Report No: TDAP-Mining
Series : 02/2022

Analysis of Chromite Potential and its Value-added Products in Pakistan

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Trade Development Authority of Pakistan.
June – 2022

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Table of Contents

List of Tables

List of Figures

List of Abbreviations

Alphabets	Abbreviation	Explanation
B	Bn	Billion
F	FY	Fiscal Year
	Ft	Feet
	FTA	Free Trade Agreement
G	GCC	Gulf Cooperation Council
H	HS Codes	Harmonized System Codes
I	ITC	International Trade Center
K	KG	Kilogram
	Km	Kilometer
M	MMT	Million Metric Tons
	Mn	Million
	MT	Metric Tons
P	PKR/Rs	Pakistani Rupee
U	UN	United Nations
	USD	United States Dollar

Executive Summary

Pakistan has huge mineral reserves covering an outcrop area of 600,000 square kilometers. There are currently 92 identified minerals, 52 of which are commercially mined, with a total annual production capacity of 68.52 MMT. On average, the sector grows at a rate of 2 to 3 percent per year. One of the most important minerals is chromite and its value-added products, which were extracted at 115,000 MT in the fiscal year 2020. Despite possessing vast riches, Pakistan has been unable to realize its full potential. Furthermore, chromite has a wider market with a $2 billion global demand. Chromite is used for the production of ferrochrome, which is then used for the manufacturing of stainless steel. Over 95 percent of chromium consumption is attributable to metallurgical applications, with stainless steel alone representing 78 percent of consumption in 2019. Trends in stainless steel production are, therefore, the main determinant for chromium demand.

Mining of chromite is done manually; no modern technology is being used in the mining process. The process includes blasting in the mine, manual hammering, and loading on the dumpers. Chromite is not locally used, but mine owners and agents sell lumps on the open streets of Muslimbagh, which is the hub of chromite mining. The price of lumpy chromite ranges between PKR 7,000-20,000 depending on the grade. A 38 to 48% chromite fine local price ranges between PKR 22,000-50,000 and more than 50% grade chromite fine ranges between PKR 60,000-90,000. Some issues have been identified during field research, which include lack of infrastructure facilities in mining and processing areas; limited supply of electricity, lack of use of modern technology, lack of support from relevant authorities, lack of exploration activities such as the mining of chromite is risk-based, lacks focus on traditional to non-traditional markets; high freight costs; limited supply of raw chrome for further processing, the high capital requirement for ferrochrome plant, etc.

Boston and Lasbela Special Economic Zone (SEZ) are preferred locations for establishing a ferrochrome production plant as they are not only close to the chromite-producing districts of Muslim Bagh, Khanozai (Pishin District), Nasai (Kila Saifullah), Gawal, Wadh (Lasbela), and Sonaro (Khuzdar), but also close to CPEC routes, which will give it easy access while transporting finished goods to steel industries located in various parts of the country.

Owing to a lack of investment, infrastructure, energy, and production problems, it is not feasible to install a ferrochrome plant now. But, addressing the said issues will definitely make it feasible as it is the main source of stainless-steel production that will generate billions of dollars for Pakistan in terms of export receipts.

South Africa, Finland, India, Kazakhstan, and Turkey are the top producers of chromite in the world. Despite having a million tons of reserves, Pakistan on average generates 115 thousand tons. While South Africa is the greatest exporter, producing 13,200 thousand tons, Turkey is the second-largest exporter, producing 8,000 thousand tons. Pakistan is one of the leading chromite exporters, ranking fourth, but the quantity is extremely modest, with $95 million in exports in 2021.

On average, China accounted for 85 percent of Pakistan's chromite exports. However, the price it receives from China is less than that of other destinations. China paid $206/ton for chrome concentrates, while Japan, Spain, and Russia paid $312/ton, $517/ton, and $459/ton, respectively.

Pakistan could also look towards new markets such as Japan, Indonesia, and Spain, which have higher prices than China. Pakistan, which has significant stocks of chromite, has an opportunity to focus on extracting this mineral, which has a high value and the potential to grow both locally and globally.

It is suggested that a distinct mining zone be formed in order to have the entire value chain in one location, making the product more competitive in the international market. Giving a tax-free zone status to the chrome processing zone will attract investors to participate in capital-intensive projects such as a ferrochrome plant. Pakistani authorities must educate its miners and producers on the product and its value addition, as well as resolve energy issues so that mining and processing can continue uninterrupted.

Chapter 1

Introduction

Pakistan has vast mineral reserves of over 600,000 square kilometers of the outcrop. Currently, 92 minerals have been found, 52 of which are commercially mined, with a total annual production capacity of 68.52 MMT. The sector expands at a rate of 2 to 3 percent per year on average. With over 5,000 working mines, 50,000 SMEs, and direct employment of 300,000 individuals, this industry contributes to the economy.

One of the most significant minerals, chromite, and its value-added products have a lot of potential and are in high demand both domestically and abroad. There are approximately 4.5 million tons of total chromite reserves, and 115,000 metric tons may be extracted each year (Finance, 2021). Pakistan hasn't been able to reach its full potential despite having enormous wealth. With a $2 billion global demand, chromite also has a larger market[1].

There are many small deposits and occurrences of chromite in various parts of Pakistan, but commercial production has been almost entirely restricted to Baluchistan. Pakistan has belts of the highest grade of chromite ore deposits in Baluchistan, where the chromite ore deposits are estimated at around 500 million tonnes available, with an annual production of 20,000 tons per year. In Balochistan, chromite is being produced in Muslim Bagh, Khanozai (Pishin District), Nasai (Kila Saifullah), Gawal, Wadh (Lasbela), Sonaro (Khuzdar), and Zhob District. Pakistan's chromite grade ranges between 28 percent and 56 percent, and it produces both metrological and refractory grades of chromite. Despite vast deposits and output, raw ore is currently transported to Karachi and refined at beneficiation plants in Yousuf Goth and Moach Goth due to a lack of modern processing and value-adding activities in the region[2].

Chromite is used directly in industrial foundries and refractory sands or converted into sodium dichromate for further refinement into other chemicals and chromium metal, but the main consumption is in ferrochrome furnaces to produce an alloy used by the steel industry. Over 95% of chromium consumption is attributable to metallurgical applications, with stainless steel

[1] Comtrade, 2020
[2] Investment, 2020

alone representing 78% of consumption in 2019. Trends in stainless steel production are, therefore, the main determinant for chromium demand.[3]

The metallurgical industry uses chromite ore (also known as chrome ore) to produce chromium ferroalloys and metals. It is also used in the chemical industry to make sodium dichromate, which is both a chemical industry product and an intermediate product used to make other chromium chemicals. Chrome ore is mainly used to smelt special alloys with elements such as cobalt, nickel, and tungsten. These special steels and special alloys are crucial materials for the aerospace, automotive, shipbuilding, and defense industries.

Moreover, chrome ore is utilized in the refractory industry to make refractory materials such as shapes, plastics, and foundry sands. These refractory minerals are then utilized to make ferrous and nonferrous alloys, glass, and cement. Because it retains its physical qualities at high temperatures and is chemically inert, it is helpful in the refractory sector.

Due to a lack of processing facilities, Pakistan hasn't been able to take advantage of the potential of chromite value-added goods. Raw chromite from Pakistan was exported for $95 million in 2021, primarily to China, Japan, and Russia. South Africa was the biggest exporter, sending out $1.9 billion worth of raw chromite[4]. The market for value-added goods like ferrochrome is worth $6 billion worldwide, but it is currently untapped due to a lack of processing facilities[5].

Although Pakistan has abundant chromite resources that have been integrated and aligned with the most recent economic system, no mining strategy exists. There are many components to this puzzle; its little reflection may be based on domestic demand, local manufacturing, and so on. There is an urgent need to examine the chromite potential, both domestically and internationally, as well as future trends.

This study focuses on chromite demand and its relationship with the domestic and international markets, as well as chromite exploitation and capitalization in Pakistan and potential intervention in capitalization.

[3] Ibid
[4] Comtrade, 2021
[5] Ibid

Chapter 2

Chromite and its Processing

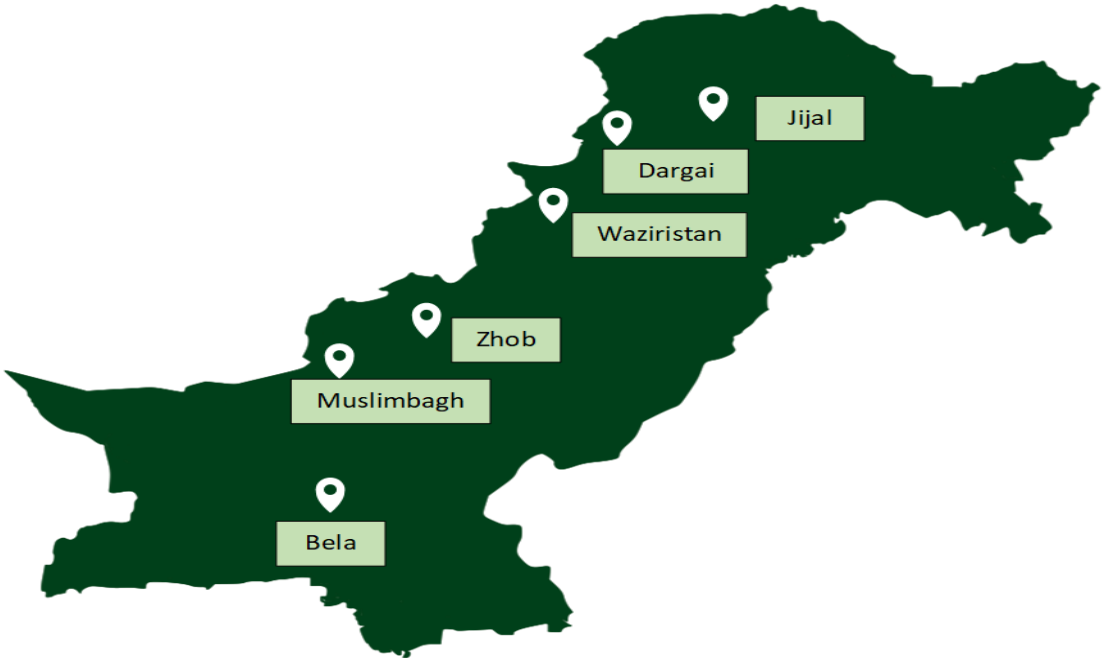
Chromite is a spinel group mineral that is the primary source of chromium metal extraction. It is primarily employed in the production of stainless steel and chemicals, and it has widespread industrial applications. It is most commonly associated with ultramafic rocks and ophiolite sequences, and deposits related to the ophiolite sequence are known as Alpine-type deposits. Pakistan's chromite deposits are of the Alpine type, found in ophiolitic rocks at the convergent margin[6].

2.1. Chromite Geo-Mapping

Pakistan has an abundance of chromite reserves, with the best being located in Muslimbagh, Bela, Zhob, Dargai, Jijal, and Waziristan.

Figure 1

Mapping of Chromite Reserves in Pakistan



Source: Planning Commission

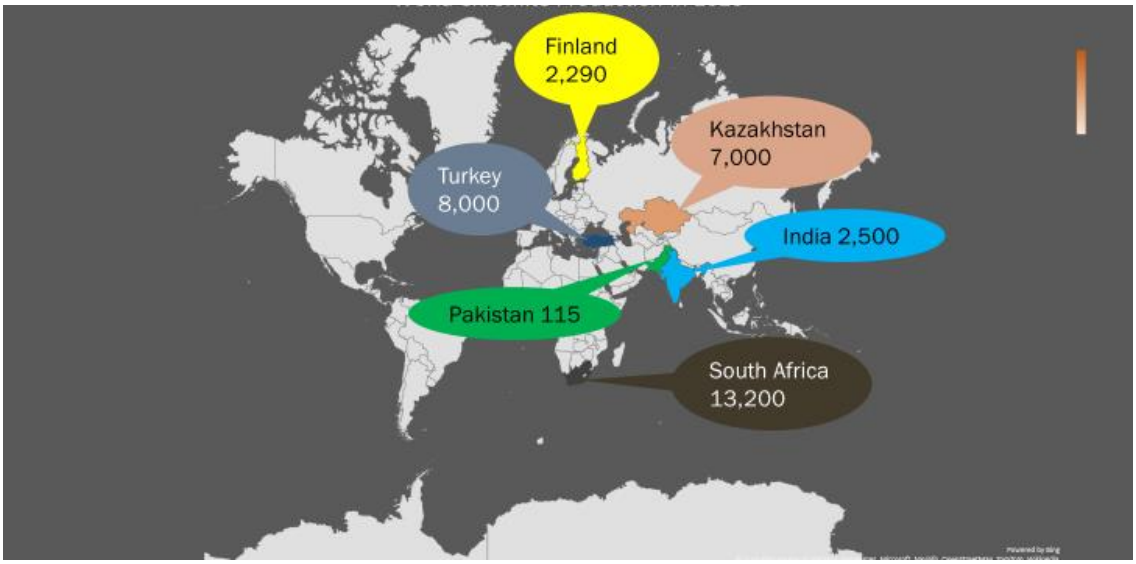
[6] Syed Tallataf Hussain Shah, 2019,

2.2. Chromite Production

South Africa, Finland, India, Kazakhstan, and Turkey are the top chromite producers. Despite having a million tons of reserves, Pakistan generates an average of 115 thousand tons. While South Africa is the top exporter, producing 13,200 thousand tons, Turkey is the second-largest exporter, producing 8,000 thousand tons.

Figure 2

World Chromite Production in 2020



Source: US Geological Survey

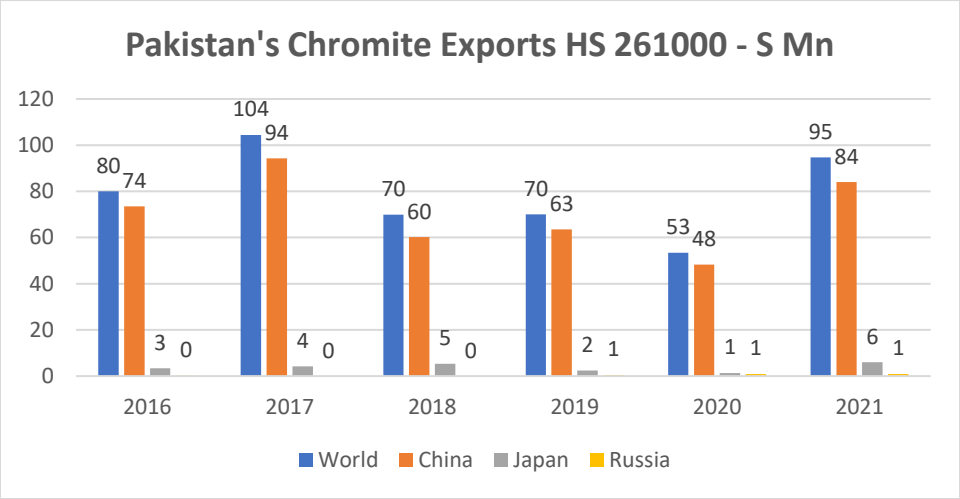
2.3. Pakistan's Chromite Production and Trade

Chromite exports were valued at $ 95 million in 2021, with key destinations including China ($84 million), Japan ($6 million), and Russia ($1 million)[7].

[7] ITC Trade Map

Figure 3

Pakistan's Chromite Exports

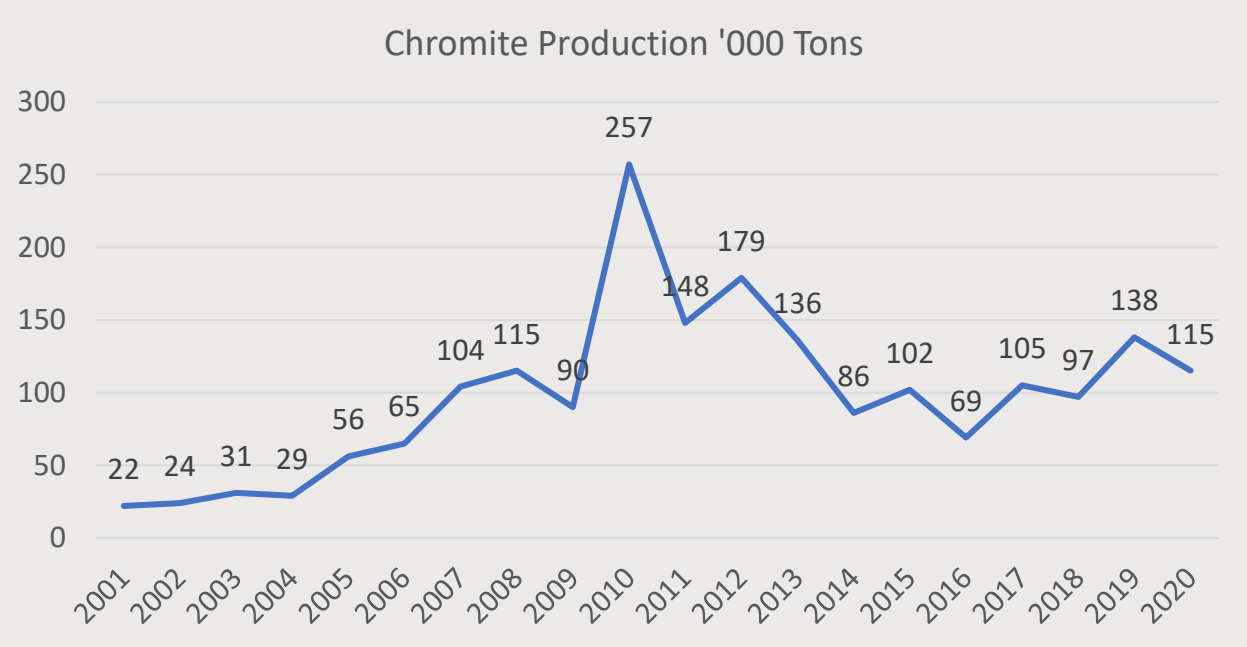


Source: ITC Trade Map

The production of Chromite has seen an increasing trend but it remains stagnant for over 20 years.

Figure 4

Pakistan's Chromite Production



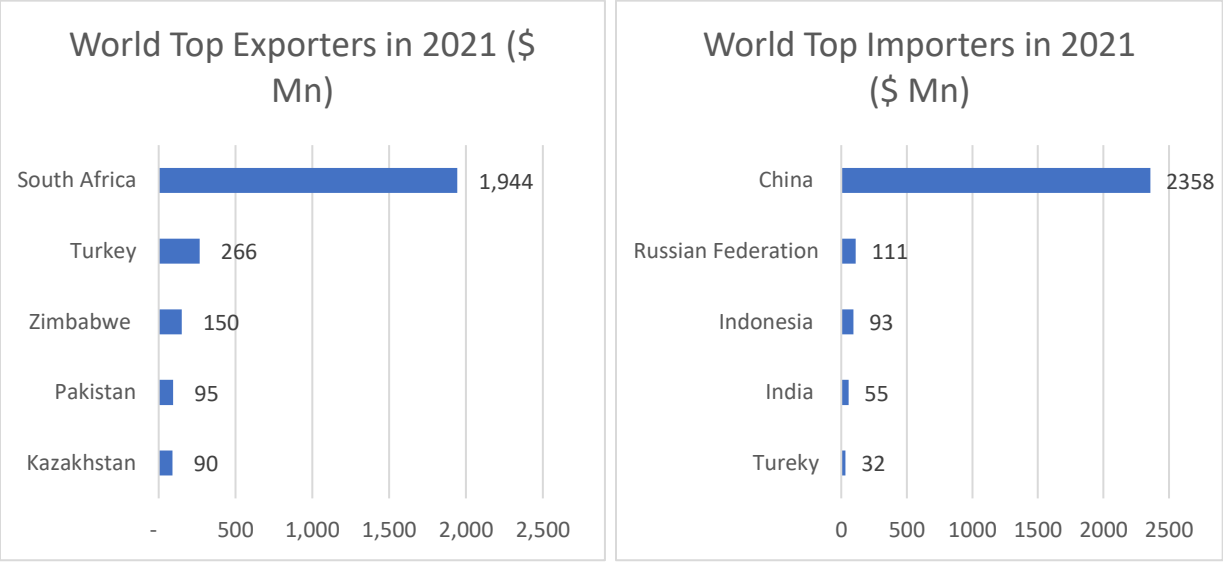
Source: Economic Survey 2021

2.4. Market Comparison

Pakistan is among the top exporters of chromite and is ranked at number 4, but the quantum is very low as Pakistan exported $95 million in 2021. South Africa, the top exporter, exported $1.9 billion in 2021 (Comtrade, 2021). Below are the world's top importers and exporters of chromite ore.

Figure 5

World Top Importers and Exporters of Chromite



Source: ITC Trade Map

2.5. Price and Tariff Comparison

Pakistan exported $95 million in 2021, out of which more than 85% of its exports were to China. But the price it gets paid from China is cheaper than other destinations. For example, China has bought chrome concentrates at $206/ton, whereas Japan, Spain, and Russia have bought at the rates of $312/ton, $517/ton, and $459/ton, respectively.

Pakistan needs to focus more on markets like Japan, Spain, and Russia as they are offering better prices than China. On the other hand, Japan and Spain have applied a 0% tariff on which Pakistan can capitalize.

Table 1

Pakistan's Chromite Price and Tariff

Pakistan's Export Destinations	Value exported in 2021 ($ Mn)	Quantity exported in 2021 (Tons)	Unit value (USD/Ton)	Average tariff (estimated) faced by Pakistan (%)
World	95	439,750	215	
China	84	408,571	206	0
Japan	6	19,433	312	0
Spain	1	2,245	517	0
Poland	1	2,805	344	0
Russian Federation	1	2,060	459	3.8
Source: ITC Trade Map				

Exporters around the world are selling between $150-230/Ton depending on the percentage and quality of Chromite. Pakistan's price is also relatively competitive compared with Kazakhstan, Albania and Zimbabwe.

Table 2

Average Price of Chromite - Top Exporters

World Exporters	Value exported in 2021 ($ Mn)	Quantity exported in 2021	Average Unit value (USD/Ton)
World	2,781	17,647,309	158
South Africa	1,944	13,596,397	143
Turkey	266	1,456,395	183
Zimbabwe	150	638,419	234
Pakistan	95	439,750	215
Kazakhstan	90	389,604	231
Albania	63	272,388	230
Source: ITC Trade Map			

Whereas, the importers around the world are importing on an average value of $170-230/Ton. Pakistan should target Indonesia and Russia, as in case with Indonesia it has not exported a single

ton in 2021. It seems that market is open for Pakistan that can be tapped by marketing the product in Indonesian market.

Table 3

Tariff Applied by Top Importing Countries

World Importers	Value imported in 2021 ($ Mn)	Quantity imported in 2021	Average Unit value (USD/Ton)	Average tariff (estimated) applied by the country (%)
World	2,864	15,928,781	180	
China	2,358	13,679,771	172	0
Russian Federation	111	442,245	250	3.2
Indonesia	93	501,367	186	4.7
India	55	252,781	219	2
Turkey	32	155,269	208	0
Germany	30	130,104	231	0
USA	30	145,550	205	0
Source: ITC Trade Map				

Chapter 3

Value-chain Analysis

3.1. Industrial Uses of Chromite

Chromite is of great use, mainly used in them manufacturing of stainless steel. Below are few main uses of Chromite:

3.1.1. Metallurgical Industry

It is often mixed into steel to make a hard and corrosion-resistant alloy, mainly used for refining stainless steel, heat-resistant steel, and various electric heating element materials.

3.1.2. Chemical Industry

Various chromium salts processed from chromite are the main raw materials in the chemical industry. Chromium salt is one of the main varieties of inorganic salts. It is mainly used in

electroplating, tanning, printing, and dyeing, medicine, fuel, catalysts, oxidants, matches, and metal corrosion inhibitors.

3.1.3. Refractory Materials

Because the melting point of chromite is as high as 1900 ℃ to 2050 ℃, it can keep the volume unchanged at high temperatures and does not react with any slag. Therefore, it can be used as a kind of refractory material for the lining of steel-making furnaces and non-ferrous metal smelting furnaces.

3.1.4. Iron Casting

Chromium cast iron refers to the addition of chromium to an iron element to change the physical structure and chemical properties of the iron, thereby expanding its application field.

3.1.5. Automobile Industry

Car brake pads refer to the friction material fixed on the brake drum or brake disc rotating with the wheel. In the automotive industry, chromium is involved in the production of car brake pads.

3.1.6. Value Addition in Pakistan

Pakistan does not have any high-tech processing plants to add further value to chromite. The country exports chromite in three forms, i.e., lumps, concentrates, and fines, which is a raw form, and all these forms are mainly exported to China, from where $3 billion worth of steel are imported.

Figure 6

Processing Stages of Chromite

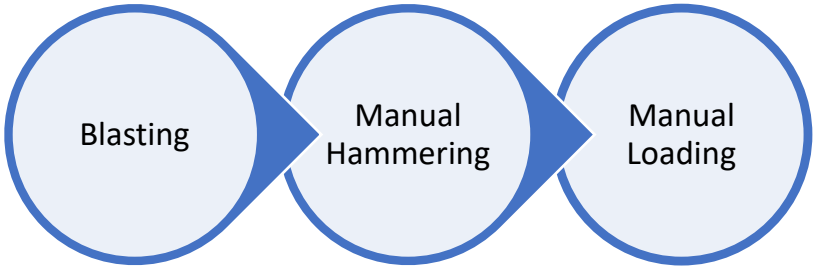
Source: TDAP Research Wing, SMEDA

3.2. Mining of Chromite

Mining for Chromite is done manually, no advance technology is being used in the mining process. The process includes blasting in the mine, manual hammering, and loading on the dumpers.

Figure 7

Mining Stages of Chromite



Source: TDAP Research Wing

Below are the glimpse of mining practice in the area of Muslimbagh, where 80% of Chromite mining is done. Mining in the area of Muslimbagh and khanozai is based on small-scale basis, and to acquire modern machinery like excavator, mine owners need more capital which for some miners is difficult to finance.

Figure 8

Mining Practice in Muslimbag area

Source: TDAP Research Wing

3.2.1. Processing of Chromite

Chromite in Pakistan is not consumed locally, and exported in raw form mainly to China. Only washing of Chromium ore is done in areas of Muslimbagh and Yousuf/Moach goth in Karachi. The process includes hammering, grinding and washing of chrome which separates impurities like mud from chromite.

Figure 9

Snapshot of Processing in Muslimbagh area

Source: TDAP Research Wing

3.2.2. Local Market of Chromite

Chromite is not locally used, but mine owners and agents sell lumps on the open streets of Muslimbagh that can be seen in Figure 10. The price of lumpy chromite ranges between PKR 7,000-20,000 depending on the grade. A 38 to 48% chromite fine local price ranges between PKR 22,000-50,000 and more than 50% grade chromite fine ranges between PKR 60,000-90,000.[8]

[8] The local selling price was revealed on the field visit of Muslimbagh, Balochistan.

Figure 10

Open Market Selling of Chromite in Muslimbagh area

Local Open-street Market of Chromite

52% grade Chrome 42% grade Chrome

Source: TDAP Research Wing

3.2.3. Cost Analysis

Table 4 represents the cost of mining and processing of chromite. Mining in Muslimbagh area is tunnel based and costs around PKR 4000/foot. Mines depth varies from 200 feet to more than 1000 feet. After that, the rock is being shifted to beneficiation plant where lumps get crushed and grinded for producing chromite fine. Washing of chromite costs around PKR 1400/ton. A beneficiation plant can be stablished by investing around PKR 12.5Mn.

Table 4

Mining and Processing Cost

Mining Cost	PKR 4,000/foot
Processing/Washing Cost	1400/ton
Final Cost (38-52% Grade fines)	PKR 10,000-40,000/ton
Cost of Processing Plant	PKR 12.5Mn
Selling Cost	
38-48% Grade	PKR 22,000-50,000
50% + Grade	PKR 60,000-90,000
Source: TDAP Research Wing	

Table 5 demonstrates a case of a Karachi based company who is engaged in mining, processing and exporting of Chrome fine. The company exported PKR 359Mn in 2021 against 12,603 tons of chrome fine. The freight cost incurred was around PKR 5040/ton (USD 700/ 20 feet container).

The estimated profit margin is calculated at PKR 13,463 as the exporting value per ton was PKR 28,503.

Table 5

Estimated Profit Margin

Case of a Karachi Based Company 42% Grade Chrome Fine	
Value Export (PKR)	359,233,998
Quantity (tons)	12,603.4
Product Cost (PKR)	10,000
Export Cost (PKR)	28,503
Freight cost (per 20 feet container/25 ton)	USD700/25=USD28/Ton OR PKR 5,040/Ton
Estimated Profit Margin/Ton (PKR)	28,503-10,000-5,040 = PKR13,463
Source: TDAP Research Wing, PRAL * USD was converted @ rate of PKR 180	

3.2.4. Owner of Mines and Processing Units

During a meeting with mine and processing unit owner, it has been revealed that the mining of chromite is a risk-based mining, as mine owners have no support from relevant authorities regarding exploration of chrome reserves. They even do not have experts, who can identify the quality and dept of reserves.

3.2.5. Lack of Infrastructure Facilites

Infrastructure is being developed by the mine owners, even electricity polls have been installed by the businessman running the processing unit.

Figure 11 is an image of road towards mine of Chromite.

Figure 11

Snapshot of Infrastructure of Mine of Chromite in Muslimbagh area

Source: TDAP Research Wing

3.2.6. Energy Woes

In the Muslimbagh region, it has also been revealed that the electricity is being supplied six hours a day to run processing plants which is not a sufficient time for plants to produce substantive amount of Chrome fines and delays the supply chain, which sometimes result in cancellation of orders.

3.2.7. Lack of Modern Technology

As discussed earlier, mining of chromite is done through primitive methods and it is totally based on manual hammering and loading which takes a lot of time.

Through manual practice, a single mine can extract 8-10 tons per day only. Whereas, using of a single excavator may increases the extraction to 150-200 tons per day.

3.2.8. Lack of Support from relevant authorities

Relevant mineral authorities are reluctant to provide support because of their following reservations:

- most of the mining is illegal
- mine owners are not paying royalties
- non-generation of skilled employment

During a field visit, it has been observed that non-skilled employment is being provided by the mine owners. No technological advancement is adopted, so creating skilled employment would be difficult unless modern techniques are adopted.

3.3. Consultation with Exporter

An exporter from Karachi, who is also a mine owner of two chromite mines in Chagi, reveals that the chromite of Chagi is far better than the chromite reserves of Muslimbagh in terms of grade and quality. He said that Muslim bagh has mixing problems and fluctuation in grades whereas the Chagi district ranges between 38-42 in grade.

The exporter identified some problems which include:

- stocking of rocks,
- infrastructure as mine owners have to build the road structure at their own expense with no government support,
- high freight cost is also an issue as it was revealed that before the covid-19 pandemic, a 20 feet container cost around USD 100, which now costs between USD 700-1100 depending on the Chinese port destination.
- It also came into discussion that the mine owner is looking for a new mine but facing difficulty to identify the reserves.
- When asked about exploring new markets, the exporter said they are not aware of any other good market for chromite exports.

- The exporter also revealed that the rock of chromite contains many other elements like MGO (20%), Aluminum (11%), and SIO_2 (7-8%). But the price they get is only for Chromite.

3.3.1. Other Issues

Metallic and non-metallic minerals are discovered in a group form when minerals are extracted from mines. Nickel, manganese, aluminum, gold, platinum, silver, and other minerals are found in chromite rock, for example. Pakistan is only paid for chromite, while other minerals related with it are sold for free. Because no infrastructure has been built where mines are located, there are severe transportation challenges. Because most minerals are found in undefined areas, there are security concerns. Political unrest is a big issue in the mining industry. Aside from these challenges, the following are key concerns in the mining industry: There is a lack of understanding of minerals in terms of customs. Concerns about investments, Infrastructure concerns, a lack of government aid obtaining an explosive license is difficult.

3.4. Strength and Opportunities of the Product

- Existence of fairly high-grade Chromite reserves of 4.5Mn tons reserves and considerable further enhancement in the reserves.
- Availability of Cheap Labor.
- Unavailability of substitutes
- Availability of metallurgical grade chromite for production of Ferro-chrome alloys.
- Increasing demand for Chromite in the international market.
- The entire local requirement of ferrochrome alloys is met through import.

3.5. Ferrochrome Production

Currently, no value-addition is done in Pakistan and Ferro-chrome production plant is recommended for which further research is required.

Over 80% of the world's ferrochrome output is utilized in the production of stainless steel. Boston and Lasbela Special Economic Zone (SEZ) are preferred two locations for establishing a Ferrochrome production plant as these locations are not only close to chromite producing districts of Muslim Bagh, Khanozai (Pishin District), Nasai (Kila Saifullah), Gawal, Wadh (Lasbela), and

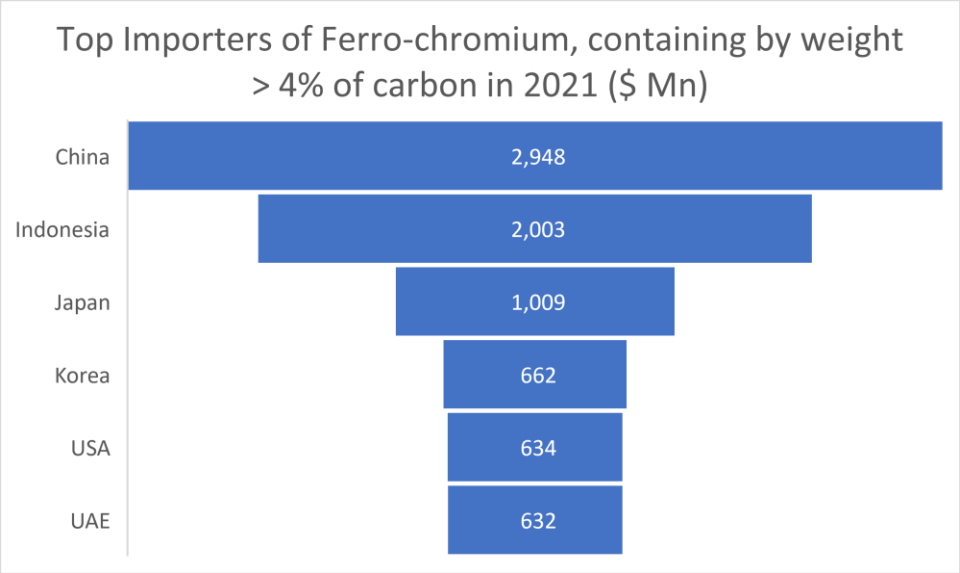
Sonaro (Khuzdar) but also close to CPEC routs which will give it easy access while transporting finished goods to steel industry located in various parts of the country (Investment, 2020).

3.5.1. Feasibility

Owing to lack of investment, infrastructure, energy and production problem, it is not feasible to install ferro-chrome plant now. But, addressing the said issues will definitely make it feasible as it is the main source of stainless-steel production that will generate billions of dollars for Pakistan in terms of export receipts.

Figure 12

Top Importers of Ferro-chrome



Source: ITC Trade Map

3.6. Potential Niche Markets

Chromite has a great potential and competitive in international market in terms of price. Below are the top markets for Pakistan that can be capitalized.

3.6.1. For Chromite HS Code 261000

Below are the top markets that Pakistan can target, as Pakistan is exporting its concentrates mainly to China, but other markets have also been identified like Russia, Japan, USA that can pay a beeter price compared with China.

Table 6

Top Markets of Chromite - HS Code 261000

Top Markets	Value imported in 2021 ($ Mn)	Quantity imported in 2021 (Tons)	Unit value (USD/Ton)	Share in world imports (%)	Average tariff (estimated) applied by the country (%)
China	2,358	13,679,771	172	82.4	0
Russian Federation	111	442,245	250	3.9	3.2
Indonesia	93	501,367	186	3.3	4.7
India	55	252,781	219	1.9	2
Turkey	32	155,269	208	1.1	0
Germany	30	130,104	231	1	0
USA	30	145,550	205	1	0
Japan	15	47,796	316	0.5	0
Source: TDAP Research Wing, ITC Trade Map					

3.6.2. For Ferro-chrome: HS Code 720241

Currently, Pakistan is not exporting ferrochrome due to non-availability of local production. But if proposed plant is being set-up then below are the markets that Pakistan can target which includes: China, Indonesia, Japan, USA and Korea.

Table 7

Top Markets of Ferro-chrome - HS Code 720241

Top Markets	Value imported in 2021 ($ Mn)	Quantity imported in 2021	Unit value (USD/Ton)	Share in world imports (%)	Average tariff (estimated) applied by
China	2,948	2,432,567	1,212	30.1	2.1
Indonesia	2,003	1,500,720	1,334	20.4	0
Japan	1,009	644,965	1,565	10.3	0
Korea	662	509,036	1,301	6.8	1.2
USA	634	449,255	1,410	6.5	0.7
UAE	632	528,331	1,196	6.4	4.6
TDAP Research Wing, PRAL					

Chapter 4

Conclusion

Pakistan, being blessed with abundant reserves of Chromite, has a chance to focus on extracting this mineral as it has a great value and potential to grow locally as well as globally. Pakistani authorities need to give awareness about the product and its value-addition to its miners and manufacturers, additionally, resolving the energy woes so that uninterrupted mining and processing can be done.

4.1. Recommendations

- Adopting modern techniques in mining to increase productivity as well as reduce wastage and protect the environment.
- Setting-up Processing units near the quarries to reduce the cost of transportation.
- Shifting from traditional export patterns to new markets like Japan, Russia, and Indonesia.
- Processing of Chrome to 50% and above grade to fetched better price.
- Awareness to manufacturers and exporters of value-added products like Chrome plating and Chromium alloys their demand in the international market.
- Setting-up processing plants for more-value added products like ferrochrome, and chrome plating.
- A separate mining zone can also be established to have a complete value-chain in one place which will then make the product more competitive in the international market.
- Giving chrome processing zone, a tax-free zone status will encourage investors to invest in capital intensive projects like ferro-chrome plant.
- Marketing of the product for better export patterns.
- Removing infrastructure bottlenecks, establishing a center of excellence for developing quality manpower, and forging partnerships with global operators and technology providers also need a prominent place on the “to do” list.

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