

Predicting the Impacts of Serra Leste: a Case Study in Companhia Vale do Rio Doce's Influence on Southern Pará

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Abstract

This project analyzes the possible environmental and socioeconomic impacts of Serra Leste, a newly proposed iron mine by the Companhia Vale do Rio Doce (CVRD). However, Serra Leste is also part of a much larger system of CVRD projects which has recently had a profound influence on the micro-region surrounding Curionópolis, the future site of the operation. Interviews, CVRD studies, and secondary sources were used and contrasted to evaluate the situation from several angles. Environmentally, Serra Leste will have profound impacts on the water, air, and soil. Specifically, the mine will probably have the largest influence on regional water tables, based on the potential use of explosives and insufficient information in the CVRD impact evaluations. In the socioeconomic sense, the project will draw a large migration of laborers which the dwindling infrastructure of Curionópolis simply cannot support. Furthermore, insufficient and ambiguous social programs and compensations suggest that the municipal government will be forced to shoulder the majority of these problems. Ultimately, Serra Leste is a case study for the larger impacts of CVRD projects in the region. This new project directly supports and sustains others, such as the Grand Carajás Railroad and the thermoelectric complex proposed for Barcarena. More importantly, it exposes the influence CVRD exerts in the region. Despite current and historic instances of corruption and dishonesty, licensing agencies cannot halt the inertia of proliferating projects, largely because they lack sufficient resources. It is necessary to evaluate the corporate-community relationship in this area and ensure that it is mutually beneficial, not simply those with power exploiting those without.

Resumo

Esse projeto analisa os possíveis impactos ambientais e socioeconômico possível da Serra Leste, uma nova mina de ferro da Companhia Vale do Rio Doce (CVRD). Essa mina é uma parte do maior sistema dos projetos de CVRD, que tem uma grande influencia na região de Curionópolis, a cidade de Serra Leste. Serra Leste vai ter um impacto de solo, ar, e água no subsolo. Especificamente, o maior impacto será de água no subsolo, porque a companhia vai usar explosivos, e também os estudos da Vale não tem informação suficiente sobre esse assunto. No senso socioeconômico, esse projeto vai atrair uma migração de trabalhadores o que a pequena infra-estrutura de Curionópolis não pode suportar. Além disso, as programas sócias e dinheiro insuficiente da Vale falam que o governo municipal precisara apoiar todos os novos trabalhadores. Os estudos sobre a Serra Leste falam também que lá existe ferro suficiente só para quinze anos de operação, se a cidade precisar da mina para economia, será um grande problema. Realmente, Serra Leste é um estudo de caso para os maiores impactos de CVRD na região inteira. Esta nova mina vai apoiar os outros projetos da Vale, especificamente, a ferrovia Grande Carajás e a nova termoeleétrica em Barcarena. O que é mais importante, é que Serra Leste vai expor a influencia da CVRD na região. A CVRD tem quase dez projetos em três municípios, uma é a maior mina de ferro no mundo, esta companhia é uma necessidade aqui. Também esta companhia tem uma historia de corrupção e engano. Os grupos de licenciamento não podem parar o aumento de poder da Vale, porque não tem tempo, trabalhadores ou dinheiro suficiente para verificar todos os prepostos da companhia. Nós precisamos analisar esta relação para ter certeza que ela vai ajudar ambas as partes, ou seja, a companhia e a comunidade.

Table of Contents

- Introduction.....1
 - Basic information on Serra Leste.....1
 - Basic information on CVRD impacts in the region.....2
- Methods.....3
- A Background of CVRD’s regional influence.....4
 - Serra Pelada.....5
- Predicting the Environmental Impacts of Serra Leste.....6
 - Figure 1.0 Iron Deposits.....7
 - Current operation.....9
- Predicting the Socioeconomic Impacts of Serra Leste.....9
 - Proposed social programs.....10
 - A System of CVRD Influence in the Micro-Region Surrounding Curionópolis.....12
 - Immediate system.....12
 - Larger system.....13
- Licensing and Systems of Control.....15
- Conclusion.....16

Introduction

This project will analyze the possible and predicted environmental and socioeconomic impacts of Serra Leste, a newly proposed iron mine by the Companhia Vale do Rio Doce (CVRD). Serra Leste fits into a larger framework of CVRD projects, and their compounding impacts in the region are a cause for alarm. As these projects multiply, their growing influence on the local economies and labor markets evokes a level of authority that is becoming harder and harder to ignore. This inertia becomes a pressure in itself on licensing groups and regional social movements that find themselves toe-to-toe with a corporate behemoth. Serra Leste is the latest of several new CVRD mining and metallurgical projects in the south of Pará state, and will be situated close to Curionópolis on PA-275, neighboring the historic *garimpo* gold mine at Serra Pelada.¹ The proposed operation will extract iron and then transport it via 28 ton trucks 50 kilometers to loading platforms at the Grand Carajás Railroad, a large track dedicated to moving CVRD product. This railroad will then ship the iron to the docks of São Luis in Maranhão state, where ocean freighters will transport the raw product to foreign countries, largely to satisfy foreign debt. Some of the iron that stays in Brazil is used in Ferro-Gusa (Pellet) factories, which perpetuate their own systems of particularly detrimental ecological and socioeconomic impacts. In 1999, CVRD exported 20.5 million tons of pellets, while all other companies in Brazil combined only exported 13.8 million tons.² Geological surveys indicate a vein of about 470 million metric tons of iron present at Serra Leste in three principal deposits.³ However, an environmental and socioeconomic impact evaluation by CVRD in Curionópolis claimed a deposit of only 29 million tons, which would be extracted at a rate of 2 million tons per year. Not only does this rate of consumption indicate that Serra Leste's window of operation will be a mere 15 years, but Serra Leste's annual output can be matched by the Carajás iron mine in only eight days. In fact, Carajás is capable of producing more than 85 million tons of iron per year, more than 40 times the annual production of Serra Leste.⁴

Serra Leste is predicted to impact both the socioeconomic infrastructure of Curionópolis and regional environment in both positive and negative ways. However, it is necessary to find an acceptable equilibrium between the negative impacts and the social benefit. Specifically, this social benefit must have tangible follow-through in the local communities. Serra Leste not only represents a

¹ A *Garimpo* is a mine operated by individuals and not owned by a larger enterprise. Generally, these operations are small and use little or no mechanized force. However, at Serra Pelada over one hundred thousand *Garimpeiros* flocked to the mine in the early 1980s to claim a piece of the vast gold deposit there. The military government of the time sent Colonel Curio to keep the peace, and essentially a violent military rule was imposed on the booming town. Ironically, the *Garimpeiros* later united under Curio to protect their ability to mine freely against private companies like CVRD trying to gain the mineral rights to the treasure of Serra Pelada. Though they succeeded in protecting their claim, the mine was closed when their simple, manual labor based operation could no longer support the consequences of such an undertaking, and the excavation pit filled with water.

² Iron Ore in Brazil: Restructuring With Growth. February 21, 2002. p. 3

³ Monteiro, Maurílio. "O Programa Grande Carajás e Suas Implicações Para o Desenvolvimento da Amazônia". PowerPoint presentation.

⁴ CVRD Report on Shareholder's Debentures: Second Half of 2006. p. 4

potentially large individual impact, but compounds the damage of the surrounding CVRD projects, such as the Carajás mine, Níquel do Vermelho (under construction) and Sossego (initiated 2004). This study focuses primarily on the impacts of nearly ten CVRD mining operations in only three municipalities: Canaã dos Carajás, Curionópolis, and Parauapebas. These three municipalities constitute a micro-region of exceptionally high impact, and will be referenced at length in this study. For a map of the micro-region and the municipality of Curionópolis in relation to the state of Pará, see Appendix 1.

This system of land use, one which the local and federal governments have recently either purposefully or tacitly facilitated, has a direct impact on the environment and socioeconomics of southern Pará. CVRD represents the single largest economic interest in Pará, and the state depends heavily on the company for economic viability.⁵ The company's revenue is larger than that of Pará, and constitutes more than two-thirds of the state's exports.⁶ This economic dependency is exacerbated by CVRD's massive labor markets in the region, and specifically the micro-region defined above. The dramatic growth of the population in Southeastern Pará is a testament to the migration of workers, jumping from almost 41,000 in the 1970s to over 370,000 in 2000.⁷ However, when only a small percentage of these migrating workers obtain steady positions, a perilous social problem is created. An example in the micro-region is that of the Sossego copper mine, where CVRD predicted a small increase in the worker population that the urban structures could easily assimilate.⁸ The population of Canaã dos Carajás jumped from 10,992 in 2000 to 14,980 in 2003 after the construction of Sossego began, an increase of almost 50 percent in only three years.⁹ Current municipal populations range as high as 30,000, and increase of nearly 300% in seven years.¹⁰ Most of the migrating workers are young men who either do not have families or leave them behind, thus creating a very specific demographic in the booming mining cities. Municipal workers in Parauapebas warned of problems with crime, prostitution, and the sheer number of unemployed young men. Simply put, many of the cities in the municipalities of Parauapebas, Canaã dos Carajás, and Curionópolis would not exist without CVRD projects as a socioeconomic crutch. Since the economies and labor markets depend on Companhia Vale do Rio Doce, the company is free to act as it pleases. Local stipends and educational projects are without doubt beneficial for local communities, but CVRD is essentially free to decide how much their investment will be. Needless to say, when

⁵ Pinto, Lúcio Flávio. *CVRD: A Sigla do Enclave na Amazônia, As Mutações da Estatal e o Estado Imutável no Pará*. Cejup, Belém: 2003. p. 143

⁶ Pinto, 92

⁷ Bunker, Stephen, Maria Coelho, and others. *Carajás: Geologia e Ocupação Humana*. João Batista Guimarães Teixeira, Vandelei de Rui Beisiegel, Belém, 2006. p. 433

⁸ CVRD. *Sossego RIMA*. March 2000. p. 17

⁹ CVRD. *Níquel do Vermelho RIMA*. November 2004. p. 26

¹⁰ Wikipedia. "Canaã dos Carajás." [searched May 28, 2007]
http://pt.wikipedia.org/wiki/Cana%C3%A3_dos_Caraj%C3%A1s

CVRD pressures the state and municipal governments to support their interest, the government is want to agree, and a system of hegemony is born.

Furthermore, CVRD's growth in southern Pará, which the military government of the 1970's directly supported because the company was then a state-run corporation, "intensified land concentration with the expropriation and expulsion of small farmers".¹¹ However, the dispossessed and now landless farmers did not quietly accept their lot, and the growing agrarian reform movement in Pará represents their vendetta. These agrarian reformists, along with the consistent and heavy migration of unskilled laborers to the south of Pará, are growing in popular and political power. It is a somewhat ironic twist of fate that the current adversary of CVRD's system of land use is a movement they helped catalyze,

This conflict not only amplifies the importance of understanding the impacts of mining in the south of Pará, but illuminates the government's weak systems of control over the "dominant advocacy coalition".¹² Though federal branches like the Secretaria Executiva de Ciência, Tecnologia e Meio Ambiente (SECTAM) exist, their ability to reign-in growth and exploitation of resources seems to do little more than dent the rate of CVRD's expansion. CVRD is an absolute economic and social necessity in this micro-region. However, it is important that the company not only work in its own interests, but take more responsibility for the impacts of its operations. Licensing is based solely on a Relatório de Impacto Ambiental (RIMA) and a Estudo Impacto Ambiental (EIA). Though these studies are meant to gain environmental license, they contain extensive research on socioeconomic impacts as well. However, overt efforts to skirt licensing by proposing the project in phases because it is easier to gain licensing for consequent extensions hide the true potential impact of the mine. Specifically, additional phases do not necessitate an EIA-RIMA or nearly as much research to gain licensing; CVRD is prepared to exploit this loophole. Furthermore, taking advantage of the legal exploratory operation to amass product before the mine is constructed, or even licensed, is an example of manipulation of conservation laws to insure faster profit. Both of these practices have been evident in the proposal of Serra Leste. Thus, the case study of Serra Leste not only illuminates a potentially damaging mine, but also its role in the developing synergy of one of the region's predominant systems of land use. Serra Leste might have a large individual environmental and socioeconomic impact, but it also compounds that of other CVRD projects in the micro-region of Curionópolis, Parauapebas, and Canaã dos Carajás. Thus, it is important to understand not only the impact of Serra Leste, but Serra Leste's contributions to the substantial influence of Companhia Vale do Rio Doce on this growing region.

Methods

¹¹ Fernandes, Bernardo. "The MST, Its Genealogy and the Struggle for Agrarian Reform in Brazil".

¹² Carvalho, Geórgia. "Metallurgical Development in the Carajás Área: A Case Study of the Evolution of Environmental Policy Formation in Brazil". *Society and Natural Resources*, 14:127-143, 2001.p. 129

This project is a compilation of information from several CVRD RIMA-EIA reports and a series of secondary sources. RIMA-EIA reports were the principle source of data on mining operations while secondary sources filled in the larger trends of the region. This data was then supplemented and contrasted with interviews of CVRD employees, the public defendant of Pará who evaluates all proposed projects in a public hearing, and SEPLAN employees from Parauapebas. These interviews were done in order to compare regional points of views directly with CVRD-driven studies. Though only three interviews are referenced directly in this study, nine semi-structured interviews were performed. Informal conversations were also held with Movimento dos Trabalhadores Rurais Sem Terra workers and SEPLAN officials, but this information was not used due to lack of consent and the informal nature of the dialogue. Ultimately, this data and information was compiled in an attempt to create an accurate portrayal of CVRD's influence in the micro-region surrounding Curionópolis and Pará in general. This topic is of growing importance not only because of the impacts in the region, but because of the larger system in place. It is necessary to evaluate this relationship between an extremely powerful corporation and the local communities it exploits to ensure that the give-and-take is indeed mutually beneficial.

A Background of CVRD's Regional Influence

Companhia Vale do Rio Doce was founded as a state-owned corporation in 1942 and then was gradually made a private enterprise between 1995 and 1997.¹³ CVRD influence in Pará began in earnest in the mid 1970s when the company began the *Programa Grande Carajás*, or the Great Carajás Project. Most noticeably, this project consisted of several metallurgical projects: the Carajás iron mine (largest iron mine in the world), the Tucuruí hydroelectric dam, and the Carajás railroad, used to transport the iron from Carajás to São Luis where it could be exported largely to satisfy Brazil's foreign debt. The project comprised 895,000 square kilometers, more than 10% of the entire landmass of Brazil.¹⁴ More important than the size, was the way in which the project was implemented:

“All the planning behind the PGC (Programa Grande Carajás) was concentrated at the federal level in the hands of few bureaucrats at the Companhia Vale do Rio Doce (CVRD), the pastoral agency in charge of the Carajás iron ore mine, and SEPLAN (Planning Secretariat of the Presidency) officials. No regional or state level agencies nor any municipal governments were consulted or brought into the policy formation process early enough to steer the project in a different direction, much less sectors of civil society.”¹⁵

¹³ Bunker, Stephen, Maria Coelho and others, 136 and 390

¹⁴ Carvalho, 130

¹⁵ Carvalho, 130

Thus, a large and extremely economically profitable portion of Brazil was essentially handed to a state-owned company in the hopes of jumpstarting development in the region. CVRD was also given enormous tax breaks and economic incentive to facilitate a smooth implementation of its programs, the company was not even made responsible for paying income taxes for 15 full years from the beginning of the project.¹⁶ Such a large investment by the government clearly indicated a strong will to develop and profit from the riches of Amazonia as quickly as possible. It was impossible then, as it is now, to accurately predict the impacts of such rapid and widespread change. In fact, many argue that the impacts of these projects were not completely beneficial:

“Living standards for those directly linked to projects are quite good, but many previous residents in these areas are even worse off. All of these projects were part of the government development efforts that explicitly included improved standards of living as a goal. This goal was fulfilled for some, but for others the projects brought problems rather than improvements. The socioeconomic impacts of these development efforts can at best be characterized as quite mixed.”¹⁷

Therefore, it is evident that many of the socioeconomic tensions evident in Southern Pará can be attributed to CVRD, with whom development began. When a government uses a state-owned company as a catalyst to ensure development and improved standards of living, the intentions are clearly in favor of the public. However, now that CVRD is a private company, it seems that not only will the same problems continue, but that CVRD will have no intentions other than furthering its own interest.

Using these advantages as a platform, CVRD created numerous projects in Southern Pará, and specifically the micro-region surrounding the Carajás iron mine. In the micro-region alone, CVRD operates Sossego, the Carajás iron mine, Projecto Bahia, Azul, Projecto 118, Cristalino, and others; Níquel do Vermelho is under construction, and Serra Leste is prepared for licensing. Needless to say, CVRD has a very visible presence in these three municipalities.

Another integral historic influence CVRD has had on the municipality of Curionópolis was its relationship with now Mayor Curio, for whom the municipality and city are named, as well as the *Garimpo* at Serra Pelada. After the federal takeover of the mine in 1980, the government sided with the *Garimpeiros*, allowing them to retain control of the operation, and used Serra Pelada as the cornerstone of its political strategy for public appeal in Southern Pará.¹⁸ However, CVRD pressured the government and authorities for control of the mine, claiming the regional mineral rights. Despite the apparent fortune at Serra Pelada, CVRD threatened to close the mine because they claimed it

¹⁶ Carvalho, 132

¹⁷ Ciccantell, Paul S. “Making Aluminum in the Rainforest: The Socioeconomic Impact of Globalization in the Brazilian Amazon”. *The Journal of Developing Areas*. 33 (Winter 1999). p. 192

¹⁸ Cleary, David. *Anatomy of the Amazon Gold Rush*. University of Iowa Press, USA: 1990. p. 179

would cost more to modernize the practices there than they could extract in gold. After a drawn out legal battle, Curio, the leader of the federal takeover, managed to ward off CVRD and protect the mine from private interest. During the course of this complicated war for rights, *Garimpeiros* rioted and marched on Parauapebas. After they “disarmed the police, (they) burnt down the CVRD buildings” before they were subdued.¹⁹ Unfortunately, by 1984 it had become apparent that the simple, manual labor practices of the *Garimpeiros* were indeed not sufficiently thought-out or structurally sound. Land slides and cave-ins plagued the miners. Ultimately, the principal excavation pit filled with water and was abandoned. However, the battle with CVRD and their threat to take the livelihood of some hundred thousand miners only to terminate operations remains a poignant memory for the current inhabitants of Serra Pelada and Curionópolis.

Understanding the history of CVRD influence in Southern Pará, and specifically the micro-region surrounding Curionópolis, is imperative to understanding the potential impacts of Serra Leste and the current system of mining projects. Large-scale industrial development literally began with CVRD in this region, and the impacts, positive and negative, in the last thirty-five years have been massive. Cities like Parauapebas would not exist without their concurrent mines, yet it is necessary to mitigate the negative impacts despite this economic dependency. Social tensions, worker migrations, and contests for land and mineral rights have been constant factors in the region; it is onto this precarious stage that current CVRD projects like Serra Leste enter.

Predicting the Environmental Impacts of Serra Leste

The possible environmental impacts of Serra Leste, and most every Companhia Vale do Rio Doce project, are predicted through the independent research company Goldman Associates. This company is responsible for the research and compilation of the EIA-RIMA, CVRD’s proposal to public and government officials for licensing. CVRD officials assure the verity of the reports, and indeed Goldman Associates is a multinational corporation that performs environmental and socioeconomic research for similar countries all over the globe.²⁰ However, Goldman Associates cannot compensate when CVRD oversteps legal boundaries or seeks loopholes; similarly Goldman Associates is capable of repressing or inadequately presenting information. These ploys represent a purposeful and premeditated attempt to acquire licensing for a mineral operation that will have larger environmental impacts than the government or public has been made aware of; all of these methods of deception are evident in the case of Serra Leste.

Serra Leste will comprise an area of 299 hectares about 30 kilometers from the city of Curionópolis. The mine will consist primarily of two excavation pits, a processing plant, explosives depot, landfill, and a large rubble pile. The two pits, the Western and Eastern, are to be situated on the

¹⁹ Cleary, 183

²⁰ Castilho, Alexandre. Interview, CVRD Employee. Parauapebas, May 18, 2007.

same side of the hill, with the rubble pile taking up the majority of the mountain top. The complex will be connected to the Grand Carajás Railroad via about 50 kilometers of paved road, along which iron will be transported to loading platforms to the railroad.

A CVRD impact assessment meeting in Curionópolis on May 21st, 2007 listed the iron deposit in Serra Leste to be 29 million tons and projected 2 million tons to be extracted per year.²¹ A recent CVRD shareholders report listed an increase in the Carajás mine’s capacity to 85 million tons per year in 2006.²² Thus, according to CVRD documents the mine at Carajás almost triples Serra Leste’s lifetime potential every year. Such a small operation will cost the company more than 40 million reais every year in taxes and another 2.5 million reais annually in royalties to Curionópolis; this does not even include construction, payroll, and maintenance costs.²³ However, other geological surveys of Serra Leste list iron deposits as rich as 470 million tons in three principle deposits. See figure 1.0.

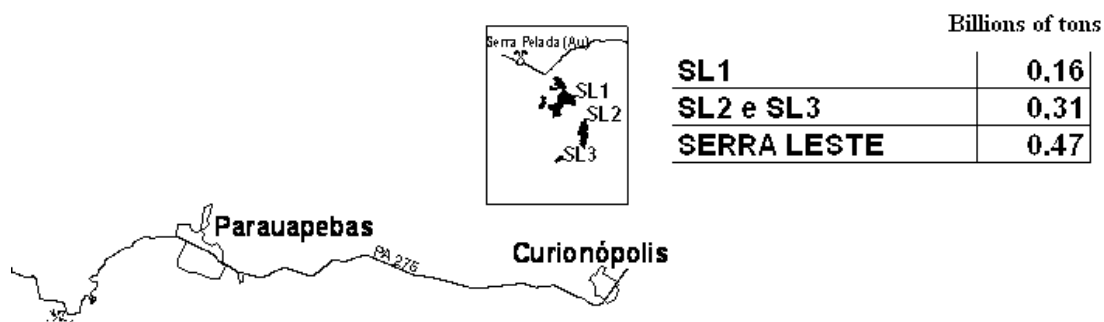


Figure 1.0 Serra Leste Iron Deposits²⁴

This represents not only a significantly larger mining operation if future extensions are added, but a much greater environmental impact. This discrepancy in numbers represents a deliberate attempt to hide the true potential environmental repercussions of Serra Leste, and licensing must take into consideration the full spectrum of operation, not just the initial piece. SL1 is also a more widespread deposit, thus necessitating a larger excavation pit, compounding environmental impacts to soil and subterranean water tables.

The exacerbation of damage to water tables closer and closer to Serra Pelada could potentially create problems with the existing mercury pollution in the water there. Water in Serra Leste will be consumed at a rate of 11,250 cubic meters per month, 4.3 cubic meters per second, for personal use in

²¹ CVRD Serra Leste RIMA. October, 2006. p. 27

²² CVRD. CVRD Report on Shareholder’s Debentures: Second Half 2006. March 30, 2007. Visited May 26, 2007. www.cvrld.com.br/cvrld_us/media/0330RelatorioDebentures2S06_1.pdf. p. 4

²³ Serra Leste RIMA, 28

²⁴ Edited from Monteiro PowerPoint

the offices and factory instead of industrial use during excavation.²⁵ This personal contact with the water only increases the chances of health complications linked to environmental impacts. It is hard to accurately predict the potential damage to subterranean water systems not only because it is unclear how large Serra Leste will ultimately be, but also because the EIA uses secondary references in describing the water table. In the section concerning the use of explosives and its effects on the subterranean water systems, the document simply states that “the geological characteristics of Serra Leste, in terms of hydraulics and hydrodynamics, are similar to Serra Norte. Therefore, in the absence of more detailed studies, we will expect similar impacts [translated].”²⁶ This is a reference to the hydrological characteristics of the Carajás mine, and it is simply inadequate information. CVRD will not even begin monitoring or researching the water table outflow until July 2007, at this point historical data on the system will be limited.²⁷ Without the availability of sufficient background information it will be extremely hard to prove the existence of any negative impacts, or analyze change at all. Elaborations to the water table maps will not be made until January 2008.²⁸ CVRD studies and information on this subject are incomplete or insufficient. Thus, the true impacts on the water systems, which will be directly used by Serra Leste employees, cannot currently be predicted, nor will future assessments have sufficient historical information to accurately gauge changes.

Directly affecting the water table will be the use of explosives at Serra Leste. CVRD will use ANFO light, blended, and emulsion explosives at a rate of 880 tons per year, approximately twice a week, with each blast leveling 1500 sq. meters.²⁹ At this rate, Serra Leste will detonate approximately 156 sq. kilometers per year, assuming that the rate is consistent. Page 32 of the Serra Leste RIMA presents a map of the proposed placement and size of the mine’s structures and operations, it indicates that the rubble pile is projected to take up more space than both excavation pits combined, on the surface at least. Serra Leste is projected to occupy 299 Ha, the equivalent of less than three square kilometers. With an operation of this size, the use of explosives at rate of 156 square kilometers per year seems absurdly large. To have this inconsistency in numbers, compiled by the referencing of secondary information to explain direct effects, is questionable at best.

Other environmental impacts concurrent with Serra Leste will be those common to any mining operation. The rubble pile will be 8,250,000 tons of scrap and earth at capacity, but is projected only to grow to 6,838,000 tons. Some of this pile will be sold off according to market prices, but the majority will remain on the mountaintop.³⁰ Another 90 tons of “residue [translated]” from the installation process will travel to the bottom of the hill where it will be placed in a landfill near piles of organic matter cleared to make space for the operation. Approximately 400 kilograms of material

²⁵ Serra Leste RIMA, 20

²⁶ CVRD Serra Leste EIA. 2006. p. 81

²⁷ Serra Leste EIA, 84

²⁸ Serra Leste EIA, 84

²⁹ Serra Leste EIA, 81

³⁰ Serra Leste EIA, 85

contaminated with grease and oil during the installation phase is to be burned after, contributing to the air pollution resultant with the operation of the mine.³¹ In addition to the explosives used, the mine will also house 1,788 kilograms of compressed Acetylene, a highly combustible hydrocarbon used in processing iron.³² However, these environmental impacts and hazards are common to every mine in the micro-region around Curionópolis. These impacts are the accepted lesser evils, but they are accepted on a case by case basis, not when all the operations in the micro-region are accumulating a larger impact.

A recent visit to the isolated mountain plateau of Serra Leste revealed a functional iron mining operation, and several large piles of mineral. Legally, CVRD is permitted to run an exploratory operation to verify geological surveys and purity. However, this type of operation should consist only of a network of core samples from small-diameter holes. As evident from the photos, available in Appendix 2, the extent of the operation is highly suspect. These pictures, taken at Serra Leste May 15, 2007, expose not only several large piles of product, but heavy machinery already operating. If this company is only to act in its own interest, then it is necessary to truly analyze the relationship it has with the local environment and society. CVRD was licensed to extract 50,000 tons of iron prior to full operations at Serra Leste by SECTAM in 2006.³³ This represents an amount far more than necessary for exploratory measures, and essentially ensures that CVRD will have product prepared for the first day of construction. The pictures confirm that CVRD is taking full advantage of the license, using heavy machinery to clear plots and extract mineral. However, it is necessary to question why such licenses are given to a company that already runs multiple mines in the micro-region. The effects amplify as each new mine is built, and though as a case study they might not seem particularly harmful, it is necessary to see Serra Leste as the part of a larger system.

Predicting the Socioeconomic Impacts of Serra Leste

The socioeconomic impacts of Serra Leste will affect the city of Curionópolis most immediately and directly, but also the entirety of the surrounding micro-region and the state of Pará. The project of Serra Leste will undoubtedly create jobs, increase revenue, and help the development of Curionópolis, and in this narrow focus many of the impacts seem positive. However, if the migration of workers to the area is at all similar to that of other cities during the initiation of CVRD projects, these positive impacts may very well not be sufficient. It is arguably harder to gauge socioeconomic impacts than environmental, and this section will draw from examples of other cities where CVRD projects have altered the socioeconomic situation in order to provide a better founded prediction.

³¹ Serra Leste EIA, 73

³² Serra Leste EIA, 79

³³ Serra Leste RIMA, 8

The construction of Serra Leste will create, at its peak after nine months, 544 jobs; this number will then plummet to 193 by the 19th month.³⁴ After the mine becomes operational, the number of employees will stay stable at this level. Worker migration aside, this means that more than half the people hired by CVRD in the first nine months to facilitate construction of Serra Leste will have lost their jobs a half-year later. This temporary boom is actually typical of mining projects. According to a February 2004 press release by Companhia Vale do Rio Doce, the Sossego copper mine outside of Canaã dos Carajás employed 5,000 workers during construction, but only 520 during operation.³⁵ In the case of Sossego, only a little over 10 percent of the original employees retained their jobs through the transition to the operational phase, this constitutes a massive reduction in job opportunities. However, the situation in Curionópolis may hold more hidden pitfalls. Between 1991 and 2000, following the decline of Serra Pelada, the population of Curionópolis has dropped about 50 percent to a scant 19,487 inhabitants.³⁶ Furthermore, this is a city based around what was essentially a freelance mining operation, the demographic and level of education in Curionópolis is in all probability uniform and low. Though higher-paying jobs exist in the Serra Leste project, it is probable that workers moving into the city will be better qualified than those already living in the dying urban area. Arguably, current residents of Curionópolis will only be able to acquire lower-paying, manual labor jobs. Such massive population fluctuations in the last sixteen years also raise questions as to the vulnerability of the city's socioeconomic structure. Will this city be able to support a migration of workers similar to that of Canaã dos Carajás where the population exploded by 50 percent in only three years? Unfortunately, this question is impossible to answer definitively.

CVRD will also bring many socioeconomic benefits to Curionópolis through the construction of Serra Leste. As is typically the case in cities hosting new CVRD mines, the company will provide direct monetary imbursement as well as funding for social projects. Specifically, programs for environmental education and the development of “fornecedores (translates to “suppliers” in the Oxford Portuguese Dictionary)” will be implemented to aid the social situation.³⁷ Furthermore, the CVRD impact assessment meeting in Curionópolis indicated that the Escola de Vale (Vale School) will work in conjunction with the NGO Alfabetização Solidária on literacy programs in the city. More generally, the operation of Serra Leste will ensure an annual stipend of 2.5 million reais to the municipality of Curionópolis to support development efforts. These programs and stipends will undoubtedly aid the socioeconomic structure of the city and municipality as a whole.

However, while these social benefits will help, it is unclear if they will adequately compensate the city and municipality for the stress that will be placed on its socioeconomic infrastructure. Whether or not an environmental education program will help alleviate a large migration of young

³⁴ Serra Leste RIMA, 25

³⁵ CVRD Press Release. February 7, 2004. Visited May 15, 2007.

http://www.cvr.com.br/cvr_us/cgi/cgilua.exe/sys/start.htm?inford=200&sid=143

³⁶ Serra Leste RIMA, 94

³⁷ Serra Leste RIMA, 188-189

men in search of work when less than 200 jobs will be available after a year and a half is questionable. Similarly, the ambiguity of a “program to develop suppliers” leaves CVRD leeway in how much aid they actually need to provide. No tangible follow-through or hard figures are outlined in the Serra Leste RIMA, the completion and level of participation in this program essentially becomes the decision of the company. It is not proportional to the aid the city requires. The Serra Leste RIMA also speaks of a program to monitor “socioeconomic indicators”, yet another plan that offers no tangible aid should the community need it.³⁸ Ultimately, CVRD proposes many programs that require the company to offer little or no concrete assistance to Curionópolis, the city it will be directly affecting.

Another dilemma with the relationship between Curionópolis and CVRD exists in the near complete exportation of product not only from the municipality and state, but the country. Serra Leste, as is the case with most CVRD iron projects, will transport its extracted minerals directly to São Luis, via the Grand Carajás Railroad, where it will be shipped to foreign countries to satisfy foreign debt. During the naissance of the Grand Carajás Project, the then-military government accumulated massive debts to a plethora of foreign countries to jumpstart development efforts. As a result, in 1999, CVRD exported 80.2 million tons of iron, while selling only 16 million tons in the domestic market.³⁹ By 2002, CVRD had exported 54.9 million tons in only the first half of the fiscal year, projecting an annual export of over 100 million tons.⁴⁰ SEPLAN employees in Parauapebas confirm the effects of this practice, lamenting that CVRD makes the majority of its profit on the foreign market, and leaves only a comparative pittance to the local communities.⁴¹ If a predominant system of land use solely extracts and exports a product, while not sufficiently compensating the local community for negative impacts, then the system must be reevaluated. In this way, CVRD is not only exploiting mineral resources but human resources in order profit on a larger stage, leaving the inhabitants of Curionópolis and the micro-region in general to suffer the consequences.

Though the social benefits provided by CVRD are an absolute necessity, it is important to keep the image of the municipality, state, and company separated. The population of Curionópolis will experience rapid development in the form newly paved roads, jobs, a new literacy program, and a wealthy housing nucleus for the upper-level employees of the mine. However, they will attribute all of this development to CVRD, not to their municipal government. Therefore, even though the aid may not be sufficient, it will be visible enough that people will associate development with Companhia Vale do Rio Doce. What will then become of the city if Serra Leste closes in 15 years having exhausted the iron deposits listed in the RIMA? If a system of complete reliance has been formed, then the city will only continue on its current trend of a shrinking population and economy

³⁸ Serra Leste RIMA, 192

³⁹ Iron Ore in Brazil: Reconstructing with Growth. p.3

⁴⁰ “CVRD Investor Relations Press Release”. April 7th, 2002. visited May 17th, 2007
[http://www.cvrd.com.br/cvrd_us/cgi/cgilua.exe/sys/start.htm?infoid=334&sid=147]

⁴¹ Interview. SEPLAN Employee. Parauapebas, May 20th, 2007.

after the mine has ceased to operate. Curionópolis undoubtedly needs this project to spark its economy and attract businesses and people, but this reliance must not be allowed to overshadow the mine's potential damage. Curionópolis cannot be a city reliant on CVRD for survival, or the socioeconomic impacts will only grow worse in the future. Unfortunately, this seems to be the trend throughout the micro-region, where cities reliant on CVRD projects are experiencing continual socioeconomic pressures. The migration of workers to certain areas has caused increased prostitution, crime, and poverty. Ultimately, it is important to understand both Serra Leste's direct impacts on Curionópolis, but also how this new mine will fit into the larger framework of CVRD influence in the micro-region.

The System of CVRD Influence in the Micro-Region Surrounding Curionópolis

Serra Leste not only represents a potentially large individual environmental and socioeconomic impact, but it fits into a much larger system of CVRD projects that has a significant influence on the micro-region surrounding Curionópolis and the state of Pará in general. Since CVRD represents about two-thirds of the exports of Pará, and has a larger income, the company is more valuable than the state in a purely monetary and economic sense. This tremendous output is still growing. CVRD recently obtained a license to increase Manganese production in the Carajás mine by 1,750,000 tons per year, and just recently iron production in the same mine was increased to 85 million tons per year, making it the largest iron mine in the world.⁴² The mine at Sossego, founded in 2004, immediately quintupled Brazil's national output of copper in its first year of operation; both Carajás and Sossego share the micro-region surrounding the proposed site of Serra Leste.⁴³ There are, also in this micro-region, more than five other CVRD mining operations for gold, manganese, iron, nickel, and copper.

Serra Leste directly amplifies certain environmental impacts in this system. Specifically, licensing for Serra Leste includes the construction of about 18 kilometers of new track and 57.8 hectares for loading docks to the Grande Carajás Railroad.⁴⁴ This supplement to the railroad, the primary means of export for the Carajás mine, compounds and supports the existing environmental impacts around this track. Primarily, because this track transports iron, it has served as the principle supplier for pellet factories which have sprung up around the railroad. As mentioned earlier, these factories use charcoal to refine iron into pig iron, a process that causes significant air pollution. Furthermore, the rush of urbanization and deforestation has been greatly facilitated by the railroad as it cheaply and effectively transports people from São Luis and Marabá into the micro-region. Also, just as the Tucuruí dam was principally built to power the Carajás mine, CVRD has just proposed a thermoelectric complex in Barcarena, Pará to power the several new mining operations in this micro-region and others. This new thermoelectric power plant will burn coal at the staggering rate of 971.25

⁴² Pinto, 138

⁴³ Pinto, 63

⁴⁴ CVRD. Serra Leste RIMA. October, 2006. p. 40

tons per hour to produce 600 Mw of electricity.⁴⁵ Though this is not organic charcoal produced from Eucalyptus, a particularly detrimental monoculture, such a large rate of consumption will clearly produce a significant amount of air pollution. Though Serra Leste will be directly linked to the railroad and the new thermoelectric complex, no mention is made of their cumulative impacts in any CVRD-driven studies. More generally, “the impacts felt in this region occurred with the retreat of vegetation in the areas conceded to CVRD use [translated].”⁴⁶ Thus specific impacts are mixed with general ones like deforestation, yet no mention is made in proposals for licensing. Isolating each operation proves a good way to diminish the general appearance of environmental impacts. However, when the system of the micro-region is looked at in its entirety, the impacts are exposed.

The culminating environmental impacts are cause for concern. Each mining license represents not only explicit permission to exploit a mineral, but also the land, space, and human resources. The Carajás mining complex is uniquely isolated in a government-protected forest, but other projects have more immediately pressing impacts. The new CVRD project Níquel do Vermelho outside of Canaã dos Carajás may prove an incredibly detrimental blow to the local environment. The mine plans to use a dam to treat chemical effluent, including sulfuric acid, from the metallurgical treatment of nickel.⁴⁷ However, this effluent will eventually be released into the Parauapebas River, the principle source of drinking water for the city of Parauapebas.⁴⁸ Furthermore, the mine will release sulfur dioxide and sulfur trioxide gases from electrolysis processes, sulfur trioxide being a principle agent in the formation of acid rain. This mine, currently under construction, will also release “névoas ácidas”, which translates literally to “haze acids”.⁴⁹ No further elaboration is made in the studies about this vague but foreboding emission. Each individual mine has its respective impacts, some worse than others, but when all of these impacts compound each other the result is dangerous. Obviously, the socioeconomic and environmental impacts will reflect such a presence in such a small area.

Furthermore, the Great Carajás Project opened the door for the charcoal market used to fuel pellet factories in and around Marabá. Though these factories offer stable jobs, the charcoal used to fuel them is an environmental and social travesty. Charcoal was abandoned in the Industrial Revolution because it became apparent that any “potential economic benefits paled in comparison to the environmental impact that charcoal-based metallurgy would have on local forests, exacerbating the deforestation process.”⁵⁰ Furthermore, the use of Eucalyptus to create charcoal creates a monoculture of alien trees that are extremely detrimental to the local soil. Eucalyptus cannot be used in any other way than to support the charcoal industry; therefore it is a monoculture supporting the predominant systems of land use in the area. Ultimately, one SEPLAN official in Parauapebas

⁴⁵ CVRD. UTE Barcarena RIMA. March 2007. p. 4

⁴⁶ Bunker, Stephen, Maria Coelho and others, 457

⁴⁷ CVRD. Níquel do Vermelho RIMA. November, 2004. p. 15

⁴⁸ Níquel do Vermelho RIMA, 31

⁴⁹ Níquel do Vermelho RIMA, 15

⁵⁰ Carvalho, 131

commented that, in their opinion, CVRD did not make clear all the environmental impacts caused by their operations. Specifically, that, in the official documents, the company purposefully hides and downplays such problems.⁵¹ If this is true, then the CVRD system is one of great environmental influence that is hiding the true extent of their impacts from the public. Thus, they are exploiting the resources of the land, and not sharing potentially damaging information with the people who live there. This represents a hegemonic and dishonest system of land use in the sense that it is manipulating and exploiting the local communities and government to obtain its own desires.

The socioeconomic impacts in the micro-region surrounding Curionópolis have also been undeniable since the initiation of the Grande Carajás Project. Cities like Parauapebas and Canaã dos Carajás have experienced enormous population booms concurrent with their CVRD projects, while cities like Curionópolis without such projects experienced only a steady decrease in population since Serra Pelada effectively ceased operating in the 1990s. In fact, Curionópolis and Parauapebas were both founded 19 years ago and in 1991 had similar population sizes of 38,672 and 36,501; the larger actually belonging to Curionópolis. By the year 2000, the population of Parauapebas had grown to 71,570, while Curionópolis fell to 19,487.⁵² In the span of nine years these two cities, literally thirty minutes apart by bus along PA-275, experienced extreme population shifts but in the opposite directions. Part of this problem stems from the temporary availability of jobs concomitant with every CVRD project during construction that fizzles during the operational phase. This trend is not only evident in the literature on Serra Leste and Sossego, the mine Níquel do Vermelho will employ 2,787 workers during construction, but only 556 during operation.⁵³ Therefore, every city in the micro-region that hosts a CVRD project has experienced this population surge and ephemeral employment opportunities on some level.

Interviews with several SEPLAN officials in Parauapebas exposed that such pressures on the local socioeconomic infrastructures create large problems. These cities are simply not adequately prepared to provide housing, education, medical attention, and developed roads if the population of their city increases by 50 percent in nine years. Furthermore, the demographic of workers, specifically single young men, creates a volatile social situation. On a larger scale, the population of Southeast Pará in its entirety has been increasing steadily since the seventies, rising from 40,370 to 377,000 people between the 1970s and the year 2000.⁵⁴ When these people cannot find work, poverty, crime, and prostitution escalate.⁵⁵ Those who cannot find work upon arrival are generally unskilled laborers, and have trouble finding employment in the city. In the end, they rely on the municipal government for support, or migrate to the next city in hope of work. Ultimately, CVRD programs of social aid act as a small but inadequate buffer, after which the municipality is forced to deal with the negative

⁵¹ Interview. SEPLAN Employee. Parauapebas, May 20th, 2007.

⁵² Serra Leste RIMA, 94

⁵³ Níquel do Vermelho RIMA, 15

⁵⁴ Bunker, Stephen, Maria Coelho and others, 433

⁵⁵ Interview. SEPLAN Employee. Parauapebas, May 20th, 2007.

impacts of the population explosion. Furthermore, the installation of these projects generally causes a small scale social disturbance. Large projects like the Carajás mine simply displace the people already living there in the name of progress. The construction of the Tucuruí dam alone displaced about 4,500 families from the area that was flooded.⁵⁶ Ironically, these displaced families and workers feed into another social conflict concerning CVRD: the agrarian reform movement.

Such organizations as the Movimento dos Trabalhadores Rurais Sem Terra (MST) and Grupo Executivo de Terras Araguaia Tocantins (GETAT) organize landless farmers in the area. CVRD has undoubtedly forced many people from their land, and they have filled the ranks of these agrarian reform movements. Between 1987 and 2005 over 94 acknowledged settlements sprung up in the Southeast of Pará, illuminating the growing numbers of the movements.⁵⁷ However, violence between the movement and dominant systems of land use, most commonly cattle ranchers, have not only been increasing, but occurring in more places.⁵⁸ Though CVRD has no role in this violence, it is most definitely perpetuating the systems of land use that are oppressing the agrarian reform movements, and forcing them to build encampments to sustain themselves. Ultimately, the conflict between the agrarian reform movements and CVRD is a current example of:

“interaction over time (longitudinally) between a dominant coalition seeking to defend the interests of the metallurgical sector and a competing advocacy coalition that manifested its opposition to the metallurgical sector in the posttransitional period (federal military government to democracy), attempting to reshape policy regulating metallurgical production in the area to mitigate environmental impact.”⁵⁹

The relationship between the two coalitions is growing more complex. The negative socioeconomic and environmental impacts of CVRD projects are growing, but so is the agrarian reform movement. Equilibrium must eventually be found between the mining sector and sustainable familial agriculture in the region, as this balance is currently weighted heavily in CVRD’s favor. The government is not controlling CVRD, but in many cases it has acted to repress the agrarian reform movement; most visibly in the Eldorado dos Carajás massacre in 1996. Thus, it is clear who is being supported in this balance. It is now necessary to reevaluate the relationship between CVRD and the local communities in order to ensure a mutually beneficial relationship.

Licensing and Systems of Control

Licensing for CVRD projects is primarily done through SECTAM, the Departamento Nacional de Produção Mineral (DNPM), and the Instituto Brasileiro do Meio Ambiente (IBAMA). Before licensing is finalized, every EIA-RIMA must also be analyzed in a public hearing with a Pará state

⁵⁶ Monteiro, PowerPoint

⁵⁷ Bunker, Stephen, Maria Coelho and others, 442

⁵⁸ Bunker, Stephen, Maria Coelho and others, 445

⁵⁹ Carvalho, 129

public defendant to afford the general public a chance to evaluate the benefits and impacts of the proposed project. Since licensing is primarily performed at the state-level, recent legislation has suggested making the process a federal affair in view of egregious environmental impacts in Amazônia. However, the Amazonian states refused this new process, preferring to keep power in the hands of the state governments.⁶⁰ Unfortunately, the Pará public defendant stated simply that SECTAM, as well as his own office in the Ministério Publica estadual (state public ministry), does not have adequate staff or resources to appropriately verify every new proposal from CVRD.⁶¹ Thus, the current situation with state licensing is indeed fragile, and catalyzing the rapid multiplication of CVRD projects in the micro-region surrounding Curionópolis and Pará in general. Unfortunately, the ability of Companhia Vale do Rio Doce to skirt licensing requirements is not just a current problem, but has been a historical trend.

While CVRD was a state-owned corporation it used several tactics to circumvent DNPM regulations. Specifically, in order to obtain more than the legal five permits per year, the company created ghost organizations to acquire licenses for various minerals. With the aid of “such measures, vast areas of Southern Pará were monopolized”, CVRD and its 38 subsidiaries managed to finagle “1,764 research permits and 89 production concessions”.⁶² Regrettably, CVRD’s dishonesty did not end with attempts to evade licensing, but on occasion has culminated in outright corruption. When two CVRD factories consumed almost five times the energy of Belém, energy prices rose for the people of the city. In October 1995, the ex-state president of CVRD was forced to admit that the price of electricity rose from corruption in the system, and that the factories did not necessitate such energy levels.⁶³ Such attempts to avoid government restrictions and admissions of corruption are not at all desirable traits of a company that one Parauapebas SEPLAN worker claims has an outright “monopoly”.⁶⁴ Indeed, a company that is exacting such a heavy socioeconomic and environmental toll should be monitored with the utmost vigilance. The proposal of Serra Leste directly calls this history into question: certain aspects of the proposal are ambiguous, others deceitful. Referencing secondary sources, potentially hiding large mineral deposits for consequent stages for which licensing is easier to obtain, vaguely defined programs to reduce necessary follow-through; these are all problems with the Serra Leste RIMA that must be addressed in the licensing dialogue.

Conclusions

The Serra Leste iron mine represents a large system of interdependent CVRD projects in the South of Pará that are both greatly aiding the state and national economy, but also exacting a heavy

⁶⁰ Pinto, 135

⁶¹ Interview. Pará state public defendant. Belém, May 30th, 2007.

⁶² Schmink, Marianne and Charles Wood. *Contested Frontiers in Amazonia*. Columbia University Press, New York: 1992. p. 68

⁶³ Pinto, 101

⁶⁴ Interview. SEPLAN Employee. Parauapebas, May 18th, 2007.

local toll. It is necessary to look beyond the Serra Leste RIMA-EIA, as it is for all projects, and understand the larger synergy at work. Serra Leste needs electricity to function- enter the new thermoelectric complex in Barcarena. Serra Leste will need to export its goods- add more track and cars to the Grand Carajás Railroad. These projects are codependent and the impacts of one amplify the others'. With each new project, the socioeconomic infrastructures and environment of this micro-region must exert a little bit more energy to sustain themselves. They will not hold out forever. Ultimately, this project seeks to question the system as a whole, and whether or not the small micro-regions are being sufficiently included or excluded. Inclusion, in this case, signifies a relationship between CVRD and the city or region that benefits and propagates both parties. In the micro-region surrounding Curionópolis, the future home of Serra Leste, this is not the case. CVRD is exploiting mineral at a fantastic pace, and then exporting the product in order to profit on a global level, in many ways leaving the micro-region to suffer. If Serra Leste closes in 15 years, it is not CVRD that will have to confront the environmental degradation and support a new population of unemployed, unskilled laborers, it will be Curionópolis. If Serra Leste continues to expand into additional iron deposits, then the compounding environmental impacts will still affect the city. This is indeed a perilous situation. Historically, CVRD has been guilty of corruption, deception, and manipulation, this course must be altered. Licensing groups like SECTAM fought to keep the power of licensing at the state level, they must now use it. CVRD is a predominant system of land use that is simply exploiting mineral, labor, and resources, to make profit at the international level. Little of this profit is returned to those who toiled for it. It is imperative to remember that CVRD is an absolute necessity in this region, but this does not mean that licensing groups and the general public should suffer abuses of this power.

Bibliography

- 1) Monteiro, Maurílio. “O Programa Grande Carajás e Suas Implicações Para o Desenvolvimento da Amazônia”. PowerPoint presentation. Fall 2005.
- 2) “Iron Ore in Brazil: Restructuring With Growth”. February 21, 2002. Visited May 22, 2007. http://www.cvrd.com.br/cvrd_us/cgi/cgilua.exe/sys/start.htm?infoid=334&sid=147. p. 3
- 3) Interview. SEPLAN Employee. Parauapebas, May 20th, 2007. [*interview conducted by author*]
- 4) Pinto, Lúcio Flávio. CVRD: a Sigla do Enclave na Amazônia, as Mutações da Estatal e o Estado Imutável no Pará. Editora Cejup Ltda., Belém: 2003.
- 5) CVRD. Serra Leste RIMA. October, 2006.
- 6) CVRD. UTE Barcarena RIMA. March, 2007.
- 7) Bunker, Stephen, Maria Coelho and others. Carajás: Geologia e Ocupação Humana. João Batista Guimarães Teixeira, Brasil: 2006.
- 8) CVRD. Níquel do Vermelho RIMA. November, 2004.
- 9) Carvalho, Georgia. “Metallurgical Development in the Carajás Area: A Case Study of the Evolution of Environmental Policy Formation in Brazil”. *Society and Natural Resources*, 14:127-143, 2001.
- 10) Interview. Pará State Public Defendant. Belém, May 30th, 2007. [*interview conducted by author*]
- 11) Schmink, Marianne and Charles Wood. *Contested Frontiers in Amazonia*. Columbia University Press, New York: 1992.
- 12) Interview. SEPLAN Employee. Parauapebas, May 18th, 2007. [*interview conducted by author*]
- 13) CVRD. Serra Leste EIA. 2006.
- 14) CVRD. CVRD Report on Shareholder’s Debentures: Second Half 2006. March 30, 2007. Visited May 26, 2007. www.cvrd.com.br/cvrd_us/media/0330RelatorioDebentures2S06_l.pdf.
- 15) Castilho, Alexandre. Interview, CVRD Employee. Parauapebas, May 18, 2007. [*interview conducted by author, name used because of written consent*]
- 16) Ciccantell, Paul S. “Making Aluminum in the Rainforest: The Socioeconomic Impact of Globalization in the Brazilian Amazon”. *The Journal of Developing Areas*. 33 (Winter 1999).
- 17) CVRD. Sossego RIMA. March 2000.
- 18) Wikipedia. “Canaã dos Carajás”. [Searched May 28, 2007] http://pt.wikipedia.org/wiki/Cana%C3%A3_dos_Caraj%C3%A1s.

19) CVRD Press Release. February 7, 2004. Visited May 15, 2007.

http://www.cvr.com.br/cvr_us/cgi/cgilua.exe/sys/start.htm?infoid=200&sid=143

20) Fernandes, Bernardo. "The MST, Its Genealogy and the Struggle for Agrarian Reform in Brazil". [SIT handout]

21) Cleary, David. Anatomy of the Amazon Gold Rush. University of Iowa Press, USA: 1990.

Appendix 1

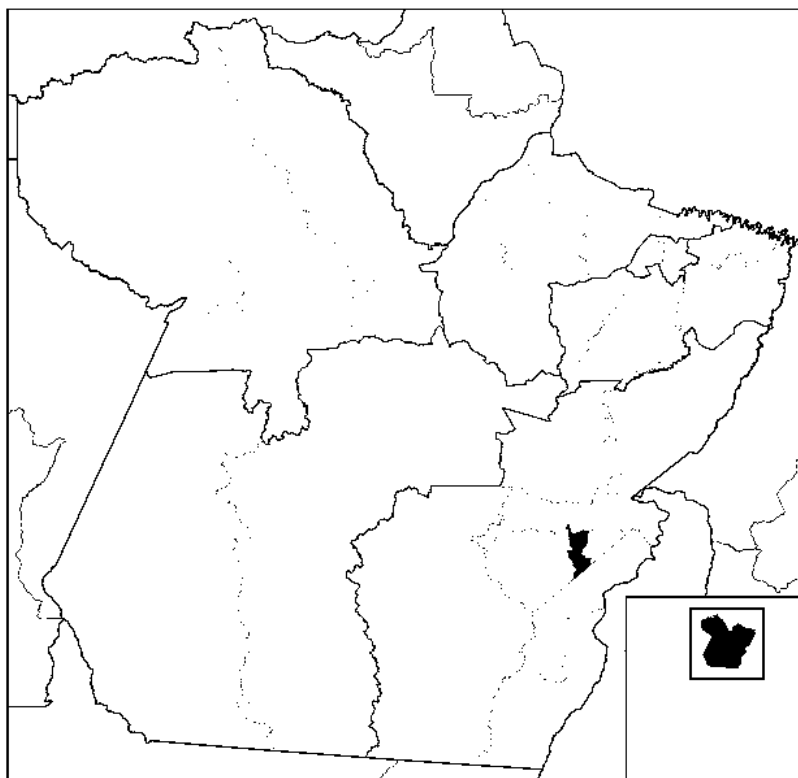


Figure 2.0 Municipality of Curionópolis in relation to state of Pará

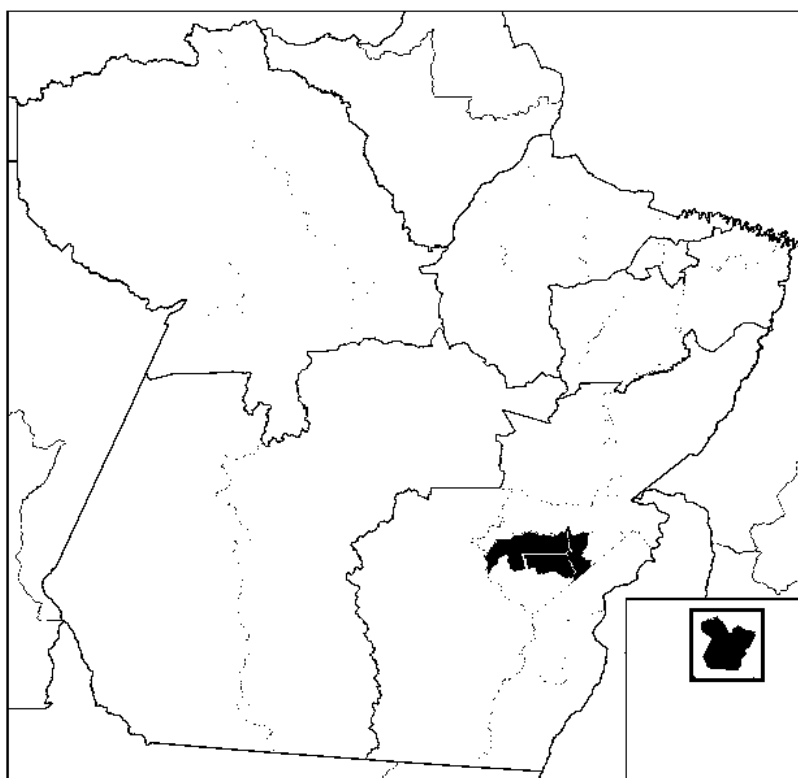


Figure 2.1 Micro-region of Curionópolis, Parauapebas and Canaã dos Carajás municipalities

Appendix 2



Figure 3.0- Photo #1 of Serra Leste, May 15th, 2007



Figure 3.1- Photo #2 of Serra Leste, May 15th, 2007