BUSITEMA UNIVERSITY

Pursuing Excellence

FACULTY OF ENGINEERING

DEPARTMENT OF MINING AND WATER RESOURCES ENGINEERING

FINAL YEAR PROJECT

INVESTIGATING THE EXTENT OF MERCURY POLLUTION IN ARTISANAL MINING AREAS. CASE STUDY: SYANYONJA VILLAGE, BUSIA(U)

By

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ABSTRACT

This research project was designed to investigate the extent of mercury pollution in water, sediment, fish and yams in Syanyonja village in order to determine whether persons are at risk from high levels of mercury contamination. The research project was conducted during the period Jan 31st- march 21st 2017

Firstly, the sampling sites were determined basing on the areas where mining processing using mercury was taking place. Three sites were chosen and samples taken from all the sites. A total of 48 water and sediment samples were picked at intervals of 10m for a distance of 40m from each site. 8 fish samples and 9 yam samples were picked. 25 questionnaires were also administered in the village. The sampling points were noted using a GPS and a map extracted out from google earth.

Results obtained showed that 28% of mercury is discharged into the water and soil during panning. 83% of the sampling points have very large mercury content compared to the water quality standard for mercury based on The National Environment (standards for discharge of effluent into water or on land) which is 0.01mg/l. The average mercury content in fish is 0.06mg/kg. The weekly intake of mercury by people consuming fish from Namukombe stream is approximately 0.42 mg/kg, which is approximately 40% higher than the PTWI of 0.3g for MeHg. The maximum total Hg intake for consumers on average for Syanyonja yams is higher than the Japanese safe guideline limit (0.036 mg/day for an adult weighing 50kg) as well as the Provisional Tolerable Daily Intake(PTDI) for adults. 31% of the residents in Syanyonja village use stream water for domestic purposes

DECLARATION

I KARUNGI SHAKILAH, hereby declare to the best of my knowledge, that this project report is an outcome of my original work and that it has not been presented to any institution of learning for an academic award.

SIGNATURE: .....

DATE: ....27/05/2017.....

APPROVAL

This final research report has been submitted to the Faculty of Engineering for examination with approval of my supervisors

Main supervisor

Signature: .....

Name: Mr. Joseph Ddumba Lwanyaga

Date: .....

DEDICATION

This report is dedicated to my beloved parents Mr. Byaruhanga Cassim &Mrs. Nakalema Janati in appreciation for their selfless care and unflinching support provided to me since childhood, and for the spirit of hard work, courage and determination instilled into me, which attributes I have cherished with firmness and which have indeed made me what I am today.

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Special thanks to all who put in efforts especially the Chemical lab technician; Mr Robert Gazetti at UIRI (Uganda Industrial Research Institute) who gave me guidance on what to do when I was carrying out my tests.

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LIST OF ACRONYMS

ASGM Artisanal Small-scale Gold Mining

LMIC Low and Middle Income Countries

WHO World Health Organization

PTWI Provisional Tolerable Weekly Intake

UNEP United Nations Environment Protection

AAS Atomic Absorption Spectrometer

GPS Global Positioning System

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CHAPTER ONE

1.1 BACKGROUND

The practice of artisanal and small-scale gold mining (ASGM) is increasing in many low- and middle-income countries (LMICs), mainly due to the rising price of gold and widespread poverty. Gold from these informal mines may represent 20–30% of the world's output ((UNEP), 2006). It is estimated that about 15 million people work in ASGM and that perhaps 100 million people worldwide depend on the sector for their livelihood (Spiegel S.J., 2006).

The ASGM sector is a significant source of employment and economic activity: an estimated 150,000 to 200,000 women and men are directly involved in ASM, with up to 1,000,000 indirectly benefitting from these activities. Almost half of ASM miners are women, though at some sites, women can make up 70 per cent of the workforce (UNEP, 2012).

Artisanal and small-scale gold mining, like other extractive activities, raises numerous environmental concerns. Emissions of mercury (Hg) into the atmosphere as well as direct releases of mercury to soil and water are of primary concern because of the extensive use of mercury to amalgamate gold by artisanal miners. Recent estimates suggest that the ASGM sector is the primary source of mercury into the global atmosphere, accounting for approximately 37% (727 tonnes) of all global emissions (UNEP, 2013).

Over the last three decades there has been increasing global concern over the Public health impacts attributed to environmental pollution, in particular, the global burden of disease. The World Health Organization (WHO) estimates that about a quarter of the diseases facing mankind today occur due to prolonged exposure to environmental pollution, most of these environment-related diseases are however not easily detected and may be acquired during childhood and manifested with age. As a concern mercury use in artisanal gold processing is a prime health hazard within the practicing areas of developing countries like Uganda.

In Busia district, Syanyonja village harbors indigenous population that practice gold mining for a living. Artisanal miners in this area use mercury to separate gold atoms from crushed rock sediments a process known as amalgamation. When this mercury is mixed with the powdered ore, and water, it attacks gold grains during the mixing, and practically not all mercury forms amalgam thus excess mercury is discharged through the used panning water and flowing slurry tailings to the stream

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