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Export Potential of Magnesium Oxide

A Case of Exploiting Opportunities in Mineral Industry

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Alphabets	Abbreviation	Explanation
B	Bn	Billion
F	FY	Fiscal Year
	Ft	Feet
H	HS Codes	Harmonized System Codes
I	ITC	International Trade Center
K	KG	Kilogram
	Km	Kilometer
M	MT	Metric Tons
	Mn	Million
	MT	Metric Tons
P	PKR/Rs	Pakistani Rupee
U	UN	United Nations
	U. S	United States of America
	UK	United Kingdom
	USD	United States Dollar
T	TPD	Tons Per Day

Executive Summary

Magnesium carbonate, also known as magnesite, is a naturally occurring mineral, and one of the key source to produce magnesium oxide (MgO), also known as magnesia. It is the eighth most abundant element in the earth's crust, present in a range of rock formations such as dolomite, magnesite and silicate. Pakistan owns 11th largest magnesite reserves. Which are estimated around 12 million metric tons, in the area of Khuzdar, Muslimbagh, Malakand, & Hazara.

Pakistan is among the 10 largest exporters of magnesite. Pakistan exports most of its extracted magnesite, around 31856 metric ton (MT), and generate $1.6 million of revenue. Due to lack of calcination facilities most of magnesite is exported to other countries. However only a handful of firms are producing low grade calcined magnesia. While, Pakistan imports around $1.4 million or 2003 metric ton (MT) of magnesia, to meet the requirement of domestic industry.

Magnesite is among those minerals that are being exploited rapidly, without any benefit to our economy. The study aims to promote domestic production calcined magnesia, and restrict the exploitation of mineral resources, through the exports of primary goods e.g. magnesite ore. The domestic production of magnesia can be enhanced by exposing imports of magnesia to tariff. Other objectives include the formalization of mining, it will bring financial benefits through financial inclusion and PSDP budget allocations.

The analysis of the study exhibits the feasibility of magnesite calcination plant, produces calcined magnesia around 100 (TPD) ton per day with purity at 90% to 92%. For one ton of calcined magnesia require almost 2.3 ton of magnesite ore. The feasibility study estimates the net income or profit after tax of magnesia per year, is recorded as Rs:198.5 million in first year, and it is extended to Rs:782 million in the fifth year. These figures are calculated at a unit cost of magnesia $250 per ton. The payback period is estimated at one year and seven months, with the internal rate of return is 85. 55% for a period of five years.

The analysis of the study exhibits that Pakistan exports around $1.63 million of magnesite at a unit cost of $51.26 in 2021. Almost half of Pakistan's magnesite exports goes to United Arab Emirates (UAE) $830 thousand, while, other major importers include China, Greece, and Egypt. Pakistan imports around $1.4 million of magnesia in 2021. Calcined grade magnesia is also produced

domestically. Pakistan fulfills most of its magnesia demand by importing from China, Japan, Taiwan, and Germany.

The study concludes that feasibility study of producing magnesia exhibits 85.55% internal rate of return, which is highly significant. Higher returns are expected by producing highly pure pharmaceutical grade magnesia domestically. Pakistan produces calcined magnesia of low grade with 90% to 92% purity level, carrying a price tag $250 per ton. While, Pakistan imports high purity, chemical grade, and pharma grade calcined magnesia at unit cost ranging from $1000 to $66,500 per ton.

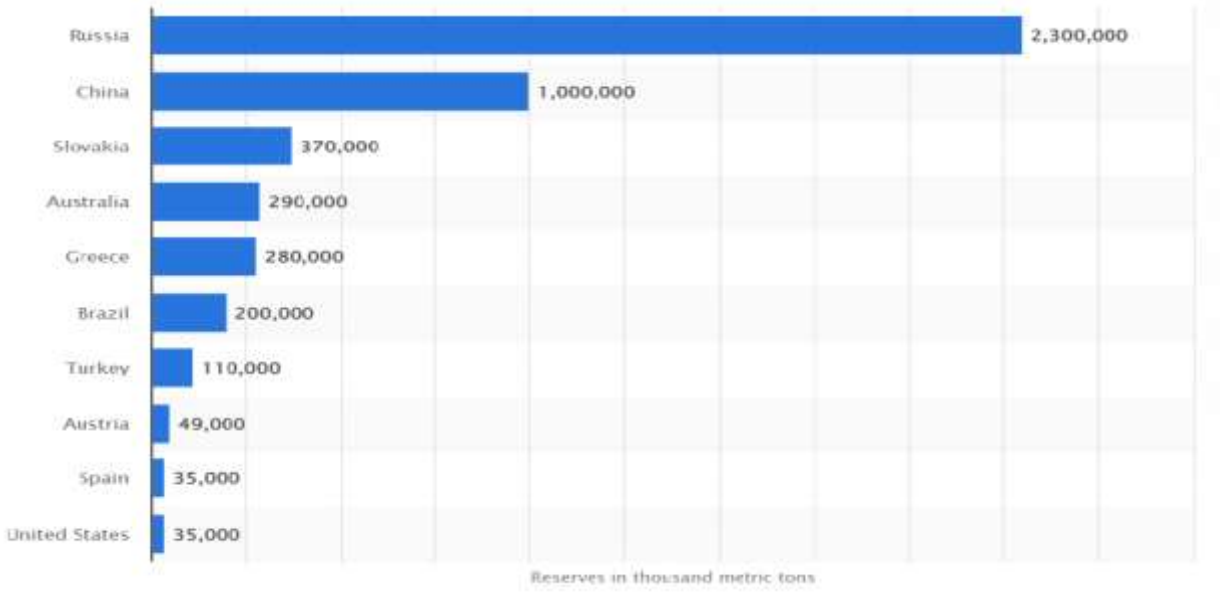
The study suggests that better investment environment or investment heavens will attract foreign investors in mineral and chemical industry. The study recommends to invite United States and Japan's firms for joint ventures and technology transfers to produce high purity pharmaceutical grade magnesia for domestic and foreign markets.

Chapter 1 Introduction

Minerals are one of the principal natural resources essential for the economic development of any country. Presently, the mineral sector of Pakistan is not substantially contributing in the Gross Domestic Product (GDP). Although, the country is endowed with huge reserves of minerals covering an outcrop area of 600,000 sq. Km. There are 92 known minerals of which 52 are commercially exploited with a total production of 68.52 million metric tons per year. The sector is a promising one with an average growth of 2-3% per annum, existence of above 5,000 operational mines, 50,000 SMEs and direct employment of 300,000 workers.[1]

Magnesite[2] is the eighth most abundant element in the earth's crust, present in a range of rock formations such as dolomite, magnesite and silicate, and also from seawater and brine sources (Tabba, 2013). As of 2021, Russia had the largest reserves of magnesite worldwide, amounting to some 2.3 billion metric tons. And, China stands at second, having 1 billion metric tons. While, Slovakia, Australia and Greece also keep substantial amount of magnesite reserves, having 370 million metric tons, 290 million metric tons, and 280 million metric tons, respectively. Magnesite reserves in Spain and United States stood at approximately 35 million metric tons that same year.

Figure 1 Countries with Highest Magnesite reserves



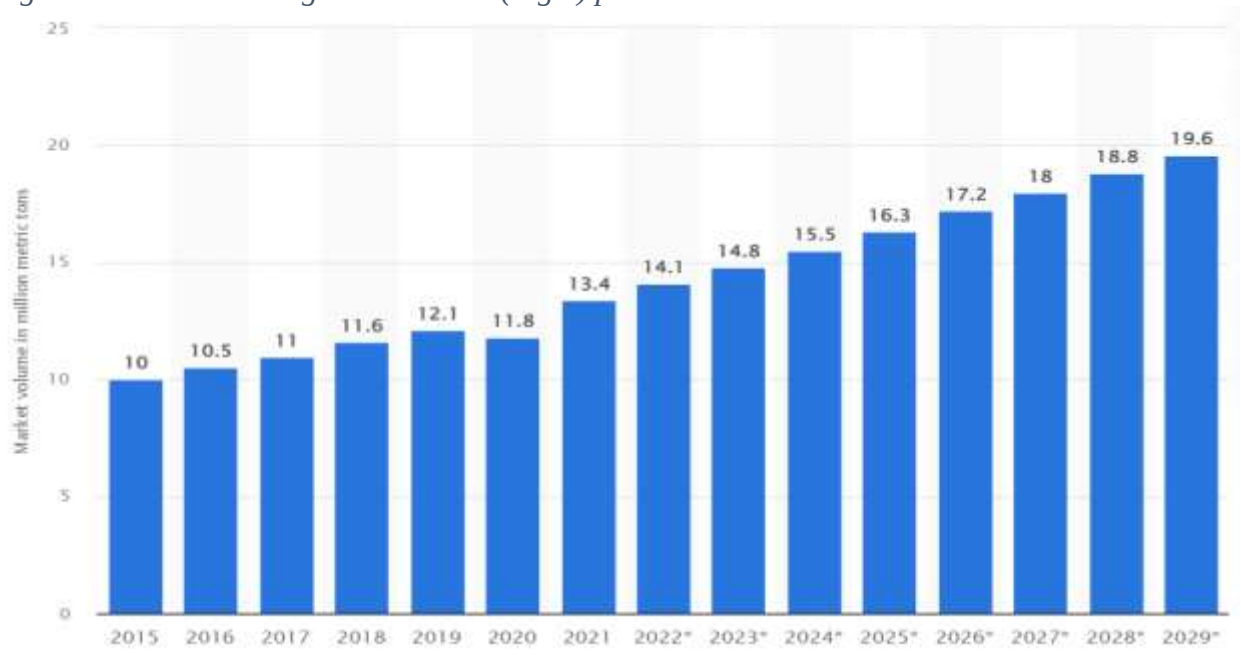
Source: Statista 2021

[1] Mineral Sector Plan/Road Map, SMEDA

[2] The study uses magnesite interchangeably with magnesium carbonate, both are raw magnesium in the form of mineral.

Pakistan owns 11th largest magnesite reserves. Which are estimated around 12 million metric tons, in the area of Khuzdar, Muslimbagh, Malakand, & Hazara. Extractions or production of magnesite in Pakistan is quite under recorded in Pakistan, due to undocumented mining in the country. According to Pakistan Bureau of Statistics, Pakistan produces around 61,263 metric tons of magnesite as of 2018. While, Pakistan exports around 42,966 metric tons, during 2018-19. Which reduced to 16,165 metric tons in 2019-20. While, at the same periods Pakistan's exports of magnesite are recorded as 68,582 metric tons, and 20,947 metric tons, according to Pakistan Bureau of Statistics. As of 2021, the major importers of the magnesite from Pakistan are UAE, China, Egypt, Greece, Malaysia, and Oman. Which imports around 37,290 metric tons of magnesite from Pakistan.

Figure 2 Worldwide Magnesium Oxide (MgO) production in million metric ton



Source: Statista 2021

In 2021, the market volume of magnesium oxide (MgO)[3] amounted to approximately 13.4 million metric tons worldwide. By the year 2029, this figure is forecasted to grow to around 19.6 million metric tons. Meanwhile, the market value of magnesium oxide reached some 4.8 billion U.S. dollars in 2021 (Statista June, 2022). China has dominated the magnesium oxide (MgO) market for decades. At the beginning of 2017, it accounted for more than 50% of global magnesia

[3] The study uses Magnesium oxide (MgO) or magnesia interchangeably. It has 3 different forms calcined, dead burned, and fused magnesia.

production. However, in 2017 and 2018, the regulations imposed by the government of China, while addressing environmental concerns, have led to the shutdown of several magnesia plants in the country (technavio, 2021).

Pakistan is among the 10 largest exporters of magnesite. Pakistan exports most of its extracted magnesite, around 31856 metric ton (MT), and generate $1.6 million of revenue. Due to lack of calcination facilities most of magnesite is exported to other countries. However only a handful of firms are producing calcined magnesia, that is not of high purity or of pharmaceutical grade. While, Pakistan imports around $1.4 million or 2003 metric ton (MT) of magnesia, to meet the requirement of domestic industry.

Background of the study

Magnesite, Dolomite, and Brucite mines are among the crucial sources to acquire magnesium. Although in this study, our primary focus is on magnesium production, trade potential, and its various applications in the industry. Magnesium is extracted in the raw form of magnesium carbonate or magnesite. And it is one of the key source to produce magnesium oxide (MgO), also known as magnesia. While, dolomite mines are also the important source for acquiring magnesia. Which is widely used to produce refractory bricks and flux. They both can with stand high temperatures. While brucite is composed of magnesium hydroxide $Mg(OH_2)$. It can be used as precursor of MgO. And, it is flame retardant.

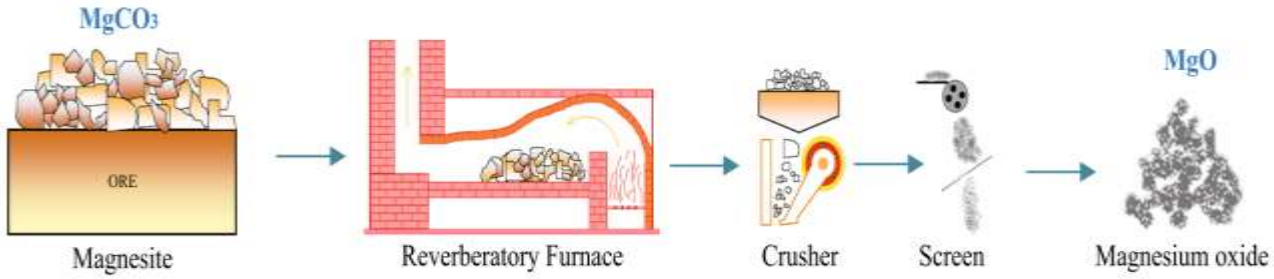
There are three crucial types of magnesia, which includes caustic calcined magnesia, dead burned magnesia, and fused magnesia. **Caustic calcined magnesia** is produced by calcination process of the raw magnesite (magnesium carbonate) at 600℃ to 1000℃ (Kümaş Manyezit Sanayi A.Ş.). Due to its high reactiry, widely used in water treatment, flue gas treatment, abrasive industry, magnesium salt production, feed industry, magnesium fertilizer in agriculture and so on. It is both, an end product and an intermediary step in the chain of magnesia products. Caustic magnesia is able to absorb liquids and to absorb heavy metals and ions from liquid streams and is therefore useful in water treatment.

Dead Burned magnesia is burned at 1750℃ to 2100℃ in rotary furnace, carbon dioxide is completely escaped, magnesium oxide formed a dense block of periclase. It is also called sintered magnesia, due to high temperature resistance, it is mainly used in refractories. **Fused magnesia** is superior to dead burned magnesia in strength, abrasion resistance and chemical stability. It is

produced by smelting of calcined magnesia in electric arc furnaces at above 2800°C. Fused magnesia is considered to be one of the best thermal and electrical insulators with high density, high purity and large crystals (Kümaş Manyezit Sanayi A.Ş.).

Magnesium oxide or magnesia belongs to ore magnesium carbonate or magnesite, as its chemical composition include $MgCO_3$. While, other impurities of magnesite include calcium oxide CaO, Silica SiO_2, Alumina Al_2O_3, and iron Fe_2O_3. The ore magnesite beneficiation process is mainly heat based. And, it is decomposed at 600^0C-1000^0C reverberatory furnace and rotary kiln. After the decomposition, the light burned MgO is with properties such as hot brittle, soft and fragile, however, the gangue mineral tale becomes hard. So the difference in the hardness and density of them is used to selectively break, sieve, and select the ore. Thus the high purity MgO powder is extracted.

Figure 3 Production process of Magnesium Oxide (MgO)



Source:(Yang, Lu, & Wang, 2018) Fused magnesia manufacturing process 2018

Magnesite is used to produce a great variety of caustic calcined magnesia products for the widest spectrum of applications, namely agricultural, industrial/technical & chemical, construction, environmental, steel / refractories. Magnesium Oxide and is widely used within the Animal Feed sector. Calcined magnesia is frequently used for ruminant livestock as a supplementary and economic source of Magnesium. During Spring and Autumn months, dairy and beef cattle are prone to magnesium deficiency called Hypomagnesaemia (Grass Staggers). The animals cannot store magnesium and therefore have low blood magnesium. So it is necessary to supplement their diet with a source of Magnesium, in order to prevent a metabolic disorder.

Table 1 Applications of Magnesium Oxide (MgO)

Uses	End User Industry	Product/ Function
Chemicals	Chemical manufacture	Additive, Feedstock, magnesium salts, metals and alloys
	Rubber	Catalyst and filler
	Pulp and Paper	Pulping Liquors
Iron and Steel	Magnesium metals	Removing sulfur from molten steel and iron
Automobile	Automobile/ Aircraft	Engine alloys, and various parts
Pulp and Paper	Pulp and Paper	Slag conditioners, insulators
Glass and ceramics	Construction and glass	Cement, Ceramics, and Fiberglass
Pharmaceutics	Pharmaceutical industry	Medicines, disinfectants
Agriculture	Fertilizer	Secondary/micronutrients
	Animal feed	Nutritional minerals
Energy	Oil and gas	Oil and gas
Human Consumption	Cosmetics	Raw materials
	Food	Raw materials

Source: (Bashir, Kaleem, & Hamza, 2008)

Magnesium oxide nanoparticles can be applied in electronics, catalysis, ceramics, petrochemical products, coatings and many other fields. Magnesium oxide nanoparticles can be used along with wood chips and shavings to make materials such as sound-proof, light-weight, heat-insulating and refractory fiber board and metallic ceramics.

Whereas dead burnt magnesia, which is chemically inert, is created in the rotary kiln by sintering raw magnesite at a controlled temperature of 1750^0C to 2100^0C. The production of refractory fiber and refractory materials, including magnesite-chrome brick, filler for refractory coating, refractory and insulating instruments, electricity, cable, optical material, steel-smelting furnace material and other high-temperature furnace material, heating material, and ceramic base plate, consumes dead burned magnesia almost exclusively.[4]

However, fused magnesia is utilized in electric insulating material for making crucible, smelter, insulated conduit, electrode bar, electrode sheet, high-frequency magnetic-rod antenna, magnetic

[4] https://www.azonano.com/article

device filler, insulating material filler and various carriers used in radio industry. It is also used as fire retardant for chemical fiber and plastics crafts.[5]

Problem Statement

Despite endowed with several high-valued mineral resources, Pakistan's mineral sector is performing unproductive and volatile. Principally, it is due to the lack of the government assistance. And, this sector is particularly shunned from its formal inclusion into the economy. The situation is similar with magnesite extraction, and production of magnesium oxide (magnesia). Magnesite is among those minerals that are being exploited rapidly, without any benefit to domestic industry or economy. Most of the magnesite ore is exported to other countries, while, country imports its intermediary or final product such as caustic calcined magnesia, dead-burned magnesia, and fused magnesia from international market.

Objective of the study

The study aims to develop or refined the policy framework, to promote domestic production of intermediary or final commodities e.g. calcined magnesia. And, restrict the exploitation of mineral resources, through the exports of primary goods e.g. magnesite ore. It will improve the trade balance, promote industrialization, and increase employment opportunities in rural areas of the economy. The domestic production of magnesia can also be enhanced by exposing imports of magnesia to tariff. The National Tariff Commission NTC is recommended to rationalize tariff in support of domestic industry, and confine dumping of magnesia from other countries.

The study aims to bring mining sector into formal economy, which is still largely informal, and confined it to declared as an industry. The formalization of mining will bring financial benefits through financial inclusion and PSDP budget allocations. It will provide opportunities to investors by raising fund from various banks. Other objectives include the sustainable supply of magnesite to domestic industry, which stabilize the price of magnesia for domestic economy. The production of magnesia should be brought at international quality standards, while, keeping environmental concerns.

[5] https://www.azonano.com/article

Significance of the study

The study will benefit the mineral sector in several ways, particularly in extraction of magnesite and production of magnesia. The study is essential to provide awareness to mine owners and encourage local investors. First, the study suggests to formalize the mineral sector. The formalization of mineral sector will bind the mine owners and investors in an institutional structure. Which will attract private investment, enhance production, and provide stable supply of mineral resources.

This study will also focus on financial inclusion of the mineral sector, and its easy access to private loan from bank. Which is crucial for the development of entire mineral sector. Second, the study will also emphasis on the feasibility of producing calcined, dead burned, and fused magnesia. And, the finally the study will suggest to tax the exporters raw magnesite. And, also introduce some duties on imports of calcined magnesia (not pharmaceutical grade). It will enhance domestic production of magnesia, and improve trade balance.

Chapter 2 Analysis of the study

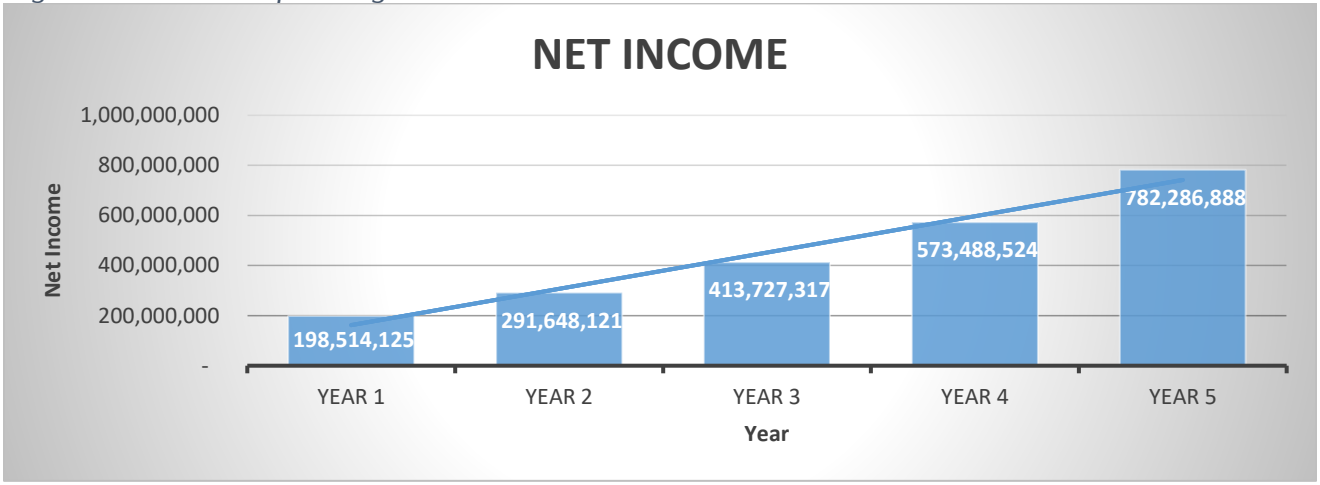
The chapter 2 covers the two major parts of the study. First, it provides and analyze the feasibility of producing calcined magnesia. And, second part will encompass the market analysis of calcined magnesia. Which exhibits the export potentials of calcined magnesia or magnesium oxide.

Feasibility analysis of the study

The feasibility analysis of the study exhibits the feasibility of magnesite calcination plant. Which produces calcined magnesia around 100 (TPD) ton per day with purity at 90% to 92%. For one ton of calcined magnesia require almost 2.3 ton of magnesite ore.

The figure highlights that the estimated net income or profit after tax of magnesia per year, is recorded as Rs:198.5 million in first year, and it is further extended to Rs:782 million in the fifth year. These figures are calculated as at unit cost of magnesia $250 per ton. The payback period is estimated at one year and seven months, and the internal rate of return is 85. 55% for a period of five years.

Figure 4 Net Income from MgO Production



Source: Employees Federation of Pakistan

Below are the five-year financial projections of Magnesium oxide production plant:

Table 2 Financial Projections of MgO Production Plant

	MONTHLY	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
REVENUE						
MgO	139,125,000	1,669,500,000	2,170,350,000	2,821,455,000	3,667,891,500	4,768,258,950
DIRECT COST						
ELECTRICITY	8,550,000	102,600,000	133,380,000	173,394,000	225,412,200	293,035,860
WATER	25,000	300,000	390,000	507,000	659,100	856,830
COAL	28,228,261	338,739,130	440,360,870	572,469,130	744,209,870	967,472,830
RAW MATERIAL	55,200,000	662,400,000	861,120,000	1,119,456,000	1,455,292,800	1,891,880,640
SALARY	4,050,000	48,600,000	63,180,000	82,134,000	106,774,200	138,806,460
PACKAGING COST	3,000,000	36,000,000	46,800,000	60,840,000	79,092,000	102,819,600
REPAIR & MAINTENANCE	1,165,906	13,990,872	18,188,133	23,644,574	30,737,946	39,959,329
MISCELLANEOUS	675,000	8,100,000	10,530,000	13,689,000	17,795,700	23,134,410
INDIRECT COST						
DEPRECIATION	3,148,610	3,148,610	3,148,610	3,148,610	3,148,610	3,148,610
SHIPPING COST	10,000,000	120,000,000	132,000,000	145,200,000	159,720,000	175,692,000
INTEREST EXPENSE	4,335,815	52,029,781	44,612,214	35,933,661	25,779,754	13,899,683
TOTAL COST	118,378,592	1,385,908,393	1,753,709,827	2,230,415,975	2,848,622,180	3,650,706,253
PBT	20,746,408	283,591,607	416,640,173	591,039,025	819,269,320	1,117,552,697
INCOME TAX	6,223,922	85,077,482	124,992,052	177,311,707	245,780,796	335,265,809
PAT	14,522,486	198,514,125	291,648,121	413,727,317	573,488,524	782,286,888
CASHFLOWS						
DEPRECIATION	3,148,610	37,783,323	37,783,323	37,783,323	37,783,323	37,783,323
OPERATING CASHFLOWS	17,671,096	236,297,448	329,431,444	451,510,640	611,271,847	820,070,211

Source: Employees Federation of Pakistan

Market analysis of the study

Pakistan exports only magnesite ore / magnesium carbonate, and imports magnesia / magnesium oxide from international market, which is an intermediary or final product. The table highlights the total magnesite exports of Pakistan since 2017 to 2021. Pakistan export around $1.34 million and $1.63 million magnesite in 2020 and 2021, respectively. Almost half of Pakistan's magnesite exports goes to United Arab Emirates (UAE), $520 thousand in 2020, and $830 thousand in 2021. While, other major importers of magnesite include China, Greece, and Egypt.

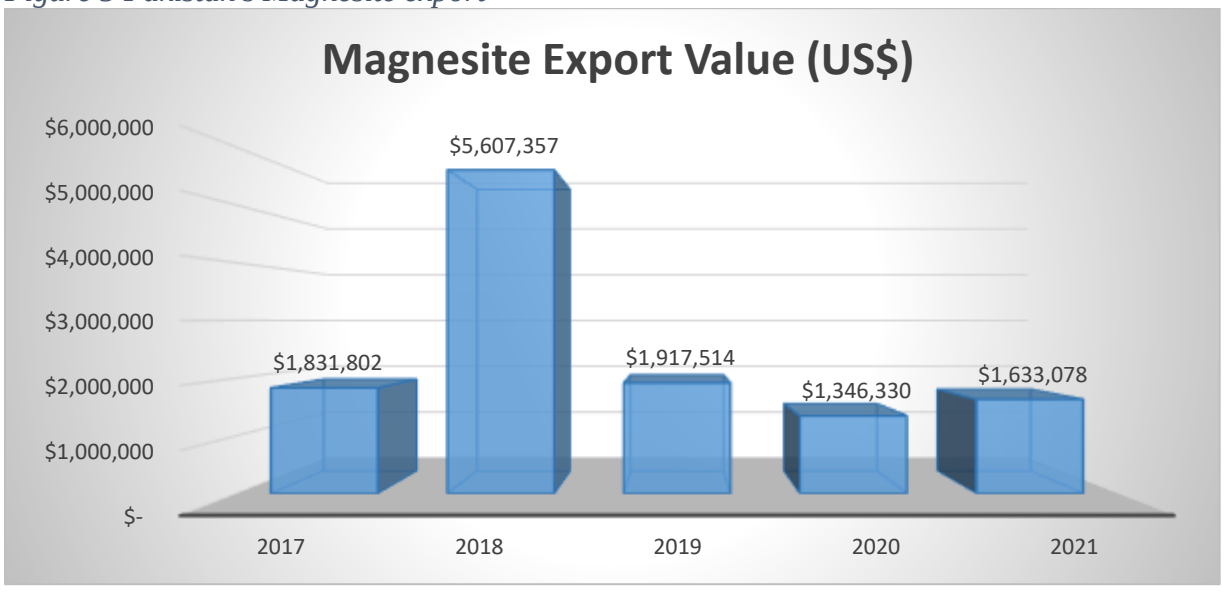
Table 3 Pakistan's magnesite export

Period	Trade Flow	HS Code	Commodity	Weight (MT)	Trade Value (US$)	USD/MT
2017	Export	251910	Magnesite	22,782	$ 1,831,802	$ 80.41
2018	Export	251910	Magnesite	79,823	$ 5,607,357	$ 70.25
2019	Export	251910	Magnesite	35,630	$ 1,917,514	$ 53.82
2020	Export	251910	Magnesite	27,578	$ 1,346,330	$ 48.82
2021	Export	251910	Magnesite	31,856	$ 1,633,078	$ 51.26

Source: Comtrade

The table also highlights that in 2018, Pakistan exports were sharply rose to $5.6 million from $1.8 million in 2017, were the result of opening trade towards India. During this period, almost $4.8 million or 86% of our total magnesite were exported to India. Additionally, the table highlights a sharp decline in the price of magnesite from $80 per metric ton to $48 per metric ton from 2017 to 2020. However, a small price gain of less than $3 per ton is recorded in 2021.

Figure 5 Pakistan's Magnesite export



Source: Comtrade

The figure also depicts the similar trends of magnesite exports, which are slightly less than the $2 million. Meanwhile, the graph also highlights a sudden huge jump in magnesite demand to $5.6 million during 2018. It was the result of opening trade towards India. And almost $4.8 million or 86% of our total magnesite is exported to only India, and remaining 14% to Greece and China.

Table 4 Pakistan's Import & Export of Magnesium Oxide

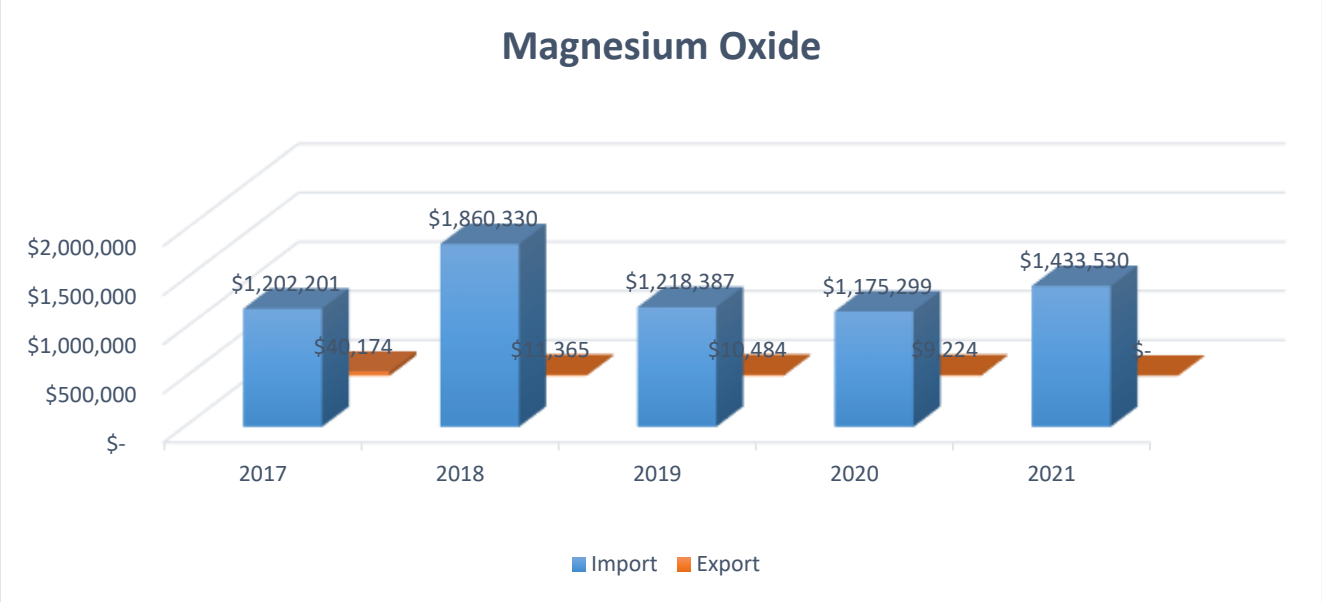
Period	Trade Flow	Reporter	Partner	HS Code	Commodity	(Weight) MT	Trade Value (US$)	USD/MT
2017	Import	Pakistan	World	251990	Magnesia	1150	$ 1,202,201	$1,045.39
2017	Export	Pakistan	World	251990	Magnesia	250	$ 40,174	$ 160.70
2018	Import	Pakistan	World	251990	Magnesia	2599	$ 1,860,330	$ 715.78
2018	Export	Pakistan	World	251990	Magnesia	88	$ 11,365	$ 129.15
2019	Import	Pakistan	World	251990	Magnesia	1436	$ 1,218,387	$ 848.46
2019	Export	Pakistan	World	251990	Magnesia	57	$ 10,484	$ 183.93
2020	Import	Pakistan	World	251990	Magnesia	2294	$ 1,175,299	$ 512.28
2020	Export	Pakistan	World	251990	Magnesia	42	$ 9,224	$ 219.62
2021	Import	Pakistan	World	251990	Magnesia	2003	$ 1,433,530	$ 715.69

Source: Comtrade

Pakistan imports around $1.4 million of magnesia in 2021, increased from $1.1 million in 2020. Calcined grade magnesia is also produced domestically, and a negligible amount or few thousand USD of magnesia is also exported to countries like India, Japan, Qatar & Greece in 2018, 2019, and 2020. Pakistan fulfills most of its magnesia demand by importing from China, Japan, Taiwan, and Germany.

Another important concern which table highlights, is that Pakistan imports magnesia at around $1,045.39 per metric ton in 2017, $ 848.46 per metric ton in 2018, and $715 per metric ton in 2019 and 2021. While, Pakistan exports magnesia at far lower prices of $129 per metric ton in 2018 to $219 per metric ton in 2020. A huge difference of the magnesia price is probably due to the quality (purity) of magnesia.

Figure 6 Pakistan's Import & Export of Magnesium Oxide



Source: Comtrade

The figure also shows that imports of magnesia are far higher than its export. Almost all of the year, exports of magnesia are ground hugging in the figure, not exceeding few hundred thousand USD (United State Dollar).

Table 5 Top Importing Countries of Magnesium Oxide (MgO)

Importers	Import Value (US$)	(Weight) MT	(US$)/MT	AGR(%) 2020-2021	Average tariff (%)
World	$ 2,430,078,000	-	-	40	-
United States	$ 305,345,000	568,702	$ 537	67	0
Congo, DR	$ 218,527,000	209,454	$ 1,043	103	5
Germany	$ 203,045,000	445,429	$ 456	24	0.2
Japan	$ 175,101,000	451,389	$ 388	64	0
India	$ 155,791,000	346,397	$ 450	63	4
Austria	$ 148,296,000	288,234	$ 514	46	0.2
Korea, Rep.	$ 112,264,000	245,165	$ 458	69	1.8
Taiwan	$ 69,484,000	258,166	$ 269	39	0.5
Poland	$ 62,289,000	120,659	$ 516	32	0.2
Netherlands	$ 59,463,000	178,374	$ 333	68	0.2
China	$ 57,425,000	45,917	$ 1,251	3	5.8

Source: Trademap

The table above highlights the major import markets of magnesia, which is estimated around $2.4 billion. The table also include the top 11 largest importers of magnesia which includes United States, Democratic Republic of Congo, Germany, Japan, India, and Austria. Which imports more than $100 million of magnesia. The country like Pakistan can benefit by improving the purity and quality of magnesia. As the table highlights that their average import price is far higher than the Pakistan's export price of magnesia. However, all countries are importing at far lower prices than Pakistan's import of magnesia, except Congo Democratic Republic.

Chapter 3 Conclusion

Pakistan's mineral sector does not produce sufficient magnesia (calcined or other) to accomplish domestic market demand. However, feasibility study of producing magnesia in Pakistan is highly significant, as industry exhibits Internal rate of return 85.55 percent. Higher returns are expected by producing highly pure chemical grade and pharmaceutical grade magnesia domestically. While, very few firms in the industry produce calcined magnesia of low grade, ranging from 90 percent to 95 percent purity level. It barely carries a price tag of $250 per ton. While, no firm is producing dead burned / fused magnesia.

The industry imports all of the high purity, chemical grade, pharma grade calcined magnesia, and dead burned / fused magnesia. These all calcined grade are imported at higher prices e.g. modest grade calcined magnesia is around $370 to $1000 per ton, high purity grade magnesia $1000 t0 $2000 per ton, chemical grade calcined magnesia is greater than $2000 to $5000, and pharmaceutical grade calcined magnesia is too expensive costs ranging from $9500 to $66,500 per ton. While, dead burned and fused magnesia is imported at unit cost of $1350 to $5000 per ton.

Chapter 4 Recommendations

The study will recommend several outputs; First, the study will suggest the security of investors and investments. The study suggests to provide viable investment environment or investment heavens and reduced security concerns. Provision of better investment environment or investment heavens will attract foreign investors in mineral and chemical industry. The study also suggests to invite United States and Japan's firms for joint ventures and technology transfers to produce high purity pharmaceutical grade magnesia for domestic and foreign markets.

Secondly, the study suggests the formalization of the mineral sector. The formalization of mineral sector will drag the mine owners and investors in an institutional structure. Which will attract private investment, enhance mineral (magnesite) extraction, and provide stable supply of mineral (magnesite) resources.

Finally, this study will also focus on financial inclusion of the mineral sector, and its easy access to private finance from bank. Which is crucial for the development of entire mineral sector.

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