Policy Advisory Board FPCCI

Evaluating Minerals' Export Potential

A Case Study of Baluchistan

Acknowledgement & Disclaimer

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We would like to express our sincere gratitude to *Jahanzeb Khan, Yusra Sadiq, Uzair Shoro,* and *Dr. Jazib Mumtaz* for their invaluable input in this report.

All data and statistics used are correct as of 30th June 2024 and may be subject to change.

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Acronyms

ESG	Environmental and Social Governance
FeCr	Ferrochrome
GDP	Gross Domestic Product
IO	Input Output
IRR	Internal Rate of Return
MCI	Mining Contribution Index
MgO	Magnesium Oxide
Mt	Metric Tons
PAT	Profit After Tax
PKR	Pakistani Rupee
PPP	Public Private Partnership
TPD	Tons per day
USGS	United States Geological Survey
US	United States Dollar

Executive Summary

Investment in the minerals sector significantly boosts economic growth by generating employment, increasing export revenues, and supporting industrial development. As global economies transition towards renewable energy and digitization, the demand for minerals is rising, highlighting the strategic importance of this sector in future economic planning. The present study evaluates the mineral potential of Balochistan, a province in Pakistan with substantial untapped resources, and explores how these resources could transform the economic landscape of both the region and the country. The expected surge in global demand for minerals presents a substantial opportunity for mineral rich regions like Balochistan to capitalize on their resources.

Balochistan harbors vast reserves of economically valuable minerals such as copper, fluorite, chromite, magnesium, and manganese, which are in high demand in the international market. Currently, Balochistan's mining sector contributes approximately US$ 1 billion to the world market, representing less than 1% of the world market share. However, with strategic investments and development, this sector has the potential to significantly boost Pakistan's national economy.

An empirical assessment of the impact of technology driven investment in the mining and minerals sector reveals that technological upgrades drive significant growth. The analysis estimates that a *50 percent* increase in mineral output could generate a **US$ 2.68 billion** increase in GDP, highlighting the transformative potential of the mineral sector. Furthermore, strong backward and forward linkages indicate that investments in the mineral sector could stimulate growth in related industries such as construction and manufacturing.

Joint venture investments driven by technology upgrades in value added products like fluorite, magnesite, chromite, manganese, and barite enhance real GDP and exports of Pakistan by billions of dollars. Empirical analysis also suggests that converting raw minerals into value added chemical products is economically viable For instance, establishing **10 production units** with a capacity of **100 tons per day** for the first by products of four minerals fluorspar, MgO , FeCr, and talc could generate **US$ 54.7 million** in revenues by 2027. However investment in local production facilities could also lead to import substitution and enhance export capabilities by **US$ 13.13 billion** significantly contributing to economic growth.

To unlock the potential of Balochistan's mineral resources, the study recommends policy reforms to attract foreign investment, improve infrastructure, and enhance technological capabilities. A robust legal and fiscal framework is essential to ensure sustainable and responsible mining practices, balancing economic benefits with environmental and social considerations Balochistan's mineral wealth offers a unique opportunity to drive economic growth and development in Pakistan. Strategic investments, coupled with supportive policies, can transform the region into a major hub for mineral production and processing, thereby boosting the national economy and improving the livelihoods of local communities. This report serves as a roadmap for realizing the immense potential of Balochistan's mineral resources.

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Introduction

Chapter 1

Introduction

Mining is a cornerstone for numerous nations' economic development a historical truth particularly evident in the developed world. The pivotal role of mineral development in fostering economic growth is undeniable, with the potential to extend its impact responsibly, acting as a catalyst for social growth in developing-countries.

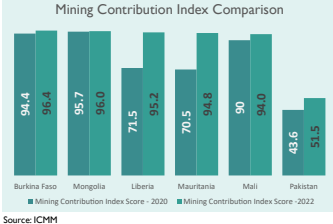
Moreover, the interdependent relationship between mining and economic advancement goes beyond mere resource extraction. The innovative technologies and methodologies employed in modern mining not only enhance efficiency but also contribute to the overall technological progress of a nation. The expertise developed in mineral exploration and extraction often spills over into other industries, fostering a culture of innovation and scientific advancement.

The minerals and mining industry is a trillion dollar giant operating globally. This industry has the capability to transform communities, improve well being, and ultimately contribute to a reduction in poverty, and ultimately contribute to a reduction in poverty, and ultimately contribute to a reduction in poverty, making a significant impact on creating a sustainable world. As of the Mining Contribution Index (2022), it reveals that most mining dependent countries continue to rank high. Significantly, most of these countries are low and lower middle income, underscoring the importance of mining to their economies.

Most studies about mining focus on how it affects the overall economy of a country, exploring whether mining brings advantages or disadvantages to the nation. Undoubtedly, mining can be an essential source of foreign exchange and fiscal receipts for governments, provided an adequate legal and fiscal framework is in place. The mining industry, therefore, finds itself at the forefront of meeting these evolving demands, playing a crucial role in shaping the future of sustainable development and economic prosperity.

Introduction

Figure 1: Mining Contribution Indexes



Source: ICMM

The significance of the mining sector to a country's economy is quantified through the Mining Contribution Index score, which indicates the sector's importance relative to the overall economic activity of the nation. A higher index score or ranking signifies a more substantial role for mining in contributing to the country's economic prosperity. Essentially, this index serves as a tangible measure of the mining sector's impact on the nation's economic landscape

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Global Outlook

Chapter 2

Global Outlook

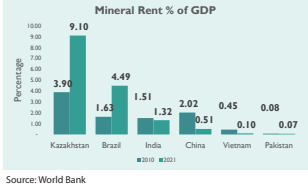
Minerals and metals are indispensable cornerstones of national economies, providing vital raw materials for diverse industrial processes and significantly contributing to global economic sectors. The demand for extractive resources is poised to escalate, driven by burgeoning populations and the increasing affluence of emerging economies. This surge is further intensified by the global shift toward low carbon energy production technologies, a transition heavily reliant on crucial minerals and metals.

Despite persistent efforts to reduce dependence on resource consumption and promote recycling initiatives, the demand for these essential materials is expected to persist. Examining the global minerals export landscape in 2021 the figures soared to an impressive 2.89 trillion US dollars. On the international stage, Asia emerges as a major player, contributing 35% to the world's mineral exports.

Europe closely follows at 27% with North America contributing 15% emphasizing the pivotal roles these regions play in global mineral trade and highlighting their economic significance.

Figure 2 illustrates notable changes in mineral rent percentages of GDP for peer countries of Pakistan between 2010 and 2021. Kazakhstan's increase from 3.90% to 9.10% suggests a growing dependence on mining and natural resources as significant economic contributors. In contrast, Brazil and China experienced decreases, hinting at potential economic diversification The data sheds light on the varying reliance on mineral resources among these nations, revealing the role of mining in their respective economies

Figure 2: Mineral Rent as Percentage of GDP --(Peer Countries)



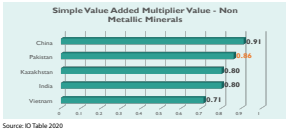
Source: World Bank

Global Outlook

Figure 3 provides multiplier values for the Non Metallic Minerals sector in various countries, emphasizing diverse economic interconnections and dependencies within these nations. Vietnam exhibits a multiplier value of 0.71, indicating a moderate level of integration of its Non Metallic Minerals sector into the broader economy. In contrast, China boasts a higher multiplier value of 0.91, signifying a more profound linkage between the Non Metallic Minerals sector and the overall economic structure. India, Kazakhstan, and Pakistan fall in between these extremes, with multiplier values of 0.80, 0.80, and 0.86 respectively. These values suggest that changes in the Non Metallic Minerals sector in these countries can have varying ripple effects throughout their respective economies, with higher values indicating a more pronounced impact

In the context of this global overview, Pakistan holds a competitive advantage in certain mineral productions, particularly within the Balochistan region. With the discovery of approximately 52 minerals in Balochistan, the region holds significant potential for a thriving mineral industry. However, it's noteworthy that only 40 of these minerals are currently operational on a small to medium scale (See Table 1).

Figure 3: Simple Value Added Multiplier Value - (Peer Countries)



Source: IO Table 2020

Balochistan's minerals' potential in global trade is shown in Table 2, where Balochistan's minerals export share in world exports of each mineral is less than 1%. This data highlights the untapped potential of Balochistan, indicating that the region has the sole potential to increase exports by many folds. This export focused approach underscores an opportunity for Pakistan to leverage its competitive advantage Investing in refining capabilities and promoting value added products of these minerals before export also spur economic growth, create jobs, and foster innovation within the country. As the global demand for minerals continues to rise, addressing internal challenges can position Pakistan to play an even more pivotal role in the evolving landscape of the global mineral trade.

Global Outlook

Table 1: Balochistan's Minerals' Production Comparison with Global Competitors

	Production – Metric Ton					
Minerals	**Kazakhstan**	**Vietnam**	**India**	**Brazil**	**China**	**Pakistan - Baluchistan**
Flourite						9,863
Mica			15,000	10,643	88,940	-
Calcite						1,095
Manganese	2,090,900	362,000	3,664,000	4,184,541	12,477,000	288
Serpentine						43
Barite	611,400	41,800	1,780,058		3,100,000	144,619
Travertine						17,590
Basalt						32,906
Copper	491,540	106,732	645,000	188,200	8,002,000	1,511
Onyx Marble						
Granite						3,250
Sulphur						448
Pumice						8,805
Magnesite			207,224	3,399,035	18,700,000	37
Chromite	5,867,700	750		514,006	67,000	143,733
Iron Ore	52,872,400	8,428	303,172	710,189,000	1,435,963,000	163,517
Limestone						4,485,444
Marble						1,553,061
Coal	109,120,000	41,516	3,408,000,000	6,969,000	3,644,000,000	2,967,286
Shale						1,379,763

Source: USGS Minerals Yearbooks and Mines and Minerals Department, Government of Balochistan

Table 2: Balochistan's Minerals Potential in Global Trade

S.No	Minerals	World - Thousand US$	Pakistan - Thousand US$	Share in World Market	Increase Up-to 1%
1	Flourite	3,348,438	15,420	0.461%	33,484
2	Mica	191,992	473	0.246%	1,920
3	Calcite	10,860,308	233	0.002%	108,603
4	Manganese	6,005,184	111	0.002%	60,052
5	Serpentine	14,146,680	10,072	0.071%	141,467
6	Barite	740,861	5,399	0.729%	7,409
7	Travertine	14,146,680	10,072	0.071%	141,467
8	Basalt	247,833	1	0.000%	2,478
9	Copper	214,846,256	862,406	0.401%	2,148,463
10	Onyx Marble	9,536,227	13,032	0.137%	95,362
11	Granite	1,635,911	267	0.016%	16,359
12	Sulphur	9,844,657	-	0.000%	98,447
13	Pumice	364,982	32	0.009%	3,650
14	Magnesite	2,373,639	1,762	0.074%	23,736
15	Chromite	3,417,135	101,420	2.968%	101,420
16	Iron Ore	156,931,071	24,199	0.015%	1,569,311
17	Limestone	1,053,925	4,305	0.408%	10,539
18	Marble	1,862,474	21,960	1.179%	21,960
19	Coal	89,519,068	6	0.000%	895,191
20	Shale	3,682,396	250	0.007%	36,824
	Total	**544,755,717**	**1,071,420**	**0.197%**	**5,518,141**

Source: ITC & Author's Estimations

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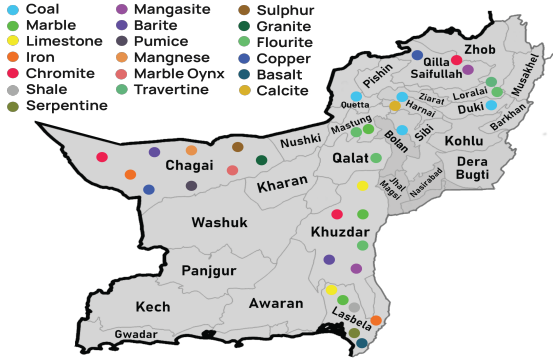
Balochistan's Minerals' Outlook

Chapter 3

Balochistan Minerals Mapping



Balochistan's Minerals' Outlook

Pakistan is currently at a pivotal juncture, poised on the verge of a transformative era that could reshape its economic trajectory on a global scale. The focal point of this potential lies in Baluchistan, a province harboring vast untapped mineral resources worth trillions of dollars beneath its surface.

This analysis delves into the extensive mineral reserves across 10 districts of Balochistan, with a particular emphasis on the active extraction zones in the Lasbella - Khuzdar belt and the northwest region of Balochistan - Chaghi. Exploring the practical applications of each mineral, the report sheds light on the diverse industries and products that stand to benefit from their extraction. Additionally, it emphasizes the economic impact by highlighting value added products at competitive market prices. Providing a comprehensive overview of mineral locations in Balochistan, the report enriches our understanding of the region's geological wealth.

By examining the mineral export dynamics over the last five years, the report compares these figures to the global average for mineral exports. This comparative analysis elucidates Balochistan's role and significance in the global minerals market.

Taking a holistic approach, the report delves into the chemical potential of minerals (see chapter 5), production rates, and reserves. This comprehensive exploration paints a vivid picture of Baluchistan's mineral landscape, emphasizing the need for meticulous exploration and strategic utilization of these resources to unlock a spectrum of transformative opportunities lying beneath the surface.

In essence, Baluchistan's concealed mineral wealth not only holds economic promise for Pakistan but also positions the region as a crucial player in the global minerals arena. The report serves as a guide, highlighting the importance of careful exploration and strategic resource management to unlock the full transformative potential beneath the surface.

Production - Metric Tons

World Exports – (2018-2022)

US$ 178.23 Billion

Copper – Thousand US$

APPLICATION

Architecture
Sheets & Cladding

Heating, and Cooling systems.
Tubes & Pipes

Automotive
Electrical Components

Industrial
Machinery Parts

Electrical
Marine Components

Electrical
Wirves

VALUE ADDED PRODUCTS

Copper Ore
$4,000 - $6,000 Per Ton

Base material extracted from copper mines.

Copper Cathodes
$6,000 - $8,000 Per Ton

Large plates of pure copper produced by copper smelting.

Copper Wire
$7,000 - $9,000 Per Ton

Electrical applications.

Copper Tubes
$8,000 - $10,000 Per Ton

Plumbing and HVAC systems.

Copper Alloys
Varies widely

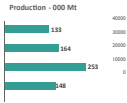
Prices can vary based on the specific alloy and its application.

Copper Sheets & Plates
Varies Based on Grade

Construction and manufacturing.

World Exports – (2018-2022)

US$ 145.84 Billion



APPLICATION

Steel Production
Steel

Home Appliances
Refrigerators, Washing Machines, Ovens

Automotive Industry
Cars, Trucks, Buses

Tools & Machinery
Tools, Machinery

Infrastructure
Roads, Railways, Bridges

Shipbuilding
Ships, Submarines

VALUE ADDED PRODUCTS

Raw Iron Ore
$80 - $200 per ton

Sedimentary rock primarily composed of carbon used mainly for electricity generation.

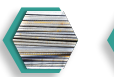
Pig Iron
$300 - $600 per ton

Used in the production of steel.

Steel Billets
$400 - $800 per ton

Compressed blocks of coal dust or other combustible biomass material.

Steel Rebars
$500 - $1,000 per ton



Produced from coal and used in air and water purification.

Stainless Steel
Varies by alloy

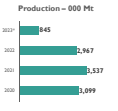
A byproduct of coal carbonization used in the production of various chemicals.

Cast Iron
Varies by product

Produced during the coal gasification process and used as a fuel.

World Exports – (2018-2022)

US$ 73.89 Billion



APPLICATION

Electricity Generation
Electricity

Carbon Products
Carbon Black

Water & Air Purification
Purified Water

Liquid Fuels
Gasoline alternatives

Gas Production
Coal Gas

Steel Production
Coke, Steel

VALUE ADDED PRODUCTS

Raw Coal (Thermal)
$ 40- $100 Per Ton

Sedimentary rock primarily composed of carbon used mainly for electricity generation.

Coking Coal
$100 - $300 Per Ton

Used in the production of steel.

Coal Briquettes
$4,000 - $6,000 Per Ton

Compressed blocks of coal dust or other combustible biomass material.

Activated Carbon
$1,000 - $3,000 Per Ton

Produced from coal and used in air and water purification.

Coal Tar
Varies by Application

A byproduct of coal carbonization used in the production of various chemicals.

Coal Gas
Varies by Region

Produced during the coal gasification process and used as a fuel.

APPLICATION

Architectural
Tiles & Wall claddings

Outdoor Applications
Garden paths

Flooring
Floor Tiles

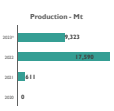
Decorative Items
Vases

Bathrooms
Travertine Bathtubs

Wall Cladding
Wall Panel

World Exports – (2018-2022)

US$ 12.52 Billion



VALUE ADDED PRODUCTS

Raw Travertine

$150 - $500 Per Ton

Base material extracted from copper mines.

Travertine Tiles

$2 - $5 Per sq. ft.

Large plates of pure copper produced by copper smelting.

Travertine Slabs

$7,000 - $9,000 Per Ton

Electrical applications.

Travertine Pavers

$8,000 - $10,000 Per Ton

Plumbing and HVAC systems.

Travertine Sinks & Bathtubs

Varies Widely

Prices can vary based on the specific alloy and its application.

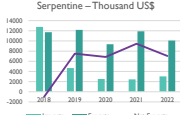
Travertine Mosaics

Varies Based on Grade

Construction and manufacturing.

World Exports – (2018-2022)

US$ 12.52 Billion



APPLICATION

Architecture
Decorative Stones

Jewelry
Necklaces

Carvings
Statues

Asbestos Source
Asbestos fibers

Gemstone
Gemstone beads

Metaphysical
Healing crystals

VALUE ADDED PRODUCTS

Raw Serpentine	Serpentine Jewelry	Serpentine Tiles & Slabs	Carved Serpentine	Asbestos (Chrysotile)
$50 - $200 Per Ton	Varies widely	Varies widely	Varies widely	Varies based on region
				
Used in various applications	Used in the gem and craft industry	Used in construction and decoration	Used for ornamental purposes, like statues	Used to produce asbestos

World Exports – (2018-2022)

US$ 8.58 Billion

APPLICATION

Countertops
Onyx Slabs

Wall Cladding
Onyx Tiles

Artistic Panels
Artistic Panels

Lighting and
Design Equipment
Decorative Items

Flooring
Onyx Tiles

Bathrooms
Onyx Sinks

VALUE ADDED PRODUCTS

Raw Onyx Marble
$4,000 - $6,000 Per Ton

Unique and exotic stone used for various interior design and architectural purposes.

Onyx Marble Slabs
$6,000 - $8,000 Per Ton

Used for countertops, walls, & other installations.

Onyx Marble Tiles
$7,000 - $9,000 Per Ton

Used for flooring and walls.

Onyx Marble Bathtubs
$8,000 - $10,000 Per Ton

Prices can vary based on design, size, and finish.

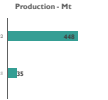
Onyx Marble Jewelry & Carvings
Varies Widely

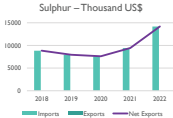
Used for decorative and jewelry purposes.

Onyx Marble Backlit Installations
Varies Based on Grade

Used with backlighting to enhance its translucency and showcase its patterns.

World Exports – (2018-2022)
US$ 3.87 Billion





APPLICATION


Chemical Industry
Sulphur Acid


Pharmaceuticals
Sulphur-based Medicines,


Agriculture
Sulphur Fertilizers


Batteries
Sulphur Batteries


Vulcanization
Vulcanized Rubber


Fungicide
Sulphur-based V Fungicides

VALUE ADDED PRODUCTS

Raw Sulphur
$50 - $150 Per Ton


Essential element used in various industries.

Sulphur Acid
$100 - $300 Per Ton


Used in a wide range of industrial applications.

Sulphur-based Fertilizers
Varies by Type


Prices can vary based on the specific type of fertilizer and its nutrient content.

Vulcanized Rubber
Varies by Grade


Sulphur is used in the vulcanization process to improve the properties of rubber.

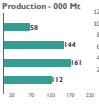
Sulphur-based Chemicals
Varies by Chemical

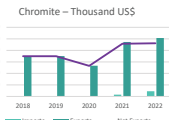

Prices can vary based on the specific chemical and its application.

Sulphur Cosmetics
Varies by Product


Used in certain skincare products for its antibacterial properties.

World Exports – (2018-2022)
US$ 2.73 Billion





APPLICATION

Metallurgy
Ferrochrome

Chemical Industry
Chromium Chemicals

Refractory Materials
Refractory Bricks

Foundry Sand
Chromite Sand

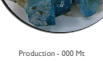
VALUE ADDED PRODUCTS

Raw Chromite	Ferrochrome	Chromium Metal	Chromium Chemicals	Chromium-Based Alloys	Chromium Plating
$4,000 - $6,000 Per Ton	$6,000 - $8,000 Per Ton	$7,000 - $9,000 Per Ton	$8,000 - $10,000 Per Ton	Varies widely	Varies based on grade
					
Primary ore for chromium used in various applications.	Produced by smelting chromite and used in the production of stainless steel.	Used in the production of various alloys.	Used in various industries including tanning and pigments.	Used in various applications, from aerospace to tools.	Used for decorative and protective finishes.

World Exports – (2018-2022)

US$ 2.58 Billion

Production - 000 Mt



Flourite – Thousand US$

APPLICATION

Hydrofluoric Acid
Rust Removers

Chemical Manufacturing
Refrigerants

Environmental Applications
Air Purification

Medicine and Pharmaceuticals
Medical Drugs

Glass Manufacturing
Glass Products

Optical Material
Optical Lenses

VALUE ADDED PRODUCTS

Raw Fluorite
$30 - $450 Per Ton

Mineral primarily used as a source of fluorine.

Metallurgical Grade
$100 - $500 Per Ton

Used in steel production.

Acid Grade
$300 - $1000 Per Ton

Highest purity form, used to produce hydrofluoric acid.

Fluorocarbon Chemicals
Varies widely

Used in various applications, including refrigerants and propellants.

Optical Grade
> $1000 Per Ton

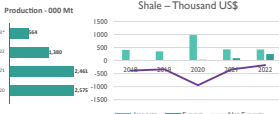
Used in the manufacture of optical lenses.

Hydrofluoric Acid
$1,000 - $3,000 Per Ton

Used in various applications, including refrigerants and propellants.

World Exports – (2018-2022)

US$ 2.41 Billion



APPLICATION

Oil and Gas
Shale Oil & Gas

Water Retention
Retaining Walls & Erosion Control

Manufacturing
Bricks, Tiles & Cement

Landfill Cover
Reduced Odors & Pest Control.

Geological Research
Fossil Records & Climate Data

Carbon Storage
Carbon Sequestration

VALUE ADDED PRODUCTS

Raw Shale
$10 - $60 Per Ton

Fine-grained sedimentary rock that can be rich in petroleum and natural gas.

Shale Gas
$2 - $4 Per Mn BTU

Extracted from shale rock formations using hydraulic fracturing.

Shale Oil
$40 - $70 Per Barrel

Extracted using hydraulic fracturingand can be comparable to conventional crude oil.

Shale-Derived Fuels
Comparable to Conventional fuels

Such as diesel or gasoline produced from shale oil.

Shale-Derived Chemicals
Varies widely

Such as ethylene or propylene, used to produce various plastics and chemicals.

World Exports – (2018-2022)
US$ 2.05 Billion

Production - 000 Mt

Marble – Thousand US$

APPLICATION

Construction
Floor tiles & wall tiles,

Sculpture
Fountains

Monument
Tombstones

Ground Calcium Carbonate
Decorative caulks & Filler in Paints

Decorative Aggregates

Acid Neutralization
water treatment pellets

VALUE ADDED PRODUCTS

Raw Marble
$50 - $150 Per Sq.m

Metamorphic rock derived from limestone used for architectural and decorative purposes.

Polished Marble Slabs
$60 - $200 Per Sq.m

Finished slabs that have been polished to a shine.

Marble Tiles
$20 - $100 Per Sq.m

Cut and finished for use in flooring and walls.

Marble Countertops
$100 - $500 Per Sq.m

Custom cut and finished for kitchens, bathrooms, etc.

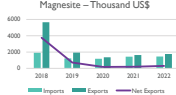
Marble Sculptures
Varies by Size/Design

Custom cut and finished for kitchens, bathrooms, etc.

Marble Decor
Varies by Item

Items like vases, trays, and other decorative pieces.

World Exports – (2018-2022)
US$ 1.98 Billion



APPLICATION

Refractory Material
Refractory Bricks, Linings

Fertilizers
Magnesium-based Fertilizers

Catalyst in Synthetic Rubber Production
Synthetic Rubber

Magnesium Chemical Production
Magnesium Salts

VALUE ADDED PRODUCTS

Raw Magnesite
$100 - $300 per ton

Mineral primarily composed of magnesium carbonate used as a source for magnesium.

Dead Burned Magnesite
$200 - $500 per ton

Used in the production ofrefractory bricks for furnaces.

Caustic Calcined Magnesite
$150 - $400 per ton

Electrical applications.

Fused Magnesite
$500 - $1,000 per ton

Used in various applications including animal feed and fertilizers.

Magnesium Oxide
Varies by Grade

Produced by melting magnesite in an electric furnace for refractory products.

Magnesium Metal
Varies by Market

Used in various applications, including in the production of aluminum alloys.

World Exports – (2018-2022)
US$ 5 794.61 Million

APPLICATION

Construction
Crushed stone, Aggregates

Steel Manufacturing
Tubes, Pipes and Fittings

Agriculture
Agricultural lime

Chemical Manufacturing
Calcium carbonate, Quicklime

Food and Pharmaceuticals
Calcium supplements, Antacids

Paper and Pulp Industry
Glossy paper

VALUE ADDED PRODUCTS

Raw Limestone

$10 - $50 per ton

Sedimentary rock primarily composed of calcium carbonate.

Quicklime (Calcium Oxide)

$100 - $200 per ton

Produced by heating limestone and used in various industries.

Hydrated Lime (Calcium Hydroxide)

$150 - $300 per ton

Produced by adding water to quicklime and used in various applications.

Ground Calcium Carbonate (GCC)

$50 - $150 per ton

Produced by grinding limestone and used in various industries.

Precipitated Calcium Carbonate (PCC)

Varies by grade

Produced chemically and used in various applications.

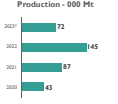
Limestone Aggregates

Varies by size/grade

Used in construction for roads and as a base material.

World Exports – (2018-2022)

US$ $ 621.73 Million



APPLICATION

Drilling
Drilling Mud

Industrial Manufacturing
Weighted Filler for Paper

Medical
Diagnostic Tests
Barium Enema

Pigment in Paints
Paints

Radiation Shielding
High-density concrete for X-ray

Ore of Barium
Barium Carbonate

VALUE ADDED PRODUCTS

Raw Barite
$50 - $250 Per Ton

Mineral primarily used in various industries.

Drilling-grade Barite
$100 - $300 Per Ton

Used in the oil and gas industry as a weighting agent for drilling fluids.

Paint-grade Barite
$200 - $500 Per Ton

Used in the paint industry due to its inertness and ability to scatter light.

Chemical-Grade Barite
$200 - $500 Per Ton

Used in the chemical industry for various applications.

Barium Salts
Varies by grade

Used in the chemical industry for various applications.

World Exports – (2018-2022)
US$ 337.56 Million

Production – Mt

Pumice – Thousand US$

APPLICATION

Concrete Industry
Decorative Precast Concrete Veneer

Horticulture & Agriculture
Pumice Soil

Polishing and Abrasives
Exfoliating Cosmetics,

Pet and Livestock Care
Livestock Care Products

Filtration Media
Water Filtration Systems

Functional Filler and Extender
Paints, Coatings,

VALUE ADDED PRODUCTS

Raw Pumice
$50 - $150 per ton

Light and porous volcanic rock used in various applications.

Pumice Stones
$1 - $5 per piece

Commonly used for personal care, especially for exfoliating skin.

Pumice Powder
$100 - $500 per ton

Used in various industries, including cosmetics and cleaning products.

Pumice Concrete
Varies by Formulation

A lightweight concrete that uses pumice as an aggregate.

Pumice-based Cleaners
Varies by Formulation

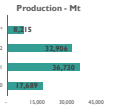
Used for cleaning hard surfaces.

Pumice Soap
Varies by Brand

Used for heavy-duty hand cleaning.

World Exports – (2018-2022)

US$ 237 Million



APPLICATION

Civil Engineering
Basalt Aggregate

Cryogenic Applications
Basalt Fiber Insulation

Automotive
Basalt Fiber Components

Reinforcement
Basalt Fiber Reinforcements

Wind Turbine Blades
Basalt Fiber Blades

Thermal Insulation
Basalt Fiber nsulation

VALUE ADDED PRODUCTS

Raw Basalt
$50 - $150 Per Ton

Type of igneous rock used in various construction and other industries.

Basalt Pavers
$2 - 55 Per sq. ft.

Used for driveways, patios, and walkways.

Basalt Tiles
$3 - 57 Per sq. ft.

Used for flooring and walls.

Basalt Slabs
$10 - $25 Per sq. ft.

Used for countertops and larger installations.

Basalt Fiber
Varies Based on Quality

Used in the production of variousproducts like ropes, nets, and in the automotive industry.

Basalt Rebar
Varies Based on Size

Used as an alternative to steel rebar in construction.

World Exports – (2018-2022)

US$ 4.75 Billion

Production - Mt

Manganese – Thousand US$

APPLICATION

Steel Production
Stainless Steel &
Carbon Steel

Chemical Production
Manganese(II) Chloride &
Manganese(II) Sulfate

Aluminum Alloys
Aluminum-Manganese
Alloys

Water Treatment
Manganese Oxide
Filters

Battery Production
Lithium Manganese
Oxide Batteries

Animal Feed & Fertilizer
Manganese
Supplements

VALUE ADDED PRODUCTS

Raw Manganese Ore
$150 - $500 Per Ton

Essential metal used in various industries.

Ferro manganese
$1,000 - $1,500 Per Ton

An alloy of iron and manganese, used in steel production.

Silico manganese
$900 - $1,200 Per Ton

Another alloy used in steel production.

Manganese Sulfate
$500 - $800 Per Ton

Used in fertilizers and battery manufacturing.

Electrolytic Manganese Metal
$2,000 - $2,500 Per Ton

Used in specialty steel and aluminum alloys.

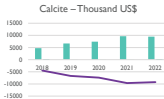
Electrolytic Manganese Dioxide
$1,200 - $1,800 Per Ton

Used as an alternative to steel rebar in construction.

World Exports – (2018-2022)

US$ 4.18 Billion

Production - Mt



APPLICATION

Construction
Limestone, & Marble

Pharmaceuticals
Calcium Supplements

Agriculture
Soil treatments & Poultry

Ceramics
Floor & Wall Tiles

Chemical Industry
Paints & Plastics,

Optics
Optical Instruments

VALUE ADDED PRODUCTS

Raw Calcite
$50 - $200 Per Ton

Common carbonate mineral used in various industries.

Ground Calcite
$100 - $300 Per Ton

Used as a filler in the paint, plastic, and rubber industries.

Precipitated Calcium Carbonate
$300 - $700 Per Ton

Produced from high-quality calcite. Used in paper, paint, and plastic industries.

Calcite for Agriculture
$50 - $150 Per Ton

Used to neutralize acidic soil.

Calcite Slabs & Tiles
Varies widely

Used in construction and decoration.

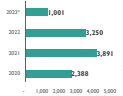
Calcite Jewelry & Carvings
Varies widely

Used in the gem and craft industry.

World Exports – (2018-2022)

US$ 1.52 Billion

Production - Mt



Granite - $000

APPLICATION

Countertops
Granite Slabs

Construction
Granite Blocks

Flooring
Granite Tiles

Architectural Features
Granite Architectural Features

Monuments
Granite Monuments

Paving
Granite Pavers

VALUE ADDED PRODUCTS

Raw Granite
$50 - $200 Per Ton

Popular natural stone used for various construction and decorative purposes.

Granite Slabs
$40 - $200 Per Sq. ft.

Used for countertops, walls, and other installations.

Granite Tiles
$10 - $50 Per Sq. ft.

Used for flooring and walls.

Granite Pavers
$10 - $40 Per Sq. ft.

Used for driveways, patios, and walkways.

Tombstones
Varies Widely

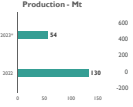
Prices can vary based on design, size, and finish.

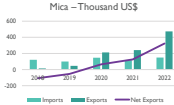
Sculptures
Varies Based on Design

Used for decorative purposes.

World Exports – (2018-2022)

US$ 230.08 Million





APPLICATION

Electrical Insulation
Capacitors

Cosmetics
Eyeshadows

Electronics
Semiconductors

Paints and Coatings
Paints

Plastics and Rubber
Plastics, Rubber Products

Aerospace Industry
Aircraft Engine

VALUE ADDED PRODUCTS

Raw Mica
$100 - $500 Per Ton

Group of sheet silicate minerals used in various industries.

Sheet Mica
$1,000 - $3,000 Per Ton

Used in electrical components.

Ground Mica
$300 - $700 Per Ton

Used in paints, cosmetics, and as a filler in plastics.

Built-up Mica
Varies widely

Used in electronic and electrical equipment.

Mica Paper
$2,000 - $5,000 Per Ton

Used in the manufacture of mica plates and tubes.

Mica Tapes
Varies widely

Used in the insulation of wires and cables.

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Empirical Analysis

Chapter 4

Empirical Analysis

This chapter delves into the pivotal roles played by industries, such as construction and manufacturing, in fostering economic growth. These sectors heavily rely on minerals as their foundation, contributing significantly to various applications (see Appendix) that fortify our economy and improve our daily lives. Employing the Leontief Expansion Model for empirical analysis, we seek to comprehend the intricate connections between these industries. This exploration unveils the symbiotic relationship between minerals and these sectors, shedding light on how their collaboration propels economic development through judicious resource utilization and innovative ideas. Furthermore, the chapter provides insights into upcoming trends and the future trajectory of these industries, offering a comprehensive perspective on their influence in shaping our society and advancing progress.

The indicators gleaned from the Input output table highlight the export to output ratio of mineral exports over the past two decades.

Table 3: Economic Indicators Minerals Sector

Indicators	FY 2000	FY 2010	FY 2020
Export to Output Ratio	0.06	0.09	0.05
Backward Linkages	1.03	1.01	0.97
Forward Linkages	0.98	1.08	1.07
Foreign Direct Investment US$ Million	-	7.10	4.10

Persistently low, this ratio signals that Pakistan's minerals sector makes a relatively modest contribution to the GDP. Robust backward and forward linkages underscore the untapped potential of Pakistan's minerals sector to escalate the extraction and production of value added products from latent minerals (see Table 3). Realizing this potential necessitates foreign investment in alignment with local partners, a dynamic that could wield a substantial impact on the overall economy. However, over the past decade, Pakistan has grappled with attracting a substantial influx of foreign investment into the mineral sector.

Empirical Analysis

Realizing this potential necessitates foreign investment in alignment with local partners, a dynamic that could wield a substantial impact on the overall economy. However, over the past decade, Pakistan has grappled with attracting a substantial influx of foreign investment into the mineral sector.

Table 4: Leontief Model Summary

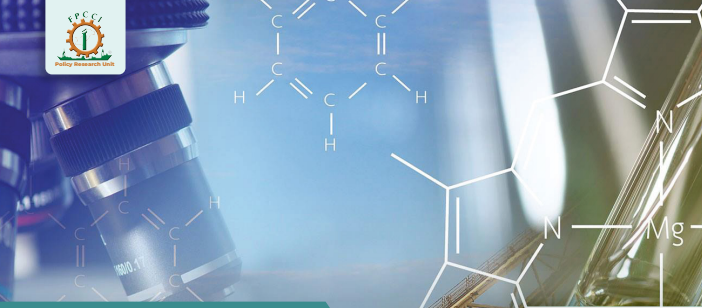
Leontief Expansion Model	
If Output **Increases by 50%** in Minerals Sector	
Overall GDP Increases – US$ Million	2,682
Share of GDP Increases	1%

According to the empirical analysis conducted through the Leontief Expansion Model, a 50 percent increase in the output of minerals could potentially generate a US$ 2.68 billion boost in GDP (see Table 4). This would constitute approximately a 1 percent share of the total GDP growth. The sector wise impact on GDP is illustrated in Table 5, providing a detailed breakdown of the anticipated economic ramifications of such an increase.

Table 5: Sector Wise GDP Summary

Sector Wise GDP Increases	
Particulars	**Share - Million US$**
Agriculture, hunting, & forestry	64.96
Mining and quarrying	436.28
Food, beverages, and tobacco	9.90
Textiles	10.92
Leather	1.66
Wood	2.22
Pulp & Paper	39.55
Petroleum	33.88
Chemicals	39.24
Rubber and plastics	8.76
Other Nonmetallic Minerals	1026.86
Basic metals	15.49
Machinery, nec	4.19
Electrical and optical equipment	4.37
Transport Equipment	6.35
Manufacturing, nec	10.08
Utilities	103.92
Construction	0.47

Source: Authors' Estimations. Working based on IO Table 2020,



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Minerals to Chemical Feasibility Analysis

Chapter 5

Minerals to Chemical - Feasibility Analysis

This chapter delves into a comprehensive assessment of the feasibility and viability of domestically converting minerals into chemical products, with a specific focus on Fluorspar, Magnesium Oxide (MgO) Ferrochrome (FeCr) and Talc.

This analysis aims to explore the potential benefits in terms of import substitution as well as export enhancement associated with the transformation of these raw mineral resources into value added chemical compounds. By examining factors such as market demand, technological feasibility, and economic viability, this chapter seeks to provide insights into the feasibility of establishing chemical processing facilities for these minerals in Pakistan. This would establish the country as a significant player in the global minerals market, in addition to ensuring self sufficiency in meeting domestic mineral requirements and bolstering the mineral processing industry.

Based on the above precedent, the following projections have been formulated under the premise that all four of the identified high potential by products of minerals (namely Fluorspar, Magnesium Oxide (MgO) Ferrochrome (FeCr) and Talc) are equipped with at least one indigenous production unit within Pakistan. Maintaining a sale price of US$ 550/Ton, the investment requisites for each of these four products, their associated operation costs, as well as the anticipated revenue generated, have been organized into a tabulated format below. This analysis is aimed at providing a comprehensive overview of the financial implications and potential returns associated with establishing local production facilities for these mineral by-products, thus facilitating informed decision making and strategic planning within the industry.

Minerals to Chemical - Feasibility Analysis

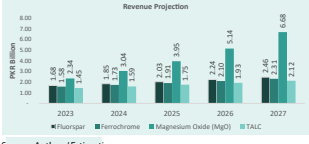
Table 6: Mineral Wise Summary of the Estimated Investment Plan

Minerals Name	Fluorspar	Magnesium Oxide (Mg_2O)	Ferrochrome (Fe_2Cr_2)	TALC
Investment - PKR Million	551.18	382.57	529.86	254.97
Monthly Revenue - PKR Million	140.13	194.78	131.31	120.76
Cost Monthly - PKR Million	117.25	184.34	96.18	59.74
Monthly PAT - PKR Million	16.02	7.30	24.59	36.61
IRR (%)	58.00	59.71	24.00	223.00
Payback Period - Years	2.10	2.04	2.00	1.31
No. of Employment	68	68	47	50
Employees Salary (PKR Million)	1.78	1.78	1.56	1.78

Source: Authors' Estimations

Based on the above estimates, the anticipated revenue for the next 5 years, following the commencement of one production plant each of the four identified potential minerals, is illustrated in the following graph.

Figure 4: Mineral Wise Revenue Projections for the Estimated Investment Plan



Source: Authors' Estimations

Minerals to Chemical - Feasibility Analysis

Export Enhancement Analysis

Four by products (Magnesium Oxide, Ferrochrome and Talc) derived from various minerals have been chosen, taking into consideration their accessibility in the Balochistan region of Pakistan and our country's production capacities. The expected benefits of import substitution, including export enhancement, has been assessed through four different scenarios based on increasing the number of production plants. The production capacity of each plant is assumed to be at 100 Tons per day, which is deemed as the minimum threshold necessary for operational viability, as any capacity value below 100 Tons/day would make the operational costs too high when compared to the estimated revenues. Moreover, while all the following four scenario analysis assumes a production capacity of 100 tons per day, it should be noted that actual capacity could potentially scale up to 500 tons per day.

Scenario # 1

Assumptions

In this scenario, we assume that each of the four desired by product of minerals has exactly one production plant in operation, with a capacity of 100 TPD.

- Plant Size: 100 TPD
- No. of Plant: 01 each Product
- Products: 4 By Products

Results

Currently only two of the four identified potential mineral by products (Fluorspar and Talc) are being exported by Pakistan with a value of approximately US$ 72.13 million. Whereas, the same products are also being imported with a value of US$ 1.83 million and US$ 0.41 million respectively.

Minerals to Chemical - Feasibility Analysis

However, based on the above assumptions, it has been deduced that operationalizing just one production plant for each product having a capacity of 100 tons per day (TPD) could contribute to a substitution of approximately US$ 4.15 million in annual imports for the country. Moreover, the production capacity would exceed the domestic demand, thus creating significant opportunities for export enhancement estimated at US$ 290.26 million annually. This would include not only the Fluorspar and Talc, but also Magnesium Oxide and Ferrochrome, for which, although the country has immense raw material available but does not have any current export base.The exact breakdown of the value-added benefit has been provided in tabulated form below.

Table 7: Export Enhancement Scenario I

Value Added Product									
HS Code	Product	Pak Trade (US$ Million)		World Import (US$ Million)	Trade Value/Ton ($/Ton)		Desired Production Capacity Tons p.a.	Import Substitution (US$ Million)	Export Enhancement (US$ Million)
		Import	Export		Import	Export			
25292100	Fluorspar	1.83	14.98	970	443	-	36,500	1.83	14.35
25199040	MgO	1.34	-	3,005	-	365	36,500	1.34	11.98
720241 & 720249	FeCr	0.57	-	12,175	3,623	-	36,500	0.57	131.67
252620	TALC	0.41	57.15	1,006	-	372	36,500	0.41	13.17
									171.17

Source: Authors' Estimations

Minerals to Chemical - Feasibility Analysis

Scenario # 2

Assumptions

The second scenario encompasses increasing the number of production plants for each of the four mineral products to 5. Thus developing the desired production capacity of each product to approximately 182,500 Tons per Annum.

- Plant Size: 100 TPD
- Total No. of Plants: 20
- Products: 4 By Products

Results

Expanding the production capacity to include five plants for each mineral product is anticipated to significantly bolster the country's export capabilities. The aforementioned considerations are projected to raise the country's exportable surplus to a substantial US$ 596.24 million, after fulfilling of import requirements of US$ 4.15 million. A detailed breakdown of the assumptions and outcomes is explained in the following table, outlining the anticipated impact of this expansion on export enhancement.

Table 8: Export Enhancement Scenario 2

Value Added Product									
HS Code	Product	Pak Trade (US$ Million)		World Import (US$ Million)	Trade Value/Ton ($/Ton)		Desired Production Capacity Tons p.a.	Import Substitution (US$ Million)	Export Enhancement (US$ Million)
		Import	Export		Import	Export			
25292100	Fluorspar	1.83	14.98	970	443	-	182,500	1.83	79.10
25199040	MgO	1.34	-	3,005	-	365	182,500	1.34	65.28
720241 & 720249	FeCr	0.57	-	12,175	3,623	-	182,500	0.57	660.63
252620	TALC	0.41	57.15	1,006	-	372	182,500	0.41	67.52
									872.53

Source: Authors' Estimations

Minerals to Chemical - Feasibility Analysis

Scenario # 3

Assumptions

Gradually increasing the number of production units of the desired mineral products in the economy over the years, the third scenario assumes the number of production units for each mineral product to be increased to 10. Thus, the total produced capacity for each product would be increased to 365,000 Tons per Annum.

- Plant Size: 100 TPD
- Total No. of Plants: 40
- Products: 4 By Products

Results

Increasing the overall number of the production units to 40, with a distribution of 10 units allocated to each mineral product, is expected to yield an annual output totaling US$ 1.75 billion across the four products. By offsetting import obligations amounting to approximately US$ 4.15 million through the substitution of domestically manufactured goods, the surplus generated, estimated at US$ 1.74 billion, can be channeled towards augmenting the country's export capacity. Product-wise breakdown of such a scenario is provided below.

Table 9: Export Enhancement Scenario 3

Value Added Product									
HS Code	Product	Pak Trade (US$ Million)		World Import (US$ Million)	Trade Value/Ton ($/Ton)		Desired Production Capacity Tons p.a.	Import Substitution (US$ Million)	Export Enhancement (US$ Million)
		Import	Export		Import	Export			
25292100	Fluorspar	1.83	14.98	970	443	-	365,000	1.83	160.03
25199040	MgO	1.34	-	3,005	-	365	365,000	1.34	131.89
720241 & 720249	FeCr	0.57	-	12,175	3,623	-	365,000	0.57	1,321.83
252620	TALC	0.41	57.15	1,006	-	372	365,000	0.41	135.45
									1,749.20

Source: Authors' Estimations

Minerals to Chemical - Feasibility Analysis

Scenario # 4

Assumptions

Finally, the fourth scenario assumes an expansion in the quantity of production units dedicated to the desired mineral products, to be increased to a total of 60 units. In this arrangement, each of the four minerals would be allocated 15 units each, with each production unit capable of a daily production capacity of 100 tons.

- Plant Size: 100 TPD
- Total No. of Plants: 20
- Products: 4 By Products

Results

By expanding the total number of production units to 60, the country could experience a considerable boost in its export capacity, foreseeing an increment of approximately US$ 876.67 million when compared to the previously mentioned scenario. The cumulative value of production under this setup is projected to reach US$ 2.63 billion. After the fulfillment of current import substitution requirements of US$ 4.15 million, the remaining US$ 2.62 billion could then be used for enhancing our exports for the next few years. This expansion in production infrastructure is anticipated to significantly contribute to the country's economic growth and trade surplus, positioning it favorably in the global market and fostering sustained financial prosperity. The exact breakdown of the value-added benefit for this scenario has been provided in tabulated form below.

Minerals to Chemical - Feasibility Analysis

Table 10: Export Enhancement Scenario 4

Value Added Product									
HS Code	Product	Pak Trade (US$ Million)		World Import (US$ Million)	Trade Value/Ton ($/Ton)		Desired Production Capacity Tons p.a.	Import Substitution (US$ Million)	Export Enhancement (US$ Million)
		Import	Export		Import	Export			
25292100	Fluorspar	1.83	14.98	970	443	-	547,500	1.83	240.96
25199040	MgO	1.34	-	3,005	-	365	547,500	1.34	198.50
720241 & 720249	FeCr	0.57	-	12,175	3,623	-	547,500	0.57	1,983.02
252620	TALC	0.41	57.15	1,006	-	372	547,500	0.41	203.38
									2,622.86

Source: Authors' Estimations

Based on the premise that each production plant operates at a minimum capacity of 100 tons per day (TPD), it is estimated that Pakistan's collective export enhancement could reach **US$ 2.62 billion**, by operationalizing just **15 production plants** for each of the identified mineral products. However, by maximizing the plant capacity up to five times the initial amount, reaching 500 TPD, which is considered a fully feasible target, the potential export enhancement could significantly increase to approximately **US$ 13.13 billion3**. This demonstrates the substantial impact that scaling up production capacity can have on enhancing export revenues for the country.

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Policy Analysis & Stakeholder Recommendations

Chapter 6

Mineral Policy Analysis - Pakistan

Ownership Structure

- Mining in Pakistan primarily involves small-scale mining by sole proprietorships, partnerships, and some private limited companies.
- While medium and large-scale mining is undertaken by private limited, public limited, and non-resident (foreign) companies.

Foreign Direct Investment

- 100% foreign private investment for mineral resources is allowed, along with guaranteed security, and repatriation of their initial investments and profits earned.

Taxes & Duties

- There is no Customs duty and sales tax on minerals sector machinery, equipment, materials, or accessories for the exploration phase.
- 5% customs duty (No Sales Tax) based on ad valorem on machinery imports for the mine construction phase.
- A 15% tax is deducted from the total amount paid to a non-resident individual for royalty and technical services fees.
- Non-resident contractors working on construction, assembly, or installation projects in Pakistan face a **6% withholding tax** on contract-related payments.

Mining Licenses

- Reconnaissance Licenses (RL) cover areas from 100 to 10,000 sq. km for specific minerals and it's valid for 12 months.
- The licensee can apply for an exploration license over 10% of the RL area if they meet the criteria, with an application fee of Rs 15,000.
- In Exploration Licenses cover areas up to 1,000 sq. km with a validity of up to three years.
- Mineral exploration companies must submit detailed information about the company, a description and map of the area, a work program, and details about their technical and financial resources.

Mineral Policy Analysis - India

Ownership Structure

- Enactment of Mines and Minerals *(Development and Regulation)* Amendment Act, 2021 enabled **Captive Mines** owners to sell up to 50% of their annual mineral production in the open market.
- The Government of India encourages public-private partnerships for the development of new mining capacities.
- The National Mineral Policy promotes private ownership in the steel industry and other high-priority mineral sectors.

Taxes & Duties

- 50% reimbursement of exploration expenses to the holder of composite license through National Minerals Exploration Trust.
- The rate of loyalty minerals varies between 2 percent to 25 percent of the average sale price on an ad valorem basis.
- The **Basic Customs Duty** also varies depending on basic metals, precious and semi-precious stones. It was reduced by 50% for items such as coal-tar pitch, battery waste & scrap, and steel-grade limestone in basic metals and minerals.

Mining Licenses

- Reduced minimum area requirement for the grant of mining licenses from 5 hectares to 2 hectares.

Foreign Direct Investment

- 100% FDI is allowed through automatic routes opened for non-atomic and nonfuel minerals.

Stakeholders Recommendations

The mineral sector in Balochistan, with its vast untapped potential, holds the key to significant economic transformation for both the region and Pakistan as a whole. To realize this potential, a comprehensive strategy encompassing public-private partnerships, infrastructure development, regulatory reforms, and technological advancements is essential. Below are detailed recommendations to optimize the development of Balochistan's mineral resources.

Public-Private Partnerships (PPPs)

Promoting public-private partnerships can expedite the development of new mining capacities. These partnerships should focus on leveraging the strengths of both sectors, the public sector's regulatory framework and the private sector's operational efficiency and capital investment.

Joint Ventures forTechnology Transfer

Encouraging joint ventures between local and foreign companies can facilitate the transfer of advanced technologies and expertise. Such collaborations can significantly enhance the technical capabilities of the local mining industry, enabling it to meet international standards.

Financial Incentives

Offering financial incentives such as tax holidays, reduced royalties, and subsidies for exploration and the production of value-added mineral products can attract both local and international investors. These incentives will lower the initial investment risks andoperational costs, making the sector more attractive.

Infrastructure Development

Investment in infrastructure is crucial to support mining activities. Developing robust transportation networks, reliable power supply, and adequate water resources will facilitate efficient mining operations. Ensuring that mining areas have the necessary infrastructure will reduce operational delays and costs, making the sector more competitive.

Advanced Mining Technologies

Adopting advanced mining technologies can increase productivity and safety in mining operations. Automation, real-time data analysis, and modern safety equipment can not only improve efficiency but also reduce environmental impact and enhance worker safety.

Stakeholders Recommendations

Skill Development Programs

Investing in skill development programs to train the local workforce in modern mining techniques and management practices is vital. Skilled labor is essential for the effective implementation of advanced technologies and for maintaining high operational standards.

Regulatory Framework Updates

Regularly updating the regulatory framework to reflect the evolving needs of the mining sector is essential. Ensuring that the regulations are transparent, consistent, and investor-friendly will build confidence among stakeholders and attract more investments.

Transparency and Consistency in Policies

Maintaining transparency and consistency in regulatory policies is crucial to build and sustain investor confidence. Clear guidelines, predictable regulatory actions, and an efficient dispute resolution mechanism will create a stable investment environment.

Environmental and Social Governance (ESG)

Implementing strong environmental and social governance practices will ensure sustainable mining operations. This includes minimizing environmental impact, ensuring the health and safety of workers, and contributing to the socio-economic development of local communities.

Export Enhancement Strategies

Developing strategies to enhance mineral exports can significantly boost economic growth. By focusing on high-value minerals and establishing local processing units, Balochistan can increase its export revenues and reduce dependency on raw mineral exports.

The mineral potential of Balochistan presents a substantial opportunity to transform the economic landscape of the region and Pakistan. By implementing these recommendations, the province can attract significant investments, enhance its mining capabilities, and position itself as a key player in the global minerals market. Strategic planning and effective execution of these initiatives will unlock the vast economic potential of Balochistan's mineral resources.

References

- Mines & Minerals Department, Government of Baluchistan
- United States Geological Survey (USGS), Country Wise data
- Tradingeconomics – Minerals Resources
- Fast market – Industrial Minerals
- National Minerals Association, Washington DC
  - /https://nma.org/wp-content/uploads/2016/09/NMA-Fact-Sheet-Minerals-and-Uses
- Bloomberg – Futures Metal Market
- Ycharts – Metal and Minerals Price Index
- World Bank – Minerals Rent
- Vedantu – Uses of Minerals
- Trademap – Minerals Exports
- IBISWorld – Global Minerals Industry
- Statista – Mining and Quarrying data
- Mining Journal – Minerals Industry Research
- Market Research – Minerals Industry Research

Appendix-1

Forward linkages Industries

Construction Industry

Applications Concrete Industry, Steel Production, Architectural, Flooring, Drilling, Wall Cladding, Road Construction, Infrastructure, Civil Engineering, Monuments, Paving

Manufacturing and Metallurgy

Applications Steel Production, Metallurgical Applications, Aluminum Alloys, Glass Manufacturing, Ceramic Production, Foundry Sand, Shipbuilding, Wind Turbine Blades, Aerospace and Sports Equipment, Automotive Industry, Oil Well Drilling, Electronics Manufacturing, Tools & Machinery Manufacturing, Carbon Products

Chemical and Industrial Production

Applications Source of Hydrofluoric Acid, Electrical Insulation, Chemical Production, Asbestos Source, Industrial Manufacturing, Plastic and Rubber, Magnesium Chemical Production

Energy and Fuel

Applications Electricity Generation, Liquid Fuels, Gas Production, Oil Production

Forward linkages Industries

Environmental and Agriculture Uses

Applications Filtration, Water Treatment, Horticulture and Agriculture, Pet and Livestock Care, Animal Feed and Fertilizer, Environmental Application, Carbon Storage

Medical and Pharmaceutical

Applications Medical Diagnostic Tests, Medicine and Pharmaceuticals, Radiation Shielding, Radiation Detection, Health Supplements, Cryogenic Applications

Consumer Products and Decoration

Applications Cosmetics, Carvings, Countertops, Gemstone Production, Decorative Mineral Specimen, Decorative Items, Paints and Pigments, Lighting and Design Equipment, Bathrooms and Artistic

Research and Scientific

Applications Scientific Research, Geological & Paleontological Research

Sources: Vedantu, Mining Journal, Market Research and Fast market