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Swedish International Development  
Cooperation Agency

## Minutes of the Meeting on the Abandoned Mines Project

Garden Court O.R. Tambo International Hotel, Johannesburg 29-30<sup>th</sup> January, 2014

### Objective of the meeting

To assess the implementation of the scoping phase of the Sida-funded project on *“Mapping and Assessing the Environmental and Health Impacts of Abandoned Mines in Sub-Saharan African Countries”*

### Attendance

The meeting was attended by 11 participants including:

1. Theo Davies, Mangosuthu University of Technology, Durban, Leader of IGCP-606 and team leader for the experimental site in South Africa;
2. Bohdan Kribek, Czech Geological Survey and Leader of the IGCP-594
3. Benjamin Mapani, University of Namibia and team leader for experimental site in Namibia
4. Imasiku Nyambe, University of Zambia and team leader for experimental site in Zambia
5. Francois Lubala, University of Lubumbashi and team leader for experimental site in DRC
6. Smart Obiora, University of Nigeria and team leader for experimental site in Nigeria
7. Beneah Odhiambo, Moi University and team leader for experimental site in Kenya
8. Joseph Penaye, Institute for Geological and Mining Research and team leader for experimental site in Cameroon
9. Nicolas Kabengeba, University of Ouagadougou and team leader for experimental site in Burkina Faso
10. Veronica Njure, Laikipia University and team leader for experimental site in Kenya
11. Felix Toteu, UNESCO Nairobi and coordinator of the project.

### Agenda of the meeting

The meeting was structured around the following points: (1) an introduction and welcoming of attendants (Felix Toteu); (2) a session on the presentation by team leaders of the results obtained in each experimental site (moderated by Theo Davies); (3) a session for compilation of report to Sida (moderated by Bohdan Kribek); and (4) a final session where Felix Toteu reported to participants on the progress towards a new cycle of collaborative programme with Sida.

Session-I: Felix Toteu welcomed and informed participants on the progress of the project since its inception in May 2013. The main highlights of his presentation were the recruitment of a GIS assistant to take care of the mapping of abandoned mines in sub-Saharan African countries; however, the assistant left in September 2013 for a Master Degree in the Netherland. He noted that following countries have their data already in the database: Nigeria, Namibia and Zimbabwe; partial information is available for Burkina Faso, Kenya and Cameroon. Concerning South Africa, negotiations are on-going with the Council of Geoscience (CGS) to access their database which is also completed. However, the

degree of compatibility of all these data needs to be checked. On the experiments in various sites, he noted the good progress of the work. As for today, most teams have already received the results of their analyses from ACME-Vancouver, the Canada-based laboratory selected for the uniform geochemical data analyses. Concerning the outreach activities, these were conducted at the same time as the field experiment. A need to strengthen this component was stressed out by moderator. Finally he recalled the inception workshop held from 2-3 May 2013 in Johannesburg where academia, geological surveys in Africa and Europe and mining industries were present. An extensive report of that meeting is available in the website of the project ([www.abandonedminesafrica.org](http://www.abandonedminesafrica.org)).

#### Session-II (moderated by Theo Davies)

Each team leader of experimental site presented the results obtained so far.

In his presentation, **Kagambega** showed that acid mine drainage has contaminated areas around Poura region in Burkina Faso. Using geo-accumulation index, the presenter drew maps and showed areas with highest/lowest concentration of contaminants. It was suggested that the study be extended to include plants and crops in the area and also to compare the results with set standards of WHO and other organizations.

**Penaye and Davies** reported that the laboratory results had not been interpreted yet but at glance, they were concerned that the study area which has a potential for agriculture was attracting only alluvial gold mining activities. The researchers reported no significant pollution associated with an alluvial gold mineralization was recorded in the study region but observed that the social aspects need to be addressed.

High volume of tailings accumulated when mining operations for Copper and Cobalt ore were going on in the D. R. Congo Copperbelt until late 1970's were reported by **Lubala**, from D R Congo. The researcher showed that the tailings have resulted in pollution of the water, soils and crops in this area. The concentrations observed showed that most concentrations were high in the leaves and low in roots of plants studied. Urine analysis among the residents showed very high concentrations of Cobalt, higher than those reported anywhere in the world. It was suggested that more medical correlations with the metal concentrations needed to be done in this area with a larger sampling campaign to obtain a good idea of the extent of the contamination.

In his presentation, **Odhiambo** from Kenya showed how -using the snowball technique - he was able to interview the local residents concerning impacts of former lead and zinc mining at Vitengeni, Kilifi, coastal zone of Kenya on the environment and human health. Health problems observed maybe related to the contamination of Lead in the area, but this has to be investigated further. Odhiambo pointed out that the water lily found growing in the water in the mining area is a possible bio-accumulator of potentially harmful elements and may be used in bio-remediation of the Lead-polluted waters.

**Ngure** presented an overview of Macalder gold mining area in Migori within the Nyanzian Greenstone Belt of Archean age in western Kenya. The analytical results from the surveyed area were yet to be received as the study was done in late December, 2013 and January, 2014.

In his presentation, Obiora from Nigeria reported that Pb, Cd and Zn in the soils were elevated compared to Canadian Standards; also that a test of elemental concentrations in the miners using a

Resonance magnetic quantum Analyser revealed elevated concentrations of Pb, Cd and As in the miners. Obiora also reported that assessment of soil data from his site reveals that they are moderately to extremely contaminated by Pb, Zn and Cd and moderately by Fe; they also show significant to extremely high enrichment in Pb and significant enrichment in Zn; these effects slightly decrease away from the mines.

**Mapani** carried out a study on bioavailability of metals in plants and crops in Tsumeb area. The area is largely contaminated from the smelting of Cu-ores. He observed that the food crops and plants such as asparagus, carrots and pumpkin are significantly enriched in As, and to a small extent in Pb.

In his presentation on Kabwe, **Nyambe** reported that the Zambian Government had put up a clinic for lead care support in the area where Zn-Pb was mined. Soils of this area are highly contaminated with Pb and Zn. He noted that his sociological research carried out in municipal institutions and in schools shows that a number of people are not quite well aware of the hazards associated with soil contamination. Results of Nyambe are based on the statistical evaluation of questionnaires filled in by about 450 people.

**Davies** also has not yet received analytical data from his field work in Krugersdorp in South Africa. Therefore, he concentrated his presentation on some characteristics of the studied area and highlighted the negative effect that mining has on the environment, impacting negatively not only on humans but also the wildlife. The balance is between mineral wealth and human and biodiversity. He further stated that it is important to consider several factors during the interpretation of results. These factors include sequestration, loss of nutrients, mineral-water interaction, neutralization, bioavailability, mineral-microbe interaction, mobility, redistribution and early pathways in rock-soil-sediments-food crop continuum. The researcher emphasized the need to integrate results with education and outreach activities.

### Session-III (moderated by Bodhan Kribek)

This session aimed to outline the report to Sida and to define the most appropriate format of publishing the results from the scoping phase of the project. The reporting did not concern the current project only, but both two IGCP (594 and 606) as well, which are the foundation of the current project. The following points were regarded as important: progress in acquisition of results, sustainability at the end of the funding, visibility of the project, and key challenges and lessons learnt. These points were successively discussed by participants.

On the *progress of the results*, there is significant progress made by teams groups in various countries. Some countries such as Nigeria and Namibia have completed their database on mapping of abandoned mines, while others are in the process of updating information for the database. The South African database is available but requires some diplomacy from Dr Toteu to discuss with the personnel concerned. Countries such as Botswana and Tanzania are interested in being involved in the unified database on abandoned mines. In order to get data, it was agreed that UNESCO makes contact with the national geological surveys of various countries.

*Experimental sites* have generated large analytical data and interpretation is in progress. There is need to extend experimental sites, have more detailed sampling in the sites and also more sites to be included. Further, emphasis was made to include more students in the experimental sites such as what has been done in Burkina Faso. Dr Toteu emphasized the need to have the experimental sites synergy with medical/biologist/ nutritionist/ biochemist / chemists/ soil scientist etc.

*Outreach and education* activities are important to raise awareness and to sensitise residents on the dangers associated with exposure from the mining activities. Some local authorities have been sensitised but to a large extent, the larger population is still unaware of the health risks involved. An example is the Krugersdorp (South Africa) which is rich in uranium. Data on contamination of soil at an Agricultural college from Berg Aukas in Namibia led to the relocation of the agricultural college from the contaminated area. This is an example of how the data and results can be used to form policies that benefit the local residents. Through this work, participants have seen the benefit of UNESCO involvement. The organisation is perceived as a body that can give a scientific, fair and independent environmental impact assessment. Participants also agreed on the necessity to bring back the results of research finding to community and other stakeholders and the need of a continued monitoring of the sites.

On *sustainability*, the need of involving students and young scientists in the project was emphasised. This field is growing in many African universities and participants believed that young generation of Earth scientists will be more productive. Another aspect is the ownership of the result of the project by decision makers.

On *visibility and publication*, there are many disseminating avenues such as meetings, website, abstract presentations, proceedings, etc. Dr. Toteu emphasized the need for a brochure for distribution to increase the project visibility. After discussion on various option of publication, it was then agreed that the outcomes of the scoping phase being published as extended abstracts in the proceeding of the Prague meeting to close the activities of IGCP-594 and IGCP-606. In this regard, Prof. Kribek proposed a template ready to use and participants were encourage to submit their articles on time.

Efforts in updating the website regularly must be carried out and distribution of the reports must have the UNESCO-SIDA logo. "Episodes", the IUGS publication, offers other avenues to publish the reports of meeting.

On Key challenges and lessons learnt, some researchers experienced difficulties to access their field of experiment. It was recommended that in each area, hostility may be overcome by using community leaders as entry points. Other challenges involved sample collection, preparation, and recruitment of students in sample collection, shipping of the samples to the designated laboratory in South Africa or elsewhere. Other challenges included breakages of bottles with the samples, especially water samples. The disbursement of funds directly to scientists appeared to be very helpful as it made the work to be done fast.

#### Session-IV

Dr Toteu exposed an outline of the new proposal submitted to Sida and stated that negotiations were still on-going. A general discussion was then conducted on various aspects of this new proposal: smooth transition from IGCP-594/IGCP-606 to a new phase of the project, necessity of developing a database, necessity of expanding experimental sites to other countries and to other types of mines (Nickel, Cobalt, Manganese, Uranium, Aluminium, and coal...), but also necessity of improving data collection on the current sites. It was emphasised that two years are need to conduct a proper and efficient study on selected sites. There was also emphasis to call on the support of the government agency or geological surveys in each country to be involved. Prof. Kribek suggested that medical staff and the mining industry be involved since they are key stakeholders in the studies. He also reminded the participants of the coming May, 2014 meeting in Prague, Czech Republic and to send their extended abstracts in good time. However all participants agreed that the full results of the project will be published in special volume of an international journal.

Dr. Toteu closed the meeting by thanking everybody for their contribution, thereby making the meeting successful and paving way for future. He remarked that indeed, he appreciated the commitment of everyone and hoped it would continue in future.

### **Recommendations**

1. Each team prepares an extended abstract to be published in the proceedings of the IGCP-594 and IGCP-606 closing meeting in Prague, May 2014;
2. Conduct additional sample collection to confirm the trend emerged from the scoping phase;
3. Involve medical expertise in the study
4. Lobby geological surveys and departments of mines to access data needed for the compilation of data on abandoned mines and their impacts on the environment and human health.

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