

STRATEGY FOR MINERAL SECTOR DEVELOPMENT IN PAKISTAN

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Executive Summary

Minerals sector has been one of the significant source of economic development of a number of developed countries; China, Italy, Turkey, Spain, Brazil etc. Contribution of mineral sector is multifarious; trade promotion, facilitation in natural resource exploitation, improve per capita income, increase employment, expand communication base for economic activities, enhance income level, accelerate economic growth. Several developed countries have been exploiting their original mineral resources by using as intermediate goods and finished products. Many of the countries are importing minerals from other countries, refining, value addition and then exporting.

Pakistan is endowed with huge reserves of minerals covering an outcrop area of 600,000 sq. Kms. There are 92 known minerals of which 52 are commercially exploited with a total production of 68.52 million metric tons per year. The sector is a promising one with an average growth of 2-3% per annum, existence of above 5,000 operational mines, 50,000 SMEs and direct employment of 300,000 workers.

The country has the world's second largest salt mines and fifth largest copper and gold reserves, and second largest coal deposits, as well as estimated billions of barrels of crude oil. Despite huge potential, contribution of mineral sector to Pakistan's GDP is around 3 % and country's exports are only about 0.1% of the world's total. In the year 2017, Pakistan's total mineral exports were 0.5 Billion USD as compared to the world's 401 Billion USD.

A number of gaps exist in exploitation and marketing of mineral. Regulatory Framework has missing links between the national mineral policy and provincial mining policies/laws, resulting in procedural delays, creates hurdles for investors particularly for foreign investors.

Sufficient Infrastructure for enabling business i.e. mine access roads, connecting roads network, utilities and industrial zones is one of key factor behind low investment and poor growth of the minerals sector.

Technology adopted both in the quarrying and processing sub sectors is outdated and is unable to produce standardized and uniform quality products for domestic market in general and for export market in particular. The quarry wastage in Pakistan reaches 75% as compared to the international standard of up to 45%.

Human Resource has low productivity with less number of qualified and trained workforce in the mining and processing level. There is no dedicated training institute providing quality training in the mineral, mining and processing.

Low Access to Finance exists without any mechanism of mining collateralization. Dedicated and friendly banking products for both mining and processing sub sectors are not available.

There exist prospects for Investment on different aspects of mineral; estimation, exploration, production, washing, finishing, value addition, technological abridging and marketing. Several number of minerals may be focused for improvement in production and marketing; Dimension stones, copper and gold, chromite, iron ore, gypsum, gemstone, coal etc.

In view of above strategic interventions are proposed to increase capitalization of mineral sector's potential. The intervention includes; regulatory framework, resource mapping, infrastructure development, technological upgradation, access to finance, human resource development marketing and constitution of district Review and Monitoring Committee.

Formulation of new National Mineral Policy with appropriate regulatory framework for facilitation of investment particularly foreign investment is required by Provincial Directorates of Mines & Minerals by aligning provincial mineral policies with the new national mineral policy.

Estimation and mapping of mineral reserves and deposits using modern scientific methods such as geo modeling and 3D modeling, in consultation and partnership with PCSIR, GSP etc. may be done.

Development of Mine Access roads for the existing and potential mineral rich areas by the Provincial Government with lead role of Directorate of Mine and Minerals, may be done by the provincial - federal government.

Technology Up-gradation may be done through, short term, medium term and long term intervention for individuals, businesses and clusters by: (i) Establishment of Machinery Pools, (ii) Common Facility centers, (iii) Training Centers, (iv) Modern Stock Yards/Warehouses to improve productivity, product quality and competitiveness.

The relevant sector development companies i.e. PASDEC, PJGDC, Provincial Directorate of Minerals, Small Industries Development organizations and SMEDA may be assigned the responsibility to accomplish this task. Marketing strategy may be developed in order to capitalize domestic and international demand for the mineral sector focusing on domestic promotion, facilitation of investors to participate in international expos, display centers, export facilitation centers with improved role of Pakistan expatriates.

Access to Finance may be increased by introduction of new financial products with proper mine collateralization mechanism to cater with financial requirement of the sector by State Bank of Pakistan. These may include; financing against products, equity participation funds, credit guarantee schemes, cash flow based financing and etc.

Human Resource Development may be done through establishment of improved and dedicated training facilities at major mineral bearing areas with state of the art machinery and training facilities. Besides this, training courses in modern quarrying and processing may be introduced in existing TVET institutes through proper regulation to cater for skill requirement of the sector. Organizations such as PASDEC, PJGDC, TEVTA, TUSDEC and NAVTTC may be tasked this.

District Review and Monitoring Committees may be constituted under the Chairmanship of Deputy Commissioners comprising representatives of respective departments. The committee will monitor accomplishment of targets allocated by the government in respective areas. The committee will also be able to accelerate implementation of development activities, removal of bottlenecks and facilitation.

District Economy may be developed at the district level, potential areas of minerals economic activities, investment opportunities, endowments, available human resource, technology entrepreneurship etc can be assessed and mapped for future planning and development as an integrated development within the national economy. This may be helpful in acceleration of economic activities.

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Introduction

Minerals sector has been one of the significant source of economic development of a number of developed countries; China, Italy, Turkey, Spain, Brazil etc. Contribution of mineral sector is multifarious; trade promotion, facilitation in natural resource exploitation, improve per capita income, increase employment, expand communication base for economic activities, improve trade volume, accelerate economic growth.

China has been importing significant amounts of raw material and by transferring it into finished products increasing exports (Pui-Kwan Tse 2013). China's output value of industrial Sector including; construction, manufacturing and mining – increased by 7.8% (driven largely by infrastructure projects and real estate development) and accounted for 43.9% of G.D.P. Owing to the Government's preferential development program, the growth rates in the western and central parts of the country were higher than in the eastern and coastal areas (National Bureau of Statistics of China 2014, P.1-10) Pui-Kwan Tse 2013) Mineral Yearbook China).

China's Mineral Trade accounted for about 25% of the country's total trade. China is amongst few countries whose domestic supply of and demand for a variety of mineral commodities affected the World Mineral Market (Pui – Kwan Tse 2013). China's trade in mineral is increasing over the time, increase of 7.6% in 2013 compared with 2012. (Pui – Kwan Tse 2013).

Similarly Italy's industrial production is dependent on a number of minerals, its industrial Sector accounted for about 25.2% of GDP in 2010, which was a 0.2% increase from the previous years. Italy's important industrial facilities are based on aluminum, automotive assembly, chemicals, iron and steel, and machine tooling and metal working facilities. These industries continued to be dependent on imported non fuel and fuel mineral inputs. (Alberto Alexander Perez 2010).

Many of the countries in future are expected to increase their production based in imported minerals, the domestic demand and international demand for mineral and mineral based industrial product will increase. Few of the countries have adopted conservation strategy by conserving their own mineral resources and exploitation of _____

1. Mineral Sector Plan/Road Map, SMEDA
2. Source: USGS, and Industry Survey.
3. Source: ITC calculations based on UN COMTRADE and ITC statistics.

other countries minerals for domestic industrial and export products. The expected continuation of China's economic growth implies that a strong demand for mineral commodities is likely to continue. It has shortages of supply of major minerals, including bauxite, chromium, copper, iron, lead, manganese, nickel, oil and potash, and relies on imports to meet its demands. Chinese Government

encourages enterprises to invest in such mineral rich countries. (Pui – Kwan Tse 2013). In view of construction of CPEC, less transportation cost; accessibility and supply from Pakistan can be increased manifold.

Significance of the Study:

Although Pakistan has a number of mineral resources in abundance, yet consolidated and aligned with latest economic system, strategy for exploitation does not exist. A number of works in pieces exist on different individual mineral, its small reflection may be domestic demand centered or local production etc. There is a dire need to analyse the mineral sector potential, its analysis in domestic and international perspective, future trends.

Objectives of the Paper:

Main objectives of the paper are to highlight mineral sector demand, its linkage with the domestic and international market; Identify gaps in exploitation and capitalization mineral resources of Pakistan. Identify potential intervention in a certain number of minerals' capitalization. Propose a number of intervention for improved exploitation, enhanced efficiency and capitalization of mineral resources of Pakistan.

This paper is organized to highlight mineral sector international demand in the regions of Asia and Europe. Part two over views Pakistan's mineral resources, potential interventions for improved exploitation of mineral resources. Part three proposes a framework for improved exploitation of mineral resources, enhancement of efficiency and better capitalization of the potential.

Data Set and Methodology:

The existing literature on high performing countries in economic growth dependent on mineral and mineral based export products has been reviewed. The existing secondary data sources of Pakistani government organizations such as Small and Medium Development Authority (SMEDA) and Geological Survey of Pakistan has been used for analysis. Qualitative and Quantitative analytical techniques have been adopted. A number of employees, private businessman involved in exploitation and business of minerals have be interviewed.

OVERVIEW OF PAKISTAN MINERAL BASE

Pakistan is endowed with huge reserves of minerals covering an outcrop area of 600,000 sq. Kms. There are 92 known minerals of which 52 are commercially exploited with a total production of 68.52 million metric tons per year. The sector is a promising one with an average growth of 2-3% per annum, existence of above 5,000 operational mines, 50,000 SMEs and direct employment of 300,000 workers.¹

Minerals are broadly classified into three categories; i) Metallic minerals ii) Non metallic minerals, and, iii) Energy/strategic minerals". Metallic minerals include metalliferous ores, aluminum, chromium iron etc, non metallic mineral include dimensional stones, clay, salt silica etc and energy/strategic minerals include, coal etc. Pakistan has immense reserves of a number of minerals and natural resources that include coal, gold, copper, bauxite, mineral salt, chromite, iron ore, and many others. Pakistan also mines a variety of precious and semi-precious minerals including ruby, topaz, and emerald.

Pakistan has a comparative advantage of its mineral resources occurring in several varieties, colours and patterns. The country has the world's second largest salt mines and fifth largest copper and gold reserves, and second largest coal deposits, as well as estimated billions of barrels of crude oil. Despite huge potential, contribution of mineral sector to Pakistan's GDP is around 3 % and country's exports are only about 0.1% of the world's total. In the year 2017, Pakistan's total mineral exports were 0.5 Billion USD as compared to the world's 401 Billion USD.²

The most potential and valuable minerals of Pakistan includes; Marble, Granite, Coal, Chromite, Gypsum, Copper, Gold, Iron Ore, Lead zinc, Bauxite, Crude oil and Natural gas. There are billions of commercially extractable reserves of these minerals that give both comparative and competitive advantages to Pakistan in the global perspective.

¹ Mineral Sector Plan/Road Map, SMEDA

² International Trade Center and Trade map Database

The major resources of core minerals in Pakistan are outlined below;³

Minerals	Reserves (Million Tons)	Grade
Chromite	2,527	Low to Medium
Copper	1352	Low to High
Gold	1,656.00	Low to High
Iron Ore	1,427.20	Low to High
Lead-Zinc	23.72	Low to Medium
Coal	185,000	Low to Medium
Gypsum	6 Billion Tons	Medium to High
Marble & Granite	297 Billion Tons	Medium to High

Sources: Author Tabulated data from GSP,

Table

02: Pakistan's Minerals Exports (Code: 25) - Year 2017⁴

Code	Product label	Millions USD
'2523	Cement, incl. cement clinkers, whether or not colored	210
'2501	Salts, incl. table salt and denatured salt, and pure sodium chloride, whether or not in aqueous ...	51
'2515	Marble, travertine, ecaussine and other calcareous monumental or building stone of an apparent ...	28
'2520	Gypsum; anhydrite; plasters consisting of calcined gypsum or calcium sulphate, whether or not ...	14
'2610	Chromium ores and concentrates	104
'2601	Iron ores and concentrates, incl. roasted iron pyrites	4
'2606	Aluminum ores and concentrates	4

¹ Source: USGS, and Industry Survey

² Source: ITC calculations based on UN COMTRADE and ITC statistics

1. Mineral Sector Plan/Road Map, SMEDA

2. International Trade Center and Trade map Database

3. 1 GSP Pakistan, DGMMs and Own Research

³ GSP Pakistan, DGMMs and Own Research

⁴ Source: ITC calculations based on UN COMTRADE and ITC statistics

INVESTMENT POTENTIAL IN MINERALS

The mineral sector of Pakistan despite of having huge reserves base of good quality minerals is still lagging far behind as compared to the world's mineral market. As compared to the world's minerals export market of 3,612 billion USD, the exports of Pakistan are negligibly small with a value of 1.17 billion USD during the last year. Pakistan is endowed with significant mineral reserves. The country has the world's second largest salt mines and coal reserves, fifth largest copper and gold reserves, and second largest coal deposits, as well as an estimated 618 billion barrels of crude oil.⁵

Pakistan has got huge potential for investment in the mineral sector. There are greater opportunities for private sector and direct foreign investments in the sub sectors; mining, processing and trading/exports. Key investment opportunities in the core minerals are as follows;

Dimension Stone:

Pakistan is endowed with vast resources of dimension stones with unique colors, patterns and occurrence. Pakistan has been endowed with extensive reserves of marble, including rare marble varieties such as Ziarat white, black & white marble and black granite that are world renowned. More than 40 types of natural colored marble are spread throughout the Khyber Pakhtunkhwa, Baluchistan, Sindh, and Punjab provinces. Pakistan has an estimated 297 billion tons of marble and granite reserves in all the four provinces, FATA, and Gilgit-Baltistan. Pakistan's annual quarry production is 3.82 million tons.⁶ Key potential investment opportunities are;

- Private sector led reserves estimation, mapping and analysis using scientific methods; 3D geo modeling and etc.
- Mechanized mining through modern technology diamond wire saw/chain saw.
- Establishment of private sector led Common Facility Centers (CFCs) for modern/mechanized mining.
- Modern block cutting and finishing facility.
- State of the art slabs cutting, polishing and finishing plant.
- Modern Agglomerated marble⁷ production, polishing and finishing plant.

⁵ Sector Brief Minerals, SMEDA

⁶ Pakistan Stone Development Company (PASDEC), Report 2017

⁷ Marble blocks/slabs produced from marble waste.

Copper and Gold

There are huge copper and gold reserves in Pakistan and are mainly concentrated in Baluchistan. There are estimated over 1600 million tons of gold reserves in Pakistan. In Reko Diq, Balochistan, main deposits of copper and gold are present. Antofagasta, the company which possesses the Reko Diq field, is targeting an initial production of 170,000 metric tons of copper and 300,000 ounces of gold a year. The project may produce more than 350,000 tons a year of copper and 900,000 ounces of gold. There are also copper deposits in Daht -e- Kuhn, Nokundi, located in Chaghi district.⁸ Key investment opportunities in Copper and Gold sector are;

- Modern copper and gold mining projects
- Copper refining plant
- Gold refining plant

Chromite:

Pakistan has belts of chromite deposits in Balochistan and parts of Khyber Pakhtunkhwa (KPK) Provinces. The highest grade of chromite ores is available in Balochistan, especially in Muslim bagh. Currently, the chromite ores deposits in Pakistan are estimated to be 2.5 million tones. At present, chromite ores are being produced from Muslim bagh, Khanozai, Nisai, Gawal, Wad and Sonaro areas of Balochistan, and Malakand and Kohistan areas of KPK. Pakistan's chromite grade ranges between 28%-56% and is produced both metrological and refractory grades of chromite.

However despite of huge reserves and production the modern processing and value addition activities are non-existent. Almost the entire production of chromite is exported to china in raw form. Despite of everlasting demand for stainless steel production there is no ferrochrome production unit in the country. Ferrochrome is an alloy comprised of iron and chromium used primarily in the manufacturing of stainless steel. The ratio in which the two metals are combined may vary, with the proportion of chromium ranging between 50% and 70%. Key investment opportunities in chromite sector are;

- Chromite processing plant for production of upgraded chrome
- State of the art Ferrochrome production plant

⁸ https://en.wikipedia.org/wiki/Mining_in_Pakistan

Iron Ore

Iron ore is among the top five minerals found in Pakistan and the country has estimated 1.427 billion tons of reserves of various grades. Iron ore is found in various regions of Pakistan including Nokundi, Chinot and the largest one in Kalabagh, Haripur and other Northern Areas. Key investment opportunities in coal sector are;

- Modern Iron Ore Mining/Quarrying Operations.
- Iron Ore Processing & Steel Mills Complex

Coal:

Pakistan is blessed with abundant coal reserves of both energy and fuel coal. The total coal reserves in Pakistan are 185 billion tones; within which ‘measured reserves’ are 3.45 billion tones, ‘indicated reserves’ nearly 12 billion tones, ‘inferred reserves’ 57 billion and ‘hypothetical resources’ 113 billion. The coals of Pakistan are high in sulphur and ash contents. The moisture percentage is also high in Sindh coal, especially in the Thar coal. Small tonnages of indigenous coal are used for electricity generation and by households, but by far the largest portion is used to fire brick kilns almost over half of the total coal consumption.⁹

It is anticipated that, if properly exploited, Pakistan’s coal resources may generate more than 100,000 MW of electricity for the next 30 years. Key investment opportunities in coal sector are;

- Coal fired alternate energy power plant.
- Coal washing plant
- Coal briquetting plant

Gypsum

Gypsum reserves are situated at Mianwali, Dera Ghazi Khan, Kohat, Rohri, Quetta and Sibi. Gypsum is found in a large quantity in Pakistan, estimated to be between 5 to 6 billion tons in all the provinces of the country. The current production of Gypsum is around 0.5 to 0.6 million tons per annum. Currently, Gypsum is mostly used as raw material in cement industry and for soil improvement for agricultural purposes.

Gypsum deposits of Pakistan have remained almost untapped for industrial uses particularly in building industry. They are generally on the surface and lend themselves to economic open cast quarrying. More-over they are well connected with existing infrastructure and can be developed without any huge expenditure and technical constrains for larger domestic use and considerable export. Key investment opportunities in gypsum sector are;

- High quality Plaster of Paris plant

⁹ <https://www.worldenergy.org/data/resources/country/pakistan/coal/>

- State of the art gypsum board unit
- Machinery pool for gypsum sector

Gemstone

Pakistan has been endowed with extensive reserves of gemstones, including rare gemstones varieties such as pink topaz of Katlang Mardan is unique and famous around the world. Gem deposits are mainly located in Northern part of Pakistan and in adjacent areas of Afghanistan. Pakistan produces world's top quality emeralds, aquamarine, tourmaline, rubies, quartz, topaz, garnet, garnet and variety of other gemstones.

More than 34 types of gemstones are being produced in Gilgit Baltistan. Swat emerald is famous in world for its top quality, color and luster. Although Pakistan produces 30% of world's gemstones, its share in global market is negligible. According to an estimate, Pakistan's share in world market was 0.03 percent in year 2017 which is very less as compared to its gemstones production capacity. Key investment opportunities in coal sector are;

- Private sector led modern gems lapidaries
- Private sector led gems cutting, faceting and polishing unit
- Internationally accredited gems testing unit

Low contribution due to application of outdated management techniques, inadequate capital and antique technical know-how besides unsatisfactory law & order situation in the areas where major bulk of our mineral resources lie.

GAP ANALYSIS

Pakistan mineral sector is still lagging far behind the world's mineral market despite of having huge reserves and comparative advantage. This is due to some inter connected and cross cutting issues across the sector. Some of the major and key gaps in the mineral sector are detailed as below;

a) Regulatory Framework

Lack of uniform and investment friendly national mineral policy/law with appropriate regulatory framework and endorsed by parliament is not there. The National Mineral Policy 2013 is not updated and various sub clauses are in contradiction with provincial mineral policies as after 18th amendments the mineral chapter is given to provincial governments.

Lack of uniformity between the national mineral policy and provincial mining policies/laws results in procedural delays and also creates hurdles for investors particularly for foreign investors. Problems arise due to the scattered nature of such procedures, while most of the mining regulations currently exist in the form of promulgated notifications.

b) Infrastructure

Absence of appropriate business enabling infrastructure i.e. mine access roads, connecting roads network, utilities and industrial zones is the key element behind low investment and poor growth of the minerals sector. Besides the existing poor infrastructure there are areas where valuable minerals deposits can be exploited but there is no access to these areas. Due to huge amount of investment in developing access roads and availability of electricity and water resources the investors are reluctant to invest in these potential areas. Absence of constant supply particularly for export market arises due to non availability of stocking yards/warehouses.

c) Technology

The current technology both in the quarrying and processing sub sectors is outdated and is unable to produce standardized and uniform quality products for domestic market in general and for export market in particular. The quarry wastage in Pakistan reaches 75% as compared to the international standard of up to 45%.

This is because of non mechanized and outdated approaches such as blasting. The modern approaches of standardized production and use of non toxic material for product finishing is nonexistent at the

processing facilities in Pakistan. There is no technology for management and disposal of the quarry and processing wastage.

d) Human Resource

There is lack of qualified and trained workforce in the mining and processing level. The level of workforce in this sector can be gauged from the fact that there is no dedicated training institute providing quality training in the mineral mining and processing. Similarly, there is no qualified and trained quarry master in the mineral sector where required. Absence of qualified and trained workforce also results in increased wastages at the quarrying and processing.

e) Access to Finance

Dedicated and friendly banking products for both mining and processing sub sectors are no available. The existing banking products focus on financing in the urbanized convectional businesses. The case is worst in case of mining where there is no mechanism for mining collateralization.

The banks requires commercial property in urban areas as collateral for availing bank finances whereas mining activities are concentrated in rural areas. At the processing side financial institutions are reluctant to finance due to high capital costs associated with the modern technology. The existing banking products for export facilitation are also subjected to complicated documentation that leads to procedural delays whereas export is time bound activity with pre agreed timeline.

STRATEGY FOR MINERAL SECTOR DEVELOPMENT IN PAKISTAN

PROPOSED INTERVENTIONS

Some of the interventions that can help in real transformation of this sector to bring it at par with global best players in mineral sector are given as follows;

Regulatory Framework:

A well focused and friendly regulatory framework plays an important role in overall minerals sector development and expansion across the globe. In similarity, an investment friendly regulatory framework is required for Pakistan. Some of the key points in this regard are as follows;

- Valuable mineral reserves concentrating across the country should be brought in front of the existing and potential investors. The available mineral reserves in general and deposits in particular should be estimated and mapped through modern scientific techniques such as geo modeling and 3D modeling.
- The existing mineral policies and allied rules should be revisited and reformulated in close consultation with all relevant public and private sector stakeholders.
- A dedicated and well equipped “One Window Facility” should be developed tasked to facilitate local and particularly foreign investors in investment opportunities in mineral sector from project conceptualization till start of production.
- Charging of levies/duties/royalties on minerals without technical/scientific classification create hurdles for investors. All the levies/duties/royalties should be fixed and should be categorized according to the nature of minerals.
- An independent Mine Magistrate should be deputed in each province to facilitate disputes/cases related minerals. This will avoid delay in disputes resolution among mine owners and local community.

Infrastructure:

Business enabling infrastructure is key to sustainable development of the mineral sector and enhanced exports. Some of the key actions required in this regard are;

- Development of mine access roads in existing and potential mineral bearing areas across the country. According to industry experts, DGMMs data and private sector stakeholders, on average 20-50 Kms of road infrastructure is required in each mining cluster across Pakistan.
- Special electricity line should be made available for each mineral mining cluster and processing cluster across the country.
- Establishment of Common Facility Centers (Stocking Yards / Warehouses- with block squaring facilities).
- Development of Export Processing/Industrial Zones for Minerals.

Technology Up-gradation:

Technology is as vital as the sector itself for increasing competitiveness and tapping international markets. Some of the key action points in this regard are;

- Establishment of Machinery Pools (at least 01 at each cluster) at major mining areas of the country.
- Establishment of Common Facility & Training Centers (at least 01 at each cluster) in major mineral processing hubs.
- Modern Stock Yards/Warehouses (export facilitation).
- Technology endowment fund for up gradation of the existing processing units/mines.

Marketing:

Market development and marketing is one of the core elements of promoting dimension stone exports. For market development and focused marketing there is need for long term marketing strategy. It is proposed that Pakistan as a whole should adopt the marketing strategy of target marketing; identify and concentrate on the market segments, which have greater demand, and select products in which we have competitive strengths like resource availability and or processing capability/know-how etc.

- Development of export oriented focused marketing strategy for the mineral sector.
- Domestic promotion, facilitation of investors to participate in international exhibitions, display centers and export facilitation centers.

Access to Finance:

Low investment in mineral mining and processing in Pakistan is directly related to absence of financial support to the existing and potential investors. Some of the key points in this regard are;

- Introduction of new financial products with proper mine collateralization mechanism to cater with financial requirement of the sector by State Bank of Pakistan. These may include; financing against products, equity participation funds, credit guarantee schemes, cash flow based financing and etc.

Human Resource Development:

At present, mostly quarrying is done by non-systematic manner involving indiscriminate blasting and improper drilling that produces up to 85% wastage across the value chain. This subsequently results in depletion of natural resources. To save the industry from further destruction & make this industry competitive in the international market and to realize the true worth of this invaluable natural resource, it is imperative to resolve these issues. This can be achieved by introducing modern training facilities at all stages of the dimension stone value chain across Pakistan.

- Establishment of improved and dedicated training facilities at major mineral bearing areas with state of the art machinery and training facilities.
- Besides this, training courses in modern quarrying and processing should be introduced in existing TVET institutes through proper regulation to with cater with skill requirement of the sector. Organizations such as PASDEC, PJGDC, TEVTA, TUSDEC and NAVTTC should be tasked this.

District Review and Monitoring Committees: may be constituted under the Chairmanship of Deputy Commissioners comprising representatives of respective departments. The committee will monitor accomplishment of targets allocated by the government in respective areas. The committee will also be able to accelerate implementation of development activities, removal of bottlenecks and facilitation.

District Economy Model: may be developed, at the district level, potential areas of minerals economic activities, investment opportunities, endowments, available human resource, technology entrepreneurship etc can be assessed and mapped for future planning and development as an integrated development within the national economy. This may be helpful in acceleration of economic activities.

IMPLEMENTATION ARRANGEMENT

Development and growth of mineral sector in Pakistan require well coordinated efforts and efficient utilization of resources. The proposed interventions are recommended to be implemented in close coordination by all stakeholders involved. Furthermore implementation of the outlined interventions should be subject to domain of each implementing partner.

Implementation arrangement along with key responsible implementers and time frame is provided below;

S #	Thematic Area	Tasks	Responsibility	Yr-1	Yr-2	Yr-3	Yr-4	Yr-5
1	Regulatory Framework	<ul style="list-style-type: none"> ▪ Formulation of new national & provincial mineral policy with appropriate regulatory framework for facilitation of investment particularly foreign investments 	<ul style="list-style-type: none"> ▪ Ministry of Energy (petroleum division) ▪ Provincial DGMMs 			
2	Resource Mapping	<ul style="list-style-type: none"> ▪ Mineral reserves and deposits using modern scientific methods such as geo modeling and 3D modeling. 	<ul style="list-style-type: none"> ▪ GSP ▪ Provincial DGMMs 				
3	Infrastructure	<ul style="list-style-type: none"> ▪ Development of Mine Access Roads ▪ Development of Mineral Stock Yards ▪ Export/Industrial Zones for Minerals 	<ul style="list-style-type: none"> ▪ PJGDC ▪ PASDEC ▪ Provincial DGMMs 	****	****	****	✓	✓
4	Technology Up-gradation	<ul style="list-style-type: none"> ▪ Establishment of Machinery Pools, Common Facility & Training Centers ▪ Technology Replication Centers/Reverse Engineering ▪ Machinery Repairing Facilities 	<ul style="list-style-type: none"> ▪ PJGDC ▪ PASDEC ▪ Provincial, Local Government, DGMMs, ▪ SMEDA ▪ Chambers/Associations 	✓	✓	✓	✓	✓
5	Marketing	<ul style="list-style-type: none"> ▪ Domestic promotion, facilitation of investors to participate in international expos. ▪ Accelerate rate of Pakistan Commercial Councilor abroad. ▪ Development of display centers and export facilitation centers. 	<ul style="list-style-type: none"> ▪ TDAP ▪ PJGDC ▪ PASDEC ▪ SMEDA 	✓	✓	✓	✓	✓
6	Access to Finance	<ul style="list-style-type: none"> ▪ Introduction of new financial products financing against products, equity participation funds, credit guarantee schemes, cash flow based financing and etc. 	<ul style="list-style-type: none"> ▪ Stat Bank ▪ Commercial Banks & DFIs ▪ SMEDA 	****	****	****	✓	✓
7	Human Resource Development	<ul style="list-style-type: none"> ▪ Up gradation of existing TVET institutions. ▪ Introduction of mineral related courses in existing institutes. ▪ Establishment of improved and dedicated training facilities at major mineral bearing areas with state of the art facilities. 	<ul style="list-style-type: none"> ▪ PJGDC ▪ PASDEC ▪ Provincial DGMMs ▪ SMEDA ▪ Chambers/Associations 	✓	✓	✓	✓

... (Short Term) **** (Medium Term) ✓ (Long Term)

Source: Author has developed the table.

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Annexure

1. Short List Clusters - Existing

Sub Sector	Cluster	Province/Region
Marble		
Mining	Lasbela Khuzdar Loralai Chaghi	Balochistan
	Buner Chitral	Khyber Pakhtunkhwa
	Khyber Agency Mohmand Agency	FATA
	Gilgit Baltistan	Gilgit Baltistan
	Neelum Valley	Azad Jammu & Kashmir
Processing	Lasbela Khuzdar	Balochistan
	Buner Risalpur Peshawar	Khyber Pakhtunkhwa
Trading	Karachi	Sindh
	Lahore	Punjab
Chromite		
Mining	Muslim Bagh	Balochistan
	North Waziristan	FATA
Processing	Karachi	Sindh
Coal		
Mining	Lakhra	Sindh
	Quetta	Balochistan
	Khushab	Punjab
Gypsum		
Mining	Karak	Khyber Pakhtunkhwa
	Kohat	
	Khushab	Punjab
Processing	Karak	Khyber Pakhtunkhwa
	Kohat	Punjab
	Khushab	
Gemstone		
Mining	Shigar	Gilgit Baltistan
Processing	Peshawar	Khyber Pakhtunkhwa

2. SHORT LIST CLUSTERS – POTENTIAL

Sub Sector	Cluster	Province/Region
Copper		
Mining & Processing	Kharan/Chaghi	Balochistan
	North Waziristan	FATA
Iron Ore		
Mining & Processing	Kharan/Chaghi	Balochistan
	North Waziristan	FATA