GOD MWANGA GEMS LIMITED

BUSINESS PLAN

FOR

MINERALS (GRAPHITE) PROCESSING

PREPARED FOR

GOD MWANGA GEMS LIMITED

1.0. Introduction

GOD MWANGA GEMS LIMITED is a company incorporated in Tanzania with Certificate of Incorporation No. 91664 dated 14 June 2012 the company is owned by 2 shareholders.

GOD MWANGA GEMS LIMITED has acquired land located at **Simanjiro Area**, **QDS 71/2, Endiamtu, Simanjiro District, Manyara region**. The proposed area will be used for minerals processing

GOD MWANGA GEMS LIMITED vision is to offer our clients reliable, secure, and fast graphite processing. GOD MWANGA GEMS LIMITED also aim to be amongst the medium size company providing graphite processing facility of high quality with environmentally friendly equipment by the year 2025.

GOD MWANGA GEMS LIMITED's location in **Simanjiro Area**, **QDS 71/2, Endiamtu, Simanjiro District,**

Manyara region is very strategic as is the area with large and good quality various industrial minerals deposit in Tanzania and the availability of skilled workforce is very fundamental for such project, **Simanjro district** is the ideal place where abundant of skilled force are available that will lower overheads in running graphite processing facility.

GOD MWANGA GEMS LIMITED intends to procure the best equipment in order to be able to provide the best for our clients, lower operation cost and increase minerals recovery. GOD MWANGA GEMS LIMITED's goal is also to ensure that we build a business structure that will aid us in achieving our corporate goals and objectives.

PERMANENT MINERALS CO. LIMITED's intention in running a smooth business with as less hitches as possible are to ensure that we hire the right number of

employees who not only have an understanding of the industry and are professionals but also are attuned to our corporate goals and vision and are committed to ensuring that these goals and visions are achieved.

GOD MWANGA GEMS LIMITED intend to provide a conducive and friendly environment for our employees as well as ensure that they get the required training that is continuous in nature so as not only to enhance their skills and increase productivity for the organization but to also ensure that the skills gotten are the best across similar start-up such as ours in the industry.

2.0 **Some Of Few Selected Machines and other items**

The graphite processing equipment primarily includes:

- Graphite vertical stirring mill,
- Flotation machine,
- Drum dryer,

- Agent agitation tank,
- Chamber filter press,
- XHGY-B series numerical control agent feeder
- Graphite ore crushing stage

3.0 The Sponsors

GOD MWANGA GEMS LIMITED will be sponsoring this project. The Company is currently jointly owned by 2 shareholders.

Names of Shareholders	Number of Shares	Nationality
GODLIZEN MATHAYO MWANGA	50	Tanzania
SIA GODLISTEN MWANGA	50	Tanzania

3.1 Objective of Study

The purpose of this study is to work out the technical and commercial details and financial viability of the project

3.2 Location

There are two considerations on this point. One is referred to as the mine and the other is the treatment plant. Ideally, the first one must be close to the plant, but sometimes the area and accessibility are serious issues. Probably, the most critical aspect is the plant location due to the idea is to have a good foundation for the buildings to be constructed and using the geography of the area. The latter is important because the gravity force must be utilized at maximum because the energy is an operative cost that will influence the economy of the project.

If the plant will be located near cold zones where the temperature can reach low values, the building must consider special protection due to exists the possibility of having frozen problems with the slurry. This situation is painful if the problem is not considered before. The project location of treatment plant has been selected

after considering all factors, the project will be located at **Simanjiro Area**, **QDS 71/2, Endiamtu, Simanjiro District, Manyara region**

3.3 Profitability

The economy and profitability of the project is influenced by the mining costs, operative costs, shipping costs, impurity levels, concentrate treatment charges and smelter/refinery returns. These factors have to be projected from the laboratory tests or scaled metallurgical tests. Basically, minerals concentrate has to be related to the mineralized block, minerals distribution, and diluents such as pyrite, graphite, clays, and organic matter. GOD MWANGA GEMS LIMITEDhas studied All these factors together in order to optimize the revenue of the project according to the mineralized zone.

3.4 Production capacity

The company's production capacity is estimated to be 1000 tonnes per year and the average selling price is US$20,000 CSPG graphite.

The company plans to export 100% of its total sales

3.5 Graphite Market Overview

The graphite market size is estimated to reach US$22.4 billion by 2027 after growing at a CAGR of 5.5% from 2022-2027. Graphite is a carbon-based mineral found in crystalline form and it is of two types i.e., natural type consisting of flakes like amorphous graphite, and synthetic type which consists of graphite made from coke & pitch. Hence rich properties like self-lubrication, high tolerance to heat and changeability, etc., makes graphite of high usage in various application. For instance, in automotive vehicles especially electric vehicles, it is used in lithium-ion batteries, as heat resistant in refractories, as an additive in lubricant, as

concrete material in construction buildings and a combination of graphite fiber with carbon nanotubes makes carbon fiber-reinforced plastics which have high usage in the aerospace sector. The drivers for the graphite market are growing demand for new energy vehicles like electric vehicles, an increase in the volume of steel production, construction activities, and rising demand for fuel-efficient aircraft through graphite-made materials. However, the grinding particles and chemicals of graphite make it a harmful pollutant as it can cause pollution and damage to the respiratory system. Hence stringent regulation imposed by the government on graphite usage will hamper the growth of the graphite industry**.**

Key Takeaways

Asia-Pacific dominates the graphite market, as the region is a hub for major steel, construction, and

automotive industries in countries like India, Japan, South Korea, and China is the largest producer of graphite

The rich properties of graphite such as self-lubrication and friction resistance make it an efficient lubricant. Hence such lubricant is mainly used for heavy mining machinery such as conveyors.

Growing demand for electric vehicles will create more demand for lithium-ion batteries to be used in these vehicles as fuel, thereby increasing the usage of graphite in such batteries.

Graphite Market Segment – By Product

Natural graphite held the largest share in the graphite market in 2021, with a share of over 40%. This owns to factors like having high cost-competitiveness, friction resistance and optimal performance. Hence such rich properties make natural graphite have high industrial

applications like in refractories, batteries, steel making, brake lining, lubricants, etc. For instance, as per the 2021 report of the National Automobile Dealers Association, the vehicle sales in Q2 totaled up to 17 million units in the US, of which 76.9% was light trucks. Also, as per the 2021 report of the National Bureau of Statistics of China, the manufacturing of electrical equipment such as computers, laptops, mobiles, etc., and other electrical equipment increased by 13.5%. Hence as natural graphite is used as a battery in electrical instruments and as brake lining in heavy trucks, so increase in production of such segments will lead to an increase in demand for natural graphite to be used in them, thereby positively impacting the graphite market.

Graphite Market Segment – By Purity

High purity graphite held the largest share in the graphite market in 2021, with a share of over 35%. This owns to factors such as high purity graphite has

excellent conductivity, lubrication and high-temperature resistance. Hence due to such rich properties, it has various industrial applications such as lubrication, metallurgy, automotive, aerospace etc. The rapid development in some sectors such as the growing demand for the electric vehicle segment in the automotive industry has created more demand for high purity graphite since it is mainly used in lithium-ion batteries for electric vehicles. For instance, as per the European Environment Agency of European Union, the electric registration of electric cars and vans increased from 550,000 units in 2019 to 1,325,000 units in 2020, hence showing an increase of 11%. Hence as the demand for electric vehicles increases, this will increase the usage of lithium-ion batteries in them thereby increasing the demand for high purity graphite in the automotive sector for the electric vehicles segment

Graphite Market Segment – By Application Type

Refractories held the largest share of the graphite market in 2021, with a share of over 30%. This owns to factors like graphite blocks made in refractories is used in various industries such as metal manufacturing, electronics, chemical, steel, and other fields, etc. but the main user is the metallurgical sector as such blocks are used for graphitization furnace, metallurgical furnace, resistance furnace, etc. The rapid development and increase in production of sectors such metal manufacturing sector have led to more usage of graphite-based refractories. For instance, as per the July 2021 report of the World Steel Association the World crude steel production for the 64 countries was 161.7 million tones (Mt) in July, a 3.3% increase compared to July 2020, and the steel demand will further increase to 2.2% in next one year. The increase in the production of steel will increase the demand for graphite blocks in

them as it is majorly used in a metallurgical furnaces. Hence such an increase in graphite usage will positively impact the demand for graphite in refractories thereby impacting the growth of the graphite industry in refractories.

Graphite Market Segment – By End User

Metallurgical held the largest share in the graphite market in 2021, with a share of over 30%. The metallurgical segment consists of electrodes, refractories, casting, and foundries. Hence as graphite electrodes are used in electric and ladle furnaces for steel production and with the rising production in steel, the demand for graphite will also increase. For instance, as per the 2021 report of the World Steel Association, the world crude steel production in May for 64 countries was 174.4 million tones (Mt), showing an increase of 16.5% when compared to 149.6 million tones produced

in the same month. Such an increase in the production of steel will also increase the demand for graphite electrodes. Hence the increasing demand for electrodes will create more usage of graphite in them, which would positively impact the demand for graphite in the metallurgical sector thereby providing more growth opportunities for the graphite industry.

Graphite Market Segment – By Geography

Asia-pacific held the largest share in the graphite market in 2021, with a share of over 40%. This owns to factor like the region consisting countries like China, India, Japan, South Korea have major end-users of graphite across automotive sector, construction sector, metallurgical sectors, and others. For instance, National Investment Promotion & Facilitation Agency, the construction sector in India will grow as the third largest globally by 2025, and construction output will grow on

an average of 7.1% each year, and infrastructure activities stood at $24.72 between April 2000 and March 2021. Also, as per World Steel Association, the production of crude steel stood at 1878 million tones of which China accounted up to 56.6%, showing an increase of 3.4% from 2019. Hence the rapid development in the construction and metallurgical sector in such countries has positively impacted the demand for graphite in them, thereby positively impacting the growth of the graphite industry in the Asia-Pacific region.

Graphite Market Drivers

Increase in Demand for Electric vehicles

With the growing technological advancements, consumers have started shifting their demand from manual vehicles to electric hybrid vehicles. Various automotive plants for e-vehicles are being set up in

countries. For instance, as per European Automobile Manufacturing Association, the production for e-vehicles increased up to 11% in 2020 from 3% in 2019 in the EU, and as per the International Energy Agency, electric car registration increased by 41% in 2020 globally, with China and Europe being the largest electric vehicle market. Graphite is used in the manufacturing of lithium-ion based batteries which are used as fuel in new generation vehicles like electric and autonomous vehicles. Hence with the increase in the production of electric vehicles, the demand for graphite to be used in lithium-ion batteries will also increase, thereby having a positive impact on the growth of the graphite industry.

Increase in the volume of construction activities

Emerging economies, rapid urbanization, and various infrastructural developments undertaken by countries

have increased the scale of construction activity. For instance, as per the National Bureau of Statistics, China construction industry grew by 22.8% in Q1 of 2021 preceded by 6.6% in Q4 and 8.1% in Q3 and 7.8% in 2020 and as per the State Council for the People's Republic of China, in July 2021 China approved projects related to the development of affordable rental homes for better access to housing in China's big cities Also, as per U.S Census Bureau, the total construction spending in November 2021 was $1,625 billion which was 0.4% more than from October same year and 9.3% more compared to November 2020 spending of $1,463.3 billion. Hence the increase in the scale of construction activities will lead to increase in demand for graphite to be used in construction material, thereby providing more growth opportunities for graphite industry in the construction sector

Graphite Industry Outlook

The companies to develop a strong regional presence and strengthen their market position, continuously engaging in mergers and acquisitions. Graphite's top 10 companies include:

- Showa Denko Materials Co., Ltd
- BTR New Materials Group Co. Ltd
- GrafTech International Holding Inc.
- Mason Graphite Inc.
- SGL Group
- Triton Mineral Ltd.
- Nippon Graphite Industries Co. Ltd
- Northern Graphite Corporation
- Syrah Resource Limited
- Graphite India Ltd.

Recent Developments

In 2021, Mason Graphite Inc. formed a joint venture with Thomas Swan Co & Limited called Black Swan Graphene. Hence the venture will enable Mason Graphite to use the graphene processing technology of Thomas Swan, thereby creating a meaningful graphite demand for the company.

In 2021, Northern Graphite Corporation signed a binding purchase and sale agreement to acquire 100% ownership of Lac des Iles graphite mine in Quebec and Okanjande graphite mine in Namibia. Hence such purchase will make the company the only North American and third-largest non-Chinese graphite producing company.

The global graphite market size is projected to grow from $14.83 billion in 2021 to $25.70 billion in 2028 at a CAGR of 8.2% in the forecast period, 2021-2028

The market for graphite

Attributes	Details
North America Market Size in 2021	USD 4.7 Billion
Latin America Market Size in 2021	USD 1.2 Billion
Europe Market Size in 2021	USD 3.6 Billion
East Asia Market Size in 2021	USD 7.1 Billion

3.7 What Equipment Is Needed for Graphite Ore Beneficiation

In recent years, with the strong rise of the new energy industry, related raw materials have received extensive attention. Among them, graphite, as an important battery anode material, is of great significance in the development of new energy, and its beneficiation technology and equipment have been greatly developed. The graphite ore beneficiation process mainly includes the stages of crushing, grinding, and beneficiation.

Graphite ore crushing stage

Graphite ore is soft in nature. Generally, the hardness of graphite ore is medium-hard or medium-hard and soft. Therefore, the crushing process of graphite is relatively simple, and the crushing process that can usually be used includes two-stage one-closed-circuit crushing, two-stage open-circuit crushing, or one-stage open-circuit crushing process. A small number of new graphite ore processing plants may also adopt a three-stage closed-circuit crushing process.

The first-stage crushing of graphite ore usually uses a. The secondary crushing can use a cone crusher to further reduce the particle size of graphite ore. Screening equipment can use circular vibrating screen

Crystalline graphite ore grinding stage

Since graphite has a flake structure, it is necessary to ensure that the graphite concentrate has as many large

flakes as possible in the grinding stage to improve the large flake rate of the concentrate. At this stage, the shape of the grinding medium and the form of the mill has a great influence on the large flake rate of the graphite concentrate. In the selection of, rod mills, vertical stirring mills, and other equipment can be selected as the main grinding equipment

Crystalline graphite ore beneficiation stage

According to the properties of raw graphite ore, the beneficiation of crystalline graphite can be divided into four types: coarse flake graphite ore, medium flake graphite ore, fine flake graphite ore, and cryptocrystalline graphite ore. Due to the different properties, the four types of graphite have different sorting methods, and flotation is the main sorting method.

①Coarse flake graphite ore has large graphite flakes and good floatability. The graphite particle size is generally 0.6~2mm, the graphite content is 1%~10%, and the raw ore contains a certain amount of mica. In the separation of this kind of graphite ores, the main purpose is to protect the large scales. The grade of graphite concentrate is above 87%.

②In the medium flake graphite ore, the raw graphite flakes are medium in size and have good floatability. The graphite particle size is 0.2~0.6mm, and the graphite content is 4%~15%. This kind of ore contains less mica, and the beneficiation is mainly to protect the existing graphite flakes and improve the yield of large flake graphite. Its graphite concentrate grade is controlled at 86% to 90%.

③ The graphite flakes of fine flake graphite ore are smaller, and the floatability is poorer than that of

medium flake graphite. The particle size of graphite in the raw ore is 0.03~0.2mm, and the graphite content is 6%~15%. The selection of this kind of graphite ore is mainly to improve the purity of graphite. At the same time, the graphite flakes are protected from damage, which can reduce the requirement of graphite recovery rate. The grade of graphite concentrate is generally around 90%. Multi-stage grinding and multi-stage beneficiation process are often used in this kind of ore separation to strengthen the beneficiation process.

④ The graphite particle size of cryptocrystalline graphite is generally below 1 μm. Due to its fine graphite particle size, other beneficiation methods can also be used in addition to the flotation method, such as alkaline acid method, hydrofluoric acid method, high temperature purification method, etc.

In the process of graphite ore flotation, the flotation equipment selected can be aerated agitated flotation machine, mechanical agitated flotation machine, flotation column, etc. Among them, KYF-type flotation machine and XCF-type flotation machine can be selected for aerated stirring flotation machine, and SF-type flotation machine, JJF-type flotation machine, BF-type flotation machine, etc. can be selected for mechanical stirring flotation machine. Among them, the XCF flotation machine can form a flotation unit with the KYF flotation machine. The horizontal configuration of the flotation unit can be realized without the need to use a foam pump, and the capital construction cost required for the stepped configuration can be reduced.

The above is about the content of graphite ore beneficiation equipment. In actual beneficiation production, scientific and reasonable beneficiation

process and beneficiation equipment should be determined according to the properties of graphite and the test results after , so as to ensure the economic benefits of the beneficiation plant and the rational utilization of resources.

4.0 Graphite Production Process

- **Mining**

Graphite ore is mined using excavating machines that carry dump trucks with raw ore.

The entire extraction process follows a mining plan, facilitating the selection of the most suitable one for final products.

- **Homogenization**

The deposition of this ore on the feeding plant is systematized to form feeding piles in layers.

The goal is to reduce the natural variability of the ore.

- **Mechanical Concentration**

The ore is subjected to successive grinding and a mechanical process separating impurities from the graphite. The mechanical concentration aims for maximum recovery of the graphite present in the ore, preserving its physical features.

- **Chemical Concentration**

The chemical concentration is used to remove the remaining impurities in the previously graphite mechanically concentrated. Nacional de Grafite uses and treats the residues of the chemical concentration in order not to pollute the environment.

- **Filtering and drying**

After the chemical concentration, the graphite is washed extensively with demineralized water, reaching a neutral pH. The remaining moisture is removed in Press-type filters and rotary dryers.

- **Classification**

Screening techniques are used to classify the particles of the concentrated graphite, reaching the desired particle size distribution.

- **Milling**

Jet and hammer mills grind the concentrated graphite until it reaches the desired size. The ground particles are classified, enabling control of the particle size distribution of the product generated. The different methods of grinding and classification allow for the shaping of the particle, giving the graphite distinct characteristics of density and a specific surface.

- **Briquetting**

In this process, agglomerated graphite grains are produced for use as carburized and carbon additives.

- **Intercalation**

Due to its extreme anisotropy, the graphite crystal enables salts to be intercalation in its structure. When heated, these salts evaporate, causing the disruption of inter-planar connections, "expanding" the graphite. Nacional de Grafite developed graphite intercalation and expansion processes compatible with the environment.

GOD MWANGA GEMS LIMITED COST STRUCTURE

	US$
PARTICULAR	
Land and Buildings	100,000.00
Vehicles	205,000.00
Plant and Machinery	1,000,000.00
Furniture & Fittings	5,000.00
Others	190,000.00
Working Capital	800,000.00
TOTAL	**2,300,000.00**

For the project to be a reality a total investment amounting to US $2,300,000. is needed

7.1 Financing pattern

The project will be financed by a US$2,300,000 contributions from company shareholders and cash flow from business

8.0 Financial Analysis

8.1 Considerations and Assumptions:

The corporate tax charged is 0% of the profits for 8 years. The capital investment allowance is 50%. The capital assets are exempted from customs duty and Value Added Tax. The straight-line method to depreciate the project's capital items has been applied.

Revenues have been conservatively estimated based on the experience of the promoters and trends in the industry.

8.2 Projected Profit and Loss Statement

The Income and Expenditure Statement shows the projected income for the 5 years period. The position depicted is that the project earns profit throughout its

life. Accumulated after profits grow from. US$ 544,075 in the first year to US $ 3,456,259 in the 5th year

GOD MWANGA GEMS LIMITEDPROJECTED INCOME & EXPENDITURE STATEMENT (US$)

-	**1**	**2**	**3**	**4**	**5**
Revenue (	10,000,000.00	10,500,000.00	11,025,000.00	11,576,250.00	12,155,062.50
Operating Expenses:	8,000,000	8,400,000	8,820,000	9,261,000	9,724,050
Gross Profit Before Interest and Depreciation	2,000,000	2,100,000	2,205,000	2,315,250	2,431,013
Interest	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Depreciation	22,750	22,750	22,750	22,750	22,750
Gross Profit	777,250	877,250	982,250	1,092,500	1,208,263
Tax (30%)	233,175	263,175	294,675	327,750	362,479
Profit After Tax	544,075	614,075	687,575	764,750	845,784
Accumulated Profit	544,075	1,158,150	1,845,725	2,610,475	3,456,259

7.5 Projected Cash Flows

This is shown in the financial statements. The project has a positive end-of-year cash flow from year 1st, i.e., US$ 1,766,825 of operation to the 6th year i.e., US$ 9,570,009

GOD MWANGA GEMS LIMITED PROJECTED CASH FLOW " US$"

SOURCES:	0	1	2	3	4	5
Profit before interest and depreciation	-	**2,000,000**	**2,100,000**	**2,205,000**	**2,315,250**	**2,431,013**
Equity	2,300,000					
Loan	-					
Total Sources	**2,300,000**	**2,000,000**	**2,100,000**	**2,205,000**	**2,315,250**	**2,431,013**
Applications:						
Capital expenditure	1,310,000		-	-	-	-
working Capital &Others	990,000					
Cash	-	1,766,825	1,836,825	1,910,325	1,987,500	2,068,534
Tax	-	233,175.00	263,175.00	294,675.00	327,750.00	362,478.75
Subtotal	**2,300,000**	**2,000,000**	**2,100,000**	**2,205,000**	**2,315,250**	**2,431,013**
Total applications	**2,300,000**	**2,000,000**	**2,100,000**	**2,205,000**	**2,315,250**	**2,431,013**
Accumulated cash		1,766,825	3,603,650	5,513,975	7,501,475	9,570,009

7.6 Projected Balance Sheet Statement

The projected shareholder's equity increases from US$ 2,300,000 in 1st year to loan US $5,756,259 in 5th

GOD MWANGA GEMS LIMITED PROJECTED BALANCE SHEET " US $"

Fixed Assets	**1**	1	2	3	4	5
Opening balance	-	**1,310,000**	**1,287,250**	**1,264,500**	**1,241,750**	**1,219,000**
Total Long-term Assets	**-**	**1,310,000**	**1,287,250**	**1,264,500**	**1,241,750**	**1,219,000**
Less depreciation	**-**	**22,750**	**22,750**	**22,750**	**22,750**	**22,750**
Closing balance	**-**	**1,287,250**	**1,264,500**	**1,241,750**	**1,219,000**	**1,196,250**
Working capital	990,000	990,000	990,000	990,000	990,000	990,000
Accumulated cash	-	1,766,825	3,603,650	5,513,975	7,501,475	9,570,009
Total assets	**990,000**	**4,044,075**	**5,858,150**	**7,745,725**	**9,710,475**	**11,756,259**
Financed by						
Equity	2,300,000	2,300,000	2,300,000	2,300,000	2,300,000	2,300,000
Accumulated profit	-	544,075	1,158,150	1,845,725	2,610,475	3,456,259
Total equity	2,300,000	2,844,075	3,458,150	4,145,725	4,910,475	5,756,259
Total equity and debts	**2,300,000**	**2,844,075**	**3,458,150**	**4,145,725**	**4,910,475**	**5,756,259**

8.0 **Economic Aspects**

Implementation of this project will have the following social and economic values

- The project is an ideal option for the utilization of the available mineral's mineral resources

- The project will create employment for **40** people on a permanent contract basis as well as on a temporary basis.
- It will create more business opportunities for local suppliers which will also have an economic trickledown.
- It will generate substantial revenue for the government in the form of corporate tax, value-added tax, and pay-as-you-earn.
- The project will have the transfer of knowledge and skills to minerals process management
- Increase in foreign currency

9.0 Implementation

Project implementation is expected to be relatively very short once the project has been approved it is estimated that the project will be completed within one year: -

GOD MWANGA GEMS LIMITED IMPLEMENTATION

S/N	ACTIVITY	PERIOD
1	Processing TIC Certificate	June 2023
2	Placing order of machines	June– August 2023
3	Installing machines	September –April 2024
4	Recruitment	April 2024
5	In house training	April- May 20234
4	Testing production	May 2024
6	Commercial operations	June 2024

10.0 Conclusion & Recommendations

The project is technically feasible, financially viable, and economically sound, provided the sponsors will manage it efficiently.

It is recommended that the project be approved by Tanzania Investment Centre and be granted the TIC Certificate of Incentives with its associated privileges and benefits as provided for under the Tanzania Investment Act, 1997.