



## ***Assessing the Environmental and Health Impacts of mining in Sub-Saharan African Countries***

<b>Geographical scope/benefitting country(ies)</b>	Sub-Saharan African countries
<b>Duration (in months)</b>	36 months
<b>Name and Unit of project Officer</b>	Toteu, Sadrack Felix, UNESCO Nairobi
<b>Partner(s) institutions</b>	African geological surveys and universities
<b>Total estimated budget inclusive of Programme Support costs</b>	US\$ 1,5000,000

### ***Rationale and background***

An important advancement in the mining sector is the legal obligation for mining companies to rehabilitate former operational mine sites and ensure that they are restored to a safe environmental state after the mine is closed. While this concept is well rooted in mining legislation in many developed countries, this is not always the case in developing countries, especially in Africa.

Apart from poor environmental governance as highlighted in the Africa Mining Vision, many African countries lack a precise assessment of past and future mining activities in their territories. It is therefore important to make an assessment of the true extent of the detrimental effects of metal pollutants and their impact on human and animal health as well as on ecosystems. This is a pre-requisite for appropriate legislation development and enforcement.

Thanks to funding from the Swedish International Development Cooperation Agency (Sida) in 2013, UNESCO has been able to (1) mobilise a network of scientists to conduct field experiments in nine African countries and (2) bring together academia, geological surveys and mining industries to allow countries or companies involved in promoting good environmental mining practices to share their experience with others. A meeting to report on

this scoping phase of the project took place in Johannesburg, South Africa, from 29 to 31 January 2014.

To move forward, it is important to realise that the extent of the problems posed by mining activities in Sub-Saharan Africa goes well beyond a one-year project implementation and needs mobilisation of important human, scientific, infrastructural and financial resources to achieve full attainment of the project objectives. During this new phase, focus will be on targeting more types of mines (in more countries) so as to develop appropriate models that permit a view and regional assessment of problems posed by mining activities in Sub-Saharan Africa.

## **Why UNESCO?**

The proposed project deals with a very sensitive issue that, if not well addressed can be detrimental to the mining industry and hence to the local economy. UNESCO is perceived as a body that can give a scientific, fair and independent environmental impact assessment. It has a proven record in earth science research and education, especially in Africa. The recent launch of the African Network of Earth Sciences Institutions (ANESI) demonstrates the Organisation's commitment to promote earth sciences in Africa. Also, the UNESCO staff member leading the project is a geoscientist with outstanding international reputation.

This project contributes to the Expected Result 7 ("Global cooperation in the ecological and geological sciences expanded") of the Main Line of Action 4 of UNESCO's Natural Science Programme. It contributes furthermore to the objective of the Priority Africa Flagship programme 4: "Fostering science for the sustainable management of Africa's natural resources and disaster risk reduction".

## **Overall Goal/Objective**

This project aims to reduce the adverse effects of mining activities on the ecosystem and health of adjacent communities while at the same time promote a peaceful mining atmosphere among industries, authorities and communities.

This goal will be achieved through the following specific objectives:

1. Objective 1: understand how past and future mining activities negatively affect the ecosystem and the health of the adjacent communities
2. Objective 2: identify, through experimentation, the most appropriate rehabilitation technologies and remedial actions for sites contaminated with trace metals from mining.
3. Objective 3: use science-based evidence to influence policies on issues of abandoned mines.

In terms of impact, the project is expected to reduce the adverse effects of abandoned mines on the ecosystem and promote a more environmentally and socially responsible mining industry.

## ***Main expected results***

**Objective 1:** understand how past and future mining activities negatively affect the ecosystem and the health of the adjacent communities.

Several decades of mining activity in many African countries have generated high levels of toxic metal compounds in various components of the ecosystem (surface and groundwater resources, vegetation and soil) as well as in food crops, with potential negative effects on the food chain and consequently, the health of local human and animal populations. With the present booming of mining activities on the continent, these problems will be exacerbated if nothing is done. To address this issue, it is crucial to gather information on the distribution of the abandoned mining sites and to understand the factors controlling the circulation of toxic elements. This will allow elaborating models to address impacts of present and future mining activities.

**Objective 2:** identify, through experimentation, the most appropriate rehabilitation technologies and remedial actions for sites contaminated with trace metals from mining.

Various technologies are used to ensure the clean-up of mine sites. In this project, the focus will be on phyto- and myco-remediation, a cost effective and environment-friendly technique using tolerance and sequestration of high metal concentrations by specific plants and fungi.

**Objective 3:** use science-based evidence to influence policies on issues of abandoned mines.

During the workshop marking the launch of the project (May 2013 in Johannesburg, South Africa), it was demonstrated that, in all countries in Sub-Saharan Africa, there exists relevant legislation that sets environmental standards for the opening of mines, mining operations and for mine closures. It was also recognised that large mining companies generally complied with these regulations. However, the problem is to ensure that mining companies meet their environmental commitments, especially during small-scale and artisanal mining operations. Although small-scale and artisanal mining are legislatively regulated in many countries, an adequate and sufficient control of compliance with regulations by government officials is lacking. One of the main reasons for this is the lack of science-based evidence to guide decision making.

## ***Activities and outputs/deliverables relating to the achievement of expected results***

To achieve the above objectives, the following actions will be undertaken:

Under Objective 1:

- Conduct a survey to map abandoned mines in Sub-Saharan Africa
- Conduct a systematic collection of samples and laboratory tests

Under Objective 2:

- Conduct field experiments in clean-up

Under Objective 3:

- Conduct educational and outreach activities toward stakeholders in the field
- Conduct an awareness campaign toward government officials

The table below details the activities and outputs/deliverables and how they relate to the achievement of expected results:

<b>Expected results and outputs/deliverables</b>	<b>Performance indicator (PI)</b> (a maximum of three):	<b>Means of verification (M)</b> (data source):	<b>Quantitative and/or qualitative Target (T)</b> (on the basis of baseline data (b)):
<b>Expected Result N°1:</b> Understand how past, present and future mining activities negatively affect ecosystems and health of the adjacent communities	Number of mine sites with locally appropriate threshold values established	UNESCO reports and publications	<b>T:</b> 9 additional <b>b:</b> 25
<b>Activity 1:</b> <i>Conduct a survey to map abandoned mines in sub-Saharan African</i>			
<b>Output/deliverable 1.1</b> Database and GIS maps of abandoned mines and their potential threat	Number of countries with data accessible online	Project Web portal	<b>T:</b> 7 additional <b>b:</b> 25
<b>Activity 2:</b> <i>Conduct field experiments with systematic collection of samples and laboratory testing</i>			
<b>Output/deliverable N°1.2</b> Chemical distribution of harmful elements in various compartments of ecosystem documented	Number of sites studied	UNESCO reports	<b>T:</b> 30 <b>b:</b> 9
<b>Expected Result N°2:</b> Identify, through experimentation, the most appropriate rehabilitation technologies and remedial actions for sites contaminated by trace metals sites from mining	Number of rehabilitated sites tested	Reports and website	<b>T:</b> 6 <b>b:</b> 2
<b>Activity 3:</b> <i>Conduct field experiments in clean-up</i>			
<b>Output/deliverable N°2.1</b> Cost effective on-site rehabilitation identified	Number of sites with appropriated rehabilitation techniques identified:	UNESCO reports	<b>T:</b> 2 additional <b>b:</b> 6
<b>Expected Result N°3:</b> Use science-based evidences to influence policies on issues of abandoned mines	<b>PI 1:</b> Number of policy briefs prepared	Publication reference	<b>T:</b> 6 <b>b:</b> 0
	<b>PI 2:</b> Number of ministerial fora with presentation of the project outcomes	Forum report	<b>T:</b> 3 <b>b:</b> 0
	<b>PI 2:</b> % surveyed countries validating recommendations	UNESCO reports	<b>T:</b> 50% <b>b:</b> 0%
<b>Activity 4:</b> <i>Conduct educational and outreach activities toward stakeholders</i>			
<b>Output/deliverable N°3.1</b> Understanding and compliance by stakeholders (government officials, mining enterprises and local communities) of project objectives enhanced	<b>PI 1:</b> Number of stakeholders involved and capacitated during the project	UNESCO reports	<b>T:</b> 40 <b>b:</b> 6

## *Beneficiaries and stakeholders*

The beneficiaries of this project include: (1) the communities living around mine sites who deserve a better understanding of the threats posed to their everyday life by mining activities; (2) the mining companies which should operate in an environment of trust with communities and local authorities and, (3) the governments which, while promoting local development, need to address challenges related to mining activities. The project demands a synergy of action between various stakeholders including scientists working in a multidisciplinary approach, NGOs involved in environmental issues, governments, communities and mining companies. All are essential to promote a peaceful mining atmosphere.

## *Implementation strategy*

The network of scientists built around the International Geoscience Programme (IGCP)'s projects IGCP-594 and IGCP-606 will form the core of the implementation team. The implementation of the project will focus on three main activities: (1) **Survey mapping** of abandoned mines in sub-Saharan African countries in order to establish their exact locations, their nature and the potential threats they pose to the ecosystem and human health; (2) **Research in the field** including systematic collection of samples on carefully selected major abandoned mine sites in the Sub-Saharan African region through laboratory analyses and data processing in order to provide science-based advice to decision makers; and (3) **Outreach and educational activities** in targeted countries in order to promote a peaceful and healthy mining atmosphere benefiting both communities and mining companies, and trigger government actions.

A large proportion of women in geosciences are in the field of environmental geosciences (focus of this project). The team intends to build on the expertise of women in geosciences and promote their involvement in the project.

## *Sustainability and exit strategy*

The problem this project is aiming to solve is of crucial importance for the environmental sustainability of Sub-Saharan Africa. Through the Africa Mining Vision, it has become a major item on the socio-political agenda of the African Union. This can be interpreted as strong commitment by Member States to take forward the recommendations from UNESCO's work and to sustain the research momentum generated in the field of environmental impacts of mining activities. The following approach is expected to support this assertion: (1) the AfDB-UNESCO efforts trigger the development of a strong network of Earth scientists in the field of environmental sustainability of mining sites; (2) the scientific achievements of the network highlights the project as one of the flagship projects of the Africa Mining Vision and generates interest from other partners including donors; and (3) the African Member States move toward a real ownership of the project outcomes and develop tools for adequate and sufficient control of compliance with the regulations on mining activities.