

Gold Value Addition and Beneficiation for Women in the Mining Sector

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Abstract

The mining sector is one of the major contributors to the growth of the economy in Zimbabwe. Gold mining is the biggest contributor to the economy and in 2017, an average of 28.4 tons of gold was obtained from both small scale and large scale miners with women miners contributing to this success. Gold presents an opportunity for value addition into products like jewellery, bars and coins, ornaments and electronic devices. The downstream processing of gold results in employment creation, technology transfer, infrastructure development and new product development. The Jewellers Council of Zimbabwe in liaison with the Ministry of Mines and Mining Development, Reserve Bank of Zimbabwe and Fidelity Printers Refiners are pushing for the value addition of the yellow mineral for the economic growth of Zimbabwe. Gender sensitive policies being formulated by government are meant to encourage women to tap into gold value addition and beneficiation initiatives for improved empowerment, income for families and empowered societies.

Keywords: Economic growth, employment creation, gold, value addition, women empowerment

1. Introduction

Gold is one of the most common minerals and is well known for its special properties and value. Gold exists mostly with silver and traces of iron and copper with a gold nugget having 70-90% of gold. Gold is mined from gold ore, the ore is crushed and the metal is separate from the ore using a variety of techniques. Gold has a very high density

with a specific gravity (SG) of 19.3 which makes it easy to separate using a gravity separation technique such as panning. However, the specific gravity can decrease due to the presence of iron and silver. Gold is very ductile and malleable and can be easily flattened. Gold is a noble metal which has a high resistance to corrosion, it therefore does not tarnish, crumble or discolour. Gold ores are normally sulphide or pyrite based and must be treated using pyrometallurgical processes. A summary of the properties of gold are shown in Table 1.

Table 1. Physical properties of gold

Property	Description
Chemical classification	Native element
Colour	Golden, Yellow
Lustre	Metallic
Diaphaneity	Opaque
Mohs hardness	2.5-3.0
Specific gravity	19.3
Diagnostic properties	Colour, hardness, specific gravity, ductility and malleability
Chemical symbol	Au
Crystal stem	Isometric
Products from gold value addition and beneficiation	Jewellery, coinage and bullion, computers, electronic appliances, cell phones, dental work, awards (medals and trophies)

Gold mining and its value addition activities are governed by the Mines and Minerals Act as well as the Gold Trade Act. Figure 1 shows a typical gold ore containing visible gold.



Figure 1. Typical gold ore with visible gold

Gold is one of the key strategic minerals that the Government of Zimbabwe is looking at. The recently launched Transitional Stabilization Program (TSP) estimates that gold production will be at 58 tons by 2020 (TSP, 2020). Women in small scale mining of gold were also critical in achieving this gold target as 60% of this gold was achieved from small scale miners. The inclusion of women in gold mining, value addition and beneficiation is also in line with the Africa Mining Vision which states that there must be

“Transparent, equitable and optimal exploitation of mineral resources to underpin broad-based sustainable growth and socio-economic development”.

The first half of 2018 is reported to have produced 17 tons of gold with a monetary value of USD 715 million. It is forecasted that by 2030, gold will contribute USD 1 billion dollars through production of 100 tons by 2030. This target is only achievable through optimal utilisation of the various gold reserves available in Zimbabwe. Figure 2 shows the distribution of gold deposits in Zimbabwe.

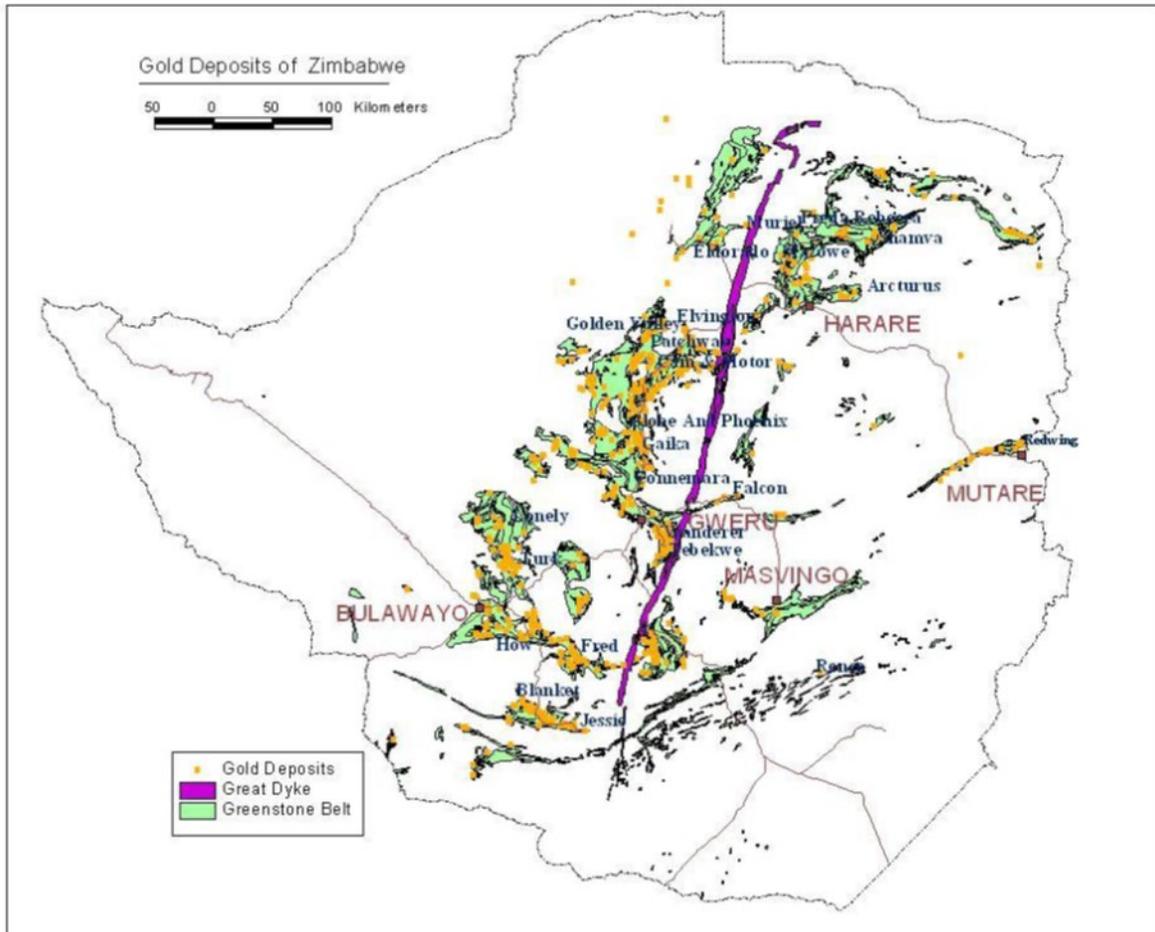


Figure 2. Gold reserves in Zimbabwe (Mugandani, 2017)

This increase in gold production will be due to increased exploration, opening of closed gold mines as well as capacitation of the existing mines. The increased gold output will result in increased raw material availability for value addition. According to the TSP and other existing government policy, women empowerment and creation of opportunities for women as a special interest group is topical on the agenda.

2. Gold processing

The value addition and beneficiation of gold ore processing involves various processes which include: ore crushing and grinding, water addition to form a slurry, lime and cyanide addition to the slurry to facilitate leaching of gold and silver into the solution. Carbon is then added to facilitate the absorption of dissolved metals from the slurry. Acid washing is then done to strip the metals from the carbon followed by circulation of a caustic cyanide solution. The gold and silver are recovered from solution by electro-winning. The metal products are then smelted into bars of bullion or can be used in jewellery and electronics manufacture. The tailings are sent to the tailings storage facility or further processing to recover gold using low cost technologies. A summary of a small scale gold process is shown in Figure 3.

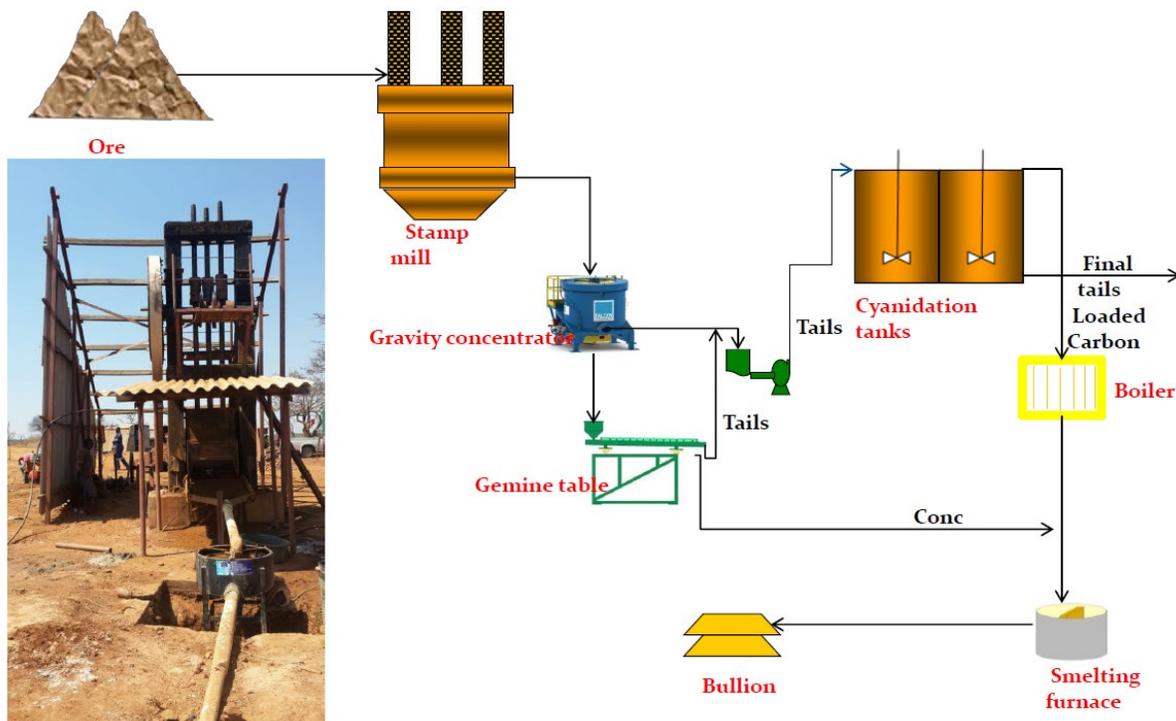


Figure 3. Gold value addition and beneficiation process

3. Gold value addition and beneficiation

From 2018 to 2020, Zimbabwe’s economic growth will be guided by the TSP programme in terms of which mineral beneficiation and value addition will play a critical role so as to increase earnings from the mining sector through exports. Gold is one of the important minerals for focus in terms of value addition and beneficiation (Mawowa, 2013). Furthermore, increased investment in beneficiation is being welcomed by government so that there is increased industrialisation and employment creation. Given the current policy for women empowerment, women will definitely tap from these opportunities.

The value addition and beneficiation of gold results in various benefits for the country including socio-economic benefits such as import substitution with local products and the export of higher value added products resulting in the country benefiting financially. There is also increased job creation, new skills development, infrastructure development, investment in research and development of new products. In all these opportunities women in gold mining can tap from these opportunities that arise from value addition and beneficiation of gold. There is also development of communities after the mining projects e.g. schools and clinics. There is increased energy access for women and improved health care. Gold value addition and beneficiation promotes gender equality, economic empowerment, improved moral and livelihoods for women in the mining sector (Spiegel, 2015). A summary of the benefits of gold value addition are shown in Figure 4.

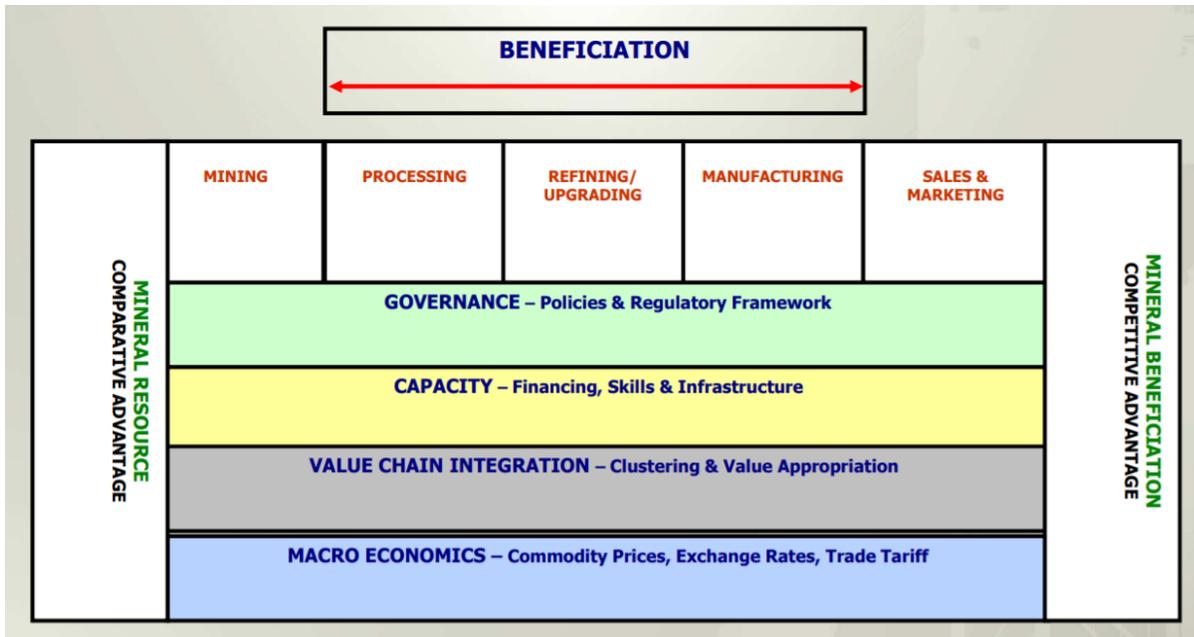


Figure 4. Gold value addition and beneficiation stages and various benefits (Mungoshi, 2011)

The involvement of women in gold value addition and beneficiation also promotes the government perspective on women empowerment as well as value addition of minerals. The various products gold can be value added to include jewellery, electronics, gold coins and invested as indicated in Figure 5.

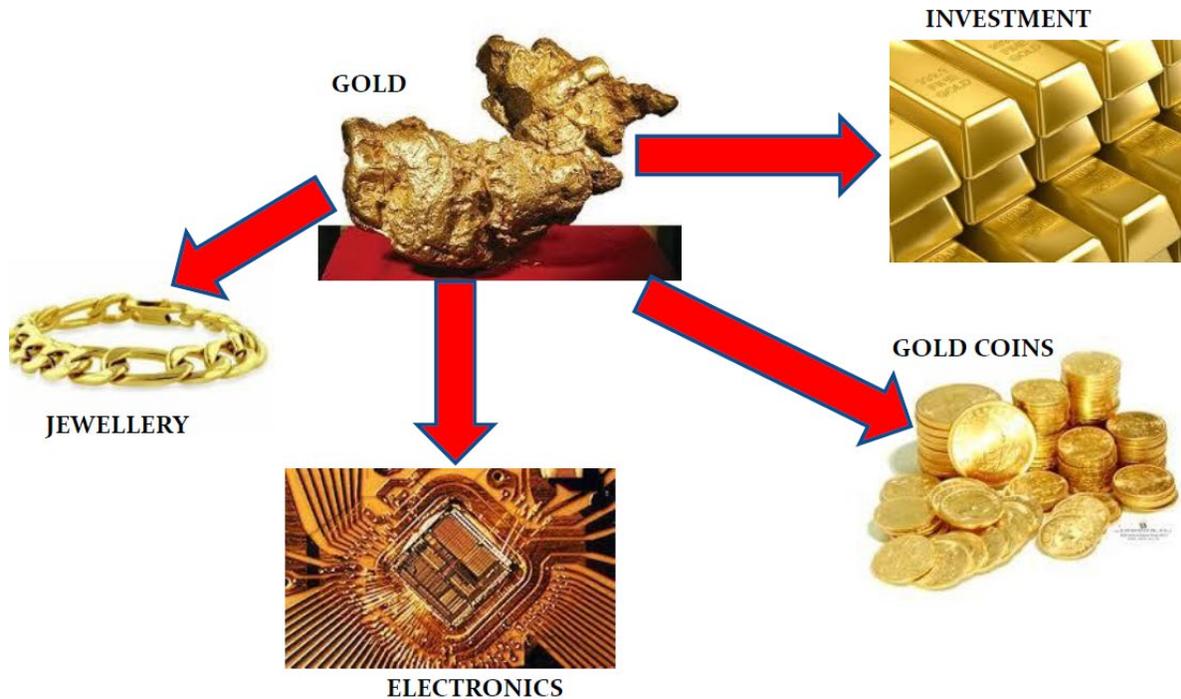


Figure 5. Various value added products from gold

4. Financial Opportunities for Women in Gold Value Addition and Beneficiation

The Fidelity Gold Printers is driving the \$40-million-dollar Gold Development Initiative Fund where women can access funding to go into gold mining and value addition. To date 12% of this 100 million fund has been accessed by women. The Government is also working hand with the Women's Empowerment Bank so that women can access funding for value addition opportunities in the mining sector. Young women can also tap from the Youth Empowerment Bank for investment opportunities for their banks. The Ministry of Mines and Mining Development has also set up a stand-alone department that focuses on Minerals Value Addition and Beneficiation in Zimbabwe including gold as the key mineral. Women also have an opportunity to be members of the Jewellers Council of Zimbabwe where value addition players in gold and related minerals are represented and have direct information from the Reserve Bank of Zimbabwe and the Fidelity Printers and Refiners.

5. Environmental Considerations

Although the value addition of gold is promoted and availability of opportunities, it is critical that environmental considerations are made and aligned to in accordance to the Zimbabwean laws and regulations. Women in gold mining must also consider the adoption of mercury free gold processing so as to minimize negative health effects on their bodies.

6. Conclusions

Gold value addition and beneficiation promotes various business opportunities for women in mining. Involvement of women in gold value addition and beneficiation promotes women empowerment, creation of jobs and improved livelihoods. The implementation of the TSP programme as well as the women empowerment programs will see women in mining benefiting.

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About the author

Dr. Eng. Mercy Manyuchi is the Director for Mining Research, Value Addition and Beneficiation in the Ministry of Mines and Mining Development. She is passionate about promoting Women in Mining initiatives and promoting sustainable mining practices.