In the “Heart” of the Comarca: Understanding the Environmental and Social Impacts of Mining the Cerro Colorado Deposit

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In the “Heart” of the Comarca: Understanding the Environmental and Social Impacts of Mining the Cerro Colorado Deposit

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The Cerro Colorado copper deposit is located in the central cordillera of Panama, in the middle of the Ngöbe-Buglé comarca. Cerro Colorado is the fourth or fifth largest copper deposit in the world, with approximately 1.3 billion tonnes of ore with 0.7% copper mineralization. With copper prices rising, the Panamanian government under President Martinelli is negotiating with international companies for the exploitation of the mine.

The Ngöbe-Buglé are two of the seven indigenous groups in Panama, and just recently established their autonomous land claim, their comarca, in 1997. They traditionally rely on subsistence agriculture and share strong kin ties that make up their political organization. There are approximately 150 Ngöbe communities which would be affected by the development of the Cerro Colorado mine, representing many thousands of people.

Since the 1990s, trade liberalization of Latin America has brought a major increase in foreign investment for extraction of mineral resources. Unfortunately, in most cases of mining development, affected communities do not receive any, or only minimal benefits, and are excluded from the decision making process. Mining companies have caused community divisions, violence, and often do not fulfill their promises of development projects such as schools, health clinics and secure employment. The international community is largely unaware of these patterns and the atrocities that mining companies commit; there is a lack of information available to the public. Likewise, local communities are not given adequate information about the environmental and social impacts of mining operations elsewhere in the world.

We decided to create a document that would synthesize information about potential environmental and social impacts of open pit mining in general. It would also seek to create an alternative archive of community reactions and the impacts they have felt from the forty years of exploration that has occurred at Cerro Colorado. To do this, we completed an extensive literature review and visited the Ngöbe-Bugle comarca to interview community members and observe the study site.

The communities near Cerro Colorado are almost unanimously against the development of the mine project. Their experiences during the exploration programs in the 1970s and 1990s were negative; the companies did not consult them, but did cause great environmental damage. Respondents consistently mentioned the following impacts: crops were destroyed due to construction and drilling, several native species have all but disappeared from the region, water levels have dropped overall and two separate instances of water contamination and fish kills resulted in adverse health impacts for the population.
Three companies are competing for the rights to exploit the Cerro Colorado deposit today, one of which is the Canadian exploration company Corriente Resources Inc. They have been conducting *capacitaciones*, or workshops where they promote their brand of “responsible mining.” Communities lament the lack of information they receive about potential negative impacts. They feel that the mine will not bring them any benefits, as work is available primarily for educated foreigners and the company tells them they will have to relocate from their homes.

There is a discrepancy between company rhetoric and how local communities feel about the mining project in Cerro Colorado. There is also a direct conflict between the *comarca* law which grants land rights to the Ngöbe-Bugle pueblo, and the federal constitution which reserves subsurface rights for the government. The negotiations surrounding the Cerro Colorado deposit will illustrate whether or not economic development is preferred over indigenous rights and environmental protection by the Panamanian government. Panamanian and transnational involvement in the Cerro Colorado project constitute a part of the greater narrative of Canadian mining operations in Latin America. This case study further illustrates the disconnect between the institutional discourse on the sovereignty of indigenous peoples and their actual exclusion from consultation regarding their livelihoods and culture.

**En el Corazón de la *Comarca*: Los Impactos Ambientales y Sociales de una Mina en Cerro Colorado**

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El depósito de cobre Cerro Colorado se encuentra en la cordillera central de Panamá, en el centro de la *comarca* Ngöbe-Buglé. Cerro Colorado es el cuarto o quinto depósito de cobre más grande en el mundo, con aproximadamente 1,3 billones de toneladas de mineral de mineralización de cobre con un 0,7% porcentaje de mineralización. Con el aumento de los precios del cobre, el gobierno panameño con el presidente Martinelli está negociando con empresas internacionales para la explotación de la mina.

Los Ngöbe-Buglé son dos de los siete grupos indígenas de Panamá, y recientemente establecieron su reivindicación territorial autónoma, su *comarca*, en 1997. Ellos confían tradicionalmente en la agricultura de subsistencia y compartieron fuertes lazos familiares que conforman su organización política. Hay aproximadamente 150 comunidades Ngobé que puedan resultar afectados por el desarrollo de la mina Cerro Colorado, que representan a miles de personas.

Desde la década de 1990, la liberalización comercial de América Latina ha traído un importante aumento de la inversión extranjera para la extracción de recursos minerales. Por desgracia, en la mayoría de los casos del desarrollo de la minería, las comunidades afectadas no reciben nada, o sólo las prestaciones mínimas, y quedan excluidos de la toma de decisiones. Las compañías mineras han causado divisiones dentro de las comunidades, la violencia, y a menudo no cumplen con sus promesas de proyectos de desarrollo tales como escuelas, clínicas de salud y el empleo seguro. La comunidad internacional está en gran parte inconsciente de estos patrones y las atrocidades que cometen las empresas mineras, por una falta de información disponible al público. Del mismo modo, las comunidades locales no reciben información adecuada acerca de los impactos ambientales y sociales de las operaciones mineras en otras partes del mundo.
Hemos decidido crear un documento que sintetice la información sobre los posibles impactos ambientales y sociales de la minería a cielo abierto en general. También trataría de crear un archivo alternativo de las reacciones de las comunidades y los impactos que han sentido de los cuarenta años de exploración que ha ocurrido en el Cerro Colorado. Para ello, llevamos a cabo una extensa revisión bibliográfica y visitamos la comarca Ngöbe-Buglé para entrevistar a miembros de la comunidad, escuchar sus historias, y observar el sitio de estudio.

Las comunidades cerca del Cerro Colorado están casi unánimemente en contra del desarrollo del proyecto de la mina. Sus experiencias durante los programas de exploración en los años 1970 y 1990 fueron negativas; las empresas no les consultó, pero causó grandes daños al medio ambiente. Los encuestados mencionan constantemente los siguientes impactos: los cultivos fueron destrozados debido a la construcción y perforación, varias especies nativas han desaparecido de la región, los niveles de agua han disminuido en general y dos instancias independientes de la contaminación del agua y la mortandad de peces como resultado impactos adversos en la salud de la población.

Tres empresas compiten por los derechos de explotación del yacimiento de Cerro Colorado hoy en día, uno de los cuales es la canadiense Corriente Resources Inc. Ellos han estado llevando a cabo Capacitaciones, o talleres en los que promocionan su marca de “minería responsable”. Comunidades lamentan la falta de la información que reciben sobre los posibles impactos negativos. Consideran que la mina no les traerá ningún beneficio, porque el trabajo está disponible principalmente para los extranjeros con formación y la empresa les dice que tendrán que desplazarse de sus hogares.

Existe una discrepancia entre la retórica de la empresa y cómo las comunidades locales se sienten sobre el proyecto minero en Cerro Colorado. También hay un conflicto directo entre la ley comarca que otorga derechos a la tierra al pueblo Ngöbe-Buglé, y la constitución federal, que se reserva los derechos del subsuelo para el gobierno. Las negociaciones que rodean el depósito de Cerro Colorado van a ilustrar si o no el gobierno panameño se da preferencia al desarrollo económico sobre los derechos indígenas y la protección del medio ambiente, participación panameña y transnacionales en el proyecto Cerro Colorado constituyen una parte de la narrativa mayor de las operaciones de explotación minera canadienses en América Latina. Este estudio de caso ilustra, además, la desconexión entre el discurso institucional sobre la soberanía de los pueblos indígenas y su exclusión efectiva de la consulta con respecto a sus medios de vida y su cultura.

Introduction

Host Institution

CIAM: Centro de Incidencia Ambiental
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CIAM is a non-governmental, non-profit environmental organization based in Panama City. The mission of the organization is to “promote environmental protection, motivate citizenship participation, by diffusing knowledge, the construction of networks, and the surrendering of stories, to impact relevant decisions and politics (CIAM, 2010).” It is involved in several projects related to environmental conservation throughout Panama. This includes the protection of marine resource and tropical forest, improving green spaces in urban areas and resisting large scale industrial resource exploitation. Because CIAM is a young team of lawyers and engineers with both energy and technical expertise, it has been one of the most successful environmental organizations in Panama. Raisa Banfield, architect and director of the organization, is a public figure who is often in the press, and has been described as an environmental celebrity.

CIAM's campaign “CONTAMINAS” focuses on spreading information to the Panamanian public about the negative consequences of mining development. It calls for a moratorium of mining in Panama based on the environmental risks the projects cause. The organization has visited many of the summer fairs across the country as part of its campaigning effort. More than that, it is bringing both the Ministry of Industry and Commerce (MICI) and the Ministry of the Environment (ANAM) to court for failing to follow and enforce environmental laws. The combination of public awareness and legal pressure will hopefully force greater governmental regulation of the mining industry.

*The Mining Industry in Latin America*

Mining as an activity has existed for thousands of years. Prehistoric peoples mined metals and used them for art and rituals. The methods they used were rudimentary and the mineral resources they exploited were probably very high grade ore, metals obvious to the eye and close to the surface.
The era of colonialism brought new pressures to mining activity. Noticing the precious metals that indigenous groups had in the Americas, Europeans explored and exploited areas known to have rich mineral deposits, and found new deposits. Artisanal methods were used, and were developed up until the industrial age. This involved much labor and low capital, with mining done by hand or by simpler tools. Ports were constructed and large ships transported precious metals out of Peru, and across the Isthmus of Panama; these commodities were exported to Europe. Dangerous reagents were often used by artisanal miners, such as mercury in the mining of gold. Historically, these mine wastes were not controlled or neutralized. It is estimated that five thousand tonnes of mercury were released into the environment by artisanal miners over time (Viega, 1997). While these small scale mines had environmental impacts, their footprints were relatively small. In the industrial age, in the middle of the 19th century, mechanized underground mining methods were introduced as a more efficient alternative to artisanal mining. Larger equipment was used to tunnel through rock to access greater quantities of smaller grade ore.

Eventually, the concentrations of metal that could be mined using these methods were exhausted. In the 1970's, open pit mining became the new preferred mining technology, although open pit mining methods had existed for long before that. Gold ore grades at producing mines in Latin America average around 2.8 grams per tonne, and many operations extract copper concentrations at less than 1% (MICLA, 2009). Open pit methods make these fractions economically feasible to remove and process, sometimes removing entire mountains to satisfy worldwide demands for metals. Gold mines that employ this method produce, on average, about 950,000 times the amount of waste as commodity. Open pit copper mines generate 450,000 times the amount of waste as pure copper. (Spitz and Trudinger 2009). While technologies for environmental remediation and control of wastes and dangerous toxins have improved, the scales of these projects are so large that the risks of contamination are still high. Open pit mining
projects require large amounts of investment from developed countries and call for a certain scientific expertise to begin exploitation, which integrates the mining industry even further into the global market.

Intense economic and political pressures are thus added to technological advances in the spread of open pit mining to the developing world. Neoliberal trade agreements—which usually involve easier and less regulated foreign direct investment—have led to an exponential increase in open pit mining concessions worldwide. Latin America is no exception; the 1990s brought several trade agreements which made it possible and attractive for foreign countries to explore mineral deposits and extract for exportation. At the same time that these trade agreements were proliferating, developing countries were developing and drafting their mining codes. Almost always, national laws privilege mining companies over local communities. Environmental regulations similarly evolved in response to pressures from international organizations and governments. While these laws mimic those of developed countries, in many instances international market pressures override environmental legislation (Viega, 1997).

Fair mining codes and environmental legislation require that local populations and ecosystems benefit, or at least are not harmed by mining operations. Unfortunately, the trend has been the opposite in the past twenty years. Violent conflicts have ensued, catastrophic environmental accidents have occurred, and companies have not been held accountable. There is no enforceable international legal framework by which to hold foreign companies accountable for atrocities they commit in the developing world. Member of Parliament (MP) John McKay in Canada wrote private member's bill C-300 on corporate social responsibility which is in 2010 well on its way to being approved by the Canadian Parliament (MiningWatch, 2009). This is a first step in forcing companies to be held responsible for their actions.

The truth is that environmental and social regulations only can do so much. Mining companies have strong international influence due to their ability to boost the economies of
developing countries. This becomes problematic because in reality, while national economies benefit from foreign investment, affected communities are systematically excluded from the positive impacts of economic development. Companies promise to build schools, health clinics and provide jobs, but usually only stay in an area until the mine closes, after which the host country is forced to pay for any remediation or continued social development work. Countries with stronger civil societies, that is, watchdog and human rights organizations, tend to protect their citizens more effectively against destructive mining projects. Specific case studies where local communities are equipped with more information and are granted more sovereignty in decision making are less destructive (O’Faircheallaigh, 2007). A lack of information and communication between the company and the community is still status quo. If mining development is going to be “responsible” in the future, it must involve a more thorough analysis of potential environmental impacts and it must devolve power to local communities during the decision making process. Through this lens we examine the mining industry in Panama, and specifically the impacts and reactions surrounding the Cerro Colorado deposit.

**Mining Context of Panama, and Cerro Colorado**

Copper was originally discovered on Cerro Colorado in 1932, by a Sinclair Oil geologist. However, there was little interest in developing this area for exploitation until the 1960’s. It was during this decade that the United Nations Development Programme began a series of mineral explorations in Central America as a way to strengthen the Panama's economy and this resulted in a country wide search for mineral deposits. The first two significant deposits to be found as part of this campaign were the copper and gold mineralizations of Petaquilla and Botija. This led to further geologic surveying, and the true size of copper porphyry on Cerro Colorado was discovered in the middle of the 1970s (Gjording. 1991).
Cerro Colorado was explored three separate times after the UNDP’s involvement in the area. The initial period of exploration lasted from 1970 to 1982 and was financed by three companies: Canadian Javelin, Texas Gulf and Rio Tinto Zinc. Originally, Canadian Javelin began exploration in the area in November 1970 without a mining concession, and by July 1973 they announced the results of their exploration and the size of the deposit, which was too large for the company to develop on their own. In the mid 1970's, the Panamanian Copper Commission was formed to take over the project, which became the Corporacion de Desarrollo Minero Cerro Colorado (Corporation for Mineral Development Cerro Colorado) or CODEMIN in 1975. This was the Panamanian government's response to Canadian Javelin's failure; it announced its interest to develop the project on its own. It was also this year that the Panamanian government decided to select American company Texasgulf, Inc. as CODEMIN’s sole partner, while allowing the Panamanian government to maintain "majority ownership" and long term control over the project development. Together they jointly owned the Empresa de Cobre Cerro Colorado, S.A. (ECCC). Texasgulf's principal stockholder was the Canada Development Corporation. The scale of the project was huge, and would diversify the national economy with what CODEMIN considered were minimal economic risks. Concerns about environmental impacts were dismissed; CODEMIN claimed that "For those of us who worry about the environment, the knowledge that the modern technology of copper exploitation is even less risky than that of oil is very encouraging” (Gjording. 1991).

Texasgulf Inc. decided in 1980 to abandon the project when it became apparent that the cost of the project and the economic risk involved were too great. The World Bank highlighted the company’s gross underestimation of the cost of the project and remarked that its development would carry significant risks. These risks originated in part from their more conservative projections of the market demand for copper, the length of time that it would take for the project to become profitable, and the sheer dollar amount needed in loans. The final price tag of the
project - not including remediation - was 3.4 billion dollars at 1983 prices (Gjording, 1991). These conclusions came in a time of drastic inflation worldwide (Landau, 1996). To this day, the only publicly available exploration data that exists is from Texas Gulf and CODEMIN surveys.

Between 1980 and the 1990s, there was no development of the Cerro Colorado deposit. Canadian company Tiomin Resources and its Panamanian subsidiary Panacobre completed a drilling exploration program between 1996 and 1998. They identified 127.8 million tonnes of copper at 0.54%, and predicted a 12 year initial phase. A feasibility study was started, and would have cost between 1.5 and 7 million dollars to complete (Landau, 1996). Again, copper prices were too low to cover the costs of mine construction and operation, so the exploration project was abandoned.

A third exploration attempt is currently underway. CODEMIN, the Panamanian government mining entity, still owns the mining concession. The government is courting foreign entities, looking to sell the concession so it can be explored again. There are three contenders presently. Corriente Resources, a Canadian exploration company with exploration concessions in Ecuador, has been the most present in the local communities. Chilean company Codelco has also been present, and there have been articles in the press recently about the South Korean government inquiring as to its possibility to explore (La Prensa, 2010). Martinelli is currently attempting to change Panama's mining code to allow foreign governments to solicit concessions (La Prensa, 2010).

**Environmental Context of Panama**

Environmental protection in Panama is a necessarily important theme in the country's history and development. Since its formation 3 million years ago, the isthmus has been a bridge between two continents and two oceans. As such it is geologically diverse, biologically rich and climatically variable (Coates, 1997). Major industrial projects will have vastly different
environmental impacts based on where in the isthmus they occur. Panama’s role as a bridge of two continent requires that attention be paid to any potential sources of damage or disruption to the natural environment. The history and present context of open pit mining worldwide has not given us confidence in the quality of environmental assessment of these types of projects. In the future local communities, organizations and governments should make sure that companies understand and communicate fully the environmental implications of the mining process.

The environmental impacts of open pit mining are complicated, and depend heavily on local conditions. Therefore it is difficult to generalize the environmental impacts of mining across Panama. Yet a few predictions can be made about the potential environmental impacts from basic knowledge about geologic formation and climate (USGS, 2004).

Geologic formation is central to understanding mine deposits both from an economic and environmental point of view. There is more information available about the geology of a deposit than any other aspect of the project because more knowledge about the formation leads to less financial risk for shareholders. The age and geologic formation of a deposit explains topography, host rock and mineralization. All of these factors are likewise crucial in understanding environmental impacts especially in the long term. Panama as a geographic entity is relatively rich in porphyry copper deposits. The central cordillera, or mountain chain, and the Azuero Peninsula hold most of Panama’s mineralization. The Talamanca Massif in western Panama is part of Central America’s older geologic formation and is different in constitution from the younger isthmus; most of the metalogenesis occurs the west and dates back to the Cretaceous period (Coates, 1997; Nelson and Nietzen, 2000). The metallic deposits are intrusions which occur in older volcanic rocks. They are manifested in various types of alterations: usually found as veins (long string-like concentrated formations typically associated with gold deposits) or as porphyry (larger more disseminated areas of mineralization, typically associated with copper) (Nelson and Nietzen, 2000). The alterations present define the waste to ore ratio and the
efficiency of an open pit mine, both essential to understanding the environmental impacts of a project which will be discussed further in the next section “Environmental Context of Open Pit Mining”.

In the mineralizations in Panama, copper and gold are often found together in deposits. In certain cases, the copper is surrounded by gold mineralization and in others, the gold is superimposed on the copper. A string of porphyry copper and gold deposits line the cordillera which formed from calcium-alkaline deposits in the Paleocene and Pliocene. There are plutons--intrusive igneous rocks--exposed in the high cordillera which vary in age. Petaquilla is one of the older deposits, being 35 million years old, whereas Cerro Colorado is a very young deposit as it is 6 million years old. The Azuero Peninsula has a completely different geologic formation than the rest of the isthmus. Whereas Azuero has larger intrusions and small porphyries, Cerro Colorado and Petaquilla are large porphyry deposits (Nelson and Nietzen, 2000).

As defined by the Koppen classification system, Panama has five climates. Climates are defined based on average and extreme precipitation and temperature. Since Panama is heavily influenced by both the Pacific and Atlantic oceanic variability, climate is influenced by the location of the mine based on its side of the cordillera. The other determining factor of climate, especially important in the tropics, is altitude. Most deposits are concentrated in high elevation zones, where climates are usually slightly cooler and rainier than the lowlands (Government of Panama). Many deposits have faces on both Pacific and Atlantic sides and thus subject to different climatic conditions, although those on the Azuero Peninsula are located exclusively on the Pacific side and experience more seasonality and slightly drier climate.

The most outstanding aspect of Panama's climate is the seasonality of its precipitation. The country as a whole receives an amazing amount of precipitation every year, which for many zones is concentrated within a few months. The marked rainy and dry season in most of the
country’s regions has major implications for the environmental impacts of open pit mines, to be discussed further in the next section.

*Environmental Impacts of Open Pit Mining*                                                            

Environmental impacts of open pit mining vary depending on the stage in the mining process. The four stages of open pit mining—exploration, construction, exploitation and closure—each have significant changes to surrounding landscapes. These changes are difficult to explain as discrete impacts, as ecosystem processes are extremely interconnected. For example, water contamination can influence land use change as surface run off can degrade agricultural soils, or land erosion influences hydrological networks (Lee, 2006). It is important to understand the time scales of these impacts and their potential to exacerbate each other.

The exploration stage of open pit mining is done before the completion of an environmental impact assessment. Even small initial disturbances can have major implications, especially in previously untouched territory. One of the major components of mineral exploration is achieving access to the deposit. Companies must create an access road in many cases so that drilling equipment can reach different drilling locations. In both road construction and in drilling itself, deforestation is a major environmental impact. Because mining is a speculative industry and exploitation is quite financially risky, companies require investments to begin construction and feasibility studies. Therefore drilling is an important aspect to exploration, as it associates concrete numbers and ore grades to specific locations, which can give an estimate of how much product will eventually be extracted. For example, at Quebrada Blanca in Chile, a copper porphyry deposit of similar size to Cerro Colorado, 307 drill holes were completed between the years of 1975 and 2007 (Quebrada Blanca Technical Report, 2008). At the Pascua Lama property in Chile, a gold, copper and silver property, 1173 reverse circulation and 562 diamond drill holes were taken (Pascua Lama Technical Report, 2005). If each of these holes requires an area to be
deforested, as well as highway access, it is clear that significant deforestation occurs even before an environmental impact assessment is started.

Exploration has other associated environmental impacts. In addition to drilling, the blasting of rocks causes erosion, deforestation, and changes of both surface and ground water levels. New highways and exposed surfaces can cause soil loss especially in sloped regions. Fauna are disrupted by habitat destruction, noise and vibrations from exploration activities. Infrastructure, including but not limited to a mine camp, must be constructed in order to conduct drill programs. Finally, the waste from the drilling and blasting must be deposited. All of these combine to make a considerable impact on surrounding environments before minerals are technically extracted.

Construction is the phase which follows exploration, in which the company builds the infrastructure necessary to commence exploitation. This includes the formal construction of a base mining camp for all personnel (amounting in the thousands for large projects), water treatment, sanitation facilities, power lines, and administrative offices. Besides these human resources needed, the mine components must be built. These include waste storage, tailings ponds, processing and smelting plants, heap leach pads, and other structures. The copper processing planned in the 1970s for Cerro Colorado included the following structures: storage for ore, a crusher and a sifter, storage for the fine mineral, a mill, a flotation plant, thickeners for concentrates and the washed mineral, a filter and a drier, storage for concentrates, a sulfuric acid plant, a precipitator, boiler, flash oven, converter, flotation plant, another oven for blister copper and finally, the port from which the blister copper would be shipped (CODEMIN, 1978). The infrastructure necessary for copper processing has not changed drastically in the past decades, and we can assume that most of it would be constructed for a contemporary mine (BCS, Inc., 2002). Construction still requires a force of thousands of workers in many cases, as well as
intense energy inputs, water and land use change, and the risk of leaks or contamination from fuel.

Mineral exploitation is the crux of the operation. It is during this third phase that the rock is physically removed and processed for export. Waste is deposited after each stage of extraction and processing. The environmental impacts of these wastes depend on the chemicals with which they were treated, the geologic composition of the rock, their particle size and the remediation technique chosen. Overburden is the waste generated before the mineralization can be accessed. Often with porphyry deposits, it is not feasible to process the surface of the deposit because the concentrations of minerals are extremely low. This rock must be extracted and deposited elsewhere for access to the mineral deposit. After the overburden, the waste rock around the deposit must be removed as the ore is being removed. Depending on the mine, this waste rock can have high percentages of sulfides as well, which has implications for long term environmental contamination upon closure. Waste rock deposition alters topography and can facilitate erosion.

Tailings are a third kind of waste from mines. Once the ore is extracted, it must be treated so that the minerals such as copper and gold can be concentrated and the rocks that are not valuable do not have to be transported. Nevertheless, reagents used to treat these rocks include chemicals such as cyanide and sulfuric acid (BCS, Inc., 2002). These toxins remain in the solution of rock, and through weathering are transported to the surrounding environment. In the copper mining process, chemicals used in the concentration process include cyanide and arsenic and concentrations of these remain in tailings (Castilla and Nealler, 1978). These tailings and waste rock have been crushed and ground before they are deposited, meaning that the particle size is extremely small (BCS, Inc., 2002). Small particle size leads to greater erosion and more surface area per particle. Increased surface area leads to the more rapid weathering and oxidation of sulphides. Other resources are needed to reduce the particle size of the rocks. The process of
blasting, milling and grinding is the most energy intensive phase of the copper processing, using about 85% of the total energy required (BCS, Inc., 2002).

Dust and emissions from plants contaminate the air, often at large distances depending on average wind velocities and topography in the region. Smelting and refining is the last step in the copper process, which releases quantities of an extremely dangerous compound SO$_2$ into the air, among other contaminants including ammonia (BCS, Inc. 2002). From here the final product of blistered copper is transported by highway or train to a port (CODEMIN, 1978).

Exploitation requires the most water of all mine stages. Usually the mine requires many times more water to function than surrounding communities. It is considered best practice to recycle most of the water, but water permits for mine operations still allow them to extract a large amount. Petaquilla needs a water permit for 34,560,000 liters per day whereas a larger local river has a flow of only 8,640,000 liters per day (Cedeño, 2009).

Closure bears the most complicated environmental impacts, because long term risks and natural processes are difficult to predict. The company which is responsible for paying for environmental remediation is only required in most environmental legislation to monitor closure for a few years, after which it is not accountable for damages. Risks are high with open pit mining projects because the quantity of waste deposited is so large, and processes can last for centuries. Environmental conditions require risk assessment in the areas of seismic activity, flooding and drought to avoid catastrophic accidents. Tailings dams are constructed to contain hazardous material, but there are at least 221 serious tailings dam accidents reported in history (UNECE, 2007). Most of these have been reported in the United States and Europe, and we must assume that there have been many more incidents in developing regions such as Latin America (Rico et al, 2008). Many of the accidents have occurred in the past 20 years, which signals high risk even in the context of improved technology and remediation (UNECE, 2007).

Approximately half of these serious accidents worldwide could have been prevented if
the tailings dams had been adequately planned and managed (Rico et al., 2008). The consequences of tailings dam accidents can be severe and include the contamination of surface water, ground water and soil. This threatens drinking water, agriculture and native species in both short and long term. In some more grave case studies, a tailings dam accident has resulted in the death: 125 in the United States in 1972, 89 people in Zambia in 1970, 12 in the Philippines in 1995 and 269 in Italy in 1985 (UNECE, 2007).

Remediation schemes are extremely case specific. Topography, climate and mineralization again dictate what is possible. In areas of extreme topography, special attention must be paid to waste deposition and storage facilities knowing that erosion is possible and leaks will impact ecosystems downslope, both terrestrial and aquatic. In climates where evapotranspiration exceeds precipitation, tailings ponds may not be practical because constant inputs of water are needed and exposure risk during dry periods exists. In climates where precipitation exceeds evapotranspiration, flooding is a risk and tailings ponds must be constructed to allow for water level increases. In dry climates, terrestrial deposition often involves compacting the tailings and stacking them because the risk of rain transport of contaminants is relatively low (Mendez and Maier, 2008).

Accidents are one source of environmental danger, others are very long term processes which are difficult to remediate right at mine closure and require adequate monitoring for decades and maybe centuries. One relatively well understood process is acid mine drainage from mines containing high concentrations of sulfides. Copper and gold mineralizations are made up of sulfides including pyrite and chalcopyrite. Once this sulfide ore is exposed to air, it can oxidize over long time periods (Nugraha, 2008). The oxidation acidifies the rock, which later leaches sulfuric acid into runoff and into the groundwater. Low pH can damage environments in and of itself, but also makes heavy metals in the rock more soluble (Price, 2003). The heavy metals can be toxic to plants, animals and humans. Contaminated soils can be revegetated to
some extent depending on their pH and heavy metal content. When waste piles and surrounding areas do not have high percentages of sulfides or of heavy metals, sometimes these areas can be restored to agricultural quality. Usually, some native species can grow with success. In some cases, surfaces are so degraded that nothing but small brush can grow (Tordoff, 2000).

Heavy metal pollution from copper mines has been studied. During exploitation and after closure, it has been found that in both terrestrial and aquatic environments surrounding active and abandoned mines, there are elevated concentrations of base metals including lead, iron, zinc, aluminum, copper, cadmium, arsenic, manganese, molybdenum, selenium, mercury, cobalt, chromium and nickel. These have caused damages to ecosystems and human health in the short and long term. Some heavy metals including copper inhibit agricultural activity, and in some studies were shown to bioaccumulate (Fernandez, 2006). Acid mine drainage is another result of tailings and waste disposal and has a few negative effects. It is during the closure phase that acid mine draining would occur, as the process sometimes does not commence for decades.

Climate change and massive time scales challenge remediation techniques. Some processes, such as acid mine drainage, may not exhibit significant impacts for hundreds of years. The issue in the future concerns who will be financially responsible for environmental remediation. The companies will have long left the area and in all likelihood will not exist. Will municipalities pay? Will the federal government pay?

Social, Political and Economic Context of Panama

Mining activities have been present in the area surrounding Cerro Colorado for 50 years. Companies, international organization and governments use the rhetoric of ‘development’ and national economic gain as their primary motivations in supporting resource exploitation. The testimony of the communities in the areas surrounding the mine site could not be more contradictory in tone and desires. What is blatantly apparent in the details is that the there has
been a marked lack of consultation with local inhabitants from the project’s inception. Their concerns have been largely excluded from any discourse or decision making regarding exploration and the potential for exploitation of this copper deposit.

A Brief Ngöbe-Buglé History and Current Social Context

The Ngöbe-Buglé people, historically and collectively referred to as the Guaymí, first came in contact with the arrival of Europeans in 1502 during the fourth voyage of Christopher Columbus (Young, 1970). European conquest of the isthmus, and Latin America in general, resulted in a massive reduction in indigenous population numbers. Those Ngöbe-Buglé who survived the peak of Conquista era activity fled to the mountains of the Panamanian cordillera (Gjording, 1991). There they lived, governed by their own local dynamics for approximately three centuries; prior to 1900 they generally pursued their traditional ways without much outside contact (Young, 1970).

Traditionally, the Ngöbe-Buglé people have been primarily subsistence swidden fallow agriculturalists. Their livelihoods have been supplemented by the use of agroforestry products – for example, in the making of chácaras – and hunting and fishing activities. They conventionally live in small dispersed communities, where families and kin relationships are a central tenet of their social organization and livelihood security (Gjording, 1991; Young, 1970). Subsistence agriculture remains the cornerstone of Ngöbe livelihood security in the communities we visited, although many Ngöbe in the Cerro Colorado area now grow organic coffee to sell on the market or work as migrant labourers on plantations during the harvest. The main exceptions to this are those families who also own convenience stores that provide communities with some food staples and basic supplies, such as sardines and batteries.

Socio-economic status of the Ngöbe-Buglé
According to the Institute de Nutrición de Centro América y Panamá (INCAP), of the total Ngöbe and Buglé population, 92.3% are identified as poor and 81.5% as extremely poor (Fundación Dobbo Yala, 2010). Extreme poverty is defined as having an annual income under $519.00; individuals at or below this line are unable to meet their minimum required caloric intake. By these measures they are the poorest indigenous group out of the three surveyed in Panamá. Generally, these poverty rates are elevated in areas identified as indigenous lands, such as the *comarca*. They also experience the highest illiteracy rates, with 35% of the Ngöbe-Buglé being unable to read or write (Fundación Dobbo Yala, 2010).

*Land Conflicts and Political Organization*.................................................................................................................................

The experience of Ngöbe – Buglé people is similar to other stories of indigenous exploitation and maltreatment in Central America. One of the defining characteristics of the Ngöbe has been their connection and dependence on the land for their livelihoods (Servicio Paz Y Justica – Panama, 1990). The struggle to continue using and to maintain sovereignty over their lands has been a continuous part of the Ngöbe historical trajectory since the arrival of the Spanish conquistadors in the 1500’s. “La tierra es el lugar de descanso y de gradeza, es la seguridad de seguir existiendo como pueblo, es el pasado, el presente y el futuro” (Servicio Paz Y Justica – Panama, 1990, pp 11).

The dependence of this group on land and subsistence agriculture makes the issue of land security and ownership an integral part of their livelihood considerations. Since the mid 1900’s, there has been significant pressures on their main livelihood strategies due to a decreasing availability of land (see Appendix 7). Factors which have limited Ngöbe-Buglé access to land include an increase of their population, activities directly related to imperialistic interests in Panama such as appropriation of lands by the Spaniards -- now largely latino lands used for cattle ranching -- and the arrival of plantations. In the twentieth century, this meant increasing
conflicts among the Ngöbe-Buglé over resources and strains on traditional systems of reciprocal labor obligations through kin and community ties. Out of land shortage came a migration to the areas in the immediate vicinity of Cerro Colorado. As well, an increasing number of people started to work as migrant labourers, and thus were unable to fulfill their reciprocal labour obligations and to assist family members with farm work. This also resulted in land conflicts as families would take over land left vacant while these workers were away. As identified by Chris Gjording in 1991, “Of this list of enemies, the most immediate for the Guaymíes was the land shortage” (pp 49).

Efforts have been made by Ngöbes and Buglés to reclaim their indigenous sovereignty. In the early 1970’s, most of their indigenous territory was a demarcated "zona indígena" (indigenous zone) of collectively owned, contiguous lands in the Chiriquí and Bocas del Toro provinces. Since this time the Ngöbe-Buglé have devoted much effort to help in the process of delineating boundaries for the comarca (autonomous indigenous territory), however political mismanagement of this effort and a general disregard for the project slowed the creation of the Ngöbe-Buglé comarca. As well, the Ngöbe-Buglé were not used to organizing or governing at larger than regional scale; traditionally the extent of their political organization was based on community and kin group relations (Young, 1970). It was, incidentally, the Mama Chi religious movement in the area that first provided the Ngöbe-Buglé with experience organizing in a larger group (Gjording, 1991). It was not until 1997 that the Ngöbe-Buglé formalized their land claims and addressed other issues of concerns with the creation of “Ley N° 10”, which established the Ngöbe-Buglé comarca (Coordinadora Nacional de Pastoral Indígena, 2003).

The presence of mining interests in the area has definitely been a motivating factor for the Ngöbe and Buglé people to demarcate and formalize their claims to land. However, this same presence is a major threat to the indigenous sovereignty of the Ngöbe-Buglé comarca.


**Research Questions**

Because of the complex nature of our topic, it was impossible to develop and pursue a single question. Rather, this topic required a multifaceted approach, which takes into account the interconnected nature of environmental and social processes at various scales.

What are the environmental and social impacts of mining the Cerro Colorado deposit? What are the reactions of the local communities to the presence of international mining companies? What do these illustrate about the potential impacts of the Cerro Colorado mine, and a prominent mining presence in Panama in the future?

**Justification**

Chris Gjording’s research on this topic ended in the 1990’s, before the involvement of TIOMIN and Panacobre. Also absent is the more recent interest in exploiting the deposit. One of his more extensive works – Gjording’s *Conditions not of their Choosing* – was an investigation on the experiences of the Ngöbe-Buglé in throughout the past historical trajectory of the Cerro Colorado mining project. He had a specific purpose for researching this specific issue: to document and understand the Cerro Colorado project “from the poor” of Panama (Gjording, 1991, pp xiv). Our own project has been an effort to continue documenting this experience, and to create an archive of the communities’ opinions and desires, especially in light of the rejuvenated corporate interests in the area and the continued liberalization of the Panamanian economy.

Given the social and environmental context worldwide, and the accelerated presence of mining concessions in Panama, more attention needs to be focused on assessing the true costs and benefits of large scale development projects. There are over 300 mining concessions in Panama, and currently President Martinelli is attempting to change the mining laws to further liberalize trade and negotiation (CIAM). With these new changes, there would be greater access
of foreign governments to the solicitation of mining concessions. There is reason to believe that
the South Korean government is negotiating with the Panamanian government for the acquisition
of the Cerro Colorado concession (La Prensa Locales, 2010).

This new development with the South Korean government is not the only reason that the
Cerro Colorado concession must be examined with care. As the largest copper deposit in Central
America and one of the five largest copper deposits in the world, the pressure for its exploitation
is marked. At the same time it exists within an autonomous indigenous territory, the Ngöbe-
Buglé Comarca. Local communities almost unanimously oppose the development of the mine.
After the initial exploration program in the 1970s there was a large movement to stop the mine
which involved both the Ngöbe-Buglé and several organizations of cattle ranchers,
environmentalists and farmers in the province of Chiriquí (Landau, 1996). While anti-mine
movements in the past may have been successful, it is more likely that volatile copper prices
explain why the deposit has not yet been exploited. Recently, however, copper prices have been
rising. The Wall Street Journal in 1979 said that “copper would have to be a minimum of $1.50 a
pound to make it worthwhile,” to exploit Cerro Colorado. Today, mine construction costs are
higher because of inflation, but copper prices per tonne have increased dramatically as well. In
April 2010, copper prices reached $3.63 per pound and are expected to rise (Times Lives). These
increases make the exploitation of a large, low grade copper mine such as Cerro Colorado more
feasible, and more profitable. One can expect the pressure from international companies, as well
as the Panamanian government, to increase as prices increase.

It is crucial to understand how mining activities have impacted the local region, both
environmentally and socially. This is due to a lack of documentation of this since Gjording’s
work in the 1990’s, and a very significant lack of consultation by those who will ultimately
operate and finance a mining project in the area. The reactions of local communities are the most
important in determining the viability of the Cerro Colorado mining project, because ultimately it
is they who will be the most affected. This document attempts to communicate those impacts and reactions to the international community, while at the same time synthesizing major sources of information about the environmental and social impacts of mining elsewhere. Local communities must have wider contextual information as well as specific technical information to be able to make informed decisions about what development and change they choose to accept or reject.

Besides Cerro Colorado, there have been approximately thirty-four mining concessions in the Ngöbe-Buglé Comarca in recent years (MICI, 2010, Mapa de Concesiones Mineras de CIAM). Therefore negotiations surrounding this mine deposit in particular will be crucial in determining how indigenous groups in Panama will be able to participate fully in their own future, and also how Panama as a country will respond to the increasing global pressure towards industrial development at the expense of local people and the environment.

Methodology

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<td><strong>Full work days in Panama City:</strong></td>
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<td><strong>Full field days in the Ngöbe Buglé Comarca</strong></td>
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**Study Site.**

Our research was conducted primarily in communities within a close vicinity of Cerro Colorado in the Ngöbe – Buglé comarca, an area with approximately 1000 inhabitants; the area of the mining concession itself contains 150 communities, whose population (in 1980) was estimated to be 6250. The communities surveyed were Cuernavaca, Laguna, Cana Brava, Arriera, Jagua, Jengibre and a community in the a valley directly above the mine site camp. Cuernavaca is located approximately 360 km from Panama City, west along the Pan American Highway and north into the mountains (See Appendix 6). The other villages are accessible only by foot. All of these communities are located in the Rio San Felix watershed. As well, some interviews were performed in Panama City.
During all aspects of our research we maintained ethical research practices as per the document “Protocol for Research in Panama’s Indigenous Communities” (McGill University, 2006). Below are the practices we followed throughout our investigation.

1. **Power, Equity and Respect**: These three basic guidelines informed all of our practices. Our project is one of respecting the communities we visit by being sensitive to local cultures, social structures, traditions and rules while engaging in research and a learning process that is based on a concept of exchange. While we did ask individuals and communities questions, we shared our knowledge with them as well as resources. Clarifications and questions by both parties were an important part of our research process.

2. **Rights and Ownership**: All of our research was conducted to create a final document for the environmental NGO CIAM. We recognized the right to ownership and control of information, and the final product is available to all the communities that we visited. We distinguish between collective information and individual information, and share information with the community in a way that does not threaten the anonymity of interviewees. Part of the research process involves establishing long term links between these communities and CIAM, and we hope that this project is a first step in a long term exchange of information and knowledge.

3. **The first meeting**: During the first meeting with community leaders, a copy and complete explanation of our work plan and research project will be available and discussed, including the different stages of the project from conception to finish.

4. **Consultation**: We always consulted with the communities we visit concerning our methodology and research methods. We worked with them to identify potential problems that
may have adverse effects in order to avoid them, and avoided dual consultation to the best of our abilities.

5. **Informed consent and confidentiality**: A cornerstone to high quality research is informed consent and confidentiality. We never proceeded without informed consent and we ensured transparency in our research project so that all involved understood what their participation meant. We ensure the anonymity of all participants unless they asked to be identified.

6. **Consent forms**: We sought oral consent.

7. **Aboriginal Knowledge**: All Aboriginal knowledge passed on to us was treated with care, respect and recognition. Consultations helped provide us with the parameters to identify how to adequately protect and recognize this knowledge.

8. **Data processing, analysis and validation**: We will be returning to the communities with our final product and will continue modifying it to correctly reflect the opinion of those we visited. We hope that this is the first step in a longer term documentation of the Cerro Colorado experience from the point of view of its inhabitants.

9. **Rights of opposition and inclusion of divergent views**: We respected any refusal to participate in our research and included divergent views in our final product where they existed.

10. **Translators and interpretation**: From the first stages of our research, key contacts were established in the communities we visited. We required the services of a translator/interpreter and we asked community leaders to help in the selection of a qualified individual that assisted us in our research.

11. **Management of time-research**: All dates of our visits and the time scale of our project was known by the communities we visited and our presence there was contingent on their agreement to those dates and to our proposed time scale.

12. **Assessment**: Constant self-assessment was an integral part of the research process. A general overall assessment of our research methods helped to outline the various considerations,
difficulties and successes of our process. This is in order to facilitate future research projects between CIAM and the communities involved.

Theoretical Considerations

Theoretically, our research methods employed elements from pragmatic, realistic, marxist and empirical approaches. Because of the multiple agents embedded in the region and project at different scales, the relationships between them were important for us to understand. A pragmatic approach also recognized the importance of changing social contexts. In addition to this, we employed a realistic approach to understand the underlying mechanisms and structures (policies and practices) of these social relations, and their contributions to the social and environmental impacts of the Cerro Colorado mining project. Due to the transnational nature of this project, and the high demand for minerals, we employed some elements from Marxist approaches in research as part of our analysis and discussion after conducting our primary research. This was mainly to recognize the economic and political structures surrounding capitalist production in the Ngöbe-Buglé comarca. For quantitative research related environmental processes and in forming our research questions, we used empirical data and research practices to create a non-normative scientific understanding of different physical processes, and to include descriptive as well as analytical aspects to our over arching research interests (Kitchin & Tate, 2000).

Research Methods

We employed two main methods of research in our investigation. First we conducted a literature review. We used secondary data collection to address our research question, for both the qualitative and quantitative aspects of our project. The sources we solicited included primarily peer reviewed literature, academic studies, government reports, reports of interested parties (other NGOs, social societies and organizations in Panama), geographical data and maps,
company documents, geological survey data and statistical data and government and geological surveys.

The second part of our investigation involved conducting interviews to collect primary data. We employed interviews to address both the descriptive and analytical aspects of our research question. We used a questionnaire with open ended questions as the base of our structured and semi structured interviews. This was to avoid suggesting answers to our respondents. We conducted face-to-face interviews in person. Our sample population was inhabitants of the communities in the proximate area of the mine, including those very close to the camp and the roads, as well as those in more inaccessible surrounding areas. We conducted structured open-ended interviews with individuals and community leaders. In these instances questions were standardized and structured. This was to address – to avoid – interviewer effects and maintain impartiality during the interview. These were usually recorded for accuracy in answers. We used an interview guide approach with households to allow for free-form discussions on specific topics. Here we used probing-questions to establish validity in statements and for clarification. Informal conversational interviews were employed when engaging with households as well as individuals to allow respondents for various ends; to understand what they identify as important topics and considerations concerning the mining project's activities in the area. Finally, group setting interviews and community consultations using our questionnaire as the interview guide we employed as another type of interview setting (Kitchin & Tate, 2000).

We went to the communities with local guides - we employed three different guides in total - for interpretation and translation, introduction to the communities and to physically locate them as many were accessible only by foot path (McGill University, 2006). All the Ngöbe people we met were fluent in Ngäbere, but not all were fluent in Spanish. We recognize that there is the potential for translation errors. However, most people spoke some Spanish, or at least understood
us in Spanish and their responses were in either Spanish or Ngäbere, depending on their language preference.

Limitations

No research process is ever perfect or without its difficulties. The main limitations we encountered concerned local guides, the remoteness of location, the complexity and sensitivity of the political situation in the comarca, language barriers, community distrust and a restriction to the access of technical information.

Because we do not speak Ngäbere, and it is the language of the Ngöbe people in our research location, we had to employ a guide every day to help translate, interpret and facilitate interviews. Some limitations involved with employing a guide were that we cannot be fully sure of the quality and accuracy of a respondent’s answer, and the possibility that having a guide influenced the respondent’s answer. However, we changed guides every day, and most respondents answered at least partially in Spanish. Many respondents were interviewed in Spanish, and a guide was not needed for many one-on-one interviews.

Another significant limitation was the remoteness of location. The total travel time to go to Cuernavaca from Panama City is approximately 12 hours. One in Cuernavaca, many communities could only be reached by foot, and this meant that much of our time was spent hiking to locations in the area. As well, once we arrived in communities, people were often suspicious of our presence and our project. It often took a detailed explanation of our project to finally gain the trust of area residents.

Initially, we were unaware of the sensitive political situation in the comarca and political tensions amongst leaders. These tensions were caused in part because of accusations of negotiations with mining companies currently interested in the deposit. It took us a significant amount of time to formally introduce ourselves to multiple political leaders, communities and
comarca residents, to clarify that we were not working for any Canadian mining companies and that we were not involved in any way with comarca politics. A final limitation was the difficulties we encountered in trying to access some technical information, as much of the studies done by companies involved in the Cerro Colorado mining project was not publicly available.

**Results: Mining in Cerro Colorado: Past and Present Impacts, Community Experiences, Reactions and Concerns**

**Environment**

*Impacts on Land*.......................... ........................................................................................................................................

In the 1970s, the American company Texas Gulf began exploring the copper deposit of Cerro Colorado that had been previously discovered by a private endeavour. It completed over 200 drill holes, constructed the highway which still runs from San Felix to Hacha on the top of the mountain, and constructed a mine camp in the community of Escopeta (Landau 1996). A large cut can be seen at the top of Cerro Colorado which was also taken at the time, in 1978. We visited the site in March of 2010, more than 40 years after the cut was made. The cut has dimensions of 20 by 100 meters, and about 30 meters deep, and there is limited growth of vegetation present. Small shrubs dot the surface and the sides have eroded with rainfall, leaving some small stream beds that were dry (See Appendix 2).

Also present at the top of Cerro Colorado was one drill hole location. It was located on the side of the highway, surrounded by an area that had been cleared (See Appendix 4). We estimated that the deforested area was 30 by 14 m, which was concentrated mostly on the north side of the drillhole location. While the drill hole itself was only a few cm in diameter, its spatial impact was much larger. The construction of the highway can be seen from either the top of Cerro Colorado or from the communities at the base of the mountain. The highway descends from Hacha, to the west, and switchbacks down the mountain towards the mining camp at
Escopeta. There is deforestation present on most of the mountain slopes in the region. Local community leaders characterized most of the savannah as “naturaleza,” something that occurred naturally. This was contrasted with deforestation caused by the company for the drilling program and the construction of the highway. Three of the mountains, including the side of Cerro Colorado, have vast tracts of deforested land on which, according to locals, there were forests and fincas before the 1970s. There are two areas close to the mine camp at Escopeta which are covered densely with pine trees. According to community members, they were part of the reforestation plan of the company. They are not perceived of well; although locals can use them for firewood or to build houses, they complain that no animals eat the fruit of these pine trees. This reforestation technique seems illogical to them, and community members were not involved in the decision making process. This and the other physical changes made to the landscape had ramifications on the local population which were a large part of their oral history.

Before these explorations by Texas Gulf, the community agreed that they were living peacefully and well. Unanimously the respondents said that there was enough water to drink and bathe, and that the water was clean and healthy. Crops produced well. There was great biodiversity of flora and fauna, including saino, the Golden Frog, deer, birds, rabbits, white faced and howler monkeys, fish and crabs. The population depended on local plants for its medicinal needs (Ngöbe respondents 2010).

The presence of native species was a common theme in the interviews. Sixteen community members separately described a lack of, or a disappearance altogether of some wild animals in the region. Birds and the Golden Frog were mentioned frequently; deer and rabbits were also noted as having dwindled. A few members spoke of the importance of these species for Ngöbe hunting practices, many spoke of how they used to eat some of these animals. The disappearance of fish and crabs from the river was often grouped with the other native species, although potential causes for these disappearances were separated.
In 1978 and 1979, community members remember a drastic change in the riverine environment. Rio San Felix, according to one man, turned various colors: red, green, yellow. Others remember it turning to “pure mud,” or otherwise becoming “dirty.” Every participant noted that the tributaries that feed the Rio San Felix dried up. The Cuernavaca community had a stream that ran near the town which provided water for locals, but it is dry now and people drink from wells or aqueducts from other streams (Ngöbe respondents 2010). All respondents remembered water levels as differing before initial exploration began in the 1970s and the present, signifying a long term process of reduced water levels.

Comparing this to official studies conducted by the company as well as environmental groups, it is clear that there were major changes to the aquatic ecosystem. The ProDefensa group from Chiriqui compiled a document which included pictures of over sedimentation at Las Lajas beach, grains of rock which appeared after the company made the cut near Hacha (Landau 1996).

The effects on the aquatic population were associated with the observable water contamination of the 1978 and 1998 years. The local population did not describe the events as discrete, rather that the fish and crab species which lived in Rio San Felix disappeared after the 1970s. Regional Cacique Celestino Mariano noted two more discrete periods of water contamination: the first as a result of activity by Texas Gulf in 1978 and the second during the exploration by Panacobre in 1998. In both instances, the Rio San Felix was filled with mud and dead fish. He said that the first fish kill lasted for about ten years, and the second for about one year. Community perceptions were less specific and made the contrast between before 1978 when there were fish, and now when there are not. The situation was described by them as a cause and effect of exploration, but interim recovery was not mentioned.
The disappearance of native terrestrial or “mountain” animals was also connected with the mining equipment and exploration program of the 1970s. Community members said that the animals were scared away by the noise of the machines and physical disturbance of the land including the removal of earth. They said that although sometimes one sees a deer, or hears birds, this occurs much less frequently than before the company arrived.

The community experienced other sudden and dramatic effects from the explorations. A woman from the community above Cuernavaca remembered the landslides caused by the highway construction and the exploration program. She said that the collapses that occurred killed all of her crops and the crops of other fincas on the hill slope, but the company never compensated them for their losses. The majority of people, including those from communities a few kilometers away, associated the exploration program in the 1970s with these landslides and overall destruction of cultivation.

Domestic animals were impacted as well, according to community members. There were six separate accounts of the company killing dogs, horses, cows, and pigs. Two mentioned the use of firearms and three mentioned poison. One woman specified that the company poisoned their food, while another spoke of domestic animals being affected by drinking contaminated water.

**Impacts on Agriculture**

There was a separation in the narrative in some areas between what occurred in the 1970s and what is still occurring. One woman living above Cuernavaca said that her cultivations are recently beginning to produce more, but she is fearful that if a mine begins exploring or operating that this progress will be halted and worse, she will again lose all of her crops. While she was optimistic about her produce, most interviewees lamented the state of their crops which
do not produce as well as they did before the company came. A prior stability in agriculture has been replaced by difficulties in producing adequate amounts of food.

While CODEMIN's studies from the 1970s remark that the land near the mine deposit is deforested, degraded and does not support crops well, families in the area still manage to survive using methods of subsistence agriculture. When asked what crops were grown in the surrounding fincas, the communities mentioned coffee, rice, corn, beans, banana, avocado, orange, name, otoy, and yucca. During our visit, bananas, name and rice made up the bulk of the diet. Two meals are typically eaten each day; name or unripe bananas for breakfast, and rice for dinner. School children eat a creamed corn or otoy drink called “crema” at school, or around midday on weekends. One community member told us that protein is eaten about three times per week (Ngöbe Respondent 20, 2010). The preferred source of protein in Cuernavaca is sardines, and the only other sources of protein available in the small stores are canned tuna. Most families own some chickens, some own hogs and cattle, but we did not observe anyone during our week stay who consumed these home-grown sources of protein. The majority of babies and smaller children have distended bellies.

The changing local perception of agriculture reflects the impact of the arrival of mining companies. Whereas before they had enough food, now they do not have food security (Ngöbe respondents, 2010). When asked what the community did in the year when the hillside produce was destroyed, the respondent said that many people went hungry. He also noted that some were able to sell their coffee or extra produce to make some money and support the others, but feared that agricultural production is so low now that if the same destruction were to occur, the outcome might not be so resilient.
Impacts on Health

Health impacts were associated with the explorations of the 1970s and 1990s. About a quarter of the respondents discussed a negative impact on health, while none spoke about positive development in health care. Most of these stories noted skin irritation, vomiting, body aches and fever from bathing and drinking the contaminated water. A few mothers said that all of the children in those years were affected by skin irritation. Two people mentioned coughing or bronchitis and one mentioned pneumonia. One contrasted the previous longevity and good health of the elderly, and said that now the elderly suffer more.

Continued Impacts

After the early 1980s and the fall of copper prices, exploration halted temporarily until the 1990s. The Canadian company Tiomin Resources with its Panamanian subsidiary Panacobre began a new round of exploration. In interviews, communities did not seem to distinguish much between the two rounds of exploration, but felt that the initial impacts from exploration periods have been sustained and continue to impact their lives to the present day. Communities as a whole are still suffering from a drop in water levels. Some feel that they have enough water but many feel that there is not a sufficient amount for everyone. Since many of the streams dried up and the river level dropped, interviewees said that some families must walk a far distance to obtain water, and others have had to share water sources that are now stressed. Water contamination indicators are still present: one mother said that irritations persist on children's skin, and fish and crab populations have not recovered. Crops, including the cash crop coffee, do not produce as well as they used to and families worry about the implications of mining operations beginning again.

Many interviewees had a clear preoccupation with potential environmental impacts in the future. Without information available from the company, they wonder whether or not the impacts
they have felt thus far would be more pronounced during exploitation of a mine. In regards to the disappearance of native species, water contamination, and destruction of crops, community members were worried that the return of mining exploration or exploitation would bring the same impacts once again, and to a more severe degree. Usually these words were used to justify their opposition to the mining project.

All of these reactions narrate environmental change, and all were connected to the presence of mining companies in the region. It is important to listen to how local communities have been impacted, and how they perceive these impacts. Many more interviews are needed to comprehensively understand what happened, what is happening presently and what they think about the future of the project.

Society, Politics and Economics

With varying degrees of severity, Ngöbe society and culture, political structure and livelihood strategies have all been influence by the presence of the Cerro Colorado mining project at multiple scales.

*Education*

The influence of mining activity in the area has been minimal at most in regards to education. Residents indicated that no mining company has provided the community with increased access to education or mining related training. Corriente Resources Inc currently hosts “*capacitaciones*” in the community, but the purpose of these meeting are to inform residents of the benefits of mining and what the company would be able to do for the communities during its operation, not to engage in any kind of capacity building training (Respondent 25, 2010).

No mining company has financed the building or maintenance of schools in the area; any community successes in convincing the government to set up a school – as was the case in
Jingebre – were because of efforts of the Ngöbe (Respondent 31, 2010). However, as Gjording noted, because the construction of roads have made this area more accessible it has also made the construction of schools more feasible, and state schools have been established in both Hato Chamí and Rincón (Gjording, 1991).

Health..........................................................................................................................................................

Mining activity has generally had a negative impact on the health status of the communities surveyed. There was a health facility built for workers at the Escopeta camp, but this is no longer operational, and even when it was, it was inaccessible to those in the area except in some cases of emergencies (Gjording, 1991). There is a health facility in Rincón as well as Hato Chamí, and the road access has made these facilities more accessible. However, the care they provide was largely described by respondents as inadequate. For example, health care providers at these clinics either misdiagnose the peoples’ illnesses (they diagnose them, provide them with medicines, but those who sought medical attention still find themselves ill), or they lack medical supplies and prescribe the same treatment and drugs for many different kinds of sicknesses. Often, the medical staff at these facilities tell those who visit them that they are not ill, even though they feel ill.

There were illnesses within the indigenous population in the area before the mining presence; however these were illnesses that have been present for hundreds of years, and most of them were curable using traditional medicines (Respondents 4,16,19, 37& 42, 2010). Many respondents indicated that new diseases have been introduced to the population since the beginning of mining activity in the 1970’s, that they cannot cure those ailments by traditional means, and, again, that the services available to them are inadequate. According to a local leader, representatives from one of the mining companies sexually abused women in the community and introduced gonorrhea and HIV/AIDS to the area. We believed this subject to be too personal and
sensitive to include in interviews, but with more prolonged interaction one might verify how widespread those effects are felt.

An important theme in our discussions concerning health impacts was the difference in the nature of the sicknesses from before mining exploration and after. There is a common perception that before, there were local and well known sicknesses which were curable and native to the Ngöbe. After the companies arrived, the types of ailments changed and suddenly there was no one who knew how to adequately treat people. The communities described these sicknesses as foreign sicknesses brought by the company, again echoing the arrival of the Spanish conquistadors in the 16th century.

**Water: Access**

As outlined in the section “environmental impacts” there has been a reduction of available water in the region. This reduction in water availability has been attributed to mining activities in the area, and there was no mention of initiatives on the part of the companies or government to improve the Ngöbe access to water.

**Infrastructure: Roads**

One of the only positive impacts of the mining project’s presence consistently mentioned is the access that has been brought by the road constructed in the area. The road was constructed in the early 1970’s by Canadian Javelin to access the Escopeta base camp (Gjording, 1991). Community members expressed that it allows for easier transportation, for example, to the school and health center in Rincon, as well as to Hato Chami and San Felix. We observed that many houses lined the road. However, people also expressed discontent with the road’s presence: the community had not been consulted before it was built, there is increased crime – namely theft - in the area, and it allows for easier access to the community of Cuernavaca and Escopeta by
non-residents. The use of the highway is unregulated which was a concern for residents, as it has resulted in the death of one person. A boy named Bianco Abarego was killed, allegedly by a company truck.

Finally, there are rumors in the community that Corriente Resources Inc. will privatize the road and not allow residents to use it unless they support the company’s activities. This claim has yet to be verified. This is a concern for residents, and they fear the benefits they have accrued from having road access will be lost if they are no longer allowed to use it.

Identity

Mining activity in the area has had an effect on indigenous culture and identity. The Ngöbes interviewed expressed a cultural and historical connection to the land and local area. The people of the surrounding communities of Cerro Colorado spoke of their indigenousness in most discussions, but only a few times was the word “indigenous” explicitly mentioned. This signifies that less than bargaining power, indigenous status implies a certain connection and longevity with surroundings and culture, and a striving for liberty and self determination in regards to any change. When community members spoke of their resistance to the mine's presence, often they used phrases such as “We live here,” or “We are accustomed to living here and nowhere else,” or “This land is God given and it is ours, for all people and not for the use of some.” (Respondents 10, 17, 39). The history of the communities came across differently in different interviews: one man talked of his great grandfather who had lived on the same land; another spoke of their arrival to the specific community fifty years ago, another community spoke of arriving much more than fifty years ago. None of these specific responses altered the overall perception that this land is theirs and has been theirs for generations. The title for them is not only legal but is inherent. Several people spoke about nature being “God given, for everyone,” and said that a mine was a direct violation of that philosophy (Ngöbe Respondents, 2010).
Two community members evoked a connection between the current conflict and the era of the Spanish conquest. Before the Spanish arrived, nature existed as it was and supported life including the Ngöbe. When the invaders came, they took gold for themselves and did not leave anything for the Ngöbe or for nature in return. This lack of reciprocity or local involvement is echoed in their minds today. In the 1970s and 1990s, foreign companies came to the region, explored for metals, damaged the environment and the livelihoods of local people and did not leave anything positive in return. There is a fear that even with company rhetoric now about development and employment, no benefits will be left for the communities and instead the company will come and extract copper, leaving the region in shambles, worse off than it began.

As an indigenous population, the historical trajectory of the project is central to their perception of the mine and its consequences. The history of Cerro Colorado leaves unusual time for reflection on what the presence of an open pit mine means. The community speaks of the one-sided information provided by Corriente Resources, about the positive impacts the mine will bring to the area. Local experience with contamination, a lack of development and work, and generally false information and no consultation has left the Ngöbe skeptical of Corriente's words and fearful of the future. Only by understanding what happened in the 1970s and 1990s during years of exploration will it be clear why the surrounding communities are overwhelmingly against the development of the mine even in the midst of Corriente's promises of opportunities and improvements.

Community Social Relations and Community – Company Relations

There were mixed responses as to whether or not the presence of mining in the area had impacts on social relationships between Ngöbes. Some people acknowledged that there were conflicts between Ngöbes, but that these were their own and unrelated to mining activities. Others indicated that now their lives are relatively peaceful now but they are concerned for the
potential of future conflicts as they believe there will be decreased availability of basic resources (i.e. food and water). Others expressed that their community had been peaceful in the past but that the company has “robbed families” and by this way incited more conflict. Some also expressed that the companies that have been there have found the “weaknesses” in their indigenous culture and used those to create problems amongst community members.

Traditionally, the Ngöbe have functioned based on localized kin relationships, and while the number of people that support the mine is few in this area, it has caused some division and an inability to work together in some cases.

Also, the company has brought a new source of conflict into the area. The relationship between the communities and the company was described by almost all as negative; 95% of respondents were adamantly in opposition of the presence of the mine. There have been demonstrations against mining in this area. In general, there has been a resistance to mining activity in the past because the Ngöbe believe these companies’ presence has reduced their autonomy and agency in various ways. They believe it had and continues to have negative impacts on almost all aspects of their lives. This negative relationship that is now part of their lives has manifested itself through demonstrations located in Escopeta, as well as through other forms of protest – including an eighteen day march from San Felix to the capital. In general they distrust the mining company currently present in the area – Corriente Resources Inc. - due to what they indicate as a lack of disclosure and consultation with the community. When it was first present in the area, it said that if the communities did not want it to be there, it would leave. It ran capacitaciones and information sessions, and both community members and leaders expressed that they were in favor of neither the company’s presence nor mining activities in the area, but Corriente Resources is still present.

The introduction of a large number of foreign employees in the area was not often mentioned as a concern. However, residents did reveal some intimidation tactics used by mine
employees in the past. They claimed that dogs, cows, horses, fowl and pigs have died either by
drinking contaminated water, eating feed that was purposely poisoned by company employees,
and by being shot by company employees. This was one of the reasons cited by a family that
relocated to a community farther away from the mine site

Political Corruption

There has been political corruption at the hands of the companies involved and the
Panamanian government. One documented case from the 1978’s illuminates how CODEMIN
and General Omar Torrijos offered the Ngöbe cacique Lorenzo Rodriguez personal benefits and
offers in exchange for political concession on the cacique’s part (Gjording, 1991).

Even now, leaders have been offered money by the companies in exchange for their
support of the project. There has been an expressed concern about these tactics, and it has
resulted in distrust towards the Corriente Resources Inc, and has motivated opposition to this
company’s presence and activity in the area.

Agency and Autonomy

In general, the presence of mining activity in the area in the past 40 years has limited the
agency and autonomy of the Ngöbes in the area. This has manifested in many ways, but the one
consistent theme expressed was a lack of consultation with the community.

There was an expressed disconnect between the dirigentes (corregimiento
representatives) and these communities (CoNaPI, 2003). Residents claimed that the dirigentes
used local names to “sell” the land and negotiated with mining companies without consulting the
communities first. Residents feel that their primary concern is to make money and not their
responsibilities to their constituents, that one rarely sees caciques in the area unless they are
campaigning, and that no one from the congress has spoken to them about the potential impacts
of the mine. This disconnect was also apparent in that some respondents said they did not know the opinion of either the government or the general cacique on the mining issue. Some indicated that in the comarca the dirigentes publicly say they are not in favor of the mine.

Many respondents felt that they were not adequately represented by dirigentes, and that they are lied to by them. Every respondent expressed that they have not been consulted on matters concerning mining and that TexasGulf – the first company to be involved in a large way – did not consult with the people.

Some individuals expressed the lack of liberty they felt would come with expanded mining activities. One respondent remarked, “We live poor but we live for ourselves,” and others have indicated that they would rather live poor than have an operational mine in the region (Respondent 14, 2010). They want to live freely in the comarca, as they are accustomed to. Many recognized that they lived simply, but that this did not bother them because they were autonomous and pursued a way of life that was their own.

There was a very large expressed desire for more information. Respondents indicated that they lacked information about the negative impacts of mining. The companies involved have only mentioned benefits to exploiting the deposit, including development and have not disclosed how they plan on remediating the effects of the mine. They also lacked information about mining projects in other countries and were especially interested in how companies operated in Canada. The lack of balanced information about the impacts of mining was repeatedly expressed. Respondents indicated that Corriente has said there will be no damage to the environment, and that they [the company] will study the potential environmental impacts. The information they have received about mines in other countries was that indigenous groups in Canada and the United States have terminated poverty through mining initiatives.

In general, the communities that will be most affected by mining activity have largely been excluded from any discourse or decision making on mining activity in the Cerro Colorado
area. In a publication given to people at a “capacitacion” meeting there was a map, which did not chart or indicate many of the villages surrounding Cerro Colorado.

Land Shortage...................................................................................................................................

A major reason why there are land shortages in the comarca is the long term presence of mining activity in the area. Recall that the initial demarcation of the comarca was a reaction to mining interests. Land shortage is the greatest problem that they face (Gjording, 1991). The construction of buildings and exploration activities have only exasperated local land shortages, but using lands that would otherwise be utilized by locals for cultivation (Respondent 27).

Relocation and Land Tenure (Land Security)....................................................................................

In the late 1970’s there were concerns in Hato Rincon about relocation. There were concerns about “where they would go, what lands they would farm, how they would keep in contact with their extended families” (p.168Gjording, 1991). At this time, CODEMIN told area residents that relocation would benefit the Ngöbe-Buglé. However, the prevailing attitude then, and now, can be described by this quotation:

“Houses are fine, but we can’t eat houses. Money is fine; but in no time, it’s gone. We need land. Land never goes away. You can’t plant money. You can’t grow money. You Can’t eat money. Only land assures us of food.” (p. 168-169, Gjording 1991)

Relocation was a major concern in the communities we visited. One family has already had to relocate from Escopeta to a community farther away from the mine site because they were afraid of the project. Some people in Escopeta would like to move to somewhere else in the area but cannot as they have nowhere to relocate to (Gjording, 1991). One respondent said that “[the] company is trying to relocate the people who live closest to the mine without paying; they will lose their crops”. People are generally afraid of being relocated and do not wish to leave their
current place of residence and work. Many spoke of one possibility that has been mentioned to them – relocation to the Darién. However, community members expressed that they were not in favour of relocation and especially not to the Darién. This was due to the following reasons: they do not have a cultural or historical connection to the land there, it is outside of the *comarca*, they do not know how to work the land there, they would have to restart their farms on a smaller tract of land and would be unable to sustain themselves. While some said they would receive compensation for leaving, they recognized that this is not a realistic solution as it does not offer them long term security. Others said that the company has indicated that people will need to relocate, but have not specified to where, and have not indicated whether there will be enough room at the relocation site for everyone. Others mentioned that in the event of relocation, they would not know how to fairly divide the land amongst relocated families. The issue of land security is one that is tied to livelihood security; at this moment in time, the ability to grow food in future locations was a central and dominant concern.

Livelihoods

The impact of land shortages on livelihoods has been marked; however these land shortages are not solely a result of the development that came with the presence of mining activities in the area. The aforementioned land shortage has meant that farmers currently cultivate the same tract of land every year, using the slash and burn method. Area residents indicated that – in general – there is no longer a fallow period for their lands.

A direct impact of mining activities on the forms of capital available to these mainly subsistence farmers has been, as previously mentioned, the actions of past companies that have resulted in the death of farm animals. These animals represent an important source of capital and ‘financial insurance’ for Ngöbe families; they are used or sold in times of shortage and in emergencies.
Another impact that the mine has had on local livelihoods concerns employment. A former employee revealed that during the time of Texasgulf, temporary workers were not paid for their labour. While people recognize the potential for mining companies to bring some employment to the area, many do not want to be involved in mining activities because they feel they are supporting something ultimately destructive to the area. Many people said that most of the jobs at an operational mine they would not be able to do – for lack of training and because it is inconvenient. People believe jobs offered by the mine would be for a relatively short period of time – maximum of ten or twelve years – and thus working there would not be feasible since they need a long term occupation on which they can depend for income in the future.

Coffee production has increased in the area since the building of the road. Most farmers we spoke to grow organic coffee which is then sold on the market, and there is a operational coffee farmer collective based out of Cuernavaca. However, the road built from *Hato Chami* to Nancity during 1980 meant a loss of crops – and consequently hunger - for those farms the road went through, as well extra work for local residents (Gjording, 1991). Today, people believe that mining activity will reduce the productivity of their crops and endanger their food security. To quote one resident: “If we say yes to the mine, we will live with hunger” (Respondent 16, 2010).

Development......................................................................................................................................

Today, most residents feel as though there has not ever been any development for the Ngõbe people in the region by the way of companies or mining activity. Promises of work from past companies have yet to be filled, and for all the exploration in the area, many expressed that the communities have experienced few or no benefits. People have expressed a need for development in the area, but almost exclusively in reference to a need for improved health care services.
There was also concern and recognition that there has yet to be exploitation of the mine site, and that a mining company – once active in the area – could bring better schools and health facilities. This was in conjunction with a concern that the government would not provide these for them; the only entity that has offered these better services to the communities is the mining company. People in this community acknowledged a need for employment, better education and health services, and they say no other way of obtaining these but through the mine. Even so, they felt the negative impacts of the mine would not be “made up for” by the employment, education and health services that could potentially come with exploitation of the deposit.

**Discussion**

**Environment**

The company points to the fact that many communities in the region have only existed as so for the past 50 years, which would seem to undermine the argument of indigenous territory. But the Ngöbe are not culturally a sedentary people. Naturally, the land was theirs to move around, and for centuries they existed semi-nomadically, living in a certain area for a time before moving to a new location. This movement allowed the land to recover from cultivation or hunting. With the arrival of the Spanish, and later with the establishment of nation states and boundaries, the Ngöbe were pushed into a smaller portion of territory and with the establishment of the *Comarca* in 1997 have a set limit to their land. The land is theirs to collectively own, but nonetheless the population is forced into a more sedentary lifestyle which is not native to them.

Their custom of slash and burn agriculture coupled with a more sedentary lifestyle has placed stress on the land. Fallow time is only a year, which is to say that between each burning, the land only has one year to recover. While this burning may change locations slightly for each farmer year after year, there is a general sense that fertile land is not allowed a long time to recover. The necessity of the people to feed their families overrides this ecological principle.
This has implications for the productivity of crops in the area and for the communities' food security in the future.

The initial destruction caused by the mine in the area around Cuernavaca would not explain why productivity of crops across the region has declined. On the immediate downhill slope from the exploration and construction, vegetation was impacted and it follows that some contamination from waterways would impact the long term growth of plants. However, five kilometers away from the site of the construction, communities noted a decline in production. More likely, climate factors or an over stressed agricultural land would account for their current shortage of crops. The presence of a mine will not alleviate these pressures; on the contrary, it would amplify them by reducing the amount of land available, causing more erosion and deforestation, and potentially causing long term contamination of the soil.

The exploration programs of the 1970s and the 1990s certainly changed the landscape of the region, and altered the natural environment. The deforestation alone that was observed can account for disturbance of local fauna, something that in a Panamanian context can have serious detrimental effects to biodiversity. The international community is currently devoting much time, energy and money into establishing biological corridors in Panama to protect wildlife. Companies do not need an environmental impact assessment to conduct exploration, therefore the proliferation of mining concessions poses a great threat to the ecological value of the isthmus.

Ecotourism is considered as a viable alternative, as well as a more sustainable alternative, to the economic opportunities brought by mineral exploitation. Jose Arcia, a journalist from Panama's newspaper *La Prensa*, discussed the two sides of the Panamanian economy. The damage that mining activity could have to the landscape and habitats would threaten a long term development of ecotourism in the country. According to him, the Panamanian public equates mining development to economic development. While they recognize that this activity has
environmental impacts, he says that they see it as a necessary part of the economy and something generally positive. This is important to consider, both for local livelihoods and for the identity and economy of Panama.

The case of Petaquilla and the studies from the region in Colon bring light to the threats that mining pose to biodiversity and native species. According to the Nature Conservancy, the disturbance of intact habitats like the MesoAmerican Biological Corridor will impede efforts, decrease resilience of the corridor, and undermine ecosystem services including: flood prevention, water resources, oxygen production, carbon cycle, climate regulation, soil processes and maintenance, aesthetic value, pollination and biodiversity (Cedeno 2009). Cerro Colorado is not part an established biological corridor, but the effects of mining exploration and habitat destruction have similar implications.

Based on what communities experienced as differences between wildlife before the company came in the 1970s and after the exploration programs were carried out, the disturbance had noticeable effects on the constitution of the biodiversity of the region. The abundance of animals has decreased. A lack of a census on the species present in the area limits the full understanding of what changes occurred. A census would be important for the future to note which species are present, giving special attention to species which are important to the Ngöbe and also species which are endemic or threatened.

The Audobon Society has preliminarily evaluated the ecological value of the area. The forests present in Cerro Colorado are only found in the Serranía de Tabasará, forests which contain two species and several sub-species of birds which are endemic to the region. The high mountain ecosystems of Panama and Costa Rica are very important for bird biodiversity, and a mine at Cerro Colorado which will disturb a great area of habitat could threaten their survival. Local communities have experienced a decline in their population since the time of the 1970s. Endemic species are also present which hold as part of their name coloradensis (Adsett). The
potential for environmental impact here is massive, and more study is needed to fully understand where threats lie. Animals such as birds, deer and rabbits are disturbed by highway construction and habitat fragmentation for two reasons. The first, which local communities explained, is the shock of disturbance when machinery is operating, producing noise and vibrations and other movement. Activity such as this can disturb animal reproductive behavior, resources and living space. In a long term perspective, it is widely documented that the loss of habitat and the creation of islands of forest instead of a continuous environment interrupts animal migration and can decrease genetic diversity.

In the specific case of the exploration of the 1970s and 1990s, it is important to understand how much area was deforested. If the exploration activities of Texas Gulf included 200 drilling sites, and those of Panacobre 340 drilling sites, we can assume that at the least there are 340 drill sites in the area and at the most, 540 drill sites (CODEMIN 1978, Mariano 2010). Assuming the area deforested around the drill site that we saw is what the rigs need to access the subsurface, this means that the area deforested just from exploration is from 142,800m² to 226,800m². 14.28 hectares to 22.68 hectares is an extremely rough estimate, because it includes areas that may have been deforested before the arrival of the company, but it does not include the area that was deforested for the completion of the highway. What is clear is that a substantial area was cleared or altered to accommodate for mineral exploration. This also brings into question the difference between subsurface and surface rights, showcasing the connection between the two. Although CODEMIN and the Panamanian government own the subsurface deposit and legally can alter it, this has real impacts on the health of the surface which should be wholly owned by the Comarca.

Biodiversity in the Cerro Colorado region is not solely a question of ecological importance. Community representatives mentioned the importance of many native species to them in terms of hunting and medicinal use. The disappearance of deer and rabbits and frogs is a
threat to the food security of the local population who now must rely more on domestic animals and imported sources of protein for sustenance. Medicinal plants are threatened by deforestation and contamination in the long term, and this has consequences both on Ngöbe health and cultural identity.

One disappearance that the communities strongly noticed was that of the Golden Frog. While it is possible that mining exploration contributed to their decline, there was a massive endangerment of frog species across Panama since the 1960s. The chytrid fungus spread across the country and Central America, and in 2008 a BBC film crew declared the species extinct (BBC News). The changes in frog populations that the Ngöbe witnessed probably did not stem directly from the mine exploration; the extinction of this important frog was a coincidence. This should not discount the changes observed in populations of other animals and plants.

Water contamination and usage is central to the environmental impacts of open pit mining. Cerro Colorado is located at the “heart” of the Comarca, and indeed is the source of the headwaters for some major rivers that run to either ocean. The contamination that community members witnessed is not uncommon for mining projects. The waste rock from the cut at Hacha, as well as any erosion from the explosions and surface disturbance, would have contributed to sediment load in Rio San Felix. The site of exploration is located at the sources of this major river. During times of heavy rain which exist in the region in October and November, any loose rock and soil would make its way to the river. Sedimentation itself causes turbidity of the water which is a threat to aquatic populations, and can cause decreased light availability and decreased dissolved oxygen. Sedimentation is an identified consequence of mining, certainly more in the exploitation stages than the exploration stages (US EPA 2000). That being said, if the local communities felt a pronounced effect in their water quality and the health of aquatic life from the sedimentation from exploration, it follows that effects from exploitation of over one billion tonnes of ore will be much greater.
One community member mentioned that the water color changed, to red, orange and green. Downstream from copper mining sites, water that is slightly orange is associated with the suspended material from extracted ore (Milu, 2002). Contamination from mines in Papua New Guinea as well as Petaquilla in Panama exhibit similar color alteration (Hyndman 2001, CIAM).

As explained in the environmental context portion of this report, many heavy metals are associated with copper mining including copper, zinc, iron, nickel, arsenic and manganese, which are generated from the existence of pyrite and pyrrhotite (Biodone 2001, Pandey 2007, Lee 2006). Heavy metals can cause dwarfism, necrosis and chlorosis in plants, and bioaccumulate into benthic organisms (Pandey 2007). They also affect agricultural lands in mining regions, and local inhabitants are at risk for disease including cancer (Lee 2006).

The fish kills that occurred in 1978 and 1998 according to Celestino Mariano were clearly linked to the two separate exploration phases from Texas Gulf and Panacobre respectively. Fish kills are usually associated with short term and acute exposures to high levels of heavy metals. It is also possible that metal compounds of cyanide could affect fish health (U.S. Dept of Health and Human Services: Cyanide 2006). The dead fish are not visible until after the pollution has been flushed out of the water body, hours or days later (Nehring 1976). Six genera, four species and six subspecies of fish were eliminated in a river in Arizona from mine contamination (Lewis and Burraychak 1979). Fish and crab populations, as predators, can be greatly affected by environmental disturbance. Heavy metal enrichment of waters can directly kill fish, as the heavy metals are toxic and they ingest and absorb them as we ingest contamination in the air. It can also indirectly affect fish and crabs by directly affecting aquatic plant life or benthic organisms.

Copper as a metal is a bioaccumulator, which means that if it is present in aquatic plant life, the organisms that eat those plants will hold proportionally greater concentrations of the metal in their bodies (Ray and White 1976). More indirectly, if aquatic plants and benthic organisms are
directly affected by heavy metal toxins and sedimentation, the fish and crabs will have fewer resources to consume. Their populations will potentially be threatened in the long term.

The Reconnaissance Study of Cerro Colorado for CODEMIN mentions the various species of aquatic life: mollusks, crabs and shrimp including White Shrimp, Red Shrimp, Fidel Shrimp, Titi Shrimp, Tigre Shrimp, and freshwater fish. It noted San Felix as a “potential area of impact on fauna” because of the mine's plans to dump tailings into the river, where seven of the shrimp species breed (Colorado School of Mines 1979). While the company did not dump tailings into the river, initial amounts of rock and chemicals used for exploration could have contributed to changes in pH, toxic conditions from cyanide and heavy metals, or turbid conditions from sediment load. Because of the sudden nature of the fish kills, we assume that they must have been directly killed by the toxins in the river. Although Celestino Mariano said that the fish kills lasted for about one year each time, the local communities phrased their disappearance as complete, and said that they cannot fish anymore (Mariano 2010).

Contamination from copper mines has caused fish kills in other locations. Rum Jungle Mine in Northern Australia, a uranium and copper deposit, caused decline in fish populations, which only began to recover after remediation measures were taken (Jeffree 2001).

Resilience Theory is an important component in environmental risk assessment. The health of an ecosystem is more than the health of its parts. If one component of the environment is disturbed and either loses functional capacity or disappears, the harm laid upon organisms can have a ripple effect through the ecosystem. Environments seek equilibria, and once a threshold has been passed, it is extremely difficult to return to the previous state. Considering resilience theory, dramatic changes to ecosystem species composition can have long lasting effects. This may explain why, given two discrete instances of water contamination, the fish and crab populations have not recovered in Rio San Felix. A thorough water quality study is needed to determine current levels of heavy metals and their implications for aquatic life.
The contamination had an effect on human health in the surrounding area. Skin irritation, vomiting, diarrhea and fever were the main ailments associated with the time of exploration. There is a risk of health impacts in the processing stage of a copper mining operation. Byproducts include heavy metals, acids, and other toxic materials (BCS, Inc.). One of the solutions used to process copper is sodium cyanide, which when put in contact with human skin can cause sores and irritation. Cyanide exposure, when not fatal, can cause nausea, vomiting, coughing, congestion, heart palpitations, and other reactions (US Dept of Health and Human Services: Cyanide 2006). This might explain some of the sicknesses experienced by the community during the two incidences of extreme water contamination. Arsenic contamination has also been shown to cause skin irritations, and copper toxicity results in nausea, stomach pain, diarrhea and vomiting (US Dept of Health and Human Services: Arsenic 2006). Perhaps the combination of heavy metals and cyanide salts caused the acute health problems to children and some adults.

Long term health risks associated with copper mining are different. As sulfide rocks are weathered by air and by rain, water bodies in the region may acidify. Acidic conditions make the heavy metals more soluble. The geologic composition of Cerro Colorado hosts a porphyry copper deposit with pyrite, chalcopyrite and pyrrhotite, all sulfides. With dry seasons, the effluent evaporates and a concentrated acidic and heavy metal rich rock is left. This rock is soluble, so with intense rain periods the acid and the metals are transported to the environment. Cerro Colorado's natural topography, with its pronounced slopes and also with its tendency towards erosion, make a large amount of acidic and metallic waste piles dangerous. The material is vulnerable to mass wasting, and if the waste is not properly contained and treated, the potential for long term health risks is great.

Long term exposure to heavy metals in drinking water can cause nausea, vomiting, stomach cramps, diarrhea, liver and kidney damage and even death (US Dept of Health and
Human Services 2006). Working in or living near a copper refining plant can cause a number of health risks as well. As the refining plant for the copper from the Cerro Colorado mine would mostly likely be located close to the coast, these impacts from inhalation are less relevant.

The environmental impacts of Cerro Colorado do not stop with the present. Local communities are concerned about the future, and most people do not understand what the physical impacts an open pit mine will have on their home. The mine deposit of Cerro Colorado has about 1.3 billion tonnes of ore in total. Before the deposit can be accessed, 200 million tonnes of overburden will be removed and deposited in the area (Colorado School of Mines, 1977). The mine will process 27 million tonnes of product annually, but will also need to deposit 86 million tonnes of waste rock each year (CODEMIN, 1978). The waste will finally total at 2.3 billion tonnes (Colorado School of Mines, 1977). This quantity of waste, with a particle size of 8", will have been titrated, meaning that it will contain quantities of heavy metals and acids which have the potential to leak into surrounding areas via surface and groundwater (CODEMIN, 1978). It will not contain the same structure as the mountain which exists now, the rocks will have more surface area exposed, and will therefore have less resilience towards erosion and weathering. Besides these waste dumps, the pit itself will impact the land because of its sheer size. The largest open pit mines in the world can be 4 kilometers wide, and considering that Cerro Colorado is one of the largest copper deposits in the world, it will most likely have a pit on the order of kilometers in diameter.

From the mine plans in the 1970s, it is clear that the processing of ore will require massive amounts of energy, and this energy has to come from somewhere. There are currently schemes for supplying energy from alternative sources such as wind or solar power. The hydroelectric industry in Panama is strong, however, and that was how Texas Gulf in the 1970s was planning to power the mine (Landau 1996). This will mean either the construction of wind turbines, solar panels, or power plants, including lines to the region.
Water consumption during the operation of an open pit mine is a major environmental stress. In the 1970's a functioning mine on Cerro Colorado would require 113.55 million liters each day (CODEMIN 1978). In contrast, the flow rate of Rio San Felix is 7.52 million liters each day in the dry season (Colorado School of Mines 1977). This means that the presence of the mine in operation will cause stress on water resources in the area, and could potentially cause conflicts over water use. If some community representatives already expressed difficulties in finding water, the risks that a mine will bring are great.

The size of the Cerro Colorado deposit and the climate and topography of the region will render the local area uninhabitable during exploitation and for many years afterwards. The sheer amount of waste generated and infrastructure needed for a mega-deposit of copper will monopolize fertile land. The environmental risks associated with the sulfides in the exposed rock, and the acids and cyanide used to process the copper mean that food, water and health security will be threatened in the long term. The real environmental impacts may not be revealed for decades after mine closure. The location of Cerro Colorado at the center of the comarca, at the head of watersheds on both sides of the Cordillera, signifies that contamination could affect a vast number of inhabitants downstream, most of whom live below the poverty line. Environmental impact assessments should take into account the flow rates of each river and the number of inhabitants who rely on their waters to predict the radius and the intensity of contamination possibility.

A document written by Manfredo relates a period when experts from the World Bank and the United States Environmental Protection Agency said that mining the Cerro Colorado deposit would have no environmental impacts, and that environmental remediation would be able to control for any environmental risks in the future. It is easy to understand why the environmental branch of the United States government and the World Bank would want to favor an American company in Panama. It is true that mining engineers and specialists can mitigate for many
environmental impacts and can attempt to control waste and contamination, but to say that a mine would have no environmental impacts is irresponsible. There have been enough accidents and contamination from mine sites in the past to definitively say that each case has associated risks. It is essential for companies to communicate these risks to the implicated communities so that they may weigh the positive and negative aspects of mine development.

Society, Politics and Economics

Generally, mining investment in Latin America involves the dispossession of land for local people. Should the Cerro Colorado mining project come to fruition, it is not impossible to envision the loss of indigenous land in the *comarca*, considering the way Canadian companies have operated in Latin America in general, as well as the Panamanian government’s past complacent attitude towards destructive foreign projects of resource exploitation.

While there is no way to say with exact certainty what will happen with this particular mining project, it is not unthinkable that certain ways of operating exhibited by Canadian companies in other Latin American countries will be replicated in Panama and in the exploitation of the Cerro Colorado copper deposit. As Gordon and Webber note: “Like other industries within the natural resources sector, mining investment in most instances simply cannot proceed without a community – often indigenous – being dispossessed of their land, natural resources and livelihoods” (Gjording, 1991). In the past, Canadian mining companies have been fairly successful at creating a favourable investment situation for corporations in foreign countries, by pressuring governments to change their mining codes and investment agreements (Gordon and Webber, 2008). These types of agreements favour foreign mining interests over those of indigenous people, and are not only encouraged by Canadian companies but by the Canadian government as well.
The potential risk of the dispossession of indigenous lands in Panama is considerable and serious. If the Petaquilla mine in Coclesito is any indication of how the Panamanian government regulates mining projects – and it is – then one can expect the same kind of irresponsibility in the potential exploitation of Cerro Colorado. The Panamanian government recently negotiated to receive a higher percentage of the profits from the Petaquilla mine, despite the fact that this mine is polluting rivers, displacing families, and causing health problems in nearby communities (Zea, 2009). As well, while the Ngöbe and Buglé have collective land rights – as described in the *comarca* law – what they do lack is an official title to those rights, and any ownership of subsoil rights (CoNaPI, 2003). Because subsoil resources are considered a public good, as per the Panamanian constitution, the government, legally, has the most control over these resources, and the ultimate authority when it comes to their exploitation. Any attempt by an indigenous group to gain sovereignty over these resources would be a long and very difficult struggle that would involve relinquishing control over such a potentially lucrative resource by the Panamanian government (Wing, 2010).

In a consolidated overview of different reports, Gjording predicts that the land required for the Cerro Colorado project would equal approximately 630.7 km², 609.3 of which would be located in “Ngöbe-Buglé Area”; there is no doubt that a large amount of this land would fall within *comarca* boundaries (Gjording, 1991). But as Felix Wing, legal director of CIAM, illuminated: even the Ngöbe-Buglé *comarca* law does not require community consultation if part of the project is located outside of the *comarca* (2010).

Thus, for the Ngöbe, mining interest in Cerro Colorado is a definitive threat to indigenous livelihoods and land rights. Dispossession has very serious consequences, financially and culturally. Since Ngöbe people are almost exclusively subsistence farmers, the need for secure and fertile land is high. Loss of these lands could mean greater financial insecurity; in other cases where peasants have lost their land they have been forced to work on plantations or move to
cities to search for an income, and many of the jobs they find are “temporary, with low pay and no security” (Hristov, 2005, pp 96). It could also mean a weakening of the Ngöbe identity, which has typically been localized and connected to places, a certain local structure based on kin ties and subsistence agriculture. The displacement of individuals means a disruption of this way of life.

Another threat to Ngöbe and Buglé indigenous identity in the event that the Cerro Colorado mining project enters the exploitation stage, would be the radical changes to the local demographics. If the mining project progresses as predicted by CODEMIN in their 1976 economic memoria there would be at least 2500 direct permanent jobs related to mining activities (Gjording, 1991). Only 20% of these permanent employees are expected to come from local communities (Landau, 1996). The supporting service sector that would develop in the area is predicted to require 10,000 people, leading to what CODEMIN predicts would be a new urban area amounting to about 40,000 people. This is for the actual production of copper; the construction period alone would employ anywhere from 3500 to 7350. “[T]he four or five years of the construction period will [witness] a level of activity only comparable to the construction of the Panama Canal, although without reaching the number of jobs of that great work.” (CODEMIN, 1979, pp 32 – 33) There is a prediction that two large construction camps for up to 3500 people each would need to be built to support just this first stage of the project. The city that would follow the permanent workers, even at conservative predictions of 15,000 people, would require massive infrastructure development (Gjording, 1991). Much of the mining and urban infrastructure needed to develop this project would be located in Escopeta, Hato Rincón and Hato Chamí.

This would effectively make the local population – the Ngöbe – a minority in their own communities. There are currently, in the concession area, at least 150 communities, that in 1980
had a population of 6250 (Gjording, 1991). Not only would even the first stages of development bring in an amount of non-indigenous workers that would match and probably surpass this number, the area surrounding the mine site would transform into a small urban center. This would probably exasperate local land shortages. The Ngöbe-Buglé community has already expressed that they are worried about the impact such a large number of ‘foreign’ workers – most of whom would be men – would have on their communities. Indeed, life in the heart of the comarca would never be the same.

Even though it has not yet been exploited, activity surrounding Cerro Colorado has already been carried out in a way that indicated the potentially devastating impacts the project could have. Already companies have come into the community misconstruing the impacts of mining projects by emphasizing the ‘development’ this project will bring to the area. Forty years of exploitation have not brought any kind of real development from any of the companies involved.

This demonstrates an obvious lack of concern for the communities in the vicinity of the mine site, especially considering the resources that have been invested into exploration, the detrimental impacts the project has had on the communities, and the little if any compensation offered in this process so far. None of this is surprising, given the reputation of Canadian mining companies abroad and the experiences of communities in other locations where they mine.

One might imagine that Canadian companies would be operating ethically and responsibly abroad. They should be; the Canadian government is involved with certain organizations and institutions, relationships that would indicate a commitment to human rights. Canada is a long standing member of the Organization of American States (OAS) and, in 2008, committed to fund a $20 million dollar three year joint plan between CIDA and the OAS to strengthen democratic governance in member states (In Depth Article: Canada at the OAS: 20 Years of Sustained Commitment, 2010). However, in practice Canadian mining companies do not pursue socially
responsible mining as a general rule. The Canadian government does not hold Canadian companies to any human rights standards – even though they are certainly aware of such standards, as important members of international institutions whose goal is to promote the protection of human and indigenous people’s rights. One of the reasons behind the government’s lack of involvement in Canadian operations abroad is their claim that there is “… no international norm for socially responsible corporate behavior that can measure a company’s deeds.” (Gordon & Webber, 2008, pp 69). There is an obvious lack of commitment to human rights by Canadian companies and government. Additionally, the government continues to promote mining under the cloak of “development” through organizations like CIDA (Canadian International Development Agency) who invested $9.6 million in 2002 into Peruvian mining initiatives, and have also contributed financially and technically to the aforementioned Colombian mining code (Gordon & Webber, 2008).

This is an especially pressing concern when one considers first, that 60% of all mining companies worldwide are Canadian-based, second, that the Canadian government expects foreign states to regulate Canadian mining companies, and finally, that the structure in Panama is set up so that its government ultimately has the power to legally allow the exploitation of mineral deposits anywhere in the country (Gordon & Webber, 2008). If the status quo is maintained, then the potential for Cerro Colorado, should the project enter the exploitation stage, to be a mismanaged environmental and social disaster is fairly likely. Unfortunately, national economic goals have historically trumped indigenous rights in Panama, and this does not appear to be changing any time soon. Currently, the Panamanian government is currently in the process of passing legislation to restrict the ability of citizens to publically protest (Respondent 8, 2010).

Panama is a member state in the Interamerican Commission on Human Rights, and have been evaluated and sanctioned by their court in the past (OAS, 2010; Wing, 2010). However, these sanctions are retroactive – imposed long after the offense has been committed. The process
to bring one’s case to the IACHR court requires victims to pursue an extensive process. Many cannot access the necessary resources – namely long term legal aid – to carry out the process (Wing, 2010). Even if the court rules against the offending government, their sanctions are, in practice, only recommendations. The IACHR has no real way of forcing compliance with their rulings (Wing, 2010).

In general, there has been a lack of responsibility towards human rights and concern for the environment by two of the major parties involved in the Cerro Colorado mining project. The complacency of Canadian mining companies and the Panamanian government, as well as the lack of any enforceable sanctions for irresponsible behavior, illuminates the problematic nature of interest in the copper deposit found in the Ngöbe-Buglé comarca. Especially concerning is the current involvement of Corriente Resources Inc, who is actively promoting the potential benefits of mining in local communities. The company has been labeling itself as a corporation that practices responsible mining, while operating irresponsibly in neighbouring Ecuador. Complaints regarding Corriente’s abuse within its concession there were brought to the Interamerican Commision of Human Rights in 2007 as part of a larger complaint of the state of resource exploitation in Ecuador. When the Ecuadorian government issued a suspension of mining activities due to social unrest in 2006, Corriente Resources continued operating under the protection of militarization (MiningWatch Canada, 2007).

Opinions in the communities directly surrounding the mine site have been strongly anti-mining. The region’s inhabitants have very clearly indicated that a large majority is not in favour of mining activity on Cerro Colorado, and that they want any companies interested to leave. Ngöbe-Buglé opposition to the mine has been embedded in their political organization from even the very first General Ngöbe-Buglé Congress – from the inception of a larger Ngöbe-Buglé political structure. The sentiment expressed by this General Congress in 1980 is strikingly similar to community opinions of mining today. A letter, signed by seven hundred people
concluded with “Not only for these reasons do we reject the exploitation of Cerro Colorado, but [also because] of many other problems and injustices that the mining corporation has committed.” (Congresos Ngöbe-Buglé es de Canquintú y Soloy, 1980, pp93). The main reason stated in this letter for their opposition to the project was its proximity to numerous communities; “Cerro Colorado is in the heart of the Ngöbe-Buglé Comarca.” (Gjording, 1991, pp182)

From this project’s inception there has been no consultation with the Ngöbe pueblo. This same historical letter stated that the project sponsors never consulted the Ngöbe, and never considered them important actors in its development and execution. The indigenous people here are, and have been, astutely aware of their exclusion from any real decision-making processes. Of those few leaders involved in the project over the years, only some have actually promoted Ngöbe-Buglé interests, while many have sold Ngöbe-Buglé interests for “special treatment”.

Based on these past relationships of mistrust and exclusion, and in the face of current disregard for community requests that Corriente Resources Inc leave the area, it is obvious that none of the companies involved in this project have acted responsibly or ethically.

There are industry standards regarding resource exploitation in indigenous lands and involving indigenous groups that have been developed. The General Conference of the International Labour Organisation adopted the Indigenous and Tribal Peoples Convention in June of 1989, which acknowledges some basic ethical practices. These not only include the responsibility of governments to identify land traditionally occupied by indigenous peoples but also “to guarantee effective protection of their rights of ownership and possession.”( C169 Indigenous and Tribal Peoples Convention, 1989, 2006) As well, Article 15.2 of ILO 169 states that

“In cases in which the State retains the ownership of mineral or sub-surface resources or rights to other resources pertaining to lands, governments shall establish or maintain procedures through which they shall consult these peoples, with a view to ascertaining
whether and to what degree their interests would be prejudiced, before undertaking or permitting any programmes for the exploration or exploitation of such resources pertaining to their lands. The peoples concerned shall wherever possible participate in the benefits of such activities, and shall receive fair compensation for any damages which they may sustain as a result of such activities.” (C169 Indigenous and Tribal Peoples Convention, 1989, 2006)

This is in addition to other widely accepted human rights standards, such as the United Nations Charter, as well as their Universal Declaration of Human Rights. Standards exist, but Panama has yet to ratify the ILO Convention 169. Will the Ngöbe and Buglé be consulted in the future, if the exploitation of Cerro Colorado becomes a feasible reality? If the past actions by the Panamanian government are any indication as to how they will proceed in Cerro Colorado, the answer is no.

**Conclusion**

There is a lack of information about the impacts of open pit mining both in affected communities and in the international community. Mining communities are not equipped with information about mine operations elsewhere, or with technical information about processes and impacts of mining. In the current global context, where prior informed consent is the best mechanism to protect local inhabitants, it is obviously important that information be available to them. Surrounding communities of the Cerro Colorado copper deposit are no exception to this rule, and as of yet they have not been adequately informed by companies or by experts about what will come to pass in the region that has been their home for generations and at the heart of their identity. With any group of people, there is an inherent connection between society and environment. Political power dynamics among groups of people have stark influences on environmental change. International mining corporations with millions of dollars in capital can
influence government regulations and policies. In turn, these national identities and priorities dictate land use, which in the case of Panama gives preference to industrial development. Local communities, indigenous or not, are pressured financially and legally to comply. Companies use scientific experts and knowledge, and systematically exclude communities from this technical information to exploit resources for their exclusive benefit. Sequestering this information, each company new to a mining project can use ambiguous rhetoric to give an air of sustainable development without disclosing details. Panacobre in the 1990s, and now Corriente Resources have done just this, each saying they will improve on the mistakes of previous companies. Neither Panacobre's “modern mining” nor Corriente Resources's “responsible mining” have consulted with local communities, or informed them of possible risks and negative impacts that open pit mining projects can bring (Landau, 1996).

The communities of Cerro Colorado know that the rhetoric of the company is a game, and that the information they are receiving is incomplete at best, and false at worst. A forty year long history of environmental and social impacts have influenced their perception of mining projects. Two separate times, with two different companies, Rio San Felix underwent a period of extreme toxicity and sedimentation, which affected both fish and crayfish populations, as well as the human health in the region. The construction of the highway and the initial cut on the top of Cerro Colorado resulted in the destruction of crops in local fincas. In an agricultural system based on subsistence, such damage has drastic effects on food security. Many varieties of native species have largely disappeared, including native species which the Ngöbe hunted. The effects have not subsided since the last exploration project by Panacobre in the 1990s. Community members feel that their environment has changed dramatically since the company appeared in the 1970s.

It is important for this alternative account to be archived. Christopher Gjording stopped his study of the “Ngöbe-Buglé” people in the 1990s before the company Panacobre arrived. It is
essential during negotiations that the experiences, desires and wants of the Ngöbe communities are understood and respected. We have found that about 95% of the members of the communities are wholeheartedly against mine development. The threats of relocation to the Darien or elsewhere outside of the Comarca directly endanger both the Ngöbe identity and livelihoods as it will undermine their situated knowledge and culture. It will also rip the communities away from the established Comarca which legally protects them as a supposedly autonomous state created within the Panamanian constitution.

The exploitation of the mega deposit of copper at Cerro Colorado, coupled with the extreme topography and intense rainy season that is characteristic of the climate, will transform the heart of the Comarca. Huge amounts of infrastructure are needed to accommodate an open pit of this size; plants, highways, energy facilities, a mine camp for thousands of workers, and waste dumps will render the area uninhabitable by the original Ngöbe communities. In the long run, even after decades of revegetation and environmental remediation in the best case scenario, the danger of environmental contamination may mean that people will never be able to live there as they did before.

According to the law of the comarca, the Ngöbe must be consulted about the project, but they do not have to approve it before the company can begin exploitation. This strips local communities of their liberty and their agency. The Ngöbe-Bugle comarca law states that land rights belong to the indigenous pueblo (CoNaPi 2003). The Panamanian constitution states that the subsurface is the property of the federal government, and the federal constitution takes precedence over the Comarca law. In the case of Cerro Colorado, this discrepancy between the two laws allows international companies with the permission of CODEMIN to enter the Comarca and extract metals from the subsurface, even if these activities have major impacts on surface environments and the people who live there. Essentially, the constitution values copper over the lives of the people who live near to or on top of the deposit.
According to Attorney Felix Wing, the greatest potential for change in these atrociously unjust policies is the international exposure of the conduct of mining companies (Wing, 2010). If investors are more informed about the negative consequences of their financial support, perhaps mining companies will be held accountable for their actions. Likewise, if local communities are more completely informed about what changes a mining project will have on their home and their society, they will be more equipped to take measures to resist a mine or negotiate with a company so that they can benefit from its presence.

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Appendices

Appendix 1. Picture of Cuernavaca and Valley, April 17, 2010.

Appendix 3. Photo of Cuernavaca from the highway, April 13, 2010.

Appendix 4. Drill hole near Hacha and associated deforestation
Appendix 5. Contamination and sedimentation at Petaquilla, April 18, 2010 (CIAM).
Appendix 6: Map of Panama and Study Site (Instituto Geografía Nacional Tommy Guardia)
Appendix 7. Distribution of Ngöbe-Buglé Peoples in Panama (Young, 1970)
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