operation and after exiting the community. Decisions should be made as to what is best for the existing community. They may have to consider community economic development planning in regards to sources of income, access to services and social infrastructure, access to capital and natural resources and access to further education and skills training. The mining operation may have to team up with another organization to work on preserving natural resources such as water, plants, wildlife and community health, cultural practices and well being. This should especially be noted for those communities that might be poor, small and in remote and under-developed countries.
- Artisanal mining involves individuals or families and small-scale mining is more extensive and with larger amounts of mechanical equipment. Although this type of organization can provide an income for the community, it can also creative negative impacts such as environmental risks (ie. tailings being dumped into streams), social issues such as conflicts over land claims, and hazards to health. Reporting needs to be compiled on these areas of mining.
- When mining operations are established, settlements may be displaced or set up. Potential impacts for the community might be the loss of productive land, loss of

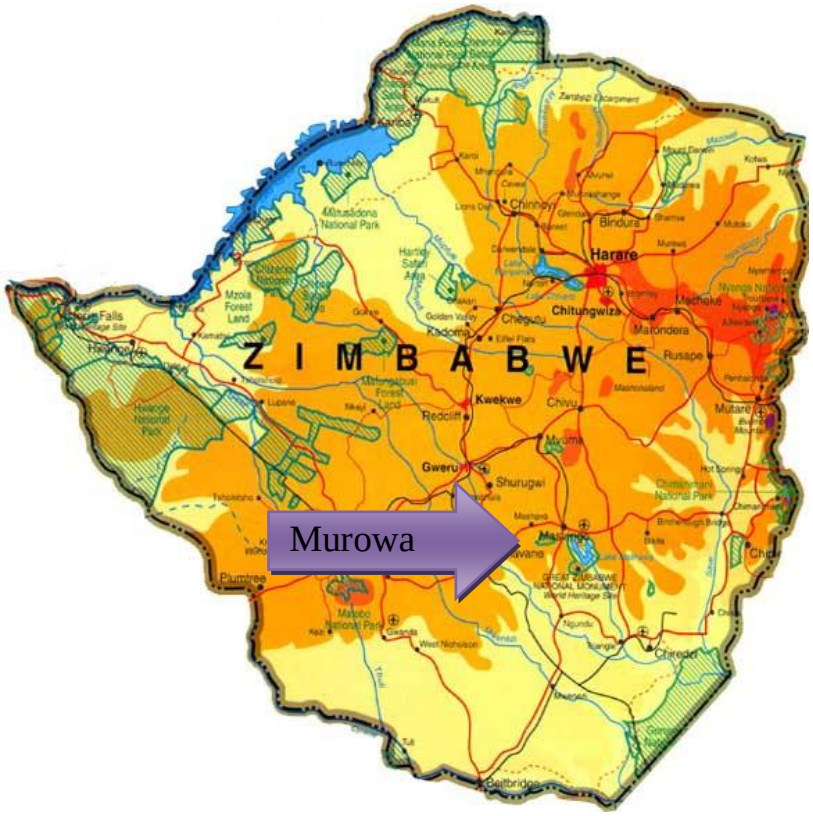
employment and income, loss of housing, loss of access to common resources and public services. The society could become split over relocation. These disputes require recording.

- The closure of a mining operation, whether sudden or over time, impacts the community. An operation needs to develop a closure plan for the community to be sure sustainable development has occurred.
- A system needs to be in place to check employee corruption to be sure the company is reporting and following procedures properly. A risk analysis report is necessary to safeguard against the potential of corruption within an organization. Employees of management and non- management levels need to be trained in anti-corruption regulations and follow the legal protocol. Corruption can risk a company's reputation and is often linked to environmental and social issues.
- An organization's ability to oblige the range of laws (international declarations, treaties, national, sub-national, regional and local) that it must operate under makes for a stronger company as it reduces risks through fines or simply reputation. When a mining company sets up operations in remote areas, they often come in contact with indigenous peoples and public attention will focus on the corporate performance when dealing with the community. How the company employees handle the agreements with indigenous communities will determine the level of risk to the organization.

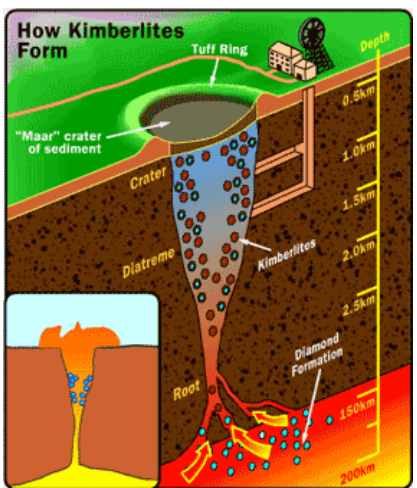
It is evident from the Mining and Metals Supplement, 2010 that there is definitely proof that mining companies are becoming more conscientious and responsible for their actions and

operations. The International Council on Mining and Metals (ICMM) has recognized the challenges facing today's mining sector and are advocating for improved guidelines for people and the environment through the publication of the GRI Mining and Metals Sector Supplement.

Appendix 2: (Zimbabwe map)

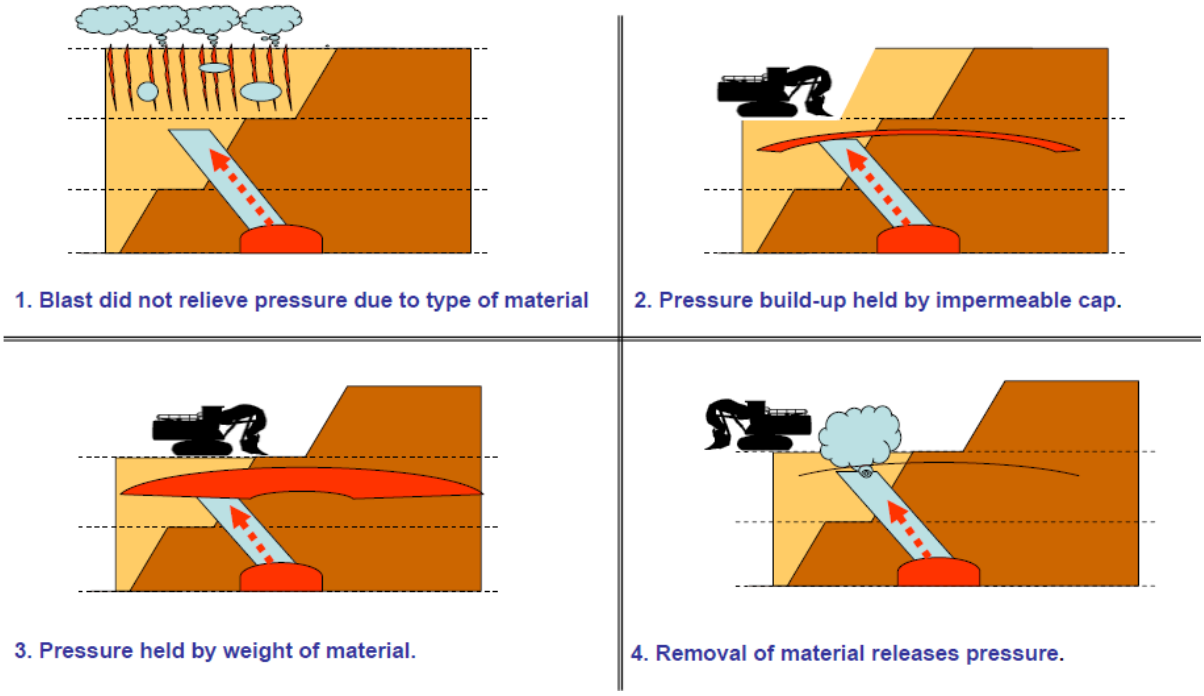


Appendix 3: (Kimberlite)



Appendix 4: (Lihir Island)

Appendix 5: (Steam Release)



Appendix 6: (Columbia)

Appendix7: (Interview)

Interview: Drew Armstrong

Trefor: Tell me what experience you have had in the mining industry?

Drew: Four years of schooling in mining engineering. Travelled to Australia for schooling in mining. Toured mines in New York, Timmins, Peterborough, Sudbury and throughout Chili. Four months of working in the oil sands operations with Suncor.

Trefor: What types of mine sites have you been to?

Drew: I have been to both open pit and underground mines, with working experience in an open pit mine. I have travelled to some truly world - class mines, the Kidd mine in Timmins which is approaching 3 km in depth, one of the deepest in north America. In Chili I visited the largest underground caving operation in the world, El Tenniente, which produces upwards of 400, 000 tonnes a day, on par with large open pit operations. The oil sands mines in Alberta (the only other oil sands reserves in the world exist in Venezuela) are some of the largest (by volume) operating mines in the world, moving over a million tonnes of material in a single day.

Trefor: As a graduating mining engineer, do you feel there is a global need for mining companies to make changes in their methods of extraction, processing and reclamation in order to protect our environment?

Drew: Major advancements have been made in the past 10 years. Mining companies have become much more conscious of both safety and the environment. Throughout this period there have been large changes in the way the mining process is undertaken. One of the major advancements is the requirement for reclamation securities to be fronted before the development of a mining project can even commence. Mining companies themselves are driving to make

their projects more environmentally concerned. Millions of dollars are being spent every year on research by these companies to find viable alternatives for some of the more harmful processes currently being employed in the mining and metallurgy industry. This trend will indefinitely continue into the future.

Trefor: Have your professors at Queen's University focused on responsible mining methods?

Drew: At Queen's we have an entire course committed to the instruction of sustainability within the mining industry. The course is taught by Tony Hodge, the president of the ICMM based out of London England.

Trefor: Are you familiar with many mining activist groups and what do you think about their mandates?

Drew: Green Peace are a bunch of shit disturbers that care more about the "potential" risk to a single bird than they do about the lives of their fellow human beings. There have been countless incidents where both human and animal lives have been lost, and it is the story of the perished animals that catches headlines under activist's exemplifications while the tragic story of the loss of human life is completely eclipsed, if reported upon at all.

Trefor: Do you feel that we will see huge changes in mining in the 21st century?

Drew: The mining industry is going through a major transformation. The majority of the mining industry is about to retire and there is huge demand for young people to take their place. With the new infusion of youth will come an accelerated shift to change the industry. There will be a great push to make the mining process more sustainable and safe. The classic miner is going to become extinct, mining equipment is becoming more automated meaning that operators will no

longer be required to work directly at the face and will be able to operate equipment from the safety of an office.