

DIMENSION STONE MINING

ABBOTTABAD / MANSEHRA, KHYBER PAKHTUNKHWA

Cluster Study



Mineral Transformation Plan Vision 2025

Planning Commission,

Ministry of Planning, Development & Reform,

Government of Pakistan.

ACKNOWLEDGEMENT

Cluster Development Based Mineral Transformation Plan is developed for Planning Commission of Pakistan, Ministry of Planning, Development & Reforms, Government of Pakistan as part of Vision 2025. This study is developed under my supervision by Mr. Mohsin Jameel Khan, Focal Person Abbottabad/Mansehra Cluster, Mineral Transformation Plan Vision 2025. We are especially thankful to the Chief Executive Officer (CEO) SMEDA, Pakistan, the Project Director Mineral Transformation Plan, Ministry of Planning, Development & Reforms, Mineral Wing- Ministry of Natural Resources, Government of Pakistan, Mr. Sarmad Hussain Khan (Consultant Management) and Mr. Humayun Khan (Consultant Geologist) and all the members of Project Steering Committee, Mineral Transformation Plan for their valuable inputs and guidance throughout the study. The successful completion of this study had become possible with valuable information and support of all the provincial Directorates of Mines & Minerals, Geological Survey of Pakistan, Pakistan Mineral Development Corporation (PMDC), Academia and other line departments.

We are thankful to the executive management and provincial/regional representatives of All Pakistan Marble Industries Association, Frontier Mine Owners Association and cluster-based stakeholders' associations for their kind support during all stages of preparation of this study. Furthermore, we also extend our thanks to the private sector stakeholders including mine owners, processors & traders and key experts from the private and public sector who participated in the focus group discussion for their valuable time and inputs.

We extend special thanks to all the SMEDA team including data enumerators, sector experts, technical experts and other staff for their untiring efforts that resulted in successful completion of the Mineral Transformation Plan.

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ABBREVIATIONS

CFTC	Common Facility & Training Center
DGMM	Directorate General Mines & Minerals
EPB	Export Promotion Bureau
FATA	Federally-Administered Tribal Areas
FBR	Federal Board of Revenue
FGDs	Focus Group Discussions
FMOA	Frontier Mines Owners Association
GDP	Gross Domestic Product
GNP	Gross National Product
GSP	Geological Survey of Pakistan
HPP	Hydro Power Plant
HR	Human Resources
IMF	International Monetary Fund
KKH	Karakorum Highway
KPK	Khyber Pakhtunkhwa
LCL	Less than Container Load
LTL	Less than Truck Load
MW	Mega Watt
NEPRA	National Electricity Power Regulatory Authority
PBS	Pakistan Bureau of Statistics
PCSIR	Pakistan Council for Scientific and Industrial Research
PESCO	Peshawar Electric Supply Company
PPI	Private Infrastructure Investment
PPP	Private Public Partnerships
PTA	Pakistan Telecom Authority
PTCL	Pakistan Telecommunications Company Limited
SBP	State Bank of Pakistan
SMEDA	Small and Medium Enterprise Development Authority
SIDB	Small Industries Development Board
SRSP	Sarhad Rural Support Programme
TDAP	Trade Development Authority of Pakistan
USAID	United States Agency for International Development
WAPDA	Water and Power Development Authority
WB	World Bank

1. ABOUT THE STUDY

Under the Vision 2025, the Planning Commission, Ministry of Planning, Development & Reforms after a competitive bidding process in compliance to PPRA Rules hired the services of Small and Medium Enterprises Development Authority (SMEDA) as a Consultant Firm to conduct Research/Feasibility Study for detailed analysis of 20 mineral clusters in AJK, Baluchistan, G.B., KP, Punjab, and Sindh within 06 months' time frame.

This specific document aims to study the Marble and Granite Mining and Processing Cluster of Abbottabad and Mansehra Districts, Khyber Pakhtunkhwa in order to create an understanding between stakeholders and policy makers to determine a sustainable course of action to reach their full potential.

1.1. RESEARCH METHODOLOGY

Our research methodology comprised of a review of secondary and tertiary sources including research papers, journals, and articles, as well as primary data gathered through survey questionnaires administered to the representatives of the cluster and focus group discussions (FGDs) with stakeholders of the marble and granite cluster of the Abbottabad and Mansehra Districts.

These inputs were analyzed through both quantitative and qualitative analysis, followed by the SMEDA team's review, and expert opinion by geological experts and external management consultants.

1.2. OBJECTIVES

- i) Situational analysis including enterprises base, products, end markets, quantum of supply, quantum of demand, supply & demand gap and growth potential.
- ii) Evaluation of clusters' major drivers of success or failure and identify the product, processes, market segment(s), technologies, infrastructure, human resources, and institutions that the cluster may be currently missing in meeting the potential high-end domestic and international demand.
- iii) Quantification of investment required along the value chain with its sources (public, private, donors, etc.) and geographical locations to turn the commodity into an internationally competitive product in high-end markets.
- iv) To serve as a guide for attracting local and foreign investment in the targeted cluster and to facilitate understanding and confidence between all stakeholders to build a platform for a sustainable growth of the cluster.

2. DESCRIPTION

2.1. OVERVIEW OF DIMENSION STONES

Dimension stone is the commercial term for any naturally-occurring rock that can be cut into specific shapes and sizes primarily for construction, but also to serve other purposes as well. While a number of igneous, metamorphic and sedimentary rocks may be used as dimension stones, typical rock types include marble, granite, sandstone, limestone and slate.

In addition to serving an aesthetic and decorative purpose, these rocks are naturally durable and being used extensively around the world for construction purposes. When valuing dimensional stones, important considerations include their colour, pattern, texture, durability and strength and the ability to be polished.

The industry is an important one in the global market with the total essential value chain of \$60 billion annually.

Marble

Marble is a dense form of metamorphosed limestone comprising primarily of calcite or dolomite or both. It is durable in dry atmospheres, but vulnerable to moist or acidic surface interactions. The purest form of marble is white colour. Other colors such as blue, grey, yellow, pink, and black result from a variety of impurities including iron oxides, clay, silt, and fossils. It can be polished to produce a high lustre and can be cut into a variety of shapes and sizes.



It occurs in large deposits that can be hundreds of feet thick and geographically spread over vast areas, mountain ranges and terrains. Large deposits of marble are found around

the world including in countries such as Italy, United States, Greece, Turkey, Pakistan, India, Afghanistan, China and others.

Marble is commonly used in the construction of buildings and roads pavements as well for decorative purposes. It is also widely used as an acid neutralizer in lakes and rivers, and in the production of antacid medicines to treat acid indigestion. It can also be used as a calcium supplement for farm animals.

Other industrial applications include its use in paint, toothpaste, and plastic.

Granite

Granite is a granular igneous rock composed primarily of feldspar and quartz with smaller amounts of mica and other minerals.

It naturally occurs in a number of colours including white, pink, grey and black. Some of the characteristics of granite make it extremely desirable including its hardness, resistance to corrosion, its strength and durability, and its ability to be polished. In comparison to other dimension stones such as limestone, sandstone and marble, granite is the most difficult one to quarry.



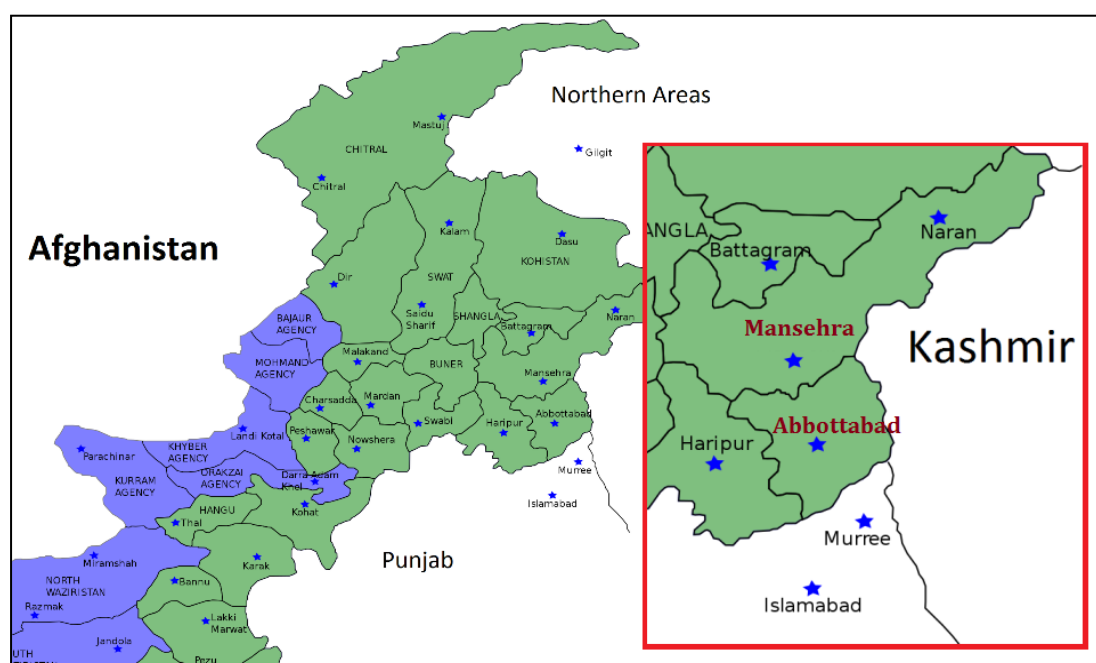
It is preferred mostly for its use in construction of buildings, roads, flooring, curbing, stair treads and table tops. As a crushed stone, it may be used as aggregate in the construction of roads, railroads, and building foundations. While its high price has reduced in popularity in many parts of the world, it continues to remain a symbol of durability and elegance. Extensive deposits of granite are found in Brazil, China, North America and India.

2.2. OVERVIEW OF ABBOTTABAD AND MANSEHRA DISTRICTS

The Abbottabad and Mansehra districts are located in the north east of the Khyber Pakhtunkhwa province in Pakistan. Both districts, in addition to Battagram, Haripur, Upper Kohistan, Lower Kohistan, and Torghar Districts, are part of the Hazara Division. The Mansehra district lies to the north of Abbottabad District.

The modern city of Abbottabad covering an area of 1,969 km² was founded by Major Abbott, a British Deputy Commissioner of Hazara (1849 to 1853) during British rule in the Sub-Continent. It is home to a population of 1.33 million (census 2017) and is famous for the production of agricultural products, mining, tourism, poultry and dependence on natural resources. Some of the minerals mined within the district are barite, dolomite, granite, gypsum, limestone, magnesite, marble, phosphate, red ochre and red oxide. In terms of infrastructure, the district is relatively well served both by major roads and telecommunications networks.

Figure 1: Geographical Location of Cluster



The district of Mansehra was named after Man Singh, the Governor General during the rule of Mughal Emperor Akbar. It has a population of 1.55 million (census 2017) depending on diverse economic alternatives such as agriculture, poultry, livestock, fisheries, mining, tourism and natural resources. In Kaghan, ores of paradox, whereas in Oghi and Battal ores of graphite have been discovered and are being excavated. Some of the other minerals found in the district are coal, corundum, feldspar, granite, marble, quartz and soap stone. Like its neighbor Abbottabad, Mansehra is also well served with both major roads and telecommunication networks.

Both districts are located in mountainous terrain and consist of vast forest reserves with populations that are concentrated in the major towns and cities. They are also home to some of the richest flora and fauna in the country. The climate is cold in winter and

pleasantly warm in summer making them a popular destination for both foreign and domestic tourists during summer.

The traditional industries that provide job opportunities to the locals include agriculture, transportation, and tourism. The most commonly spoken language is Hindko with a sizeable minority of Pashto, Urdu and Punjabi speakers.

2.3. SITUATIONAL ANALYSIS

Previously estimated at 166 billion tonnes, current estimates of Pakistan's marble and granite reserves puts the figure at approximately 297 billion tons. However, no systematic exploration of Pakistan's marble and granite reserves have been adequately conducted. More than 85% of these reserves are believed to lie in the Khyber Pakhtunkhwa (KP) province and erstwhile Federally Administered Tribal Areas (FATA). Balochistan and Sindh also have considerable reserves. Deposits of other minerals such as Slate and Limestone are found in the northern Punjab.

The global trade in marble and granite is estimated at \$45 billion a year. However, despite having huge reserve deposits, annual production of dimension stones in Pakistan has been a meagre 7 million tons in 2017 – 18, constituting only 0.2 percent of the global market. The situation is even more pathetic in the case of Granite whose average annual production is estimated at 5,676 tons – only three percent of that is exported to other countries. There may be less than 100 granite miners and processors in Pakistan.

There are presently about 1,400 quarries that are operating while about 3,000 processing units are supplying value-added products to domestic and global markets. At present, the Mining and Quarry sector in Pakistan contributes nearly 0.6 per cent to its GDP.

However, it has been facing numerous challenges in reaching its potential as a leading producer due to outdated machinery and techniques, lack of trained workers, poor infrastructure, and unfavorable security and regulatory environment.

The below- Table 1 shows that currently it is Khyber Pakhtunkhwa that is leading the production of marble in the country with 2.47 million tons. The province had registered great growth in the number of marble producers in the past two decades. While it had experienced a slump in production during militancy in several parts of the province. It has been a hub for many private investments in this sector.

Table 1: Provincial Break-Up of Marble Production¹

Annual Provincial Break-Up of Marble Production in Pakistan (in tons)					
Year	Punjab	Sindh	Khyber Pakhtunkhwa	Balochistan	FATA
2010-11	1,078	500	185,708	522,482	423,132
2011-12	250	5,090	376,996	735,211	633,031
2012-13	410	5,590	1,091,229	758,606	504,279
2013-14	660	1,100	1,490,724	947,582	479,717
2014-15	-	964	1,712,137	531,899	570,621
2015-16	-	3,125	2,473,562	1,442,346	829,682

¹ Granite production is not considered due to very insignificant output

Source: Pakistan Statistical Year Book 2016

As per the Economic Survey of Pakistan 2017-18, with the exception of 2016-17, the mining and quarrying industry has registered growth since 2012-13 that shows the potential of marble and granite to contribute to the country's foreign exchange.

The following portions will cover cluster specific information relating to the number of mining and processing units, products, and production statistics.

2.3.1. ENTERPRISES BASE

The marble and granite cluster in the Abbottabad and Mansehra District is home to vast reserves of primarily granite, rather pockets of marble reserves as well. It also houses several mining and processing units a brief overview of that may be found in the table below.

Table 2: Cluster at a Glance

Name of the Sub Sector	Number of Units	Number of Employees	Estimated Total Investment (Rs.)
Mining Units	23	1,283	1,902,636,667
Processing Units	57	407	439,376,159
Total	80	1,690	2,342,012,826

Of the above-mentioned mining units, 29% were operating as sole-proprietorships while another 29% and 42% were operating as partnerships and registered companies respectively. With respect to the processing sector, the entire study sample was operating as sole-proprietorships.

It must be noted here that most of the mining in the cluster was concentrated in District Mansehra where excavation of granite was taking place on a much larger scale as compared to marble.

A large number of small and medium-sized processing units were set up in both districts with slightly more than half of the total number of processing units in Abbottabad. All processing units operating in the Abbottabad are processing both marble and granite though granite is being produced a lot more as compared to marble. However, About 92% of the processing units of district Mansehra are processing granite and the remaining are processing marble.

2.3.2. PRODUCTS

Even though the cluster is home to large reserves of some of the highest quality granite and limited marble reserves, and a sizeable number of mining and processing units, the range of products produced is limited for a number of broader reasons, but that may primarily be attributed to the unscientific and rough cutting of stones that have strictly restricted their use for domestic and international markets.

Moreover, a lot less focus has been paid to other commercial and industrial applications for dimension stones and waste generated during stone excavation and processing.

Products are categorized sector-wise below based on whether they are produced by the mining or processing sector.

Mining Sector

Based on the results of our survey on mining units operating in the cluster, the primary products produced by that sector include high quality raw blocks, boulders, chowkas and kandas. These products are produced simultaneously during the extraction process.

International standard sizes of **Raw Blocks** are many that vary in dimensions and weigh between 15 to 25 tons. However, smaller size blocks are also produced and marketed. These raw blocks may be used to produce slabs and tiles.

Boulders are comparatively smaller and rounder blocks of raw marble often weighing less than 10 tons. Due to their smaller size, they are suitable for processing tiles through large boulders can also be utilized for processing slabs. For international miners, boulders may often be considered byproducts. However, in Pakistan they are often the primary mining products.

Chowka is smaller than boulders usually weight up to few hundred kilograms a piece. In low value varieties such as sunny grey chowka is considered as wastage and are dumped around the mine site. However, some varieties are purchased by small scale processing units for production of smaller size tiles. These are also used for production of handicrafts and marble chips.

Figure 2: Types of Mining Products



Kanda is the local terminology used for scrap produced at the mine site resulting from blasting. While the terms kanda and chowka are used interchangeably, kandas are stones usually purchased by crush plants for production of varying mesh sizes used mainly used in construction.

Processing Sector

The processing sector of the cluster produce slabs, and both polished and unpolished tiles.

Slabs or **Strips** are large sheets of semi-processed marble usually of different sizes and 2 inch thickness. They are prepared by cutting blocks or boulders and are often used for table tops, flooring and other purposes. In addition to quality considerations, Smaller-

sized slabs of 8 to 12 square feet are often sold cheaper than larger-sized ones. These slabs may be sold to other processors in the local market.

Figure 3: 3” X 4” X 6” Stone Slabs



Unpolished tiles are semi-processed tiles that have already been cut in size for further processing and polishing by others in the local or export market. Since these are much cheaper compared to polished tiles, they are in high demand. Polished tiles have undergone several value-added processes and are fit for final consumption of the customer.

2.3.3. PRODUCTION STATISTICS

Based on statistical reports published by the Pakistan Bureau of Statistics (PBS), a statistical overview of annual production for both marble and granite in Abbottabad and Mansehra Districts has been presented below.

Table 3: District-wise Marble & Granite Production in Cluster

	Year	2010 - 11	2011 - 12	2012 - 13	2013 - 14	2014 - 15	2015 - 16
Abbottabad District	Marble	935	115	360	395	70	0
	Granite	20	120	0	0	0	0
Mansehra District	Marble	0	0	86	40	0	0
	Granite	15030	15413	13353	19982	36538	44712

During the preparation of this research report, we relied on field surveys that our teams carried out for this study for determining an estimate of current production units for Abbottabad-Mansehra cluster.

Table 4: Product-wise Cluster Production

Product Description	Average Production Per Unit (Sq. Ft or Tons)	No. of Units ²	Total Production (Sq. Ft or Tons)
Category 01 - Mining			
Raw Blocks	3,033	23	69,767
Boulders, Chowkas & Kandas	1,567	23	36,033
Total			105,800
Category 02 - Processing			
Slabs / Strips	205,646	57	11,721,840
Tiles	161,284	49	7,902,960
Total			19,624,800

2.3.4. SWOT ANALYSIS

Strengths

- ⊕ Accessibility to enormous deposits and varieties of superior quality granite
- ⊕ Close proximity to major cities in Khyber Pakhtunkhwa, Punjab, Gilgit Baltistan, and Azad Kashmir
- ⊕ Significant number of Mines and Processing Units Capacity for production increase
- ⊕ Low-cost mining labour
- ⊕ Increased mechanization of mining and processing sectors

Weaknesses

- ⊕ Inadequate and unstable regulatory environment and policy
- ⊕ Insufficient infrastructure of electricity and roads, critically low on mines
- ⊕ Limited access to finance, and lack of investment and capitalization
- ⊕ Outdated technology and mining skills
- ⊕ Absence of economies of scale
- ⊕ Uneven supply of raw materials
- ⊕ Lack of research and development
- ⊕ Non-existent supply chain
- ⊕ Lack of product awareness & quality grading
- ⊕ Limited marketing efforts & trade support
- ⊕ Lack of international competitive capabilities

² As all of the units are engaged in the tiles manufacturing so the total number of units in this category is considered

Opportunities

- ⊕ Large established and potential world markets
- ⊕ High demand for quality marble and granite in the International Market
- ⊕ Rehabilitation of Afghanistan and Central Asian countries
- ⊕ Improved awareness of industry requirements and availability of local stone
- ⊕ Increased governmental support and improved regulatory approach to enhance private sector facilitation and investment
- ⊕ Increased implementation of quality standards
- ⊕ Enhanced transportation and supply chain capabilities
- ⊕ New trends in marble and granite usage including utilization of waste products for allied industries

Threats

- ⊕ Bad governance and political instability
- ⊕ Instability in regulatory environment
- ⊕ Destruction of mineral sources and reserves
- ⊕ Critical loss of development opportunities in backward areas
- ⊕ Rupee Depreciation
- ⊕ Unmanageable environmental degradations and loss of life

2.4. INSTITUTIONAL FRAMEWORK

The type of institutions by role are different for mining and processing sub sectors, explained as below:

2.4.1. DIRECTORATE GENERAL MINES & MINERALS

In pursuance to the implementation of National Mineral Policy (NMP) and directives of the Chief Executive of Pakistan on 04.06.2001, the Directorate General Mines & Minerals was created vide notification dated 18.08.2001. The creation of the DGMM is based on NMP 1995 in line with the Australian Technical Aid (AusAid) consultants report, 1997.

After the 18th Amendment, The KP Minerals Development Department (MDD) was granted custodial rights of mineral resources of KP and the first ever Provincial Mineral Policy was formulated in 2014 in light of that KP Minerals Policy 2014, Khyber Pakhtunkhwa Mineral Sector Governance Act 2017 and Rules 2017 have been formulated and promulgated.

Functions & Responsibilities of Directorate General Mines & Minerals include:

- Grant of mineral titles
- Collection of rents & royalties on minerals
- Control of unauthorized excavation and transportation of minerals
- Compilation of mineral production data

- Geological Mapping of mineral bearing areas
- Evaluation of mineral resources
- Promotion and exploration of minerals
- Provision of mineral testing facilities
- Technological Management of Mineral Titles

2.4.2. ENVIRONMENTAL PROTECTION AGENCY

The Environmental Protection Agency or EPA has been tasked with administering and implementation of the The Khyber Pakhtunkhwa Environmental Protection Act, 2014 including preparation of procedures and guidelines, enacting revisions and enforcement of NEQS (Industries, Municipalities, Vehicular emission), establishing & maintaining laboratories, certifying laboratories for conducting "tests and analysis" and assisting local councils/authorities and Govt. Agencies in execution of projects.

They are further tasked with establishing a system for surveys, monitoring, examining and carrying out inspections to combat pollution. Additionally, they conduct trainings for Govt. functionaries, business owners and managers and provide information to the public on environmental issues.

2.4.3. PAKISTAN STONE DEVELOPMENT COMPANY

PASDEC was established as subsidiary of PIDC for development of model quarries, up-gradations, machinery pools, common facility and training centers (CFTC's) & warehouses for marble and granite sector. PASDEC has following major objectives:

- Raise Value Chain Productivity
- Investment in Workforce Development
- Export Marketing
- Promote Strategic Partnerships (J.V. & D.F.I.)
- Develop Industrial & Market Information

2.4.4. SMALL & MEDIUM ENTERPRISES DEVELOPMENT AUTHORITY

SMEDA is a federal government organization working under Ministry of Industries and Production for the facilitation and development of small and medium enterprises in Pakistan. SMEDA plays major role in long term development and growth of the mining and processing cluster. SMEDA provides policy and strategy level inputs to DGMM KP in formulation of investment friendly policies. SMEDA also provides help desk facilitation, legal facilitation, capacity building, networking and linkages development directly to SMEs.

SMEDA has designed number of long term economic development initiatives including rock mining training institute, model quarry project, industrial state and etc. SMEDA has provided number of trainings on controlled blasting techniques, safety, product development, business management, quality standards, marketing and exports. SMEDA

has also rehabilitated and upgraded over 200 mining and processing enterprises by providing matching grant support through the MDTF funded ERKF Project.

2.4.5. DIMENSION STONES CENTRE

The Peshawar Laboratories Complex of Pakistan Council of Scientific and Industrial Research or PCSIR has established a Dimension Stones Centre in 2008 that is geared towards providing testing facilities, providing short training courses, and research and development of innovative new products.

2.4.6. INTERNATIONAL ORGANIZATIONS

Small-scale initiatives have been taken up by international organizations such as USAID, and the World Bank. Recently, the World Bank (WB) provided machinery of Rs. 400 million to the marble and granite industry in Khyber Pakhtunkhwa in 2015. They have also provided their technical analysis and drawn the attention of the strengths and weaknesses of the industry in Pakistan to policy-makers, investors, and other stakeholders.

2.4.7. FRONTIER MINE OWNERS ASSOCIATION

Frontier Mine Owners Association is a registered association of all mine owners across Khyber Pakhtunkhwa representing the entire mining sector of all minerals in the province. This association has members from the Abbottabad and Mansehra cluster as well.

2.4.8. OTHER VOLUNTARY ASSOCIATIONS

There are only a few trading and industrial associations in the country specific to the marble and granite industry. Of the more larger and important, the All Pakistan Marble Industries Association (APMIA), represent a large number of mine owners, however, field surveys revealed that very few in the cluster were associated with APMIA. Instead, miners were mostly associated with the Frontier Mines Owners Association (FMOA) while all Abbottabad-based and Mansehra-based processing units were associated with the Abbottabad Marble Association and Mansehra Marble & Granite Association respectively.

These platforms work for the cumulative benefits, welfare and development of the mine owners and processors in Abbottabad and Mansehra.

3. DEMAND AND SUPPLY GAP- DOMESTIC MARKET

3.1. QUANTUM OF SUPPLY

A field survey revealed the presence of a large number of operational mining and processing units in Abbottabad and Mansehra Districts. Production is supplied almost entirely to the domestic market with only 11% of miners exporting their products to China, which the secondary literature has revealed is reflective of the nation-wide trends for the marble and granite industry.

Still, the processing sector has complained of suffering from a lack of consistent supply of quality raw materials for its industry. Supplies may be delayed or even halted completely due to one or more of the following reasons:

- Relatively small-scale mining operations
- Poor road infrastructure because of which large-scale transportation of mining products is not possible
- Inefficient production due to the unscientific approach to mining and quarrying
- Local community and land ownership issues
- Lack of a formidable supply chain infrastructure of stores and warehouses
- Lack of capacity to test and grade products

The retail segment of the marble and granite industry is relatively well-organized, but faces similar constraints in finding regular supply of quality products. Retail prices for processed dimension stone products are highly variable due to lack of product standards in the market.

3.2. SUPPLY TRENDS

A majority of businesses in the processing sector depend on more suppliers in order to reduce the dependency of their business operations on a single supplier and ensure regular processing and sale of products. This reflects the high risk assessment of cluster participants with respect to the availability of raw supplies.

The mining and quarrying sector does not experience any seasonal or cyclical trends. However, business sales do depend on quarrying activities and transportation that may be hampered during the rainy season due to landslides.

Processors procure raw stones by directly contacting the mines or through traders who bargain over prices depending upon perceived quality and color of raw stone. Some medium-sized mining units are also involved in processing of dimension stones that depend on raw stones extracted from their own mines.

Smaller- and medium-sized processing units cut and polish raw stone blocks to slabs or tiles that are sold entirely in the domestic market. Miners focus mostly on the domestic market with most of their products sold in Khyber Pakhtunkhwa followed by Punjab.

It is worthy to mention that since mining of marble takes place on a limited scale in the the cluster, processors rely on marble transported from Peshawar, Mardan or Rawalpindi for further processing.

3.3. QUANTUM OF DEMAND

The industry of dimensional stones began to develop in the late 1960s during the country's economic boom that led to an increase in both industrial and construction activities. However, the industry in Pakistan remained far behind in technological advances of other producing countries such as China, Japan and the United States due to which it could not keep up with the increasing global demand for quality. Local demand for dimensional stones also picked up during the same period as a result of the urbanization and modernization of the country, though demand remained relatively insignificant.

While usage of the marble chips became very common in the 1990s and continues to occupy a significant portion of total local demand, the processing sector of the cluster has been focused on producing marble and granite tiles and slabs, whose demand had remained very high through the country during the last two decades.

Whereas critics argue that imported marble remains in high demand, the increase in housing and construction projects have led to an increase in demand for domestically mined and processed marble as well.

With demands for processed granite stone rising in the global and domestic market, the processing sector of the cluster is playing a noteworthy role in meeting at least local demand and can play even more significant role in times to come. However, currently, it is unable to meet quality standards of the global market beside other limitations and weaknesses.

3.4. DEMAND TRENDS

The raw material needs of the processing sector is met locally with buyers often sourcing them from wholesalers, local dealers or directly from the mines. While mining activities are predominantly based in remote areas, most processing units are based in Abbottabad and Mansehra city or their suburbs to wherein raw materials are transported.

Mining products such as blocks and boulders are demanded by domestic processing units and only 11% of miners directly exporting their products. Semi-processed slabs and unpolished tiles are sold to other processing units while processed tiles and tabletops are sold to retailers (showrooms), architects and builders either directly or through middlemen.

3.5. KEY MARKET SEGMENTS

The relevant market segmentation for the marble and granite cluster in Abbottabad and Mansehra is done so on the basis of stone colour, products produced, uses and applications, geography or type of buyer.

In terms of *products* produced, the market comprises of processing units for mining products such as blocks and boulders whereas products such as slabs and tiles are utilized either by other processors or retailers. In terms of *application* and use, the market consists primarily of builders and architects that utilize processed stone either in the construction of commercial buildings and factories and residential houses. Other applications of dimension stones are not relevant to the the cluster.

The market may also be segmented on the basis of *geographical* locations into domestic and international markets. However, keeping in view that very few units from the cluster export their products, it may be relevant to further classify the domestic market into provinces. Geographically, the Khyber Pakhtunkhwa province constitutes the largest market for the cluster.

Lastly, the market may also be segmented based on type of buyers involved including wholesalers and retailers.

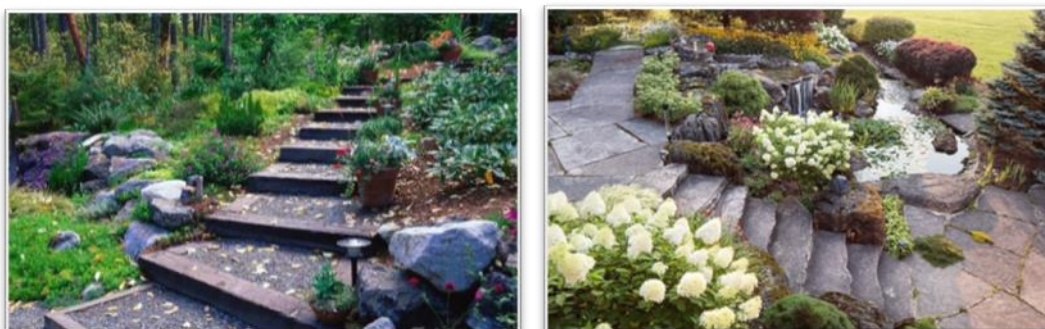
3.6. POTENTIAL NICHE MARKETS

At present, the cluster supplies a very limited number of products to the market. There is a need to diversify and target the largely untapped niche markets either by marketing new and innovative products or finding new applications for their existing products.

Developing niche markets allows companies to attend to the specialized needs of a small group of customers without risking their appeal to a larger market. Potential niche markets for the cluster may include one or more of the following:

Landscaping

Landscaping refers to the modification of the aesthetics of a building or land by introducing natural elements including rocks, terrain, flora, fauna, water, or weather elements to the setting. The industry can find a new revenue stream by marketing, what may constitute their wasted product created as a result of blasting techniques, to this particular niche market.



Marble Mosaic Products

These are commonly used in the construction industry and for decorative purposes as well. The market for these products comprises builders, architects, domestic consumers, corporate customers and even exporters.



Farm Applications

Marble and limestone in the powdered form are commonly used as a calcium supplement for animals and birds. This serves as a very good way to recycle marble wastage due to its enormous potential in the domestic market.

Construction Aggregate

Both marble and granite can also be used as a construction aggregate as a component for concrete and asphalt concrete, or as filler in the foundation of buildings for reinforcing the strength of construction materials and structures. Granite is particularly strong for use as a construction aggregate.

Agricultural Lime & Acid Neutralization

Marble can also be used for the production of agricultural lime for treatment of acidity in soil. In combination with fertilizer, it has been found to be effective in increasing the yield of the soil. Marble powder that is processed to be clean of any impurities is also used in products used for the treatment of acid indigestion.

Natural Stone Cladding

A thin layer of natural stones such as marble, granite, limestone and granite may be applied as cladding for external walls but may also be utilized in internal walls of building structures in order to achieve a textured and three-dimensional traditional appearance.

Cemetery Markers

Both marble and granite can also be used to produce cemetery or grave markers. Marble, however, is not as resistant to acid precipitation and loses its polish and edges over a long period of time.

Soft Abrasives

Both marble and granite can also be used as a scrubbing agent due to its abrasive qualities. Marble in particular is useful for scrubbing without producing undesirable scratch marks. Granite, on the other hand, may not be used on materials that easily scratch but may be utilized for scrubbing harder materials.

3.7. EXPECTED GROWTH OF CLUSTER PRODUCT

Presently, the cluster has many weaknesses in the domains of technology, marketing, access to finance, infrastructure and the regulatory environment that has hindered its growth at a significant rate. Utilization of existing production capacity is high, however, production capacity is limited to begin with.

In the domain of marketing, the implementation of quality standards and development of niche markets will help increase the growth of the cluster's products. Moreover, technology can also increase productivity and reduce waste while a more favorable regulatory environment can promote the entrance of new enterprises and expansion of existing ones.

Substantial mining activities for the dimension stone Dolerite – whose trade name is Black Granite – are already in operation in the Oghi area of Mansehra district. In a show of support and confidence, the Pakistan Stone Development Company or PASDEC recently inaugurated a mechanized quarry with state-of-the-art heavy earth-moving machinery that is capable of producing higher yields when in full production.

In addition, the Directorate General Mines and Minerals (DGMM) has recently granted several mining concessions and exploration licenses through a process of competitive bidding to local parties with the experience and resources to explore and extract mainly granite in the Mansehra District.

Under the present circumstances, the cluster will continue to grow at an annual average of 10 to 15 percent. Though this will remain insignificant considering the potential of the cluster to grow at a rate of over 150 to 500 percent in the next five years with the implementation of a well-coordinated set of key interventions that we shall propose in some detail in Chapter 7.

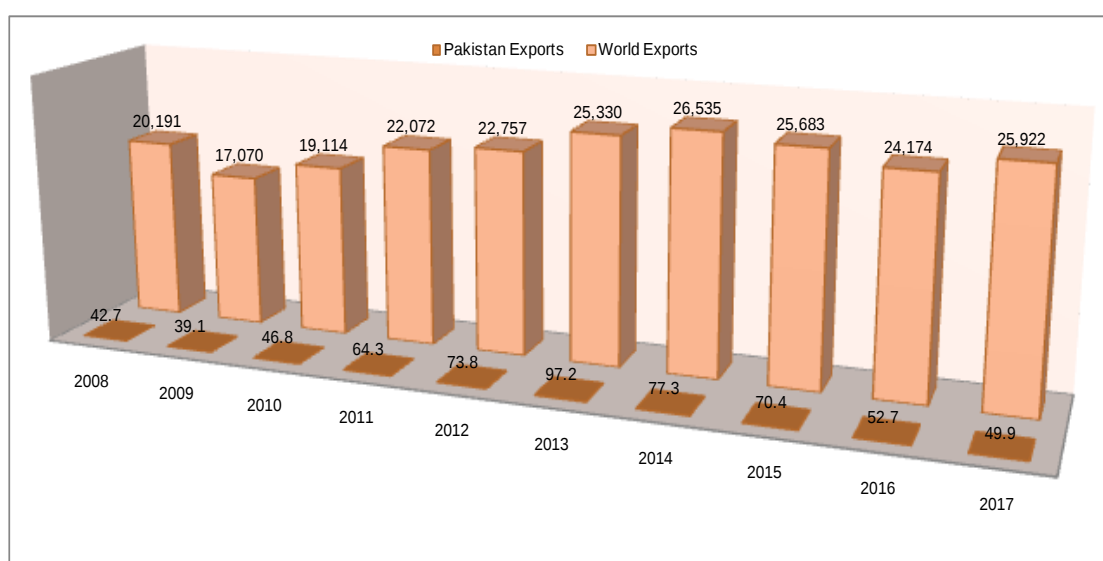
4. DEMAND & SUPPLY GAP - EXPORT MARKET

4.1. ANALYSIS OF EXISTING EXPORTS

The global dimension stone export market for mining/quarry products was estimated at \$75.0 billion in 2017. Asia Pacific was the largest geographic region accounting for \$40.5 billion of exports, over 54% of the global market. China was the largest country accounting for \$23.7 billion or 31.6% of the global dimension stone mining products consumption.³

Partially finished stone, merely cut and sawn and square blocks of a rectangular shape, constituted almost 80 percent of Pakistan's exports. Pakistan share in global exports in terms of quantity and value for 2007-2017 is given in the figure below:

Figure 4: Pakistan Share in Global Dimension Stone Export Market



Pakistan share in global mineral market including dimension stone is negligible both in terms of quantity and economic value. This is due to absence of mechanized mining practices, outdated technology, standardized processing, standardized products, lack of value addition and unfavorable export related regulatory framework.

Partially finished stone, merely cut and sawn and square blocks of a rectangular shape, constituted almost 80 percent of Pakistan's exports. Despite some rare and valuable varieties of dimension stone, the country has not acquired full potential of the export

³ Dimension Stone Mining Global Market Report 2018, Global Information Incorporation, 2018

markets. Pakistan also needs to move beyond the export of marble blocks and tiles and into slabs and decorative items such as tabletops to obtain higher margins.

The current performance of the cluster as far as exports are concerned is abysmal. Based on what we gathered from study participants, only 11% of miners were involved in the export of their products estimated at a paltry 3,067 tonnes per annum. The processing sector, on the other hand, feared even worse. Of the respondents we spoke to, none of them directly exported their products neither had they any confirmation of whether their products made it to the export markets or not.

These analysis have confirmed findings of experts on the marble and granite industry in Pakistan that the focus is almost entirely on domestic markets. Despite registering growth in the past two decades, Pakistani exports currently stand at \$134 million that is about 0.5% of the international market estimated at \$45 billion.

Moreover, of the products that are exported, most are in the form of mining products such as raw blocks. Our study also confirms the increasing trend of exporting raw blocks to China that is only importer as far as the cluster is concerned. China accounts for about 60% of Pakistan's marble and granite exports.

It is also important to understand the wider perspective of the country's marble and granite industry. Countries such as Russia, US, as well as European and Middle Eastern countries demand fully processed marble products, and hence constitute less than 10% of Pakistani exports. Amongst Middle-Eastern countries, demand comes primarily from the United Arab Emirates and Saudi Arabia that alone purchases \$1.5 billion worth of processed marble products every year. This suggests that there is a huge need for building industry capabilities so Pakistan may be able to capture a big share in the world trade market.

The construction boom in Afghanistan has also played a very important role in the country's exports following the US-led Coalition's efforts to rehabilitate the country's infrastructure.

Although Pakistan has an advantage over India and China in quality marble and granite reserves, its exports are much behind its rival India. At present, Pakistan remains a very marginal player in the International Market. Nonetheless, advancements in infrastructure and technology could turn things around and help the country reach its potential as a major global contender.

4.2. ANALYSIS OF EXISTING SUPPLY FOR EXPORT

Our study results have found that the cluster has been generating its marble and granite exports in a less value-added segment of the international market. Its current exports are entirely in the form of raw and unprocessed blocks to China.

This reflects similar trends around the country of exporting less-value added products in the form of marble chips and powder exports to Bangladesh or raw unprocessed blocks of

marble and granite to Italy, Taiwan and China. Chinese buyers that the largest importers of Pakistani marble and granite products predominantly source raw blocks for further processing and value-addition in their own country. It is believed that the same products are later re-exported to other countries at much higher prices.

The foregone potential value-addition could be costing the cluster about 50 to 100 percent of its revenues. The reason behind this less value-added focus can be attributed to the lack of competitiveness of its products in the international market. Most producers in the cluster run small-scale operations and find themselves unable to meet large international orders. In addition, the lack of modern machinery and technical expertise to produce high-quality products, and difficulties in management of supply chain has added to the cluster's woes.

There is a need for the clusters to not only improve the quality of products in line with the international standards, but to strongly position them in the international market to create demand. With respect to marble, the World Bank reports the unit value of marble exports is over 25 times higher than that of domestic sales which underlines the significance of the marble and granite value chain in generating higher incomes for cluster participants.

4.3. ANALYSIS OF COUNTRY WISE EXISTING DEMAND

China accounts for 80% of Pakistan's total marble exports, however, the major portion of the exports to china is in raw form. Russia, USA, Japan, Korea and European countries demand finished marble products, and thus constitute less than 10 % of our export.

Demand for Pakistan marble and granite is higher in the Gulf Cooperation Council (GCC) countries particularly Saudi Arabia and UAE. The GCC stone market is worth over USD 5 billion and constitutes approximately 20% of the global demand in the stone market. There are an estimated 20,885 active construction projects in the GCC; the major construction activities appear to be in the United Arab Emirates and Saudi Arabia, both of which constitute approximately 70% of all construction projects in the region.⁴

In terms of the country-wise existing international demand for the cluster products, China is the only country that is currently importing raw blocks from the cluster. Moreover, it is doing so on a much smaller scale compared to the cluster's potential. International demand for processed cluster products, on the other hand, is non-existent.

4.4. SUPPLY & DEMAND GAP

The supply and demand gap is especially wide when it comes to international markets. Buyers and investors from other countries have expressed interest in locally produced dimension stone. However, the regulatory framework in place in the country is restrictive and discourages foreign and local investment. Most cluster participants do not have the capacity to fulfil international orders that are often very large compared to what any unit

⁴ BNC Project Intelligence

in the cluster can currently produce. Only 11% mining units that are few to begin with, export raw granite blocks to China.

4.5. EXPECTED GROWTH OF CLUSTER

The growth of the cluster is expected, but its current state identifies serious weaknesses on many fronts that can only be overcome through well-coordinated steps engaging all relevant stakeholders in order to support the financing, marketing, technological and infrastructural needs of the cluster.

It is also very essential for cluster participants to develop an export orientation in their business operations and processes.

4.6. POTENTIAL SUPPLY AND DEMAND

While Pakistan's current dimension stone exports of \$134 million represent only a fraction of less than 1% of the international market. According to USAID estimates the country has potential of exporting dimension stone worth \$2 billion.

Presently, the national marble and granite industry mainly exports raw blocks of stone to China and Italy. Semi-finished marble products find their way to Russia, the Middle East, the United States and Malaysia, while finished products are exported to European countries and the Middle East. Since these markets are already aware of some of the country's products, it would be suitable for the cluster participants to promote their products in these established markets.

On the other hand, granite exports from the country have been negligible with most of the exports stemming from Sindh and Balochistan despite ever-increasing demand for granite in the international market.

The cluster could play a significant role in granite exports as it has been blessed with one of the two largest workable deposits of granite in the country in the Mansehra District. Moreover, mining activities in the cluster are focused on the extraction of granite stone. Efforts by institutions such as Pakistan Stone Development Company (PASDEC) have also had a positive impact on the mining of granite in the cluster that recently developed a model quarry for excavation of the highly desirable "Black Granite" that is found in abundance in the Mansehra district.

Moreover, with over 96% of all processing units in the cluster involved in the processing of granite, it is well-positioned to play a significant role in the export of processed granite products. Processing of marble, on the other hand, is limited mostly to the Abbottabad district that sources raw marble products from nearby cities such as Peshawar, Mardan and Rawalpindi.

Based on our analysis, the processing sector, with support from relevant stakeholder institutions, could potentially earn 100% higher returns simply by ensuring better product quality while the cluster has the overall potential to increase its exports by over 25 times in the next five years.

4.7. POTENTIAL NICHE MARKETS WITH GROWTH TREND

Potential niche markets with a growth trend for the cluster may include one or more of the following:

Decorative Items & Handicrafts

A locally-produced range of handicrafts and decorative items can help create a niche market in the international market. The quality of handicrafts produced not only in the cluster, but around the country is high. However, there is a dire need for standardization as well.

Most processing units can complement their businesses by establishing handicraft factories and hiring locally-sourced artisans and craftsmen to create high quality handicrafts strictly for the export market which would fetch several times more the revenue they may earn through sale of other products in the domestic market. Items may include pillars, sculptures, fire places, ashtrays, flower vases, lamps, bowls, et cetera.

Marble Mosaic Products

These are commonly used in the construction industry and for decorative purposes as well. The market for these products comprises builders, architects, domestic consumers, corporate customers and even exporters.

The demand for marble mosaic products is high in the international market particularly in Europe. With enough support from institutions such as SMEDA, the cluster can serve as a platform for production of marble mosaic products in the country.

Farm Applications

Marble and limestone in the powdered form are commonly used as a calcium supplement for animals and birds. This serves as a very good way to recycle marble wastage due to its large scale potential not only in the domestic, rather in export markets as well.

Good quality marble suitable for the proposed purposes may be identified for production of high quality calcium products for the global animal and bird farming industry.

Cemetery Markers

Both marble and granite can also be used to produce cemetery or grave markers. Marble, however, is not as resistant to acid precipitation and use to lose its polish and edges over a long period of time.

Since these products have an emotional appeal, a focused approach towards selling gravestones to Europe, Middle East, North America and East-Asia could bring in large foreign exchange.

Soft Abrasives

Both marble and granite can also be used as a scrubbing agent due to its abrasive qualities. Marble is in particular useful for scrubbing without producing undesirable

scratch marks. Granite, on the other hand, may not be used on materials that easily scratch, but may also be utilized for scrubbing harder materials.

4.8. KEY REQUIREMENTS OF POTENTIAL MARKET

There are several requirements of export markets for dimension stone products. Some are generalized requirements and some specific requirements of the export market for dimension stone vary from region to region, country to country and in some instances from client to client as well. The generalized requirements of export markets are outlined below:

Dimensions / Measurement:

Standard sizes & technical requirements of dimension stone are given in the following table:

Figure 5: Internationally-accepted dimensions of Dimension Stone Products

<i>Product</i>	<i>Dimension/Measurement</i>
<i>Blocks</i>	Maximum size of 8ft x 5ft x 5ft
<i>Slab</i>	Standard dimensions are; 2200 x 1200mm to 3300 x 1950mm. Standard slab thicknesses are 20mm and 30mm (+/-2mm) OR maximum size of 8ft x 5ft with thickness of 2-3cm
<i>Cut to size</i>	Custom ordered sizes, depends on intended usage
<i>Tiles</i>	Generally less than ¾" thick and not exceeding 24" in its greatest dimension.
<i>Cubic stock</i>	Marble units greater than 2" thick.
<i>Veneers</i>	Standard nominal thicknesses for marble veneer are ¾", 7/8", 1¼", 1½" & 2".
<i>Mosaic/Inlays</i>	Custom ordered sizes, depends on intended usage
<i>Powder</i>	Custom ordered sizes, depends on intended usage

Required Tests:

In the prevailing environment, the emphasis is on safe, permanent, low maintenance products, of which stone leads the list in the minds of architects, designers, and consumers worldwide. Most architectural specifications require that stone meet certain specified ASTM or other testing standards before it will be accepted for use. Some products in the market today have not been tested for quality standards that are required for certain projects. Some of the global standards that specify tests to be conducted for dimension stone before its usage:

- The American Society for Testing and Materials International (ASTM),
- The American National Standards Institute (ANSI),
- NSF International, formerly the National Sanitation Foundation,
- European Commission for Standardization (CEN)

Besides, above mentioned standards there are individual standards and tests for dimension stone of different regions/countries. The exporter should confirm from buyer about such tests/standards if required. Some of the key tests required for different applications of dimension stone in construction is given below:

Figure 6: Type of Tests Required for Marble Based on its Application

<i>Types of Tests</i>	<i>Interior Walking Surfaces</i>	<i>Exterior Walking Surfaces</i>	<i>Interior Wall Chalking</i>	<i>Exterior Wall Chalking</i>	<i>Exterior Vertical Traffic</i>	<i>Cubic Trims, Curbs, Coping etc</i>
<i>Absorption</i>	■	■	■	■	■	■
<i>Density</i>	■	■	■	■	■	■
<i>Compressive Strength</i>	□	□	□	□	□	□
<i>Abrasion Resistance</i>	■	■			■	
<i>Flexural Strength</i>	■	■	■	■	■	■
<i>Friction</i>	■	■			■	
<i>Structural Performance</i>				□		
<i>Modules of Elasticity</i>				□	□	
<i>Individual Anchorage</i>			■	■		■
<i>Petrographic Analysis</i>	□	□	□	■	■	■

Stone Finishes

Natural stone comes in a varying degree of finishes. These are listed in ascending order, for each stone, from smoothest to roughest:

Table 5: Required Finishes of Marble and Granite in Export Market

Dimension Stone	Required Finishes
Granite	Polished, honed, rubbed, abrasive, diamond sawn, thermal (flamed, exfoliated).
Marble	Polished, honed, abrasive, diamond sawn, thermal (flamed, exfoliated).

Packaging

- Stone and marble products are to be packed in 20 feet closed container boxes.
- Wooden bundles should be used for packing the products.
- Plastic polythene separators to be included in between slides.

Labeling

- No specific labeling required, exporters can choose to include product descriptions and quantities.

A **summary** of these requirements may be found below:

- Better quality standards to ensure that the product supplied to the export market is consistent and as per pre-defined buyer requirements
- Better transportation and logistics infrastructure
- Export-friendly regulations and procedures
- Enhanced production capacity in order to meet large international orders or creating consortiums of existing producers in order to be able to meet them
- Compliance to international regulations and standards as they pertain to child labour, environment, etc.
- Mutual coordination between international buyers and local sellers / producers for production of high quality dimension stone products

4.9. ANALYSIS OF CORE COMPETING PRODUCTS AND COUNTRIES

While the cluster is engaged in the mining and processing of a number of varieties and colours of marble and granite, both our research and on-the-ground experts suggest that Black Granite whose large deposits are located in the Mansehra district could serve as major competing variety of granite if it is positioned and marketed whilst meeting international market requirements.

Figure 7: Absolute Black Granite extracted from Mansehra District



Similar varieties of “Black Granite” are found in other countries such as China, India, South Africa, Angola, and Brazil.

China produces a number of black granites such as Mongolian Black, Supreme Black, Nero Assoluto, and Shanxi Black that is particularly popular in the United States and Japan in the construction of monuments, grave stones, counter-tops, facades and exterior floors.

India, that along with Spain, Italy, China and Brazil, dominates the international granite market, also possesses a large variety of Black Granites such as Black Galaxy from Andhra Pradesh, Jet-Black from Tamil Nadu and Tiger Black from Karnataka.

Other famous varieties include the Andes Black of Brazil and Angola Black from Angola. Countries such as Canada, Sweden, Finland also produce high quality granite though their commercial presence is overshadowed by other coloured varieties of Granite.

4.10.CLUSTERS EXISTING & POTENTIAL COMPETITIVENESS

Amongst the cluster's existing and potential competitive strengths, those summarized below are very relevant to establishing its export competitiveness:

- Large reserves of high quality granite reserves
- Growth of mining sector in the last decade and increased facilitation and support from relevant stakeholder institutions such as Small and Medium Enterprises Development Authority (SMEDA) and Pakistan Stone Development Company (PASDEC)
- Support from the processing sector that specializes in granite processing
- Proximity to China, Central Asian Republics (CARs), and Afghanistan which is still in the process of rehabilitation and reconstruction

The above-mentioned competitive strengths, however, need to be complemented with initiatives in the domains of technology, regulatory environment, and infrastructure for the cluster to reach its potential in world markets.

4.11.MAJOR DRIVERS OF SUCCESS OR FAILURE

Our research and analysis of the cluster in comparison to Pakistan's overall marble and granite industry and the international markets have led us to identify the following major drivers of success and failure:

- Technology
- Product testing and quality standardization
- Production capacity to meet large international orders
- Transportation & Logistics
- Market awareness and access
- Strong linkages between buyers in the international market and local producers

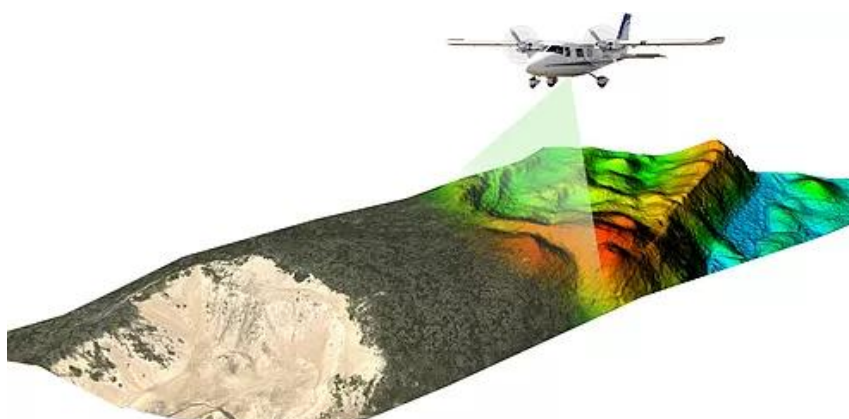
These shall be covered in detail in next portions of this research study.

5. CLUSTER GAP ANALYSIS IN LIGHT OF INTERNATIONAL BEST PRACTICES

This section deals with analysis of gaps between the cluster underlying practices and best practices in domestic and international market both in mining and processing. In order to identify gaps both the domestic market and international markets are assessed separately. Efforts are made to assess the best practices in those countries that are newly emerged and Pakistan can get into their position with available resources. Gap analysis in mining and processing are analyzed separately here:

5.1. RESERVE MAPPING & ESTIMATION

In countries such as Italy, USA and Spain, modern scientific methods and modern techniques are used for identification, estimation and mapping of their dimension stone reserves. Remote surveying and geological mapping of potential mineral sites is done through light detection and ranging (LIDAR) and unmanned aerial vehicle (UAV) technology that pave way for easy allotment of mining rights through tenders. Even Afghanistan has mapped their mineral resources of all the existing and potential clusters. Scientifically mapped and estimated resources help in better planning and utilization of the natural resources.



However, there is no system for estimation and mapping of reserves in the cluster and no sincere efforts have been made in this regard so far. In absence of mechanism for reserve estimation and mapping, there is no authentic data on type and quantity of reserve available in the cluster. Prospecting licenses and mine leases are allotted on the basis of a basic geological survey having no scientific grounds. Use of modern scientific methods and techniques such as LIDAR, UAV and geo modeling are nonexistent in the cluster.

5.2. INFRASTRUCTURE

Electricity

The increase in production of electricity over the years, the cluster remains very much dependent on the national grid for meeting its electricity demands. Hydel power projects have been initiated and planned by the government in collaboration with the private sector to increase supply of electricity to both districts.

Notable projects relevant to the cluster include the 147 MW Patrind HPP that is already operational and aimed specifically to meet electricity demands of Abbottabad and Mansehra districts. The 840 MW Sukki Kinari HPP which is anticipated to be completed by 2023 shall also boost not only electricity supply to both districts, rather also improve economic activity. Other potential projects include the high capacity Balakot HPP, Nila Da Katha, Bhimbal Khata, Bata Kundi as well as projects in Naran – all based in the Mansehra District.

Figure 7: View of the Patrind Hydropower Project



Currently, however, the rising demands for electricity and inefficiencies in the distribution systems have created many difficulties for the cluster with respect to receiving uninterrupted supply of electricity for production purposes.

The processing sector, for instance, has been badly affected by electricity shortages and has to rely on electricity generators to maintain continuous operations due to load-shedding that is estimated at 4 to 8 hours in winters and up to 12 hours during the peak of summers. In the case of the cluster in Abbottabad, processors spend an average of Rs. 0.7 million on the acquisition and installation of electricity generators whereas processors in Mansehra spend an average capital cost of Rs. 1.2 million on electricity generators. This situation has arisen despite the fact that most of the processing industries are based predominantly in the government-facilitated Small Industrial Estate, Abbottabad, and Small Industrial Estate, Mansehra, respectively.

Moreover, our primary research suggests an average annual cost of electricity for the processing sector to be Rs. 1.44 million for Abbottabad, and Rs. 1.35 million for Mansehra. With respect to other utilities, electricity expenses accounted for almost 90% of all utility expenses. In addition to raising the cost of production, high electricity costs

have hindered the acceptability for more electricity-intensive modern machinery leading to greater reliance on labour-intensive manual processes.

Due to the remoteness of mines and inability of the government to supply electricity, the situation is even worse in the case of the mining sector that has to rely almost entirely on self-production of electricity through generators that leads to both higher capital and operational expenditures. This is in sharp contrast to countries such as China and India that ensure uninterrupted supply of electricity to their industry.

Amongst the study sample, electricity was cited as one of the key issues that our marble and granite cluster faced.

Transportation & Logistics

An overall analysis of transportation and logistics in Abbottabad and Mansehra districts may aptly be summed up as insufficient to meet not only the needs of private citizens, rather businesses as well including the cluster that relies solely on road transportation for movement of goods from mines and processing units to other processors or wholesalers.

The Railway network connects Havelian in Abbottabad with Taxila, Rawalpindi and Karachi. Nonetheless, the focus of the state-owned Pakistan Railways has focused mostly on passenger travel than cargo services. Air transportation through airports based in Islamabad and Peshawar also remains unviable for the industry that is rarely considered as an alternative mode of transportation.

From the provincial perspective, Khyber Pakhtunkhwa, where the cluster is situated accounts for a mere 16% of the entire country's road network. Of this, a sizeable portion is considered to be of low quality. While the road network in both districts were most badly affected during the 2005 earthquake, the federal and provincial governments have taken steps to improve the quality of roads there with the aim of improving connectivity with other major towns and cities in the country.

Both are presently linked to Islamabad and the rest of the country via the Karakorum High Way (KKH) and the Mansehra Narran Jalkhat (MNJ) road that links the KKH in Mansehra city to the Kaghan Valley. However, connectivity of both roads are vulnerable to recurrent land-slides, mainly during the rainy season. A section of the recently inaugurated Hazara Motorway or M-15 connects the Burhan Interchange near Hasanabdal with Haripur and Havelian while future sections will further connect it with Abbottabad, Mansehra, Shinkiari, Battagram, and Thakot. In addition, the previous Hasanabdal – Mansehra road also remains operational while undergoing repair and maintenance at various sections.

Figure 8: Hazara Motorway or M-15



The road network in the Abbottabad and Mansehra districts is estimated to be better compared to both the provincial and country-wide average. Nonetheless, most roads are low-type roads or jeepable tracks that connect the remote parts of both districts to other urban centres.

As for the mining sector, most access roads to mines in the cluster comprise of shingles or gravel roads that are mostly developed by mine owners themselves in sharp contrast to India and China that ensure semi-construction of roads to mines and Italy that fully develops the road network from mines to nearby warehouses and markets.

In many cases, these roads are not easily traversable by larger trucks. Our primary data suggests that in Mansehra, the average length of these mine access roads was just over 13 kilometers and that the average cost incurred for their development are in the range of Rs. 11 million. This huge capital cost for ensuring transportation of marble and granite products from mines to other processors or exporters has also been a major discouragement for private investment in the mining sector.

In addition, the long distances between Karachi, Lahore and Peshawar where the largest clusters of processors in the country are situated – have resulted in higher transportation costs for miners and others alike. Compared to countries such as Italy and India, transportation costs for the cluster and the country at large, are much higher not only due to the long distances between major cities, but also because of poor road conditions, prevalence of older fuel-inefficient trucks, and various unofficial payments collected by local authorities and other influential people.

It is also a matter of discouragement for the cluster to export their products to non-contiguous countries other than China or Afghanistan due to the large distance to Karachi, which is the nearest sea-port. Furthermore, there are limited warehousing and supply-chain services in both districts.

Due to the above-mentioned reasons, the current distribution system for marble and granite is quite distorted with many miners being unable to ensure consistent supply of their products to domestic and international markets.

Telecommunication

Telecommunication services such as fixed landlines, mobile phone and internet services have certainly registered explosive growth in the Abbottabad and Mansehra districts over the past two decades. Average annual telecommunication costs for the cluster is about Rs. 0.033 million that is reasonable as compared to the rates of telecommunication services. Nevertheless, due to the hilly geography of the area, network coverage remains a major issue.

Water

While the availability of water in most areas of the Abbottabad and Mansehra districts have been ensured to a great extent by successive governments, but it still remains a problem for miners located in remote parts of these districts.

Mine owners have to rely on their own sources of water by digging wells and installing electric pumps. In Mansehra, miners spend an average of Rs. 0.2 million capital cost for ensuring water availability. However, the situation is much better for most processing units that are based in government-facilitated industrial estates. The average annual water expenses for most processors based in Abbottabad and Mansehra are about Rs. 0.06 million which is reasonable.

Industry-specific Infrastructure

With respect to industry-specific infrastructure development, the federal and provincial governments with the assistance of the Pakistan Stone Development Company (PASDEC) have taken initiatives to set up marble cities and model quarries in the country. A mechanized quarry for extraction of the valuable black granite was recently set-up by the Abbassi Mining Company with support from PASDEC and the Ministry of Industries & Production. However, such measures taken by the government and other institutions are few and far between considering the scale of Pakistan's deposits and its potential to become a major exporter of marble and granite. In addition, there is a lack of testing facilities in the entire country not to mention the cluster.

By comparison, Italy has a strong base of model mechanized quarries and enjoys infrastructural support from its government that provides facilities in and around mineral-bearing areas and processing clusters. Warehouses are also available in abundance near processing clusters and sea ports in order to ensure consistent supply of their products. China, too, has made major gains by setting up model quarries, testing facilities and training centers with cooperation from Taiwan and Italy.

Figure 9: Organized Industrial Zone in Turkey



Government support to the mining sector can betterly be judged by the capital cost incurred by miners in Mansehra and Abbottabad that spend an average of Rs. 10.6 million on mine area development. Other major capital costs include construction of access roads that have already been discussed in previous sections.

Furthermore, many processing units in Abbottabad have complained of being allocated small plots of land that are not suitable of large-scale production of processed marble and granite products.

5.3. TECHNOLOGY

While the mechanization of mining and processing units in the cluster is certainly catching up over the years, the pace of progress is slow and hindered for a number of reasons, are discussed in detail in the next chapter.

Wastage in the mining sector of the cluster has been reported by sample participants to be 45% that if estimated correctly could mean that compared to wastage standards of the country, the cluster is doing relatively well. Nevertheless, the techniques and processes that were reported to mostly being in use at mines in the cluster are considered outdated by modern and scientific standards being adhered to by the major global producers such as Italy and Spain and increasingly China and India as well.

For instance, the blasting technique of extraction – that remains in use till now results in wastage and uneven blocks of stone that are vulnerable to cracks. This creates less desirability for such blocks in the international market that only accepts square blocks of stone.

In the case of the cluster in Mansehra District, more than half of the miners continue to use blasting techniques. Developed mining countries such as Italy, Spain, Greece, India,

China, etc, on the other hand, use diamond wire saw and chain saw cutting techniques for ensuring more precise extraction and cutting of dimension stones with minimal waste.

Moreover, due to a lack of both technology and technical expertise, the focus group discussions confirmed that only surface mining was taking place in the cluster as opposed to underground mining that makes the most of available stone deposits. The result has been the closure of quarries once extraction of stones is completed on the surface.

One very relevant reason includes the high cost of imported machinery in the country that has kept a number of private investors at bay. Even those that were currently using such advanced machinery predominantly used rented equipment and machinery offered by PASDEC suggesting a lack of large-scale mining operations that would financially justify the ownership of such machinery.

So is the case with the processing sector that is negatively affected by use of uncalibrated marble and granite products such as tiles and slabs with cut variations of up to 4 mm that is unacceptable by international standards, but nevertheless acceptable to domestic markets. Wastage for processing units in the cluster was estimated at an average of 40%. Nevertheless, our research findings suggest that it is using intermediate-level technologies reflective of a small-scale industry.

Besides, the technologies available to them are locally-manufactured ones with not nearly the efficiency or productivity that can be expected from imported technologies. Increase in production of processed marble and granite would be achieved if the capacity to acquire a higher number of higher-output machinery were to be developed.

However, the high capital cost involved in acquiring such machinery discouraged many owners from expanding their operations. In their discussions with our research team, business owners and managers regularly pointed to their financial limitations to operate at their desired levels.

Figure 10: Modern Mechanized Mining in Italy (Diamond Wire Saw)



By comparison, countries such as Italy, USA, and Germany have made collaborative efforts to further enhance mining and processing technologies. Emerging countries such

as China and Turkey also have a well-developed processing industry using modern machinery that is both precise in their cuts and also leads to less wastage. Italy also has a state-of-the-art processing industry and has made vast contributions in research and development (R&D) as well as human resource development in both the mining and processing sectors.

Figure 11: Monowire Gang saw Machine used in Iran



5.4. MARKETING

During the course of this research study, it came to our knowledge that many of the problems that were discussed in secondary sources were reverberated by our study sample and focus group alike. The cluster as well as others in the country, it seems, have been going through common problems – marketing being a very important one of them.

The national industry at large and the cluster was found to be especially weak in terms of marketing. Not only are the products rarely positioned to create demand for them, their grade and quality are hardly ever identified due to the lack of available testing facilities that is vital from the investment and marketing perspective. Many owners and managers continue to lack a sound understanding of their products from a mineralogical, engineering and marketing point of view. Market rates are not standardized and good quality dimension stones and bad alike are sold in a price-competitive market at varying rates to different buyers who sellers say attempt to control pricing based on uncorroborated perceptions of product quality. The opposite scenario is also likely to be true of sellers offering lower quality marble products to gullible customers at premium prices.

It follows that there are many producers of marble and granite who do not recognize the potential value of their products to domestic and international markets. International markets, though, are not so compromising in their attitudes towards measuring the grade and quality of products offered. They are, however, very much interested in a good bargain that the industry's faulty product positioning strategies have made possible.

The dumping of Pakistani products in the international market has also lowered its prices. Products produced by Pakistan, albeit of comparable quality to that of other producing countries, fetch much lower prices in the international market. A well-coordinated effort by relevant institutions – that has been lacking so far – to create demand for its products and earn higher profits through a comprehensive marketing strategy for the industry could raise its exports almost twenty- to twenty-five-folds over the next five years by this step alone.

The dissemination of market information also remains a major hurdle to the marketing efforts of producers. The demand and supply for, or the buyers and sellers of, products are seldom coordinated. One of the major reasons for the cluster's failure to adequately market their products has been the lack of interaction or exposure, or the lack of a successful platform or cohesive organizational framework connecting buyers and sellers that is particularly lacking in the case of international markets.

During our research, it was discovered that only one out of all the miners in our study sample produced marble in addition to granite that was produced by all. It is necessary to keep in mind that the Mansehra district where a larger number of mines are operating has high quality granite reserves. Meanwhile, processors in both Mansehra and Abbottabad Districts produced both marble and granite though the focus seems to be on producing marble products that are easier to cut and polish compared to granite that is harder and, consequently, requires better cutting and polishing tools.

It has been estimated that the cluster sells over four times as much in Khyber Pakhtunkhwa as it did from the Punjab province that also had a high demand for its products. This only further reinforces the assessment, and echoes the concerns, of our study participants that market access is severely limited and that the selling focus seems to be almost entirely on the domestic market even though many would like to export their products at higher international prices.

Of all participants of our study sample, only 11% of miners were engaged in exporting of their products to China while not a single processing unit exported his products to other countries. This is, to some extent, reflective of the overall marble and granite industry of the country. India, by comparison, exports nearly half of its production to other countries.

Products are sold through personal relationships and references to wholesalers and middlemen on a cash-credit basis. Communication between buyers and producers (or sellers) predominantly takes place through personal visits and telephone calls, with mines and factories serving as point of sale.

It is also pertinent to mention that rarely of our study respondents ever show-case their products at a trade fair or exhibition. In fact, the almost all of respondents had even not participated in such exhibitions. Trade fairs and exhibitions serve as platforms for not only increasing awareness of latest trends and international best practices rather also essential for promoting and marketing products. Local trade houses are also non-existent.

Countries such as Italy, Spain, and Greece, on the other hand, promote their products and technologies through a number of exhibitions and trade fairs, which they host themselves. Countries such as India and China are also following suit. By doing so, they are developing trade linkages which connect buyers with producers or sellers.

These countries have also created institutions that are engaged in the study and publication of market trends and information, providing technical support and training, and promoting local products.

Another major marketing problem stems from the inability to ensure a consistent supply to the market especially international ones that place big orders than most producers in the cluster are able to fulfill. In addition to the need for large-scale investment, improved technology, and the establishment of material testing facilities, the solution to this problem also lies in improving feasible warehousing and transportation infrastructure.

Besides, none of the respondents had hired professional marketing firms that could favourably present their products to buyers. Use of websites was also non-existent.

5.5. EXISTING BUSINESS MODELS

Understanding the business models currently in practice in the marble and granite cluster of Abbottabad and Mansehra Districts was one of the aims and outcomes of this research study that was carried on the basis of primary data collection from business owners and managers of both mining and processing units as well as focus group discussions that took place between representatives of business enterprises engaged in marble and granite processing as well as those from institutions including Small & Medium Enterprises Development Authority (SMEDA), Pakistan Stone Development Company (PASDEC), Directorate General Mines & Minerals (DGMM), Small Industries Development Board (SIDB) and the Environmental Protection Agency (EPA).

Though there may be variations from business to business, a typical model of how products move from extraction to markets is elaborated below.

Mining Sector

As understood from the model given above, the marble and granite value-chain for the cluster begins with the extraction of raw stones from mines. These mines are based in more remote locations of the Abbottabad and Mansehra Districts though granite extraction was taking place on a much larger scale than that of marble. The concentration of mines is mainly in the Mansehra district that is home to one of the largest granite reserves in the world.

Miners, who took part in our study were either sole-proprietorships, partnerships or registered companies, each of whom operated more than Three (3) quarries on average. The estimated deposit of each of these quarries was about 3.2 million tons which brings the total estimated deposits for each of these business enterprises of about 10 million tons each. These estimates were based on primary data collection from respondents who say they spent between Rs. 0.2 million to Rs. 2 million on carrying out geological surveys.

The common use of geological surveys in the cluster is a welcome step that allows mining operators a better understanding of the topography of mines, reserve estimates and chemical and geological analysis of stones as well. They also assist miners in determining the right direction of extracting stones from mines in order to make the most of their deposits.

Nonetheless, the high cost of conducting geological surveys is certainly a discouragement for many SMEs that are otherwise interested in pursuing their business interests in the marble and granite industry. Compared to Pakistan, countries such as Italy, China and India provide exceptional support to the industry as far as geological surveys, and stone testing facilities are concerned.

However, it remains disappointing to note that none of the miners who took part in our study made the most of these geological surveys and carried out surface mining only even though underground mining would allow a huge extraction of stones from available mine deposits. The reasons for relying solely on surface mining for extraction of stone may lie in the dire need for advanced machinery, and the higher cost and difficulty of extracting stones through underground mining.

In addition to paying advances of up to Rs. 1.8 million to land owners, mining businesses spend between Rs. 1 million to Rs. 30 million on mine area development. Each miner also spent an average additional amount of Rs. 11 million on construction of mine access roads that goes to show the lack of available road infrastructure to help facilitate the investment effectiveness of private enterprises.

The capital cost of owned machinery involved in the excavation and transportation of raw blocks of stone was between Rs. 1 million and Rs. 100 million. There was, however, huge reliance on rented machinery either due to lack of a financial justification or lack of finances to procure them. Capital cost of other equipment also costed between Rs. 2.5 million and Rs. 25 million for miners in the cluster.

Moreover, due to the remoteness of these mines, electricity was almost entirely produced through generators on a self-finance basis. Miners also spend up to Rs. 0.2 million for ensuring availability of water for both production and domestic purposes.

Surface rent of mines was between Rs. 0.2 million and Rs. 1.5 million though surface rent was also based on tonnage of stone extracted from these mines in 33% cases. It was also customary to pay an increase of 10% in surface land rent every year. Royalties of about Rs. 6.5 million were also paid annually with some miners paying royalties on a per-ton or even per-truck basis. Hut containers costing about Rs. 1 million on average were also installed by some of the mining enterprises to serve as offices for managing administrative operations.

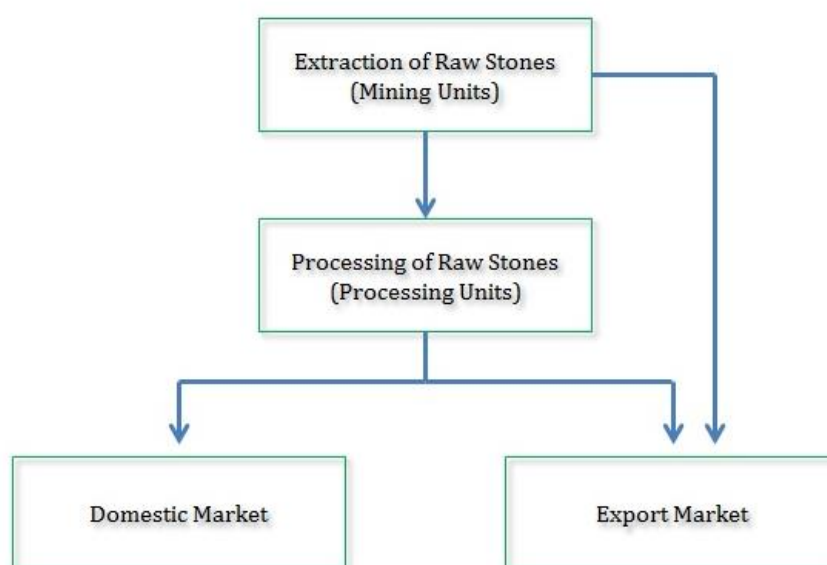
Other operational expenses such as fuel cost, and repair and maintenance of machinery were especially high. Fuel cost range from Rs. 0.8 million to Rs. 4.8 million on a monthly basis with an average annual fuel cost of Rs. 23.3 million that is staggering to say the

least. Repair and maintenance of machinery also cost between Rs. 0.05 million and Rs. 1 million on a monthly basis while the average annual cost of repair and maintenance among study participants pertaining to the mining sector was Rs. 5.6 million. HR cost was determined to be at an average of Rs. 12.4 million per annum for each mining unit. Other significant costs include loading / unloading as well as transportation costs.

Moreover, based on findings of our primary research it was discovered that miners in the cluster produce an average of 4,600 tonnes of blocks and boulders whereas their annual revenues range from Rs. 3.6 million to Rs. 144 million in the case of larger producers.

In terms of cash flow, most miners reported selling on both cash and credit basis while 22% of respondents stated that they sold entirely on credit basis. They report that these products are sold through wholesalers and middlemen hailing primarily from Khyber Pakhtunkhwa, but also from Punjab though it is also likely, based on previous studies conducted on the marble and granite industry, that miners may not know exactly where these products eventually end up. Nonetheless, based on our interactions with study participants, these raw marble products predominantly find their way to local processors who cut and polish marbles for various construction purposes. Only 11% of the respondents state that their raw products were sold directly to the international market i.e. China in the case of the cluster.

Figure 12: Basic flow of Mining Products to markets



It is pertinent to mention that the export of raw marble and granite stone has picked up over the years primarily to China that certainly add to the country's exports, but are hurting the industry's prospects as processing of local dimension stones take place elsewhere and are even later re-exported to other countries at exorbitant prices. Nonetheless, almost all respondents pointed to lack of market linkages, weak regulatory environment and lack of adequate warehouses are ing to be major reasons that resulting in weaker selling positions of miners.

All mines were fully self-financed with family members also providing financial support in some cases. Despite many state that they want to avail banking loan facilities, several stated that their loan applications had been rejected while others cited complex documentation procedures as discouraging them from applying for loans. Lastly, our overall assessment is that the mining sector is extremely capital-intensive which means that it requires large amounts of investment before they are able to earn handsome returns. As such, the mining sector may not be ideal for small-scale businesses with limited capital investment of their own.

Processing Sector

With respect to the processing sector, all of the processors based in the Abbottabad and Manshera districts were sole-proprietorships engaged in the processing of both raw marble and granite. All of them reported that they were fully self-financed and lacked means to expand their businesses due to a range of infrastructure- and finance-related issues.

Most processing units procure raw materials either directly from local mines or through middlemen and traders, who coordinate the exchange of materials between miners and processors. Price of products rarely depends upon perceived marble quality and colour. These products are cut and polished to required sizes for products such as tiles and slabs. None of the study participants were involved in the production of other commonly-produced marble chips, powder or handicrafts. It has been reported by the respondents who participated in the study that these products are sold entirely to the domestic market through wholesalers and middlemen.

Table 6: Location of Mining Sales

Direct Sale at Mine or Factory	Indirect Sale to Wholesaler, Middlemen or retailers
86%	14%

Almost half of them owned their current factories and offices spending an average of Rs. 2.78 million on setting them up. The remaining that rented office building or factories reported to pay a monthly average of Rs. 0.046 million as rent. All of them owned their own machinery and equipment having spent an average of Rs. 4 to 5 million on acquiring them.

Other capital costs include that pertaining to electricity generators, the average cost of which was about Rs. 0.98 million underscores the importance of electricity generators to ensure consistent supply for electricity-dependent machinery to operate. It also goes to show that having a generator to augment government supply of electricity is a basic requirement for any potential investment in the processing sector.

In terms of operational costs, HR and electricity constitute the major portion. The average electricity cost for the processing sector falling within the cluster was about Rs. 1.43 million per annum whereas the HR cost is averaged at Rs. 1.33 million per annum.

It is relevant to mention that due to the scarcity of skilled labour, worker retention becomes especially challenging as they tend to easily switch to competitors offering slightly better salaries. Moreover, labour productivity remains an issue not just in the cluster but the country at large that in comparison to countries such as Italy and Spain may be up to five times lower than the labour productivity in those countries.

In the case of water and telecommunication expenses, the annual average is at Rs. 60,000 for water and Rs. 0.034 million for telecommunication. Meanwhile, miscellaneous cost associated with processing has been estimated at Rs. 0.072 million on average.

Furthermore, the average annual production of processing units was estimated at 0.95 million square feet. It goes without saying that these products end up with retailers in all major cities and towns in the country. None of respondents in the processing sector reported selling to export markets.

Lastly, it cannot be stressed enough that a strong processing sector has been one of the major success factors for development of the dimension stone industries of top global producers. Therefore, more concentration is needed in the coming years to support and augment it.

5.6. CLUSTERS EXISTING & POTENTIAL COMPETITIVENESS

Amongst the cluster's existing and potential competitive strengths, those summarized below are very relevant to establishing its competitiveness in both domestic and international markets:

- Large reserves of high quality granite reserves
- Growth of mining sector in the past decade and increased encouragement and support from relevant stakeholder institutions such as Small and Medium Enterprises Development Authority (SMEDA) and Pakistan Stone Development Company (PASDEC)
- Support from the processing sector that specializes in granite processing
- Proximity to China, Central Asian Republics (CARs), and Afghanistan that is still in the process of rehabilitation and reconstruction

6. KEY ISSUES

The cluster faces many issues that prevent it from achieving its potential as a major center for production of dimension stones in the country. In this chapter, we will discuss the most relevant and glaring of those issues and with proposed solutions in the next chapter.

A summary of those key issues that impact the cluster may be found below:

- Lack of high-quality equipment and machinery
- Limited awareness and support for utilization of modern technology and processes
- Shortage of qualified engineers, skilled workers and professional managers
- Inefficient extraction techniques and methods leading to substantial wastage of raw product
- Non-existence of quality control processes and practices
- Inaccessibility to adequate financing and loan facilities
- Deficient supply chain infrastructure leading to inconsistent supply of product to the market
- Non-competitive business model and strategy
- Insufficient geological data and technical knowledge of mines and mine products
- Opacity and instability of mine leasing procedures
- Poor policy and management of property rights
- Lack of coordinated governmental and institutional support

It is important for the reader to note here that while each of the below-mentioned issues facing the cluster are inter-connected, we have categorized them into manageable sub-topics.

6.1. TECHNOLOGIES, PROCESSES, AND PRODUCTS

Pakistan has one of the largest reserves of top-quality marble and granite and the potential for being a major exporter of its products. However, the country has been plagued by the lack of modern machinery and the usage of outdated techniques and processes that has restricted its ability to make the most of its vast reserves of high quality dimension stone. In the case of the cluster though, things are looking better in the technology aspect than the general impression created from previous related studies on the marble and granite industry. However, technology continues to be a major thorn in the side of the cluster as well that requires the latest technologies to increase both output and quality.

A review of the available literature reveals that about 95% of the quarries in the country continue to utilize the blasting technique of mining that not only results in an inefficient and low yield. While the average loss of raw product at the quarry is estimated at 45% around the world, wastage in Pakistan can go as high as 85% which is seriously damaging and depleting marble and granite reserves of the country. Our primary research confirmed

the continued use of blasting techniques in the cluster where 55% of respondents stated that they used blasting techniques for breaking for excavation of dimension stones. This waste also has negative consequences for the environment.

Figure 13: Use of Blasting in Pakistan



Blasting is a method for breaking rock that involves drilling of holes into stone and filling those holes with explosives for a relatively-controlled detonation to produce pieces of stones of manageable size.

Moreover, the blasting technique also results in smaller marble blocks or “potato” blocks that are vulnerable to cracks during further value-added processes making them less desirable to buyers, and to the processing sector who may discard as much as 60% of the incoming product while this same percentage was estimated at 40% in the case of the cluster. These smaller pieces may also find their use in the processing of tiles or in handicrafts though none of study participants confirmed the application of stone produced by them for the handicrafts industry.

Figure 14: Country-wise wastage estimation

Country	Total Waste
Pakistan	74-85%
Egypt	45-80%
Australia	45-80%
India	45-75%
Jordan	35-75%
Italy	25-50%

Source: Global Development Solutions, LLC, Master Marble (Pvt) Ltd.

With respect to the mining sector of our processing, machinery such as excavators, wire-saws and air compressors were being utilized along with loaders and dumper trucks for carrying raw stones to storage or processing sections of mines. However, wire-saws that

ensure precise cutting of stone and are highly desirable for mining, were only available with 33% of respondents. It also came to light that most of these machines were hired on rental basis which would suggest that most miners lacked the financial capacity to own their machinery or that the financial justification was not there yet.

However, our primary research respondents also suggested legal restrictions, lack of trained staff, in addition to financial constraints (due to high prices) to acquire technology. As per the participants of our focus group discussion, the machinery commonly acquired in the mining sector is suited only for surface mining as compared to underground mining that would help miners make the most of their deposits. They also reported that while the Pakistan Stone Development Company (PASDEC) was offering machinery to the mining sector on rental basis, the rental charges are too high for most of them rely on. The high number of cross-checks required for benefiting from PASDEC's machinery pool also complicates affairs.

With respect to the processing sector, the cluster that comprised of mostly smaller enterprises were commonly using cutting machines such as bridge-cutters and vertical mills, along with manual polishers for processing of stones into tiles and slabs. However, output and quality remained a problem for them with their existing machinery that is why most of them cited financial constraints for acquiring modern machinery as obstacles to their survival and growth. Unreliable electricity supply can also be another hindrance to acquiring such technologies. Wastage was estimated at 40% for the processing sector.

Table 7: Cost of Existing vs Required Machinery

Machinery	Total Cost	Avg. Cost
Existing	178318600.0	17831860.0
Required	205500000.0	20550000.0

It is also worthy to mention here that during the course of this research study, we found that processing sector of the cluster only produced slabs and tiles. There was not much consideration of alternative applications especially when it came to utilization of waste in the form of defective products, marble chips or marble powder.

Moreover, with little or no calibration, most processing firms cut tiles with a variation of up to 3 – 4 mm in tile thickness whereas international standards only allow for a variation of 0.5 mm for tiles and up to 1 mm for slabs.

Some of the reasons that have hindered the introduction of latest technologies and techniques in the mining and processing sectors include the following:

Small mining operations

Most of the enterprises engaged in the processing sector of the cluster were running small-scale operations that do not financially justify the acquiring of high-output and high quality producing machines.

Limited infrastructure

The lack of appropriate infrastructure such as an under-developed road network, limited supply of water and electricity shortages have discouraged the use of heavy quarrying machinery. While roads not only facilitate the movement of machinery, it also facilitates the distribution of product, which in the case of cluster may not guarantee financial success due to high transportation costs despite the attractive proposition of higher yields.

The limited supply of electricity also makes it unfeasible to install the latest machinery that consumes a lot more electricity than other less-modern alternatives in both the mining and processing sectors.

Uncertainty of mining leases

Mining leases for natural stone have been awarded to applicants who lack the financial strength and business acumen to exploit stone deposits on modern technological and scientific grounds. Moreover, the uncertainty of the duration of leases have also led to a discouragement to invest in technology in the mining sector.

Lack of innovation in products

Interest of enterprises in both the mining and processing sectors has been tilted towards production of the same products using the same technologies such as blasting, drillers, vertical & horizontal cutters, gang saws, and polishers that have been around for decades.

Lack of awareness and technical knowledge

Due to a lack of market exposure, most miners and processors are not aware of latest mining and processing techniques, market trends, product diversification options and international standards. This has hindered the adoption of a more technology-oriented approach towards production. Moreover, there is also a dearth of trained labour able to operate these specialized machines.

Lack of favourable regulatory environment

On the regulatory front, the situation has been no more favourable to owners and potential investors in the market to encourage them to spend large sums of capital on efficient machinery. There continues to be a lack of coordination between various stakeholders in modernizing the existing industry as well as other regulatory bottlenecks including taxes and cumbersome machine-importing procedures.

6.2. INFRASTRUCTURE

The infrastructure in the cluster continues to remain a major impediment to building its competitiveness in both domestic and export markets. By international standards, infrastructure in the form of electricity, road networks, and water and sanitation may be rated as “fair” in the case of the processing sector that is mostly based in and around the cities of Abbottabad and Mansehra while the mining sector that is based in remote areas has especially suffered due to the practically non-existent infrastructural support it receives.

Nevertheless, the Abbottabad and Mansehra districts have seen many developments in electricity and water supply, along with an improvement in quality and expansion of its road network. The use of mobile phones and the internet have also vastly improved communications between the two districts and the rest of the country.

However, with a high fiscal deficit of 4.1 % of GDP in FY 2017, trade deficit of up to \$10 billion and a current account deficit at almost 3% of GDP, the country has been unable to allocate substantial funds for physical and social development. This has prompted the government to encourage private sector investments in order to finance building of infrastructure-development projects. The government policy of inviting private sector investment proposals has paid off very well with the country witnessing an investment of \$5.9 billion during the year 2017 which has made it to the top five countries in the world with the highest level of Private Infrastructure Investment (PPI). Nevertheless, 95% of these private investments have been in the energy and transport sectors while telecommunication and water and sanitation have received minimal attention.

On the cluster level, it is important to keep in perspective that the Mansehra and Abbotabad districts along with Battagram and Muzaffarabad in Azad Jammu & Kashmir (AJK) were the most affected in terms of human loss and devastation of physical infrastructure in the earthquake of October 2005. In the Mansehra District alone, about 16,000 persons died while almost 10,000 persons suffered injury. As per available statistics, a total of 108,283 housing units were ruined completely while 34,001 were partially damaged. Water supply for domestic and irrigation purposes were also severely disrupted in both Mansehra and Abbotabad districts. Landslides also caused huge damage to roads, bridges and public structures.

While many roads and bridges have been rebuilt, there remain many link roads and pathways that have not yet been developed due to which transportation of even basic goods and products across the districts has been hampered.

Following are some of the broad issues that the cluster faces with respect to infrastructure:

Electricity & Power

The power sector of Pakistan has been the focus of numerous public and private sector projects. The country has seen consistent growth in the production of electricity. In the past five years alone, there was an increase of 30% in production. However, rising demands due to an ever-growing population along with inefficiencies in the distribution system, inadequate billing and poor financial health of the Water and Power Development Authority (WAPDA) and other producers have led to a shortfall that has frustrated not only economic but everyday life.

Pakistan currently produces about 15,886 MW whereas its country-wide demand is 19,500 MW that means there is a shortfall of over 3,500 MW. These shortages can further rise to 6,000 MW during summers leaving the government no other option but to cut electricity supply for 3 to 4 hours in urban areas and between 8 to 12 hours in rural areas.

According to a report published by the World Bank, power shortages have been a major obstacle to business expansion. It is estimated that on average a typical business in Pakistan loses 5.6% of its annual output due to this. Other surveys have determined that the country's suffocating power problems negatively affect its GDP by up to 3% a year. Moreover, over 500,000 households are faced with unemployment due to the negative impact of power shortages over business activities. Industries forming that backbone of the country's economy including the textile, petroleum, and automobile industry have all suffered due to the energy crisis.

In the case of the Abbottabad and Mansehra districts, electricity supply is governed by the Peshawar Electric Supply Company (PESCO) which manages all aspects of production, distribution, provision of consumer connections, and bill collection.

The electricity produced in both districts has been insufficient to meet local demand that is why they have had to depend heavily on the national grid. Nonetheless, most of the towns and villages are well-served with the Abbottabad district having a comparatively better access to electricity than Mansehra district. Load-shedding is common especially during the peak summer season. However, remote villages have to depend on their own for their energy needs.

The remoteness of mines in the cluster have compelled most mining enterprises to rely on self-production of electricity which is an expensive affair. The processing sector has also been badly hit by electricity shortages with many processors alleging a lack of interest of the government to ensure regular electricity supply to industry. While most processors heavily depend on labour, the shortage of electricity has hindered the switch to more modern machinery that require an intensive usage of electricity.

Additionally, most consumers – domestic and commercial alike – face much difficulty in getting electricity connections having to wait about 6 to 12 months if they are to acquire them by legal means. Others have to pay large sums of money as bribes for getting their connections on a timely basis.

Lastly, the pricing structure of electricity has traditionally been in favour of domestic consumers who are regularly the target of government subsidies as opposed to commercial industries that are charged much higher than what is feasible for a developing industry such as marble and granite.

Transportation & Logistics

The transportation and logistics infrastructure in Pakistan may be considered somewhat developed while continuing to lack some of the efficiencies that may be found in more developed countries. The country hugely depends on road transportation accounting for almost 90% of freight and passenger traffic. The railway network, on the other hand, accounts for only 3% of freight and passenger traffic.

The total length of roads in Pakistan – including Gilgit Baltistan and Azad Kashmir – has been estimated at 264,401 kilometers making it the 21st largest road network in the

world. Of this, about 187,807 kilometers of the road network is considered to be of a high quality while about 75,549 kilometers of it is viewed to be of lower quality as per latest available figures. A province-wise estimate places Punjab as having the highest proportion of the country's road network at 41% followed by Sindh with 31%, Khyber Pakhtunkhwa with 16%, and Balochistan with 11%.

The ratio of paved to unpaved roads in Pakistan has seen growth over the years and is testament to an improvement in the quality of roads. However, road density – which is a measure of the total length of a country's roads to its land area – continues to remain very low compared to that of India that has a road density of 142.7 compared to Pakistan's road density of 33.0. Nevertheless, it has been argued that the quality of roads is better than countries such as Egypt, India, Iran, and Bangladesh.

Moreover, in addition to smaller scale of imports and exports, the vast distances between Karachi – which harbors the only sea-port in the country – and other major cities in the Punjab and Khyber Pakhtunkhwa provinces have led to many cost inefficiencies that are hurting the country's economy. The situation is further exacerbated by the widespread use of older and uneconomical trucks that take more than twice the time to reach their destinations compared to transport systems in Europe and East Asia. Overloading of trucks is also common that has deteriorated the condition of roads in the country.

Rail transportation in the country is monopolized by the state-operated Pakistan Railways that has traditionally focused on passenger traffic. Most trains and railroads are in a dilapidated condition. However, efforts are being made by the government to revamp it. Air freight, on the other hand, has been unable to cater to both domestic and international demand.

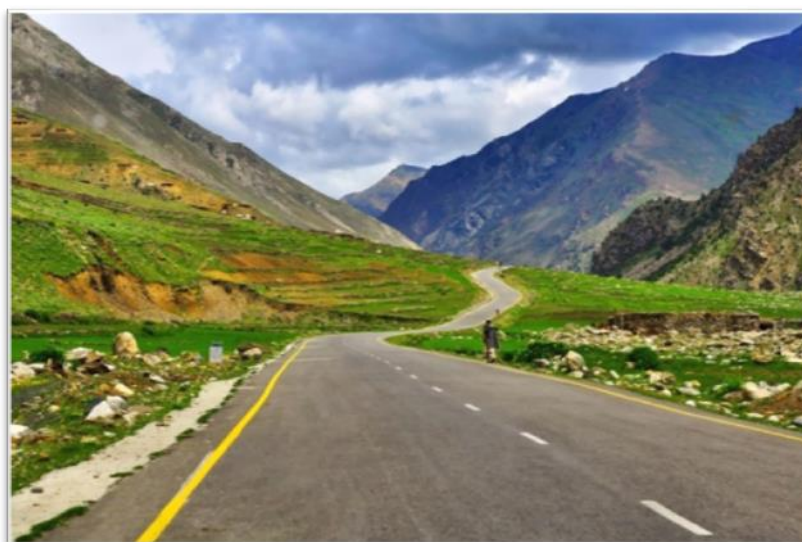
Logistics and supply-chain in Pakistan are in a developing stage and currently provide a basic level of service, though private investment has brought about an improvement to meet market needs. Customs clearance procedures remain very cumbersome and time-consuming discouraging import and export businesses in the country. Moreover, there is still a largely unfulfilled need in the market in terms of warehouse management, inventory management, cold storage among many other aspects of supply-chain logistics. Other areas of weakness include inefficient less-than-truck load and less-than-container load supply chains and a lack of integrated supply-chain management services with real-time monitoring and internet-based transactions.

According to figures from the World Bank, Pakistan has been ranked 68th out of a total of 150 countries that were evaluated in comparison to India that stood at the 25th position and China at the 27th position. It has been estimated that Pakistan loses nearly 5 – 6 % of its GDP as a result of the mentioned inefficiencies in transportation and logistics.

With respect to Abbottabad and Mansehra where the cluster is located, the road network had seen many improvements that were later disrupted due to the earthquake that took place in 2005 with both districts being one of the most badly affected districts in the country.

Both are currently linked to Islamabad and the rest of the country via the Karakorum High Way (KKH) and the Mansehra Narran Jalkhad (MNJ) road that links the KKH in Mansehra city to the Kaghan Valley. However, connectivity of both roads are vulnerable to recurrent land-slides, mainly during the rainy season. A section of the recently inaugurated Hazara Motorway or M-15 connects the Burhan Interchange near Hasanabdal with Haripur and Havelian while future sections will further connect it with Abbottabad, Mansehra, Shinkiari, Battagram, and Thakot. In addition, the previous Hasanabdal – Mansehra road also remains operational while undergoing repair and maintenance at various sections.

Figure 15: View of the Mansehra-Naran Jalkhad Road



The road network in the Abbottabad and Mansehra districts is stated to be better compared to both the provincial and country-wide average. Nonetheless, most roads are low-type or jeepable tracks that connect the remote parts of both districts to other urban centres.

In addition, Havelian that falls in the Abbottabad district connects it to Karachi via Taxila and Rawalpindi. There is no airport in either of the districts and instead rely on international airports based in Peshawar and Islamabad.

With respect to the processing sector of the cluster, most of the enterprises are based in government-facilitated industrial estates with a fairly reliable road network. However, next to zero attention has been paid to developing road infrastructure in and around mines that are located in remote areas of both districts. Our field survey revealed that miners in Abbottabad and Mansehra personally financed mine access roads which mostly comprised of shingles or gravel roads while some miners spending up to Rs. 10 million on developing them.

Telecommunication

Telecommunication in Abbottabad and Mansehra districts has seen progress over the course of the last two decades. Previously, communications were limited to fixed landlines operated by the Pakistan Telecommunication Company Ltd. (PTCL). Recently,

however, most telecommunication in the cluster has been dominated by the widespread use of mobile phone services.

Mobile telephony began in Pakistan with the launching of Ufone as a state-owned mobile phone company followed by the entrance of several private companies including Mobilink, Telenor, Warid, and Zong among others. The current subscriber base of Pakistan has been put at 150 million making Pakistan one of the largest consumer of mobile telephony services. At the same time, the subscriber base for 3G/4G services has expanded to 55 million while the Pakistan Telecom Authority (PTA) that is regulatory authority for telecommunications in the country expects to launch 5G services in 2020 following its approval by the Federal Cabinet in 2017.

Internet penetration, however, remains at 22.2% with only 45 million internet users in late 2017. Internet coverage and connection speed also remains a major problem for the country.

All cellular companies are operational in the major cities of both Abbottabad and Mansehra Districts while access to fixed landlines is estimated to be only slightly higher than the provincial average and focused in urban centres and larger towns.

Water & Sanitation

The water and sanitation system in the cluster may be considered to be outdated not only from the technical perspective, but from an economic point of view as well. At present, irrigation for agricultural purposes accounts for more than 90% of water usage in the country while the remaining is used for industrial and domestic purposes.

According to the International Monetary Fund (IMF), Pakistan is currently facing an acute shortage of water while other studies consider it to be one of most water-stressed countries in the world by 2040. This may be reflected by the growing awareness campaign for the conservation of water in the recent initiatives taken by the Supreme Court of Pakistan and the Prime Minister of Pakistan to collect funds for building of the Diamer-Bhasha and Mohmand Dams. Other water reservoirs in the country include the Tarbela Dam, Warsak Dam, and Mangla Dam amongst about 150 small and large dams.

Water in Pakistan has been largely untaxed as governments face pressure to keep prices low. This has been a major hurdle for the government in being able to cover the costs of development, maintenance and provision of water supply services. The lower price of water in the country has discouraged private operators from investing and those that do rely on government subsidies that has further impacted the government's own resources.

Moreover, citizens and businesses alike commonly complain of an insufficient and asymmetrical supply of water that has led them to dig wells, install electric pumps, and build storage tanks on their own initiatives. In the case of the mining sector, water is entirely own-sourced. The processing sector, on the other hand, has been relatively better as most enterprises are based in industrial estates that have regular supply of water.

Waste collection and management are also largely undeveloped not only due to a lack of interest on the part of the government, but general unawareness or apathy of its citizens who resort to building their own systems without any regulation from concerned government institutions. Furthermore, there are very less controlled landfill sites in the country to speak of.

6.3. INSTITUTIONS

The impact of local institutions that have been tasked with promoting and facilitating growth of industries in general, and the marble and granite industry specifically may be considered weak. At present, there exists an ever-dire need for developing strong linkages between various stakeholders: regulators, non-profit organizations, state-owned enterprises, private investors, miners, producers, and foreign and domestic customers, technical training institutes, and communities.

There have been initiatives on the part of various institutions that we shall discuss briefly here, however, we shall also mention some of the limitations of these institutions and discuss how to overcome them in the next chapter.

Pakistan Stone Development Company

PASDEC has been severely restricted for financial reasons from expanding its activities to satisfactorily jump-start mechanization of industry. There are a large number of miners in the country and it is difficult for PASDEC to provide its services to the large number of small enterprises engaged in mining in remote locations of the country. PASDEC has also been unable to follow-through on plans for marble cities in the country. Its machinery pool is only capable of serving a limited number of quarries that have been reported to be some of the larger miners in country. Its role with respect to building linkages with other institutions is also weak.

Small & Medium Enterprises Development Authority

With regards to the marble and granite industry, SMEDA has taken initiatives to provide skill development training to women participants on marble mosaics, and to assist PASDEC in the establishment of a marble city in Mohmand Agency. However, the organization is yet to create a positive impact on a significant level when it comes to the marble & granite industry, though it has lived up to its true purpose in other sectors and industries. The capacity of such institutions as SMEDA need to be further enhanced so it can play a role appropriate to the scale of its challenges to transform business in the country.

Directorate General Mines & Minerals

The DGMM has been ineffective in monitoring and regulating the marble and granite industry with many of our survey participants and focus group complaint lack of cooperation on the part of the DGMM. They also reported that there was a lack of security of tenure that discourages them from making further investments at their existing mining locations. It was also pointed out that there was a limit on the number of leases

given to mining companies that is one of the many unnecessary steps taken by the DGMM that has only hindered the growth of the cluster and the industry at large.

Moreover, there is an urgent need to fix the discrepancies between the DGMM and other regulatory authorities such as the Environmental Protection Agency (EPA) or Forest Department as many of our study participants reported being found in violation of environmental compliances and fined despite having valid leases issued by the DGMM. The process for issuance of leases has also been criticized for being too complicated and not business-friendly at all.

Others have reported it to be lax in its issuance of mine leases and its implementation of environmental and safety compliances. Also, there have been numerous mining accidents and reports of illegal mining taking place in the province.

Dimension Stones Centre

There has been very little awareness regarding the activities of the Dimension Stones Centre in Peshawar and most producers of marble and granite are unable to make the most of its facilities.

International Organizations

Small-scale initiatives have been taken up by international organizations such as USAID, and the World Bank. Recently, the World Bank (WB) provided machinery of Rs. 400 million to the marble and granite industry in Khyber Pakhtunkhwa in 2015. They have also provided their technical analysis and drawn the attention of the strengths and weaknesses of the industry in Pakistan to policy-makers, investors, and other stakeholders.

Beside, this there has been very little support from international organizations in assisting the cluster in growing to its potential.

Voluntary Associations & Industry Representation

There are only a few trading and industrial associations in the country specific to the marble and granite industry. Of the more larger and important, the All Pakistan Marble Industries Association (APMIA), represent a large number of mine owners however, our field surveys revealed that very few in the cluster were associated with APMIA. Instead, miners were mostly associated with the Frontier Mines Owners Association (FMOA) while all Abbottabad-based and Mansehra-based processing units were associated with the Abbottabad Marble Association and Mansehra Marble & Granite Association respectively.

However, their drawbacks have always included a lack of direction in promoting the industry, and non-existent technical support. Furthermore, they have been criticized for not having a futuristic approach towards building a good foundation for long-term development and promotion of the industry. International linkages and sharing of market information amongst members is also not characteristic of these associations.

6.4. HUMAN RESOURCE

The marble and granite industry has provided jobs to an estimated 200,000 workers in Pakistan. A significant portion of these workers come from underprivileged backgrounds, and are unskilled, unqualified, and unproductive too due to lack of not only adequate machinery, but also due to a lack of knowledge about modern cutting techniques.

Except for a few recent modest initiatives, dedicated training institutes that provide technical trainings on mining and cutting techniques and procedures are virtually unavailable in the market. Most workers in both the mining and processing sectors have been brought on as apprentices and have learnt on-the-job. Nonetheless, about half of the miners in the cluster reported their staff as having attended technical trainings. The focus group discussion also revealed that managers were in dire need of international exposure and trainings.

Table 8: Human Resource Metrics

Number of Employees	Avg. Experience (years)	Formal skills Training %
364	8.5714	10%

The demand for innovation is also not there as producers are content with producing and selling the same products to the same buyers they know and are comfortable with for years that has left a niche-level demand for higher-level of machine-operating skills in the mining sector only.

Also, the nature of manual work in these mines results in a high worker turnover for health reasons though the labour market for the cluster remains very price- or wage-conscious and workers may switch over small increases in salary.

Safety precautions in accordance with international standards are not adhered to by any of the miners we interacted with, however, it was heartening to know that our study participants from both the mining and processing sector were aware of the need to provide protective gear to their staff and to take safety precautions where safety risks were imminent. Even so, the remoteness of most mines in the cluster makes it difficult for regulatory authorities to monitor their activities and implement labour laws. The lack of scientific quarrying in more than half of the cluster's mining sector hampers productivity and quality in addition to posing safety risks to workers and labourers.

Blasting through explosives is a very dangerous way to quarry, and injuries and tragic deaths are not uncommon at mines in the country yet our field studies suggest that insurance benefits and compensation (as mandated by law) for injuries and death are not provided by about half of the miners. Even our study participants pointed out that they were facing problems complying with applicable labour laws.

Though not well-documented, there are enough reports that working conditions at many mines and processing units are exploitative and workers are often not paid for overtime. Our study revealed that many miners were operating shifts of up to 14 hours. However,

basic facilities such as shelter, access to clean drinking water and washrooms were provided by all enterprises in the cluster.

It has also been argued by various stakeholders that the recent shift in export trends in shipping of raw blocks of marble & granite as opposed to value-added products especially to China has also had a negative impact on the local job market. Most of these importing countries have set up their own factories and re-export a significant portion of Pakistani dimension stones. This means that value-adding processing units are not being set-up in Pakistan that would provide job opportunities for the workforce here. It also means that high-level value-added skills will not gain traction within the industry and the miners and processors will continue to hire easily-replaceable low-skilled workers at their units.

The lack of a competitive labour market based on skills has unevenly distributed skills in the country with major cities such as Karachi, Rawalpindi, and Peshawar being home to the largest number of processors in the country. Many of these workers are not easily motivated to shift their current job locations to other areas for reasons including security, low demand for higher-level skills, lack of infrastructure and facilities that are otherwise available in the mentioned major cities.

With respect to both Abbottabad and Mansehra districts, people are generally engaged in various trades and labour activities. Many households are supported by male members of their family who have gone abroad particularly to Middle Eastern countries such as the United Arab Emirates and Saudi Arabia to earn livelihoods.

Transport and agriculture are major sectors for employment in the Mansehra District whereas Abbottabad, being a tourist centre, provides more service-related opportunities in hotels and restaurants, and in the retail and communication sectors. Other important sectors include agriculture, construction, and transport. Unemployment is high in both districts and the percentage of economically-active population has been estimated at 20% only. The rising population will make matters worse and there will be a need for the government to facilitate self-employment generation opportunities in order to tackle the impending crisis.

While skilled-labour is short in both districts, Abbottabad is even more so due to the engagement of its community in seasonal tourism and transport.

6.5. REGULATORY FRAMEWORK

The regulatory environment in the cluster specifically and the nation-wide industry is marred by a number of weaknesses including a lack of regulatory oversight, ineffective import and export policy, impractical tax structure, burdensome export procedures, and uncertainty over mine leases and property rights.

These shall be discussed briefly in the following sections.

Lack of Oversight & Coordination

While there are many businesses –engaged in the mining and processing sectors – that prepare financial statements, only few of them ever have them audited. Most business owners shy away from disclosing financial information relating to capital invested, business assets, revenues, incomes and expenses. These factors have not prevented the government from gaining an accurate picture of the industry, it has negatively impacted on the account of taxes that are collected.

It has also been reported that government departments tasked with granting mining leases do so without properly assessing the financial and technical capacity of applicants to exploit mineral deposits on scientific lines. Most work-plans that are mandatory to submit while applying for a mine lease are hardly ever critically analyzed with the result that most applications are accepted or rejected on subjective rather than objective grounds.

Moreover, the concerned regulatory authorities have been unable to implement labour, safety and environmental regulations as well. In a recent case, unchecked mining in Mansehra leading to the creation of deep ponds resulted in the deaths of 4 people. As per mining laws, the lessee's have to level mining lands after extracting mineral, however, this has been largely violated with the authorities being mere spectators in such cases.

It has also been reported that a sizeable portion of Pakistani marble estimated worth millions of dollars is smuggled primarily to Afghanistan, but also to China and Iran. Retailer margins are also variable with rates varying from location to location and from seller to seller. The need for strict regulatory oversight is the need of the hour for ensuring that regulations are adhered to for the overall benefit of the industry and not just a few players.

Also, our focus group discussions revealed that many of the forest and environmental laws are in direct contravention of existing lease agreements issued by the DGMM that resulting not only in the imposition of unreasonable penalties but have also become a source of discouragement as well.

In Abbottabad, the Abbottabad Complex Hospital was built adjacent to processing firms that raised unnecessary environmental and noise pollution issues for them.

Import / Export Policy & Trends

The government has been time and again criticized for the lack of a long-term focus on developing the marble & granite industry and its short-sightedness and uncertainty in policymaking that has discouraged innovation and risk-taking by potential investors.

For instance, the import regulations in place are inadequate to support local industry and fuel only local consumption. Mega construction projects in the country such as the Bahria Town or DHA City use processed marble imported from Spain and Italy. Rather than facilitating the local processing industry in the country and to enable it to create value-addition through use of modern machinery, it has created even more problems by getting it to compete with technologically-advanced products in the market.

The Pakistan-China Free Trade Agreement or FTA that came into effect in 2007 has also been a major flaw in government policy to promote the industry. It is very important to highlight that the increase in production of marble & granite in the country owes itself to this Free Trade Agreement that led to the bulk export of marble to China to the detriment of the long-term future of the industry and to the country's deposits. Rather than equipping miners and processors with latest technologies and techniques to add value to their products, the bulk export to China has been merely a shortcut to success with long-term consequences.

To add to its woes, the same China processes marble products for re-exporting to other countries including Pakistan which means that the local industry is competing with their own products in its own markets against the cost-efficient machine that is China today.

Inefficient Tax Structure

The tax structure in place is also not favourable and considering the plight of industries requiring urgent need for governmental support. A number of taxes levied by the federal, provincial and district governments has raised the cost of production substantially.

While duties and taxes for export-oriented industries including marble & granite are zero rated, duties on import of machines are hindering the development of the local industry. The government has taken steps to improve the situation, but continues to charge import duties on inbound technologies.

As per the Fifth Schedule to the Customs Act, 1969 (2018 – 19), following is a list of import duties for chain saws, gang saws, polishing creams, among other items.

Figure 16: Import Duties for Chain Saws, Gang Saws, and other items

S. No.	Description	PCT Code	Customs Duty (%)
17	Following machinery and equipment for marble, granite and gem stone extraction and processing industries.		
	1) Polishing cream or material.	3405.4000 3405.9000	3% 5%
	2) Fiber glass mesh	7019.5190	5%
	3) Chain saw/diamond wire saw in all sizes and dimensions and spares thereof, diamond wire joints all types and dimensions, chain for chain saw and diamond wires for wire saw and spare widia.	8202.4000 8202.9100	5% 5%
	4) Gin saw blades.	8202.9910	5%
	5) Gang saw blades/ diamond saw blades/ multiple blades or all types and dimensions.	8202.9990	5%
	6) Air compressor (27cft and above).	8414.8010	5%
	7) Machine and tool for stone work; sand blasting machines; tungsten carbide tools; diamond tools & segments (all type & dimensions), hydraulic jacking machines, hydraulic manual press machines, air/hydro pillows, compressed air rubber pipes, hydraulic drilling machines, manual and power drilling machines, steel drill rods and spring (all sizes and dimensions), whole finding system with accessories, manual portable rock drills, cross cutter and bridge cutters.	8464.9000 & Respective headings	3% 3%,5%
	8) Integral drilling steel for horizontal and vertical drilling, extension thread rods for pneumatic super long drills, tools and accessories for rock drills.	8466.9100	5%

The government though provides further reimbursement of these taxes for exporting enterprises, however, these refunds are claimed through lengthy processes sometimes taking up to six months that discourages importers of such items.

Moreover, the advance income tax regime imposed by FBR has also been criticized due to over valuation of minerals extracted.

Inefficiency of Regulatory Procedures

The cumbersome export procedures also add to the troubles of exporters who have to compete in the international market against more efficient exporters. These procedures have been put in place to increase regulation of the export sector. However, it has come at the cost of export efficiency.

In terms of the time it takes and the documents that are required to export, Pakistan is much behind regional players such as India, Malaysia and China. The following table highlights the number of documents required and the average number of days it takes to export anything from the country in comparison to regional players.

Figure 17: Country-wise efficiency of Export Procedures

Efficiency of Export Procedures		
Country	Documents to Export (Number)	Time to Export (Days)
Pakistan	9	24
India	8	17
China	7	21
Malaysia	7	18
Thailand	4	14

Source: The Global Enabling Trade Report 2009, World Economic Forum.

According to the World Bank's Investment Climate Assessment, Pakistani managers spend about 10 percent of their time dealing with government regulations – more than twice as much as in Sri Lanka and Turkey.

Unstable Mining Leases & Property Rights

Mining rights in the cluster are regular concerns for both foreign and domestic investors. All mines are the property of the state with the provincial governments authorized with granting leases to applicants.

Applications for mining leases take up to 6 months to process and for the Directorate General Mines & Minerals or DGMM to make a decision. Even so, mining leases can be arbitrarily cancelled at its discretion that has led to an insecure environment for investment. Moreover, due to a lack of effective management, surface rents for mines often becomes a point of friction between mine operators and landowners that sometimes seriously disrupt mining operations in these areas. Our focus group discussions also revealed that there was no law in place to minimize landowner interference and unfair bargaining. Additionally, the DGMM does not allow equity-based partnerships with other potential investors that could help finance capital and operational requirements.

All of the above factors have left private investors unwilling to invest in modern machinery leading to an increased reliance on blasting of mines that has led to substantial wastage of marble & granite reserves. It has also discouraged estimation of reserves by core drilling methods. Even the development of model quarries by PASDEC on a 70-30 ownership with locals has not produced the desired results.

Lastly, inconsistencies in regulations and their poor implementation have led to exploitation of natural resources, and a sense of disadvantage and mistrust on government policies and procedures.

6.6. ACCESS TO FINANCE

Based on our survey findings, the capital cost of setting up a business in the cluster is high. The mining sector required a particularly high investment between the range of Rs. 10 – 30 million for a single quarry. Establishing a unit in the processing sector, on the other hand, still requires an initial capital investment of between Rs. 5 – 10 million.

This high capital cost has been beyond the means of most entrepreneurs who preferred investing in the processing sector that was less capital-intensive. According to the State Bank of Pakistan (SBP), owners of 39% of mining and processing units across the country did not make any capital expenditure in the five years preceding their study in 2007. Because of a lack of awareness over SME-specific financing efforts made by the government, and a lack of industry-specific credit facilities, most businesses are set-up using equity. Owners have to rely either on their business cash-flows and savings to make necessary capital investments, or on financial support from their relatives and personal relationships.

This situation can be blamed partly on legal and regulatory restrictions that prevent miners from accepting foreign or local investors as partners, and partly on the lack of available credit facilities for the marble and granite cluster.

While many business owners cite religious reasons and higher interest rates as reasons for being discouraged from using bank loans, the banking industry has also been slow in developing products catered specifically to, or with a consideration of, the marble & granite industry. Very few cluster participants have even applied for bank loans to begin with, and many of those who have, have had their loan requests rejected. Others stated the complicated process of acquiring loans as a major hurdle discouraging them from applying for loans. Furthermore, unlike the textile and sports industries in the country, the marble and granite industry has not been facilitated to obtain loans from commercial banks.

For the bank's part, they are discouraged from doing so partly due to the insecure nature of mining leases that cannot be guaranteed and can be cancelled almost any time. They also require collateral for loans that many business owners are unable to provide. Many banks do not consider mines as collateral as mine operators are not actually owners of the mine. Even the reserves that mine operators are authorized to extract as per lease agreements are not considered as collaterals due to a lack of reserve estimations through core drilling that is expensive to carry out.

In addition, there is very little appetite for insurance products as well and very few businesses have acquired insurance for their equipment.

The State Bank of Pakistan has taken several initiatives including creating policy guidelines for development of banking products to meet the needs of the industry. It has already made it mandatory for commercial banks to commit a part of their financing portfolio for micro-loans to the SME sector. The Bank of Khyber (BoK) has also established a specialized micro-financing unit that provides loans to rural communities

through the SUNGI Development Foundation and Sarhad Rural Support Programme (SRSP).

Despite these initiatives, the most common problem for most of businesses in the marble & granite industry include a lack of access to finance. A lot more needs to be done to encourage the banking sector and other development organizations to provide finances at reasonable rates.

The lack of adequate financing has led to the increased reliance on manual and outdated techniques such as blasting, as most business owners are unable to acquire modern technologies. It has also resulted in a lower production capacity leaving most business incapable of fulfilling large international orders.

6.7. SOCIAL ISSUES

In addition to the short- and long-term environmental impact that mining and processing units in the cluster have on the local community – which will be discussed in the next section – our field studies confirmed that the majority of them commonly faced problems from the local community with some mining units reporting that they were hostile and even resorted to blackmail in some cases.

These conflicts are usually concerned with surface rents that mine operators pay to the local community but they may also pressurizing mine operators to hire unskilled local labour amongst other day-to-day conflicts. Moreover, the dispute resolution mechanisms that are facilitated by provincial and local governments have also been deemed inefficient by relevant stakeholders. And while the situation has slightly improved because of these dispute resolution mechanisms, there is still a very strong need for adequate measures to be put in place for ensuring a smooth working environment for mine operators.

Such conflicts are one of the primary reasons that investors are deterred from investing in the development of mines or technology acquisition. Even banks lack the interest to lend to mining units due to the potential for conflicts to undermine mining operations that previously also resulted in mine closure.

Moreover, due to a lack of effective government regulation, mining activities have also resulted in many deaths and injuries.

6.8. ENVIRONMENTAL ISSUES

The extraction of dimension stones as a result of mining and its further processing has implications for the environment including the quality of air, water, and soil, and impact on local flora, fauna and nearby communities.

For instance, air quality in remote areas of the Abbottabad and Mansehra districts where most mines are located is severely affected with none or very few measures taken to prevent the dispersal of particles into the air. In addition to potentially damaging nearby vegetation and local forestation, some of the mine operators interviewed confirmed that

their activities had resulted in water pollution. Mining activities also commonly result in soil erosion and land-sliding.

Mining also poses threat to birds and animals. Endangered species such as the Himalayan Ibex and the Kashmir Markhor were reportedly found migrating from the areas because of the disturbance in the habitat due to mining.

Processing units also create a large account of waste when cutting and polishing slabs. In the case of marble processors, waste in the form of marble slurry – which is water mixed with marble powder – is particularly damaging when it is haphazardly dumped in nearby pits or empty spaces for lack of any better alternative. During the rainy season, this slurry or mixture may be carried to drains and rivers thereby affecting water quality that is detrimental to both aquatic life and human communities that rely on those sources of water. Some of our study participants also confirmed that their activities were causing water pollution.

Soil quality is also potentially affected though none of our study participants pertaining to the processing sector reported their activities as causing soil contamination. Some of them did, however, report a negative impact on nearby vegetation.

The processing units in the cluster also disperse a lot of particles in the air, as confirmed by our field studies that is especially harmful to the workers due to their proximity and may result in silicosis that is caused by excessive inhalation of marble particulates.

The noise and vibrations caused by machinery were also reported to have an adverse impact on the neighborhood.

Very few environmental impact studies have been conducted over the effects of mining and processing activities and little has been done in the way of minimizing those effects. Miners in country are required by law to rehabilitate mining lands after minerals have been fully extracted or the term of their leases conclude. However, these regulations are hardly ever adhered to. Numerous accidents or negative consequences of illegal mining on all aspects of the environment have been reported yet the regulatory authorities seem incapable or unwilling to implement environmental compliances and regulations.

7. PROPOSED INTERVENTIONS

During the course of preparing this research study, we were aided a great deal by our interactions with several stakeholders of the cluster who were generous in not just highlighting key issues that the cluster faced rather also in sharing their insights and feedback over what may be done to deal with some of those glaring issues.

Previous chapters of this research study have already expounded upon the need for better infrastructure, technology, regulatory environment amongst other relevant aspects of the marble and granite cluster in Abbottabad and Mansehra districts. We also touched upon various issues that the cluster faces to which we shall propose our recommendations for facilitating the survival and growth in this chapter.

7.1. NEW/IMPROVED TECHNOLOGIES, PROCESSES, AND PRODUCTS

As previously discussed in detail, there is a dire need to overhaul the current technologies, techniques, and practices that are currently in place in the cluster. At present, the cluster is only partly mechanized leaving a lot to be desired in the way of modern technology. Very few initiatives have been taken by relevant authorities in the cluster that have had a positive impact in the technological domain.

Recently, however, the Pakistan Stone Development Company (PASDEC) had launched a mechanized quarry in the Oghi area of Mansehra District for the mining of Black Granite. PASDEC has also been providing modern machinery to mining enterprises in the cluster on rental basis.

Based on our interactions with relevant stakeholders including business owners and managers, however, it came to light that the number of cross-checks required has made the process of renting out machinery cumbersome and complicated to which we propose a revisiting of rental agreements in order to ensure they are business-friendly. Moreover, the rental charges must also be reduced so mining enterprises of lesser financial strength can also make the most of PASDEC's machinery pool.

It is also proposed that PASDEC formulate an asset transfer policy as opposed to a rental one that would further encourage investment in the mechanization of quarries. The State Bank of Pakistan (SBP) and the Directorate General Mines and Minerals (DGMM) also need to devise more lenient machinery-acquisition policies.

Moreover, there is a need for introduction of technology suitable for underground mining. Currently, none of the cluster's mining units are in possession of such technology and only rely on surface mining for extraction of stone which not only results in a lower yield, but often leads to a closure of such mines before full extraction of stone has taken place. Without underground mining taking place, the cluster will be unable to make the most of its reserves. PASDEC can play a significant role in this respect by ensuring the availability of such machinery.

There is also a need for attracting international mining technology producers to set up their plants within the country. Until this is made a reality, there is a need to support and

facilitate suppliers of imported heavy duty machinery along with the availability of necessary spare parts and technical support for future repair and maintenance. PASDEC can facilitate the establishment of bonded warehouses in Hub or Risalpur where it can dedicate land for commercial importers to display their machinery to prospective buyers.

Local machine manufacturers must also be engaged, with government support, in the development and manufacturing of modern machinery for both the mining and processing sectors. PASDEC and the Directorate General Mines and Minerals (DGMM) can also initiate linkages and offer grants to top engineering universities and professionals in the country to assist in the development of such machinery.

While PASDEC's traditional focus has been on the introduction of mining technologies, it needs to shift its focus on processing technologies as well that are vital in supporting the overall dimension stone industry. The cluster is currently unable to process stone according to international standards due to low-quality cutting and less-calibrated machines being used by the processing sector. Production output through the use of these machines is also a key issue to address.

It is also important for the SBP to address some of the financial issues relating to the acquisition of modern machinery including granting concessions in import duties, allowing the use of imported machinery as collateral, lowering the collateral requirements for acquiring loans, and encouraging commercial banks to finance machinery for their clients.

The prevalent use of the outdated blasting technique has also been one of the major reasons for the poor cluster performance especially with respect to international markets. Diamond wire-saw and chain-saw cutting machinery and techniques need to be introduced to curb the quantity of wastage that is currently being produced through blasting. A “no blasting policy” must also be on the cards of the DGMM though it would be reasonable to delay its implementation till alternative technologies are easily available to mining enterprises.

Nevertheless, an awareness campaign focused on the introduction of modern and responsible technologies and practices needs to be initiated by institutions such as SMEDA, DGMM, and PASDEC. Meanwhile, institutions such as the Geological Survey of Pakistan (GSP) and DGMM can play vital role in providing up-to-date geological information to potential investors.

Moreover, PASDEC with the cooperation of the Trade Development Authority of Pakistan (TDAP) and SMEDA needs to be engaged to provide training and mineral testing facilities in the cluster or in nearby areas. They also need to provide market information and enable the creation of business linkages by organizing exhibitions and facilitating entrepreneurs in participating in similar exhibitions elsewhere in the world. They also need to identify specific products that will bring in large revenues as opposed to the traditional dumping of products in the international market.

The processing sector needs to be aware of the potential products they can create, however, the focus must be on the production of more value-added products such as polished tiles and slabs cut into internationally-accepted dimensions. Furthermore, niche products with applications in farming, construction, landscaping, and marble mosaics must be promoted. The use of marble slurry in the production of bricks should also be considered as an alternative product.

7.2. NEW/IMPROVED INFRASTRUCTURE

Improvement in quality and coverage of power and electricity, water supply, sanitation, transport and logistics is a major pre-requisite for improving economic activity and quality of life in any geographical area.

In addition to bringing about improvement in technology and processes, the cluster requires a great deal of infrastructural-support not only to reduce the cost-of-doing-business but also to increase its overall competitiveness.

With respect to power and electricity, immediate attention needs to be paid to ensuring a basic supply of electricity to mining areas. At present, all of the mine operators we interviewed confirmed that they were relying entirely on self-generation. The federal and provincial governments in collaboration with other local and international development agencies such as USAID needs to identify potential power projects in mining areas and determine terms that make economic sense to potential private investors. Where such projects are not financially viable, which would be common in the case of mines that are spread wide apart and surrounded by small villages that are very few in number, the government would need to look into potential public-private arrangements that would make investment in such areas more feasible.

In addition, the processing sector has also suffered a great deal due to frequent and lengthy power outages that would halt business operations were it not for their reliance on electricity generators. A change in the traditional orientation of the government that diverts power to domestic households to the detriment of industries is required immediately. The processing sector of the cluster consists of a small number of small-scale processors predominantly concentrated in Industrial Estates to which a regular supply of electricity needs to be ensured with the cooperation of PESCO.

Further, PESCO will need to look into some of the administrative problems or financial limitations they face with respect to reducing the time it takes to ensure electricity connections. In order to do this, PESCO may need to develop a specialized commercial and industrial cell that would fast-track processing of requests for electricity connections.

Also, it is important to reduce electricity tariffs that are currently unfavorable for cluster participants. As such, it is suggested to include the marble and granite industry in relief packages much like the textile industry.

An improvement in transportation and logistical infrastructure is also overdue. While numerous road construction projects have been successfully completed, there has been a

lack of focus on building roads to transport raw stone from mines to the processing sector and onwards to the domestic and international markets. The railway transportation mode will also need to be considered for shipment of dimension stone products to major processing centres in the country such as Rawalpindi, Lahore and Karachi.

The government will need to identify potential road construction projects that are attractive to the private sector that may collect toll charges for allowing road access. Such projects need to be assessed on a project-to-project basis and where such feasibility does not exist, the government will need to consider co-funding options with private investors in general or mine operators specifically. Where neither of these is feasible, the government may incentivize mine operators who personally finance building of such roads by giving them tax breaks for a certain period of time in that case the DGMM, FBR and other local and provincial departments need to be aligned. The government can also extend credit facilities through state-operated banks on reasonable terms.

Moreover, warehousing and storage facilities need to build in Abbottabad and Mansehra city so marble and granite producers can manage a consistent supply of their products to the market.

Additionally, it suggested that a detailed assessment be conducted to determine whether it would be financially feasible for private investment to engage in waste collection and utilization. The DGMM in collaboration with the local administration also needs to engage such institutions as the EPA and Forest Department to assess and recommend suitable waste management initiatives.

In any case, waste management needs to be prioritized with the government developing two landfills i.e. 1 in Abbottabad city and 1 in Mansehra city.

7.2.1. MINI-GRANITE CITY IN MANSEHRA

Rationale/Justification:

There is currently an opportunity for most of the clusters granite deposits by providing adequate infrastructural, storage, testing facilities, utilities and other requirements to mining and processing units through the development of an integrated mini-Granite city in Mansehra.

In addition to this, various informal clusters have been created at various locations that negatively impact nearby residential communities and the environment that can be highly reduced with this initiative.

Proposed Project:

Keeping in view the success of Special Economic Zones in developing specific sectors, both in the developing and industrialized countries, it is proposed to develop a State of the Art Mini-Granite City in Mansehra based on modern technology and customized facilities to create largest and most technologically advanced industrial park. Facilities that this estate will provide include:

- Establishment of Industrial Park for Processing Industry
- Warehousing Facilities: The warehouse will provide storing, stacking, and cutting/squaring services for irregular shaped blocks of marble.
- Waste Water Treatment Plants / Slurry Management: A water-treatment or recycling unit shall be developed for effective water utilization and prevent wastage and pollution.
- Mechanical & Electrical Workshops / Services” Local service providers of mechanical and electrical support shall be present on site.
- Support facilities:
 - Establishment of Stone-testing laboratory
 - Technical / Training Institutes
 - Expo Centers/ Machinery Display centers



Responsibility:

The proposed organized marble cities should be developed by respective provincial government.

Estimated Cost:

The total estimated budget for setting up one organized marble city is PKR 500 million and cost of such project.

Results/Impacts:

The proposed project would have following impacts:

- Employment for around 2,000 direct and indirect individuals.
- Various schemes including plantation, sewerage water/waste water treatment plans, slurry management unit and incentives to the industry will be available.
- Mini-Granite City will support clusters in developing value chains and that too at an organized and well integrated manner.

This will drastically reduce production costs, improve quality and enhance awareness amongst all units inside the city that will largely make them internationally more competitive.

7.2.2. ADVANCED GRANITE PROCESSING CENTER - HAVELIAN

The Abbottabad district is home to vast reserves of primarily granite along with pockets of marble, limestone, slate and gypsum reserves as well. There are about 23 Granite

mines and over 60 processing units in the region including Mansehra District having an approximate production of over 0.9 million tons annually.

Rationale & Justification:

The majority of these deposits are being exploited by the private sector using conventional methods. The non-existence of advanced scientific processing methods is preventing local vendors to export quality material internationally, as well as hurting their domestic competitiveness. It is required to have an advanced processing unit in the region to ensure quality production in line with international quality standards. This will help majority of Khyber Pakhtunkhwa province's mineral sector to overcome the below listed issues:

- Poor quality production due to lack of advanced technological machinery
- Unskilled machinery operators and machinery engineers on modern technologies
- Non-competitiveness & niche international market share due to low quality
- Exporting raw form product instead of value-added finished goods

In order to make the industry competent for international export it is imperative to build a state of the art processing center. It is proposed to establish an advanced granite processing center in Havelian, Abbottabad District, which will facilitate the domestic vendors for cutting, shaping & polishing raw granite into internationally accepted and standardized finished form.

Proposed Project:

A processing center is proposed in Havelian that would be equipped with advanced machinery required for granite processing and value addition. This facility will be set up in accordance with accepted international standards with collaboration of foreign experts. The proposed processing centre would be aimed at efficiency, capacity building, quality enhancement, technical development, technology advancement and advancement of industry to make it export oriented. Moreover, this facility would also train new processing operators, machinery engineers and other relevant staff on modern machinery and techniques.

Estimated Cost:

The total estimated cost of the proposed processing center is given as follows:

S. No	Cost Heads	Total Cost (Million PKR)
1	Machinery & Equipment (European)	228
2	Taxes, Import Duties and others	78
3	Land (4 Acres)	160
4	Building & Civil Works	50
5	Preliminary Expenses & Project Management	30
Total Project Cost		546

Results/Impacts:

The proposed project would have following impacts:

- Ability to produce Internationally acceptable processed granite
- Employment generation of over 15 direct and 200 indirect in the region
- Increase of country exports leading to higher contribution to the GDP
- Capacity building of existing industry's human resource

7.3. NEW/IMPROVED INSTITUTIONS

In terms of some of the institutional weaknesses that were discussed in the previous chapter, this section focus on some of the proposed interventions proposed to improve support and coordination between various stakeholders to remove some of the hurdles the cluster currently faces. At the same time, it is important to develop trade linkages and enhance representation of local producers that could be accomplished through a comprehensive approach on the part of several institutions that we will mention here.

For instance, PASDEC that has been unable to significantly support the dimension stone cluster in Abbottabad and Mansehra needs to rationalize its rental charges to make it more feasible for mine operators to utilize their machinery pools. It is also strongly suggested that PASDEC develop a mini-Granite City in Mansehra replete with modern testing facilities and training centres. Further, in collaboration with the Trade Development Authority of Pakistan (TDAP), PASDEC must spearhead the development of linkages with the international market and organize interest-generating trade fairs and exhibitions modeled on similar exhibitions taking place in other developed countries in order to promote some of the highly desirable stones such as Black Granite that are produced in the cluster. PASDEC can also play an invaluable role by developing a consortium for dimension stones extracted here that would allow individual miners to collectively sell their products to be able to fulfil large international orders that they would otherwise be unable to do so.

SMEDA can also enhance its efforts in the cluster by developing an industry-specific cell consisting of subject matter specialists focused on providing advisory services, securing financing, conducting pre-feasibilities, and organizing workshops and seminars, specifically catered to individual marble and granite clusters. The processing sector needs to be focused on as they are more feasible for SMEs to invest as compared to mining that is more capital-intensive. In collaboration with PASDEC, SMEDA can play a key role in helping to identify and promote both desirable and alternative products following a necessary quality standardization process amongst processing units based in Abbottabad and Mansehra. SMEDA must also sign MoUs with universities and training institutes to help develop training courses specifically catered to the marble and granite industry.

To the DGMM, we would propose an overhaul of the cumbersome and discouraging mine leasing process that is not in the best interest of the marble and granite industry in the

country. The DGMM needs to step up its efforts with respect to conducting detailed geological mapping – in coordination with the Geological Survey of Pakistan (GSP) – and stone quality testing before determining lease agreements. It also needs to get rid of unreasonable regulations including the limit on the number of mines each mining unit can operate simultaneously as well as the limitation it has placed on mining units restricting them from partnering with potential investors on equity basis.

The DGMM needs to consider various stakeholder apprehensions before instituting regulations that have far-reaching consequences for the industry. Where necessary, the DGMM would need to take up the enacting of new laws that govern mining activities and land-owner issues. It also needs to better implement some of the required environmental and social compliances in coordination with the EPA and Forest Department that have often been alleged to have a bone to pick with mine operators with valid leases from the DGMM.

In addition, we propose that the Dimension Stones Centre currently set up at the PCSIR in Peshawar open up a field office in Manshera and Abbottabad for facilitating the testing of mining products.

The attention of donors agencies such as World Bank and USAID also need to be drawn to provide their technical and financial support to the cluster.

At the same time, it is important to strengthen mining and processing associations by providing them technical assistance with respect to market trends, technologies, best practices, etc. These associations also need to be encouraged to develop machinery pools that would be a lot more feasible for its members to afford. Similar interventions may be made with respect to building common warehousing facilities that would consolidate product supply and enhance price bargaining.

7.3.1. INVESTMENT MOBILIZATION DESK

Rational/Justification:

The low investment in the marble & granite cluster is linked with the lack of a one-window Investment Mobilization Desk that would guide, facilitate and support investors in each step of investing process from finding relevant investment opportunities in the cluster, acquiring permits/licenses, to providing production support.

At present, most investors find themselves venturing into the unknown that discourages investment interest in the cluster while others are discouraged much further in the prevalent complicated process.

The availability of a centralized facilitation and support unit will not only contribute to promotion of investment opportunities and greater investment in this sector, but will also help in introducing improved technology and provide employment opportunities for local communities living near mining areas.

Proposed Project:

It is proposed to establish an “Investment Mobilization Desk” in Mansehra equipped with technological and technical resources for providing updated information on marble & granite deposits/mapping, mine leases, potential mine leases, potential clusters, and opportunities for joint ventures/public private partnerships, etc. The desk will also be linked with relevant department/organizations for updated information, templates and requirements to be provided to the investors. The centre will provide the following core services (but not limited to) to investors:

- Facilitation in each step of the investment process from design/licenses to actual production of the product. This will also cater to registration, acquiring NOCs/Permits, Bank Account, NTN, Security, etc required in this sector.
- Investment opportunities in marble and granite sector coupled with investment briefers/mini feasibilities as per investor needs.

Responsibility:

The investment mobilization desk will be established and operated by provincial DGMMs KP in close collaboration with provincial BOIs and other relevant platforms from design to operationalization.

Estimated Cost:

The total estimated cost of setting up one investment mobilization desk is estimated to be Rs. 6.0 million.

Required Time Frame:

The proposed project is short term and proposed timeline for setting up the investment mobilization desk is one year.

Results/Benefits:

The proposed investment mobilization desk will have following immediate impacts in first 2-3 years:

- Availability of one stop facility for facilitation and support of investors.
- Increase in existing base of enterprises, production and turnover by over 20% across the value chain.
- Additional investment mobilization from local investors of over Rs. 1 billion across the mining and processing sub sectors in the next 5 years.
- Employment opportunities for over 1,000 local people generated.

7.4. NEW/IMPROVED HUMAN RESOURCE

In the previous chapter, we discussed some of the issues that the cluster faces with respect to its human resources including the unavailability of trained workers, lack of exposure, high employee turnover, health and safety issues as well as the potential value-added loss as a result of the raw export of marble and granite to other countries. It is in this regard that we shall be proposing interventions in this section.

Presently, units in both the mining and processing sectors have been suffering due to the lack of workers trained in the techniques and processing needed for them to become competitive. Help could be sought from institutions such as the Technical Education & Vocational Training Authority or TEVTA who, in collaboration of PASDEC and SMEDA could provide technical trainings to students and workers on products, technologies, and latest techniques. Soft skills trainings must also be provided for managers and supervisors, with the help of training consultants, in order to improve their management expertise and skill-set.

Furthermore, in coordination with technical colleges and engineering universities, the local chamber of commerce and industry associations can provide internships to students for better exposure and orientation to industry requirements. Moreover, we propose that PASDEC in collaboration with SMEDA and SIDB organize visits for Owners and Managers to model quarries, technology suppliers, and trade exhibitions, in order to gain better exposure to best industry practices.

In order to curb the high rate of employee turnover, the local chamber of commerce and Industry Associations can play a vital role in developing a framework for controlling pay structures and to implement a system of contracts and bonds in order to limit the threat of high employee turnover.

Attention also needs to be paid to the health and safety of workers. The provincial Labour Directorate needs to be engaged to conduct periodic audits to both mining and processing units to assess whether health and safety compliances are being adhered to. Also, we propose the establishment of labour hospitals and rescue centres in the mining and processing clusters.

7.5. REGULATORY FRAMEWORK

In the case of the cluster, there is an urgent need for a well-coordinated and comprehensive set of rules, procedures and laws concerning land owner issues, lease agreements, taxation, and environmental and social compliances that can be successfully implemented to improve its competitiveness, and for it to attract domestic and foreign investment. Our field studies and focus group discussions (FGDs) provided us with critical information and suggestions on how to intervene to improve the regulatory framework that shall be summarized for the benefit of the reader in this particular section.

Of particular importance is the need to revisit lease cancellation rules that allow the DGMM to arbitrarily cancel lease agreements that has negative implications for not just new but further investment by existing mine operators. This lack of security in tenure has had far-reaching consequences for the industry as it has not provided the economic justification for investing in modern machinery and equipment, human resources and detailed geological surveys that would help make the cluster domestically and internationally competitive. At the same time, it is also important for the DGMM to

assess mine leasing applications on more objective grounds, and consider the financial strength and technical expertise of applicants before granting licenses.

Moreover, land-owner issues need to be addressed by enacting a legal and regulatory framework to effectively deal with land-owner interference and unfair bargaining. Such a framework would have to define the rights of land-owners and lease-holders including those concerning development rights and length of tenancy. Also, procedural delays need to be limited by introducing formalized dispute resolution. Furthermore, surface rent committees need to be strengthened to resolve land-owner issues related to royalty fees and the pressure of hiring local unskilled labour.

Furthermore, the trade regulation and tariff structure that in Pakistan harbours a so-called “anti-export bias” needs to be revisited. In addition to reforming the duty drawback or refunding regime, it is also necessary to simplify export procedures and to make them more efficient so as not to discourage the export of goods to other countries.

The tax regime must also be overhauled to support the marble and granite cluster in Abbottabad and Mansehra that has huge future potential. In addition to granting tax holidays and concessions for those investing in the industry, the number of applicable taxes needs to be reduced and combined to reduce the administrative burden on existing and potential players in the market. Our focus group also pointed out that the advance income tax regime that has been put in place by FBR over-inflates material prices to which we propose that the FBR should consult relevant stakeholders and value minerals at market rate.

A well-coordinated approach on the part of such institutions as DGMM, EPA and Forest Department is also required so they do not conflict one another to the detriment of business owners. These institutions also need to collaborate with each other for ensuring environmental compliances not just during course of mining activities, but also upon mine closure.

Moreover, a one-window facility needs to be introduced in coordination of the DGMM, EPA, SIDB, and WAPDA for easing the process of establishing new units.

7.5.1. INVESTMENT FRIENDLY MINING POLICIES

Rationale/Justification:

The Abbottabad and Mansehra Districts have a huge potential for investment in the dimension stone sector, however, a lack of appropriate regulatory framework/mineral policies has resulted in numerous difficulties for domestic and foreign investors.

The existing mining regulations in place in the country have been developed without consulting relevant private sector stakeholders that has resulted in the discouragement of investment in this sector. In addition to offering limited investment security to local investors, foreign investment has been practically kept out for unjustified reason. It is

because of this, in addition to other fundamental problems, that the cluster is unable to transform itself to compete in the international market.

There is, therefore, an immediate and significant need for the promulgation of appropriate mineral policies/laws with incentivized regulatory framework for dimension stone sector both at federal and provincial level in line with international best practice to win the confidence of the foreign and local investors.

Proposed Project:

It is proposed that a new investment-friendly National Mineral Policy / National Mining Law should be prepared in close consultation and coordination with relevant public and private sector stakeholders.

A renowned consultant/firm with extensive experience in this field shall be engaged for development of the policy. Moreover, a high-level committee should be formed by the federal government that shall be responsible for finalization, approval and notification of mining law/mineral policy. The policy should be developed in light of consultation with all relevant stakeholders and based on international best practices in mining laws.

Pursuant to the national mining law, all the provinces should develop their own mining laws approved by provincial assemblies. The mineral policies should be backed by properly legislated incentivized regulatory frameworks at the federal and provincial level and strong institutional setup. Clearly-defined legislation will encourage investors to invest in the mining sector.

The proposed policies/regulatory frameworks at federal and provincial level should include the following amendments at minimum:

- The mining/quarrying sector should be given the status of industry with appropriate legal cover in the proposed mining laws/policies.
- Type of mining should be divided into categories based on nature and value of minerals and mining rights should be granted as per the new categorization.
- Investment friendly clauses and incentives for foreign investments, which should provide special guarantees between the foreign investors and the Pakistani State. This law should ensure free repatriation of profits and capital, as well as tax stability and non-discrimination against foreign investors.
- The competent forum that grants leases shall have the authority to assess need for explosive for mining activities and grant permit for such.
- Clauses regarding utilization of locally made marble and granite in government funded/constructed projects should be made part of the mineral policy and proper legal cover should be introduced for this.
- All taxes/levies/royalties/fees/surface rent etc should be merged and collected under one head, “Mining Royalty” by the government. The collected amount from mine owners should further be provided to relevant departments, land owners etc by the authority that collected the royalty.

Responsibility

At federal level, Ministry of Energy & Power in collaboration with geological survey of Pakistan, Federal Board of Investment & PASDEC should formulate proposed policy. At provincial level the Directorate of Mines in Minerals in collaboration with Provincial Board of Investment, All Pakistan Marble Industries Association and local mineral sector associations should formulate their respective policies.

Estimated Cost

The total estimated cost of developing the revised national mineral law/policy including consultant cost and other associated costs is Rs. 5.0 million.

Required Timeframe

The proposed timeline for the development of New Mineral Policies/Regulatory Framework is 01 year.

Results/Benefits:

The proposed mineral policies/regulatory framework will have following expected benefits in both short term and long term:

- Investment mobilization of over Rs. 2.0 billion in the cluster including foreign direct investment of over Rs. 1.0 billion in the first 3 years.
- Increase in overall exports of dimension stones by over 25% of raw, semi processed and processed stone.

7.6. ACCESS TO FINANCE

This section will deal with taking necessary steps for improving the availability of multiple financing options for both existing and potential investors.

At present, the DGMM has placed restrictions on allowing the induction of additional partners – foreign or domestic – to existing lease-holders. This needs to be revisited immediately with the DGMM drafting the legal requirements and documentation necessary for on-boarding partners in the best interest of the cluster.

Once this is achieved, institutions such as PASDEC and the Trade Development Authority of Pakistan (TDAP) need to attract international investors to invest in both mining and processing technologies. Moreover, in collaboration with the DGMM, mines with considerable export potential need to be identified and promoted for attracting foreign investment.

Additionally, SMEDA must conduct a detailed study for evaluating alternative equity models including crowd-sourcing for coordinating a number of private investments in the cluster.

Moreover, the State Bank of Pakistan (SBP) needs to assist and encourage commercial banks especially Islamic Banking institutions to assess loan requests in consideration of the industry-specific collaterals that can be offered. These include imported machinery

which presently is not being considered as collateral by most commercial banks. Moreover, the SBP in collaboration with the DGMM and experts from the Geological Survey of Pakistan (GSP) need to come up with effective parameters for subsidizing core-drilling activities at mines with high potential for stone excavation. This would provide commercial lenders with a scientific estimate of dimension stone reserves that may be considered as collateral.

7.7. SOCIAL & ENVIRONMENTAL COMPLIANCES

In order to minimize the social and environmental impact of mining and processing activities, we shall propose a few interventions in the form of necessary compliances in this section of the report.

Firstly, we propose a revised framework for conflict resolution by amending regulations after taking into consideration inputs from such stakeholders as DGMM (KPK Government), local government bodies, industry associations, not-for-profit organizations, and the local communities located in the vicinity of the mining and processing cluster. These regulations must address not just monetary negotiations over surface rents rather also matters concerning planning and development, operations, closure and post-closure.

Furthermore, as most local communities are unaware of the true potential of mines at the time of negotiation of surface rents and other related matters, they hurry into agreements only to regret them later. Therefore, it is proposed that core drilling techniques be used by the DGMM in collaboration with the Geological Survey of Pakistan (GSP), to rightly assess and present the potential of mines before local communities.

Regardless, a mechanism must be put in place whereby part of the royalty proceeds must be recorded and channeled back into the community for developmental projects.

Similarly, with respect to environmental compliances, the DGMM must revise its approach and grant leases to only those mining and processing units that have concrete environmental and waste management plans. Appropriate compensation must also be accorded to vulnerable local communities in accordance with the Land Acquisition Law. Additionally, we propose the removal of covert subsidies and the promulgation of tax exemptions and concessions for units that use environmentally-complaint technologies.

Lastly, the processing sector that is concentrated in the cities of Abbottabad and Mansehra also need to be relocated to areas further away from the cities.

7.8. MONITORING & EVALUATION MECHANISM

The following table shall provide a direction for monitoring and evaluating of the interventions proposed in previous sections of this chapter:

New / Improved Technologies, Processes & Products					
Cluster Initiative	Key Performance Indicator	Implementing Institution	M&E Institution	Cost of Intervention (PKR)	Project Implementation Duration
Reduce the no. of cross-checks for renting machinery from PASDEC's Machinery Pool	No. of cross-checks reduced to 3 - 5 cross-checks	PASDEC	Industry Associations	N/A	3 months
Machinery Rental Charges to be reduced by PASDEC	Reduce rental charges regime of machinery pool by 10%	PASDEC	Industry Associations	11 million	3 months
Introduction of Asset Transfer Policy by PASDEC	PASDEC to evaluate feasibility of Asset Transfer Policy of heavy machinery	PASDEC, SBP	Industry Associations	N/A	3 months
Introduction of Underground Mining Technology	Initiation of Underground Mining in the cluster	PASDEC	Industry Associations	100 million	6 months
Attracting International Mining Technology Producers	Setting up of Mining Technology plants by International companies	PASDEC	PASDEC	10 million	1 year
Engaging local machine manufacturers and engineering universities to produce mining and processing technologies	Establishment of mining and processing technology plants in the cluster or province	DGMM, PASDEC	PASDEC	10 million	2 years
Introduction of processing technologies in PASDEC's machinery pool	Inclusion of Processing Technologies in PASDEC's Machinery Pool	PASDEC	Industry Associations	100 million	6 months
Promoting Diamond wiresaw and Chain saw machinery	Lowering reliance on blasting	PASDEC, Industry Associations	DGMM, SMEDA	5 million	1 year
Providing up-to-date geological mapping	Increasing no. of. available geological maps of cluster	DGMM	PASDEC, Industry Associations	50 million	2 years
Developing training and mineral testing facilities	Establishment of training institute and Mineral Testing Facility in cluster or nearby locations	PASDEC, TDAP, SMEDA	DGMM, Industry Associations	25 million	1 year
Providing up-to-date market information and developing market linkages	Creating an up-to-date database of accessible market information and building linkages with International Producers	TDAP, PASDEC, SMEDA	Industry Associations	5 million	3 months
Building awareness of Niche Products	Conducting training sessions for owners, managers, existing and potential labour force	SMEDA	TDAP, PASDEC	2.5 million	3 months
New / Improved Infrastructure					
Cluster Initiative	Key Performance Indicator	Implementing Institution	M&E Institution	Cost of Intervention (in rupees)	Project Implementation Duration
Identifying and promoting development of financially-viable power projects through public-private arrangements	Development of key power projects in the mining and processing cluster	Planning Commission, Provincial Govt. - KPK, Private Investors	Industry Associations	150 million	2 years

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Prioritization of power distribution to industry and commerce sector	Reduction in load-shedding for the mining and especially processing sector	PESCO	Industry Associations	N/A	N/A
Establishment of specialized cell at PESCO for fast-tracking commercial and industrial requests for electricity connections	Reducing speed of establishing electricity connections within Two (2) weeks time	PESCO	Industry Associations	10 million	3 months
Inclusion of marble & granite cluster in electricity relief packages	Lowering electricity tariffs and rates for cluster participants	PESCO, SBP, TDAP	PASDEC, Industry Association	100 million	3 months
Identifying and promoting development of financially-viable road construction projects through public-private arrangements	Development of key roads connecting mining and processing cluster with nearby markets & warehouses	Planning Commission, Provincial Govt. - KPK, Private Investors	Industry Associations	150 million	2 years
Development of warehousing facilities	Developing Two (2) warehouses or One (1) each in Abbottabad and Mansehra city	PASDEC, Private Investors	Industry Associations	30 million	1 year
Development a waste collection and management strategy for the marble and granite cluster	Developing waste management & collection protocols for streamlining them	Local Municipal Authorities, EPA, Forest Department	EPA, Forest Department, PASDEC	25 million	1 year
Establishment of Mini-Granite City in Mansehra	Conducting detailed feasibility and plan for establishment of Mini-granite city in Mansehra	PASDEC, Planning Commission, DGMM	SMEDA, TDAP	500 million	2 years

New / Improved Institutions

Cluster Initiative	Key Performance Indicator	Implementing Institution	M&E Institution	Cost of Intervention (in rupees)	Project Implementation Duration
Development of a consortium in order to meet large international orders	Establishing a consortium of cluster marble and granite producers in order to supply large international orders	PASDEC, TDAP, Industry Associations	SMEDA	25 million	1 year
Establishing specialized cell for providing business advisory services, conducting cluster-specific pre-feasibilities and conducting trainings and seminars	Providing specialized services; conducting periodical seminars on technologies, best practices, market trends, etc	SMEDA	PASDEC, Industry Associations	10 million	3 months
Increased coordination between DGMM, EPA and Forest Department	Streamlining many inconsistencies in policies of respective institutions	DGMM, EPA, Forest Department	Industry Associations	N/A	6 months
Strengthening Industry Associations by providing technical and resource assistance with respect to market trends, technologies, best practices, etc	Increased coordination between PASDEC, SMEDA, TDAP, and Industry Associations	Industry Associations, PASDEC, SMEDA, TDAP	TDAP	10 million	6 months

New / Improved Human Resources



Cluster Initiative	Key Performance Indicator	Implementing Institution	M&E Institution	Cost of Intervention (in rupees)	Project Implementation Duration
Training of workers in modern techniques, technologies, processes and products	Regular courses being conducted by TEVTA	TEVTA, PASDEC, SMEDA, Industry Associations	Industry Associations	10 million	6 months
Training of managers in modern business and management tools and techniques	Regular courses being conducted by hired consultants	Private Consultant, PASDEC, SMEDA	Industry Associations	10 million	6 months
Providing internships to students of engineering universities and technical colleges	Increase in number of internships being offered	Chamber of Commerce, Engineering Universities, Technical Colleges	Industry Associations	1 million	3 months
Curbing high employee turnover	Developing of a revised framework for establishing written contracts with workers	Chamber of Commerce, Industry Associations	Industry Associations	N/A	6 months
Organize visits for Owners and Managers to model quarries, technology suppliers, and trade exhibitions	Organizing semi-annual visits	PASDEC, SIDB, SMEDA	Industry Associations	25 million	6 months
Establishment of labour hospitals / rescue centers in the mining and processing clusters	Establishing labour hospitals / rescue centers in Abbottabad and Mansehra	Provincial Labour & Health Dept.	Industry Associations	20 million	1 year

New / Improved Regulatory Framework

Cluster Initiative	Key Performance Indicator	Implementing Institution	M&E Institution	Cost of Intervention (in rupees)	Project Implementation Duration
Overhaul of discouraging mine leasing process including unreasonable lease cancellation rules, limitations on no. of leases & inclusion of partners	Revised regulatory framework for encouraging investment in marble and granite cluster	DGMM	PASDEC, Industry Associations	N/A	6 months
Addressing land-owner issues	Enacting a legal and regulatory framework to effectively deal with land-owner interference and unfair bargaining	DGMM	Industry Associations, Local Communities, District Govt.	N/A	6 months
Trade regulation and tariff structure harboring a so-called “anti-export bias” needs to be revisited	Reforming the duty drawback or refunding regime, and simplifying export procedures	SBP, Freight Forwarders	TDAP	N/A	3 months
Tax regime must also be overhauled	Granting tax breaks and concessions, also the number of applicable taxes needs to be reduced and combined	FBR	TDAP	50 million	3 months
One-window facility needs to be introduced in coordination of the DGMM, EPA, SIDB, and WAPDA for easing the process of establishing new units	Establishing one-window facility	DGMM, EPA, Forest Department, WAPDA, Industry Associations	Industry Associations, PASDEC	15 million	6 months

New / Improved Access to Finance

Cluster Initiative	Key Performance Indicator	Implementing Institution	M&E Institution	Cost of Intervention (in rupees)	Project Implementation Duration
Restrictions on allowing the additional partners – foreign or domestic – to existing lease-holders must be lifted	Drafting the legal requirements and documentation necessary for on-boarding partners	DGMM	PASDEC, Industry Associations	N/A	3 months
Identifying and promoting mines with considerable export potential for attracting foreign investment	Increasing Foreign investment in the mining sector	DGMM, PASDEC	TDAP	50 million	Ongoing
Conducting a detailed study for evaluating alternative equity models	Presentation of viable alternative equity models suited to marble and granite cluster	SMEDA	PASDEC, State Bank of Pakistan	10 million	3 months
Addressing finance-related issues to acquiring technologies such as granting import concessions, lowering & tailoring collateral requirements	Granting Import Concessions and encouraging lowering and matching of collateral requirements	SBP	PASDEC, Industry Associations	N/A	6 months
Subsidizing core-drilling activities at mines with high potential for stone excavation	Increase in information pertaining to estimate reserves	DGMM, GSP	PASDEC, Industry Associations	25 million	Ongoing

New / Improved Social & Environmental Compliances

Cluster Initiative	Key Performance Indicator	Implementing Institution	M&E Institution	Cost of Intervention (in rupees)	Project Implementation Duration
Part of the royalty proceeds must be recorded and channeled back into the community for developmental projects	Development of system for recording and channeling of royalty proceeds to community	DGMM, Chamber of Commerce, Local Communities, District Govt.	PASDEC, DGMM	N/A	6 months
Revising approach to grant leases to only those mining and processing units that have concrete environmental and waste management plans	Increased environmental regulation	DGMM	Industry Associations, EPA, Forest Department	N/A	3 months
Processing sector in Abbottabad and Mansehra need to be relocated	Relocation to a suitable location with necessary infrastructural support	SIDB, Chamber of Commerce, Industry Associations	EPA	100 million	2 years

7.9. GRIEVANCE REDRESSAL MECHANISM

In addition to the current grievance redressal mechanisms in place, we propose the creation of specially mandated mining courts in order to speed up the process of settling grievances. Moreover, we propose that specialized judges with knowledge of mining laws and regulations in addition to industry requirements be assigned so the process gains the confidence of both existing and potential investors.

8. ECONOMICAL, SOCIAL & ENVIRONMENTAL IMPACTS

The proposed interventions outlined in this cluster feasibility study are expected to generate greater economic returns and benefits for the national economy, SMEs and all other concerned, provided that these interventions are implemented as proposed and within the recommended timeline. Each intervention proposed in this feasibility study is equally significant and critical for the cumulative growth and development of this particular cluster.

It is pertinent to mention that every project/intervention will have standalone greater impacts as outlined under each intervention, however, more importantly the collective benefits that these projects will generate will be phenomenal. The economic, social and environmental impacts of all the proposed projects are given separately below:

8.1. ECONOMIC IMPACTS

Economic impacts here refer to the direct and indirect benefits obtained by all the concerned stakeholders i.e. federal government, provincial government, district administration, SMEs and etc. This may translate into expansion of existing enterprises, new enterprises started, enhanced production, direct exports, investment mobilization, increased income generating opportunities, direct and indirect employment.

Key economic impacts are summarized into the following table:

Table 9: Key Economic Impacts of the Proposed Interventions

Economic Indicators	Pre Interventions	Post Interventions
Mining Enterprises	23.00	76.00
Processing Facilities	57.00	134.00
Cumulative Investment (PKR million)	1,902	4,584
Annual Production-Mining (tons)	105,800	605,080
Annual Production-Processing (Sq ft)	19,624,800	51,273,872
Direct Employment	1,690	5,000
Indirect Employment	10,000	38,000
Direct & Indirect Exports (USD million)	0.425	44.05

8.2. ENVIRONMENTAL & SOCIAL IMPACTS

As per our analyses, the careful implementation of the proposed interventions discussed in the previous chapter shall have a positive economic as well as environmental and social impact.

The economic impact shall see an increase in total investment and number of enterprises in the cluster. It is also expected that production and revenues shall be enhanced as well as profitability due to the reduction in the cost of doing. The mentioned interventions shall also result in an enhanced access to modern technologies, better-trained staff, improved access to finance as well as improved product positioning and marketing as well as access to both local and international markets.

These interventions shall also have a positive impact on the environment and local communities including the decrease in the amount of raw material wastage and reduced contamination of water, air and soil. The negative impact of industry processes on local communities as well as flora and fauna shall also be lessened as a result. Moreover, the economic enhancement of the cluster will bring about numerous direct employment opportunities and enhance the livelihoods and improve socio-economic conditions of nearby communities.

Further, we expect to see an enhancement of worker health and safety as well as better law and order through the decrease in the level of friction between mining and processing enterprises on the one hand the local communities on the other.

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