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### **SOUTHERN BRAZIL AGONIZES OVER COAL MINING**

*Story by Flávio Sturdze*  
*English version: Karla Brunner*  
*Photos by: Monica Zarattini*

A gigantic excavator rests between the deep craters it dug up with a 30 meter-long mechanical arm, out of 2,500 hectares (ha) of land. The area, once fertile, now resembles a lunar landscape.

Two years ago, the last bed of surface mineral coal was exhausted in the southern part of Santa Catarina State, in Brazil's temperate southern region.

The excavator is about to be transferred to São Mateus, in neighboring Paraná State, where it will be used in the search for bituminous coal (soft coal), for Petrobrás (the federal oil company).

No one seems to remember that this same machine was once hailed as a symbol of power and modernity. Today, it is seen as one of the most devastating instruments to the destruction of the environment in the carboniferous (coal) basin of Santa Catarina - a 9,400 square-kilometer area, composing 9.5% of the entire state.

Only 240 kilometers from Florianópolis, the state capital, and some 1,300 kilometers from São Paulo, South America's largest city, the coal basin is also home to 20 percent of the state population - 800,000 people.

Here, soil, rivers, and air quality are irreparably damaged. Ironically, like the environment, the coalmining industry has also suffered.

Coalmining in the southern part of Santa Catarina began at the start of this century, and later came to represent 90 percent of the economy in the region. Low coal prices and opening import markets, since September, reduced this role to 50 percent.

The production of coal fell from 370,000 tons per month in 1985, to 150,000 tons last year. Of the 50 mines in the region, only 14 are in operation. They employ 6,500 miners, of the original 13,000.

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## Clean-up exists only on paper

There have been many discussions regarding the indiscriminate destruction of the landscape and the pollution caused by coalmining in southern Santa Catarina. So far, little has been done to change the present scenario.

Hopes actually ran high in 1982, when former Brazilian President João Figueiredo, signed a decree labelling the coal basin the fourteenth most critically polluted area in Brazil.

"But it (the decree) is still on paper, because the clean-up initiative required international, as well as federal and state funds \_ never released," lamented Joaquim de Bem, regional superintendent of the Support Foundation for Technology and Environment (Fatma), the state environmental defense and fiscalization agency.

Provida, another program, had a similar objective. Launched in April by President Fernando Collor de Mello, in an effort to improve the quality of life in the region by the year 2000, and coordinated by the National Sanitation Secretariat, Provida has far-reaching intentions. These include a list of actions in the areas of housing, health, education, and environmental recovery for the 34 municipalities in southern Santa Catarina.

Local environmentalists have seen the project in a skeptical light.

"It's an umbrella project that covers several old projects, and lacks coordination and funding," said Antonio Rogerio Inácio, national director of the Brazilian Association of Environmental and Sanitary Engineering (ABES).

"It shouldn't even be called a project, because it is really nothing more than a letter of intentions," said Inácio. He accused the government of "camouflaging the fund shortages and specific environmental projects with marketing strategies."

The regional coordinator of Provida, Dr. Americo Farias, defeated in the race for governor last year, when he ran on President Collor's party ticket \_ the PRN (National Reconstruction Party ) ticket \_ accepted the so-called letter of intentions.

"Until now, we have not received any news on specific funding for the recovery of the environment," he said, "As long as there is no money, or at least no specific goal, we cannot begin to think about projects."

The project state coordinator, vice-Governor Antonio Carlos Konder Reis, although more confident, confessed his worry over the delay in the release of funds.

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While some sectors like sanitation, housing, and education have been assured funds, environmental recovery received only a promise of US\$83,000 (Cr\$350 million). Konder Reis hopes to receive the sum by the end of the year, though he is not sure when.

This is not the only wait Reis is in for, he is also expecting a response from the federal government regarding two recent lawsuits: 1) the release of a US\$17.8 million (Cr\$7.3 billion) endowment from the federal government, which President Collor said is unavailable, and 2) the transfer of US\$19 million (Cr\$8 billion) obtained from additional charges placed on freight ships transporting coal.

Although the government agrees on the use of these funds, their value is insignificant, if compared to the US\$150 million estimated necessary for the recovery of the carboniferous basin. "Besides the money, there is the question of time," said Fatma regional superintendent, Joaquim de Bem.

"In order to recover the area in a 20-year period, we would have to stop everything today," said de Bem.

### **Acid Lakes**

Soil deterioration in the region is the most visible result of the destructive effects of a century of unfettered mining. Of the 2,500 hectares devastated by surface mining, 1,100 hectares are located in the municipality of Siderópolis.

The landscape is always the same: arid terrain covered by deep craters formed by ore extraction procedures. Many of the craters are now lakes, resultant from groundwater seepage, or accumulated rainwater.

The lakes are surrounded by piles of waste: leftovers from the mining process, which measure up to 40 meters. The largest of the piles is 3,000 meters-wide, 20 meters-long, and 30 meters-tall. In the middle of this pile, is a red, 15 meter-deep lake. The water volume of the lake is around six million cubic meters. Its color is attributed to the oxidation of iron (Fe), found in the pyritiferous waste matter (iron ore, sulfur, and heavy metals), and is extremely acidic.

Because of the sulfur, the pH of the water is less than 2.0. The normal pH index for water is about 6.0.

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Fatma tried to recover some small mining areas. The Norozini area, in Siderópolis, opened in 1982, and exhausted two years later, for example. The effects of mining on the 93.6-hectare area were less disturbing than most.

In this mine, the course of the Morozini River was veered, and the excavation was done layer-by-layer. Besides these procedures, most of the refuse was returned to the pit from which the coal was mined.

Because of these procedures, and despite the acidic soil, the fields are covered with ferns and eucalyptus trees. The local effluent is also the only in the region to maintain clear water, with neutral pH.

In 1982, Fatma developed a similar project in Siderópolis, on an 11-hectare area: the ground was levelled, the acidity corrected, and vegetation introduced.

The Siderópolis project was not finished, due to a shortage of funds, said Joaquim de Bem.

Another environmentally destructive factor in the region, is the pyritiferous refuse matter, carelessly thrown over the soil. There are 7.5 million tons of waste, comprised of iron ore, sulfur, and heavy metals dumped in the area each year.

According to estimates made by Fatma technicians, only 500 hectares of the 2,900 hectares in Sidesópolis received "adequate" treatment, similar to that given to other deposits recently. In this process, the ore was compressed into 10-meter layers covered with 30 to 50 centimeters of properly drained clay, then capped with a cover of vegetation.

In the old deposits, usually up to 50 meters high, and often located in the outskirts of the cities, the leftover waste piles were left exposed to bad weather. When the piles came into contact with humidity, the pyrite released sulfurous gases, and a nauseating smell of rotten eggs. Worse than the smell, however, was the irritation of the respiratory tracts, caused by the gases.

All the effluents in the mining areas flow directly into the rivers of the region. The Mãe Luzia, Sangão, Florita, Carvão, and Deserto rivers have a pH between 2.35 and 3.57 and have not helped in any way to preserve the hydrographic basins of Ararangua, Urussanga, and Tubarão, which together occupy 9,000 square kilometers.

On the contrary. According to a study done by Fatma, two-thirds of the basins are dead due to the iron oxide, sulfuric acid resulting from the oxidation of ore, and heavy metals carried by the waters.

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At the mouth of the Araranga, Tubarão and Urussanga rivers, the pH index is lower than 4.0. The river pollution has also affected the fish and crustacean industry in Santa Catarina. The Tubarão River, for example, flows into the Santo Antonio lake, linked to the Imarui and Mirim Rivers. Together, they form a lagoon (110 kilometers from Florianópolis), where the largest fish and crustaceans farms in Santa Catarina are found.

The last test done on the water and fish in the lakes, back in 1983, resulted in some frightening statistics, said Fatma chemist Nadja Sim Alexandre. The level of zinc in the water was 7.5 to 7.7 milligrams per liter. The maximum tolerated is 0.1, and for copper 0.5 \_ 10 times higher than the allowed maximum of 0.05.

In the fish, the copper level was 0.5 to 0.7 micrograms per kilo. The limit for human consumption is 0.3.

### **Water: Fetid, Acrid and Oily**

Inácio Losso, 45, lives in southern Santa Catarina, and works at the Siderópolis City Hall. He remembers a time when swimming and fishing in rivers like the Mãe Luzia were possible. The river flows in front of Losso's house, in the Volta Redonda district.

"You can't even get close to the river with that fetid, acrid, and oily water," said Losso, a father of eight children. He pointed to the reddish river cutting through terrain dried-up by the acidity. Less than 20 years back, the city-hall worker planted corn, rice, and beans here.

"Back then, they told me that mining was going to improve everyone's lives and I believed it," he said, "Well, I was left without my land, without fish, and my children no longer have a place to play."

From 1985, Fatma required mining companies to install drainage-basins to reduce the pollution in the rivers. "The basins retain the coal dust, and the effluents are purified; but the watercontent, though clear, is acidic, and contains dissolved heavy metals," said chemist Alexandre.

"In an ideal situation, the pH in the effluents would be neutralized with sodium hydroxide," said the chemist. He attributed the lack of investment in environmental clean-up to the high cost of procedures.

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The air quality in the region is another notable factor. The smoke stacks of the Jorge Lacerda hydroelectric power plant, installed in Tubarão (125 kilometers from Florianópolis), release 170,000 tons of sulfuric acid per year, as well as nitrogenous oxide, chlorine and fluorine. The Santa Catarina Carbochemistry Industry (ICC), in Imbituba, a phosphoric acids and sulfur industry, releases ore dioxide, which, transformed into sulfuric acid when it comes in contact with humidity, results in the phenomenon known as acid rain.

### **An Unhealthy Environment**

Crédio Gava, 41, passes most of his time sitting in a chair in the veranda of his house, located on the outskirts of Siderópolis.

Gava wheezes when he speaks, constantly feels short of air, and loses his breath when he walks even a short distance. Of Italian descent, 1m88 (6'2") tall, he weighs 73 kilos (160 lbs.), and misses the days when he could eat pasta and polenta, accompanied by generous glasses of wine.

"I don't have any appetite these days," said Gava. Having spent 13 years in the mines, the former miner retired nine years ago for medical reasons, and receives six minimum salaries - equivalent to about US\$365.00, from a state pension.

Gava is one of 3,000 miners in Santa Catarina who has pneumoconiosis. Like other miners, he breathed the coal dust and silicon dioxide, and now has the most advanced stage of massive progressive fibrosis, which not only keeps him from working in the mines, but makes him unable to indulge in any other activity.

Dr. Renato Mattos, who treats Gava and several other pneumoconiosis patients in his clinic in Criciúma, the main city in the Santa Catarina carboniferous region, avoids talking about his patient's life expectancy. Gava, however, said that "many friends and fellow workers have gone."

Pneumoniocosis is considered the most serious illness among coal miners. It afflicts five to eight percent of the estimated 12,000 miners in Santa Catarina. In Europe and the United States, the illness manifests itself generally after five years of mining, and is so far incurable. The most serious cases end in the patient's premature death.

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According to Mattos, measures adopted to reduce the rate of incidence of pneumoconiosis \_ ventilation of the underground passages and filter masks \_ have not been efficient. Dr. Mattos said that the disease is not the only illness caused by the poor air quality in the mining region. Almost all of the miners suffer from chronic bronchitis and occupational asthma, as well, and 55 percent of pediatric internments are due to respiratory problems.