GEFÖRDERT VOM
Bundesministerium
für Bildung
und Forschung

Fraunhofer
IKTS

Project No. 01GD21055

Mining and Water Security. Development and implementation of innovative strategies for the prevention and remediation of mining-related damage to critical water resources in Southern Africa (MiWaSec)

Abstract

The project carried out within the framework of the WASA program - initial phase - with the participation of MINTEK (Randburg, RSA) and Wismut GmbH Chemnitz served to prepare a project application for the main phase. According to the work plan, capacity building and stakeholder engagement measures were carried out, the local conditions were analysed and knowledge management measures were implemented. Based on this, the main features of a project proposal were developed. The target region is the West Rand mining area, Gauteng Province, RSA due to its importance for the economy and communities with all its consequences on the one hand, and on the other hand the strategic importance of the groundwater reserves in this very region for the drinking water supply of Gauteng Province as the economic heart of South Africa.

In the initial phase of the project, unforeseeable staff changes or absences and difficulties with administrative procedures led to delays of several months without greater progress.

As part of the stake-holder engagement, a large number of contacts were established with companies, authorities, universities and representatives of the affected municipalities in the West Rand region. Within the framework of several workshops, the concept pursued was presented, discussed with the representatives of the companies and institutions, and suggestions and criticisms were taken on board. The workshops were attended by more than 50 participants. In addition, there were numerous other contacts and on-line meetings.

The analysis of the situation on the ground showed, among other things, that due to the ongoing closure of gold mines, there is great pressure to improve the water supply and ecological situation in the addressed mining area, and that there have already been numerous initiatives for improvement, but also obstacles to their implementation. Conflicts between competing mining companies, authorities and municipalities seem to play a major role. The role of the authorities has been critically addressed several times. A particular problem is that of the so-called water use licences and how to deal with them. This can also seriously complicate practical implementation in the main phase. However, there is obviously also a lack of will as well as of the technical and human resources for continuous monitoring and analysis of the situation. After numerous announcements of remediation measures or their lack of effect on the population, the awareness of the problem and the willingness to actively participate seem to be little developed. It is difficult to counteract this. New projects must therefore offer the prospect of a sustainable and measurable improvement within a manageable period of time. Several times, the South African side raised the question if there are also other intentions of the German side. A factor that should not be neglected are the requirements for safety and physical integrity of staff in the study area. Personal protection was recommended for activities outside secured areas of companies operating there.

An excursion to the Far West Rand study area was also used to obtain water samples at a mine water treatment plant and at uncontrolled mine water overflows. The analysis and evaluation indicates a need for water treatment processes that is capable to meet complex treatment requirements with large water flow rates and whose performance goes far beyond the usual neutralisation and precipitation of iron. According to the available analyses, the focus must also be directed on the separation of sulphate ions, uranium/natural radionuclides, toxic heavy metals

(Co, Ni) and above all arsenic. Purification to tolerable sulphate contents would require the separation of 37,000 t/a of sulphate in one of the cases considered e.g. This and the other requirements can probably best be met with an electrochemical treatment process in which the sulphate can be recycled thereby producing hydrogen at the same time. The toxic metals can be separated down to traces. However, such treatment processes are unknown in the region so far, which leads to corresponding scepticism.

The basic thematic orientation of a follow-up application focusing on in-depth monitoring, modelling/prediction and technology adaptation/testing was described and an rough time and personnel resource planning was developed.

A project proposal for the main phase was not formulated and submitted due to the South African side's withdrawal after the funding conditions became known.