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URANIUM MINING IN THE UNITED REPUBLIC OF TANZANIA: CURRENT STATUS, CHALLENGES AND OPPORTUNITIES

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1. INTRODUCTION

Tanzania is heading for a new dimension in large scale uranium mining [1]. Significant uranium deposits have been identified in various parts of the country [2, 3]. More than 25 companies are conducting exploration of the uranium in different deposits in the country. These explorations are based on the already radiometric surveys conducted in the 1970's, which pointed to uranium enrichments in various places in the country [1]. One of the major uranium development projects is the Mkuju River Project, located in southern Tanzania, about 470 km southwest of Dar es Salaam. The project's operator is Russia's Uranium One Inc. Currently (2016), the project maintains an active status since research and preparatory operations are under way. The mineral resource base of the project is currently representing approximately 58,500 tons of uranium. The company has already acquired a prospective mining license from the Ministry of Energy and Minerals but they are not yet started mining due to depression on the uranium price.

1. CHALLENGES

There are a number of challenges encountered during the exploration as well as expected to be encountered during mining and processing of the ore, some of these challenges are explained below;

a. PUBLIC ACCEPTANCE

There is a public concern in the deposits which are found in the farming fields of some villages. This concern has been experienced in the areas around Bahi and Manyoni deposits located in the central zone of the country [4]. In this region, there are wetlands areas which are mostly utilized for agricultural activities as well as livestock keeping. Most of the villagers, with help of Non-Governmental Organizations have been rioting against the government's decision to permit the exploration projects in their areas [1]. People everywhere in Bahi and Manyoni districts are rejecting uranium projects, they are afraid of losing their land to uranium mining companies without proper compensations. Apart from the fear of losing their land, there is a big issue of environmental impact in the areas of Bahi and Manyoni. Most of the exploration sites are within the agricultural fields, therefore the issue of contamination should be considered [5]. Most of the population in these areas are depending on underground water through boreholes drilled either locally using

b. REGULATORY FRAMEWORK

Experiences from historical uranium production sites all over the world have consistently shown that unregulated uranium mining practices have led to significant damage of water, soil, put persons at risk and resulted high cost of clean up the environment [6]. In Tanzania, the primary legislation, which control practices of ionizing radiation is the Atomic Energy Act 2003 [7] and associated regulations: Mining (Radioactive Minerals) Regulations of 2010 [8] and the Atomic Energy (Radiation Safety in the Mining and Processing of Radioactive Ores) Regulations of 2011 [9]. According to the Act an ore is classed as radioactive mineral if its total activity concentration exceeds 74 Bq/g [6]. In this context, the activity concentrations of economical uranium ores which are likely to exceed this activity are classed as radioactive ores and thus subject to stringent regulatory control. The dose limits applicable in these regulations are those recommended by the ICRP (1977) for both

occupation-al and public exposure to ionizing radiation [10]. The dose limits are as follows: maxi-mum occupational dose of 50 mSv in any year with a mean of 20 mSv over any five years, and a public dose limit of 1 mSv in any single year. In addition, the regulatory authority has a clear role to enforce regulatory compliance with the national and international standards.

Although a legal framework and relevant infrastructure for the management and control of occupational and public exposure, waste and the environment are in place, there are challenges for effective monitoring of the uranium mining industry in Tanzania [11]. Finance and technical resources sounds as major limitations that may hinder the regulatory authorities to complete its primary responsibilities. Establishing baseline environmental data by the regulatory authority and the mining company prior to project development is of crucial importance and cannot be underestimated. Lack of comparable data could prevent the effective monitoring of changes in compliance with the environmental standards during and after the mining activities [11]. Since data that established after the mining activities commences cannot be used to relate the impacts of uranium mining have on the environment and public exposure. Because the anticipated area in need of pre-mining data is vast and time available to establish them before actual uranium mining commences is very short, the regulatory authority need substantial amount of resources. Big cost required establishing the baseline data and building technical capability wholly resting on the government funds are big challenges. Implicit, inadequate budget and technical capability could lead to impairment on assessing and effective controlling the uranium mining.

c. URANIUM PRICE

Uranium price has been declined for the past 11 years [12]. According to the source, U3O8 was down more than 25% in 2016 with the UxC broker average price sliding to 25.69 USD per lb. The price, according to the source was the cheapest uranium price has been since May 2, 2005.

This decline in uranium price has led the Uranium One, an international mining company of Russian State Nuclear Energy Corporation to apply to suspend the Mkuju River Project [13]. This is a big challenge for the country due to the fact that, the project becomes the first uranium mine to receive license from Tanzania's Ministry of Minerals (formerly Ministry of Energy and Minerals). As of March 2013, the project had measured and indicated resources of 48,000 tU plus inferred resources of 10,600 tU at average grade of 0.026% U [13].

d. WILDLIFE CONSERVATION ISSUES

Despite the suspension application by Uranium One, the project area was initially part of the UNESCO World Heritage since 1982. UNESCO agreed to change the boundary, therefore enable uranium mining in this unique conservation area [14]. Selous, being the largest Game Reserve in Africa is inhabited by most important populations of the critically endangered wild hunting dogs as well as elephants. The UNESCO describes the Game Reserves as an immense sanctuary of 50,000 km2 which is relatively undisturbed by human impact and which is inhabited by large number of elephants, black rhinoceroses, giraffes, hippopotamuses and crocodiles. The reserve has variety of vegetation zones, ranking from dense thickets to open wooded grassland. The UNESCO accepted a boundary change of the reserve and thus enabled the mining of uranium in the conservation area.

The planned mine is situated in an elephant corridor between Tanzania and Mozambique, and will approximately utilize the area of about 200 km2. The mining methods preferred in this project after the exploration results and nature of the area was either Open-Pit or In-Situ Leaching (ISL) due to the nature of the deposits in the area. Both methods have environmental impacts in the mining area as well as areas beyond the mining site. For the case of open-pit, the environment suffers with enormous heaps of tones of radioactive waste which may lead to the contamination of large area of the project and beyond the mining area [12]. Control of water from surface runoff and underground aquifers plays an essential role in an effective pit operation. If not well controlled, contaminated runoff will pose threats to the game reserve inhabitants. In case of ISL, the risk of spreading of leaching liquid outside of the uranium deposits, involving subsequent ground water conditions after completion of the leaching operations. Moreover, ISL releases considerable amounts of radon, and produces certain amounts of water slurries and waste water during recovery of the uranium from the liquid.

1. OPPORTUNITIES

Despite the fact that uranium exploration and mining pose some great challenges, there are opportunities during the exploration activities as well as expected opportunities when the mining starts. The following are the opportunities: -

a. EMPLOYMENT

Uranium projects in Tanzania have created a number of employment opportunities during explorations and are also expected to create a number of jobs during the mining and milling of the ore. Some 1,600 people are expected to be employed during construction and will be 750 permanent jobs when the mine starts operation [12]. At present, there are 120 employees who are involved in exploration activities.

Also in order to ensure maximum implementations of the regulations which ensure maximum safety in the industry, regulatory authorities involved in the uranium control will need to increase number of skilled staffs. This will in turn, increase the number of job vacancies to be filled.

b. EXPORT EARNINGS

The Mkuju River Project is expected to attract Foreign Direct Investment (FDI) amounting to about USD 1bn [12]. This will boost the country's economy to support the government's desires to improve the economy of the country to a middle-income economy.

Other opportunities include government royalties, taxes and fees as well as infrastructure development in the regions where the mining activities are carried on.

1. CONCLUSION

Uranium mining has seen to have the capacity to improve the economy of the country. Currently the price of the commodity is depressing. However, the demand is expected to rise in the near future due to a number of expected nuclear power constructions in various countries. The expected rise in demand and price is going to benefit the mining companies as well as the countries with uranium deposits. However, despite benefits which may be expected, the challenge seems to outweigh the opportunities.

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Country or International Organization

United Republic of Tanzania

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