A golden future...

Posted on 05 December 2002 |

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Dawn's warm early light glows through the thick mist hanging over the lower Madre de Dios river in Peru's Amazon rainforest, casting brilliant hues of red and orange over a cluster of small boats. The tiny vessels, floating near a sandy bank, conjure images of traditional Japanese fishing boats, hand-crafted using ill-matching local materials - a small deck and a cabin with a tin or plastic roof to keep out the rain, mounted on two large wooden canoes. A quaint picture in paradise except for one nagging detail: the boats are gold-panning barges, contaminating the river and soil with toxic mercury. The river forms a natural border along the north-eastern tip of Peru's newly-formed Tambopata National Reserve and environmentalists say the spread of gold mining poses a major threat to one of the Amazon's most bio-diverse zones.

Although most miners struggle to eke out a meager living with homemade equipment and small, family-run operations, poverty and political tensions have lured thousands of mountain

dwellers into the Amazon over the past 30 years, hoping for a golden future. These immigrants now make up nearly half the state's population of about 75,000 people. The Peruvian government has granted 210,000 hectares, or 5.9 percent of Madre de Dios, to mining concessions but since the majority of operators do not hold legal concessions the real figure is much higher - and continues to grow. By 1999 just 10 percent of the state's estimated gold reserves had been extracted. At current rates of extraction this means about 648 tonnes of mercury will be dumped into this region of the Amazon over the next 72 years.

This looming threat helped fuel the creation of the Tambopata National Reserve in September of 2000. According to Peru's protected areas legislation, gold mining is banned within the reserve's nearly 275,000 hectare expanse. Major concern now revolves around the 'buffer zone' - a strip nearly equal in area that stretches across the reserve's northern border, meant to provide a cushion between the reserve and non-protected areas and allow 'sustainable use' of the forest's resources. But a lack of clarity regarding what can - and can not - be done in the buffer zone has frustrated locals, environmentalists and even government officials. Environmental groups say the government lacks the legal weight and resources to keep mining out of the buffer zone. Peru's National Institute of Natural Resources (INRENA), the government agency in charge of protected areas, says it can not interfere in mining issues and the ministry in charge of mining seems reluctant to get involved.

The confusion has provided a perfect shield for some of the more daring gold miners to enter the once-off limit waters of the lower Madre de Dios. From 1990 until the creation of the reserve and buffer zone, both areas had been part of a transitory protected area but since the buffer zone's designation, park rangers say the number of mining boats has increased from a few to more than 20.

Fernando Rubio, INRENA's director in Puerto Maldonado, says the buffer zone requires an effective management plan, devised in consultation with miners and other local groups. Rather than using an iron fist to keep miners out of the zone, he says the government must work with them to provide alternate employment opportunities. "You can't suddenly convince the population to follow new laws from one day to the next. If you don't win people over you will never be able to enforce the law," he says.

At the same time, Rubio worries that gold mining has already caused devastating effects on the reserve's ecosystem. Like most conservationists, he is especially concerned about the use of mercury.

Large plastic tubes running from gold mining boats into the pitch black waters of the lower Madre de Dios suck the river's sediment onboard to be 'washed' with liquid metallic mercury, also known as elemental mercury. Gold particles adhere to the mercury and the substance is heated so that the mercury evaporates, leaving the gold behind. Once airborne, mercury vapors are inhaled by workers or absorbed into the atmosphere until they are rained onto the river and forest, sometimes kilometers away. Workers dump the leftover slew of soil, water and mercury down a heavy wooden plank into the river, leaving behind an estimated 10-30 tonnes of mercury in the Madre de Dios river each year.

Contact with water can convert metallic mercury into organic mercury, an even more dangerous toxin for its ability to move through the food chain. The most infamous case of organic mercury poisoning occurred in Minamata Bay, Japan, beginning in the 1950s. Thousands of locals were poisoned and suffered neurological disorders, mental illness and severe birth defects or miscarriages from eating fish with high levels of mercury.

A study by the Frankfurt Zoological Society of fish from various rivers in Madre de Dios state has already found concentrations of mercury above legal limits for human consumption in Germany and the United States. More disturbing impacts of the gold mining boom are chronicled in a WWF report published this April. Lucila Pautrat, the report's author, found that along with mercury contamination, gold mining produces a myriad of negative environmental effects including oil, gas and noise pollution, habitat destruction and an increase in suspended particle matter which can kill fish populations. In Huaypetue, the state's mining center, north-west of the Tambopata reserve, fish have already disappeared from the Puquiri river, a tributary of the Madre de Dios. Much of the area's wildlife has also fled the zone where at least 6,000 hectares of forest have been cut down to make way for mining activity.

Luckily, awareness about mercury's adverse effects on human health has been growing and some miners now use a simple machine to catch the mercury as it evaporates. According to the World Health Organization, about 80 percent of inhaled metallic mercury enters the human bloodstream from the lungs and is quickly sent to other parts of the body. Long term effects include renal damage, central nervous system disorders, miscarriages and birth defects.

Kleber Chavez is one miner who not only fears the impact of mercury on his own health; he also exhibits a passionate concern for the environment. Chavez uses a home-made retorta to catch mercury vapors for recycling. And he has numerous ideas on how to green the mining industry, including safe deposits for the mercury-contaminated slew. Over the years he has attended numerous seminars and workshops about mining's effects on the environment in his capacity as president of the Association of Miners, a local trade organization for informal miners. But even Chavez admits he's a rare breed: "Many miners are not aware of the health risks, or maybe they don't want to know because there is no other alternative for them (but to work in mining)."

The 40-year old miner learned the trade from his father and grandfather - who immigrated to Madre de Dios from the mountains. Gold fever aside, the stark reality for most miners is a hardscrabble existence with laborers earning just US$4 a day. Chavez is one of the lucky few. After generations of harsh, often dangerous work, his family owns 2 boats, a tiny wooden house in one of the state capital's dusty, outlying shanty-towns and a small farm near the reserve.

The would-be entrepreneur dreams of converting his farm into a family-run eco-tourism lodge for backpackers but Chavez complains that he lacks the capital to get started and necessary permission from INRENA. The government and environmental groups should be working with miners to develop alternative businesses and jobs, says Chavez bitterly. Instead, he says INRENA is "too stringent. They haven't been flexible. The only thing they want to do is kick

us out of the area."

Chavez says INRENA attacks miners for being 'informal' - meaning they do not hold legal concessions or comply with required environmental studies or monitoring - yet he says INRENA will not support formalization. Like Chavez, more than 95% of the state's estimated 10,000 miners are considered informal. The issue of whether to help them become formal, and thus susceptible to environmental controls and legislation, has also been the source of much debate in conservation circles.

Lucila Pautrat, WWF's Biodiversity Conservation Program Officer in Peru, has gained fame in conservation circles as an expert on Amazonian gold mining and over the years has learned a pragmatic approach. She points out that the industry is one of the state's top income earners, accounting for 15.2% of GDP. On a national level, Madre de Dios provides nearly one-third of Peru's annual gold yield, making the state an important player in the country's multi-billion dollar gold industry. This makes elimination of gold mining from the Amazon unlikely, she says, but if the industry were formalized, it could be made more socially and environmentally responsible. Pautrat says this could include zoning restrictions to keep mining out of protected and highly biodiverse areas as well as cleaner technology, training programs "and above all a serious commitment from the public and private sector to develop a joint, coordinated plan to monitor the impacts of mining."

Other conservationists, like Carol Mitchell of Conservation International, are against formalization or legalization, fearing this would legitimize an activity that "has no place in the Amazon." Mitchell, who has lived and worked in the Amazon for nearly 20 years, believes mining "can never be considered sustainable resource development."

But both sides do agree that whether mining is formalized or banned, the reserve's future depends on developing less ecologically damaging income-generating activities like Brazil nut harvesting, eco-tourism or sustainable timber extraction in neighboring areas like the buffer zone. If the protection of biodiversity were worth its weight in gold - or at least allowed for a modest lifestyle - Tambopata's miners would prove ready conservation-conscripts.

Stephanie Boyd is a freelance journalist commissioned by the WWF Forests for Life Programme.

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