

Geoscientists to map toxicity of abandoned African mines

A team of 50 geoscientists will be devoting the next 12 months to mapping the impact of mining on human and environmental health in sub-Saharan Africa, within the International Geoscience Programme (IGCP). The project is being coordinated by geologist Sadrack Felix Toteu from UNESCO's Nairobi office (Kenya), with US\$237,000 in funding from the Swedish International Development Cooperation Agency.

Over the next 12 months, the team will compile a database and use geographical information systems to elaborate precise maps of the location of all abandoned mines in Sub-Saharan Africa. At selected sites, they will study and document the rate at which specific toxic trace elements are absorbed by the soils, plants, fungi, surface and ground water, as well as by animals and humans via the food chain. Samples collected from the site of major derelict mines will be analysed by the laboratories of participating institutions. Different technologies will also be tested to ascertain which give the best results for rehabilitating sites contaminated by trace metals.

On the basis of their findings, the team will then advise governments and local authorities on the best available remediation technologies and on land-use planning. It is also planned to prepare a policy brief and other materials for decision-makers. The geoscientists also intend to give interviews to local media on the project, in order to alert the general public to potential hazards and keep people informed of progress.

Mining operations contribute more than 20% of GDP in sub-Saharan Africa. Just under half of the world's diamonds come from Africa and one-fifth of the world's gold. Africa also produces about 5% of copper, coal and aluminium, 9% of bauxite and 16% of uranium.

'Like agriculture, mining is crucial for the region's economy,' observes Toteu. 'The two industries are not only complementary but also inextricably linked, with pollution from mining impinging on the development of agriculture and *vice versa*. Decades of mining metals has polluted surface and ground water, soil and food crops,' he adds. 'Moreover, in many counties,

the danger is compounded by the lack of a precise inventory of abandoned and derelict mines. The surveys and impact assessments we shall be conducting over the next year will reveal the true extent of metal pollutants across the continent and their impact on human and animal health, the environment and ecosystems. This groundwork should pave the way to the adoption and enforcement of legislation.'

In developed countries, mining companies are legally bound to rehabilitate operational mine sites and ensure that they are environmentally safe once the mine has been closed down. However, in Africa, this is rarely the case. The highly publicised case of the dumping of chemical waste in Côte d'Ivoire in August 2006, after a Dutch multinational company shipped its toxic cargo to Abidjan on the *Probo Koala*, illustrates the legal loopholes in environmental protection on much of the African continent. Rather than pay the €500,000 demanded in the Netherlands to depollute the cargo, the multinational preferred to pay a fraction of the cost to a local Abidjan company which then dumped the waste in and around the city, according to Amnesty International and other reports. More than 100 000 people were treated for intoxication and at least 15 died.

The impact on public and environmental health of derelict mines has become so critical in South Africa that the government faces liability of more than US\$4.2 billion to rehabilitate about 6 150 abandoned mines around the country. In most sub-Saharan countries, little information has been gathered of the concentration and behaviour of numerous hazardous compounds, including heavy metals such as lead or cadmium, radioactive elements such as caesium or strontium, or even fine particles such as soot or asbestos fibres. Many of these accumulate in the ecosystem over time; for example, fish in polluted rivers stock the contaminants in their bodies, where they accumulate until the fish is ingested by a bigger fish or human.

The past few years have seen a surge in cooperation between geoscientists from Europe and Africa via two other IGCP projects which operated on a

more modest scale; these studied the environmental impact of mining in Ghana, Namibia, Nigeria and South Africa in particular.

Given the magnitude of the problem on the continent, the new project involves a much larger network of geoscientific institutions and more consequential funding. The team leaders remain the same, however: Theo Davies from Mangosuthou University of Technology in Durban (South Africa) and Bohdan Kribek from the Czech Geological Survey.

Via their host institutions, the African geoscientists collaborating on the new project belong to the African Network of Earth Science Institutions. This network was launched by UNESCO on 13 January, with the endorsement of the Conference of Vice Chancellors and Deans of Science, Engineering and Technology.

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The Karavatu Mine in Namibia extracted copper and zinc until it was abandoned in the 1970s.