



Titanium bonanza – or titanic blunder?

*As the controversial Tiomin mining venture at Kwale, near the Shimba Hills National Reserve on Kenya's South Coast, is given the nod, environmentalist **Dan Stiles** takes stock.*

The eight-year Tiomin saga entered a new phase on 29 September when the Kenya government awarded Tiomin Resources, Inc. its long-awaited mining license. The Kwale mine is supposed to generate about 1,000 jobs and to produce 4.7-million tonnes of ore worth roughly KSh 50-billion (US\$ 665-million). "This is an exciting moment for the Kwale project and for Kenya," said Jean Charles Potvin, Tiomin's president, responding to the announcement. "We are pleased that the government has shown that Kenya is open for business and is welcoming international investors."

The Environment, Natural Resources and Wildlife Minister Newton Kulundu said the project would earn Kenya an impressive KSh 15-billion (US\$ 200-million). The project has been dogged by controversy and legal challenges since Tiomin first applied for the mining license

in 1997. Kulundu complained of the politics involved, grumbling how "... some people saw only evil in the mining project."

Some people still see evil. The National Council of NGOs objected to Tiomin's application for a special mining lease in a double-page spread placed in May in the local newspapers. The objections included many environmental, socio-economic and legal concerns, most of which had been raised earlier by the Coast Rights Forum. CRF opposition to Tiomin's plans came to naught in July 2002 when the Canadian firm received its environmental permit from the newly established National Environmental Management Authority – the first such permit ever granted by NEMA. The National Council's objections also suffered defeat.

Tiomin has prepared an Environmental Management Plan, but does this respond adequately to the bewildering array of con-

cerns raised by the critics? The ludicrous, such as claims in a Kenyatta University Environmental Impact Assessment that the mine would result in sea level rise, thus creating the need to move wildlife to higher ground, can safely be excluded from scrutiny. More serious are concerns about ground water depletion and contamination, marine and coral reef degradation, and damage that could be caused to the soils and biodiversity in the area.

I live on the South Coast, not far from the mine site, so I take a personal as well as an academic interest in what might happen there. How the Tiomin case plays out also has implications for how future international natural resource investment projects will be handled by the government. There are even larger mineral sand deposits in Kilifi District that Tiomin wants to mine. Something this big always has pluses and minuses. The bottom line is, does Kenya end up with a plus or a minus?

The existence of heavy minerals in ancient beach dunes along the East African coast has been known since the 1940s, but it wasn't until 1995 that Tiomin came to Kenya to take a closer look. Tiomin Resources, Inc., is a Canadian base metals exploration company, not a mining concern. What they found in 1996 and 1997, after putting in a test mineral extraction

plant in Kwale District, must have looked too good to pass on to others, for they decided to mine it themselves.

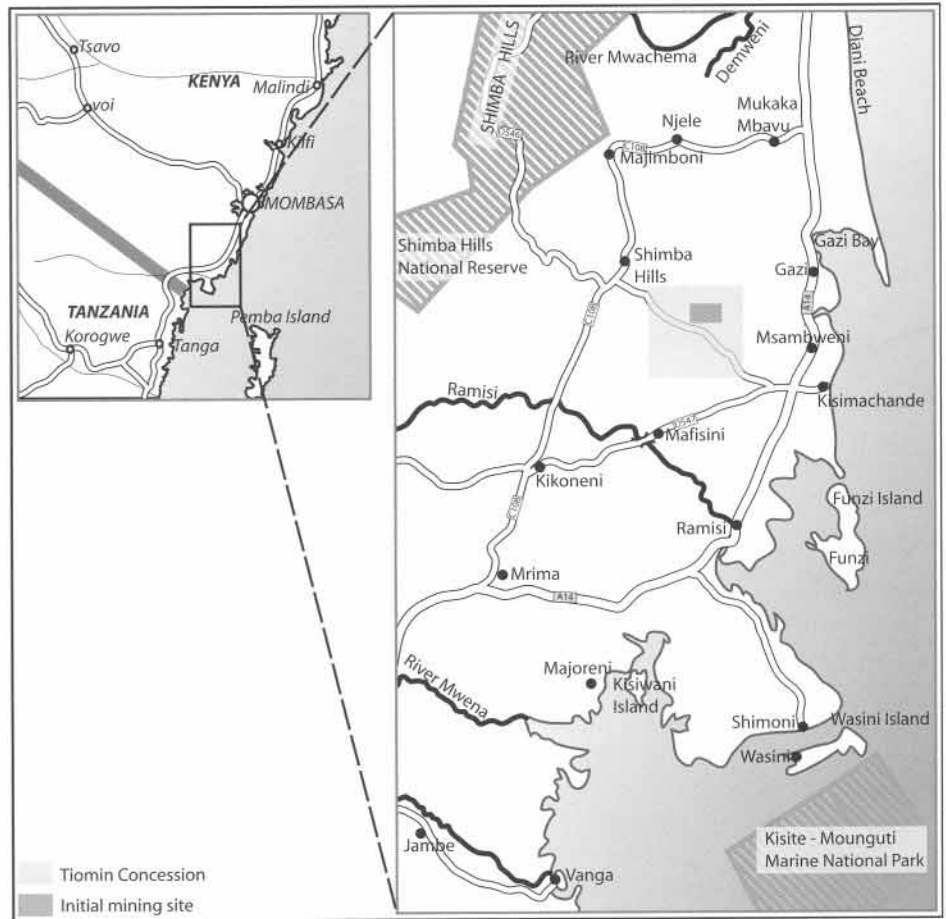
The minerals they are concentrating on are ilmenite, rutile and zircon. The main product made from the first two is titanium dioxide, which provides more than 90 % of the white pigment used in paints in the world today. Most people think of the titanium metal used in aircraft components, but very little of the ore in Kwale will go into metal. Zircon is used to make high temperature ceramic tiles (think Space Shuttle) and foundry moulds.

After the topsoil is removed and stockpiled for later restoration, two gigantic bucket wheel excavators will basically just scoop the sands out, down to depths of 30-40 metres. These sands will be transported to the nearby Wet Plant where they are mixed with water and screened to remove stones, bits of vegetation and bugs. The fine soil particles are removed in gravity cyclones, and then spiral separators concentrate the minerals. Everything rejected is pumped into a tailings dam. The remaining mineral concentrates are taken to the Mineral Processing Plant on the site for extraction of the mineral ores. These will be trucked to Shimoni 35 km away and put on ships bound for various market destinations. Roughly 450,000 tonnes a year of bulk ore will be shipped out.

Sounds simple, but it isn't. It would take a thick book to deal properly with all of the issues. I went to see Colin Forbes, the Tiomin General Manager based in Ukunda, the coast office. I trust Colin because he is a long time coast resident who cares about environmental matters. We went for a visit to the mining site in rolling farming country near the Shimba Hills.

"What about the question of water contamination or depletion?" I asked him. He told me the mine needs about 33,600 m³ a day to make the slurry, assuming at least 50 % of it can re-used. Some of this water will be pumped from the Mukurumudzi River, which flows through the mine site, but most of it will be drawn from boreholes in the area. The Msambweni Aquifer in the Kilindini Formation is estimated to hold 240-million m³, of which about 50 % lies above mean sea level. If draw-down of the water from extraction exceeds 12.5 metres there could be salt water intrusion, which would ruin useable water supplies for people living in many areas of South Coast.

"And if it reaches that level – what then?" I asked. Colin told me that recent Tiomin hydrological tests concluded that even during a period of extended drought,



'Preparatory phase': a biodiversity-rich swamp area on the mining site (map above) has already been affected (facing page) by the mining activities.

the aquifer could be pumped for ten years before salt water was drawn in. "Under good climatological conditions, the draw-down would never reach 12.5 metres," said Colin. "And Tiomin will put in water interface monitoring gauges in boreholes to determine the depth of fresh water above the salt water intrusion level. If draw-down comes too close to the salt layer they will cease pumping. Since salty water would also ruin the mineral extraction process it is in our interest not to cause intrusion."

“What about ground water or soil pollution from chemicals used in the mining?” I asked. I had earlier been to see John Mshimba, Programme Co-ordinator of the Coast Rights Forum in Mombasa. He warned me that the tailings reservoirs that would hold the mining waste water would contain toxic chemicals. About 600 tonnes of sulphuric acid a year are needed to upgrade the zircon.

"The sulphuric acid after use will be combined with lime, which makes gypsum. This will just be mixed in with the slime in the tailings dams. It shouldn't leach into the

groundwater, but we'll monitor it," Colin explained.

The Tiomin Environmental Impact Assessment (EIA) admitted that more needed to be known about the chemical processing to gauge the exact impacts, but nevertheless it concluded that there was no significant environmental risk from the gypsum. There is always the possibility of a lorry accident and a spill while transporting the acid, however, especially on the narrow road from Mombasa plied by speeding matatus.

The NGO National Council expressed concern about the radioactivity the mining would release. John Makopa, a lecturer in the Department of Chemistry at the University of Nairobi, demanded that, "The government and Tiomin Company should tell us how they intend to deal with it." Colin said too much was being made of the issue. The zircon processing will concentrate trace uranium and thorium elements – which are common in mineral sands – but these will be mixed in with the tailings. The radioactivity levels after mining would be the same as they were beforehand, at safe levels. "The entire issue

is explained in detail in the EIA, which is available on Tiomin's web site. Why don't critics read it?" (John Mshimba of the CRE, for one, told me he had never seen it.)

After studying the options, Tiomin decided that Shimoni, about 80 km south of Mombasa, would be the best place from which to load and ship the minerals. This will mean having to upgrade existing roads and construct new ones from the mine site to the sea. It will also mean building a 200-metre jetty, docking structures, storage facilities and a conveyor loading gallery about a kilometre east of the present jetty. People too might have to be moved, but there are no firm plans. The main environmental concern is the impact that the loading and ships might have on the marine and reef ecosystem. An ore-loading spill would obviously harm the sea life on the seabed, but the larger scale impacts would be limited.

"The conveyor system is completely enclosed," added Colin. "So large spills aren't even possible."

I was most worried about possible damage or pollution that the port and ships could cause. Kisite-Mpunguti Marine Park and Wasini Island, both important tourist attractions, are close to the proposed port. I have scuba dived there, and damage to the fabulous reef would be a crime against nature. About 16-18 ships a year would be visiting Shimoni. Ian Schache, the former Tiomin General Manager for Kenya, addressed some of these issues in an interview for the *South Coast Gazette*: "There will be no blasting or dredging. There is no refuelling facility, and bulk ore carriers do not have fuel tanks near the outside hull. The ships would literally have to break apart to create an oil spill, and the channel at Shimoni is protected from the weather." A shipping expert studied the Shimoni area and concluded that the probability of a ship accident was extremely low.

The ships would be coming from all over the world. They carry sea water as ballast, which they empty before they load the ore. This water would contain organisms foreign to the local waters, which could cause foreign species invasion problems.

"The ships will empty their ballast two kilometres out to sea," was the best Colin could do.

The Tiomin EIA admits that the problem of invasive species at Shimoni would be permanent and of moderately severe impact if it occurred. This problem needs



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On site: Tiomin's General Manager, Colin Forbes explains how the Kwale Titanium mine will operate.

to be given more thought by Tiomin and the government.

Turning back to the mine site, I wondered if any important microhabitat or species would be affected. Looking around, I saw mainly grassland, tree clumps and shambas. The entire area was obviously disturbed by human habitation.

"Quentin Luke studied the plants in the mine area," said Colin. I knew Luke to be an expert on coastal vegetation, and he had at one time headed the Coast Forest Conservation Unit. "There are," Colin added, "a few rare plants and trees in the site area, but none that are in danger of extinction. No wetlands or riverine forest will be touched, the places where you find high biodiversity."

asked about the Gongoni and Buda forest reserves, which were just outside of the mine site. "No clearing will be done in the reserves, but boreholes will be put in the Gongoni Forest." I had read in the EIA that the Msambweni Aquifer was centred under the forest, where borehole yields would be highest. "But the water will be drawn from 70 metres down, and it won't affect the vegetation," said Colin, reading my mind. The EIA advised that boreholes should not draw from higher levels, as that could dry out the forest.

"There is also a small swamp forest with the palm *Elaeis guineensis* in it. Part of it is in the planned tailings dam, so I'm afraid it will be affected."

The EIA concluded that rare and endemic plant species would be severely impacted in the mining area, and moderately impacted at the national level.

As far as the wildlife goes, there are almost no large mammals left because of the human population. What mammals there are take refuge in the Shimba Hills National Reserve about 10 km away. Harvey's Red Duiker, bushbuck and about 30 buffaloes inhabit the Gongoni and Buda forests, but are becoming rare due to bushmeat hunting.

There are quite a few rare and endemic reptile and amphibian species recorded from the South Coast region, and the brief biodiversity survey done by Tiomin established that 23 reptile and ten amphibian species inhabit the mining area. Probably more would be found in a detailed survey. I am sure the last thing they want is the discovery of a unique species, such as the Kihansi Spray Toad that caused such havoc with the development of Tanzania's power supply (see *Swara* 24:3).

Since the 800-hectare mining area is typical of the South Coast hinterland, most of the species found there are almost certainly found elsewhere, but special care should be taken to protect the riverine and swamp forest habitats, as the threatened Forest Leaf-folding Frog (*Africalus sylvaticus*), the Red-spotted Reed Frog (*Hyperolius ruberovermiculatus*) and Merten's Dwarf Toad (*Mertensophryne micranotis*) might be present. Most of the rare reptiles (mainly geckos, chameleons and snakes) are found in the Gongoni and Buda forests, which are to be left intact.

Overall, there are significant environmental concerns. I haven't even mentioned questions about the transportation and use of fuels and air pollution. If everything goes wrong, a large area of South Coast could be left without useable ground water, the Kisite-Mpunguti reefs could be covered in oil and invaded by foreign marine life, The Gongoni Forest could be sucked dry and die, and rare (even unique) plant and animal species might be wiped out. And don't forget the horrific traffic that over 11,000 round trips a year from mine to port with 40-tonne trucks would cause. I wonder if the Pemba Channel Fishing Club at Shimoni is looking forward to it.

On the bright side, maybe Tiomin will get things right. The Environmental Management Plan simply registers the potential problems and states that Tiomin will set up monitoring programmes and contingency response plans. I should very much like to see those when they are ready. For only then can anyone decide whether the project is a plus or minus. 🐾