THE ROLE OF MINING CADASTRE SYSTEMS IN MINERAL DEVELOPMENT OF PAKISTAN

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NATIONAL UNIVERSITY OF SCIENCE & TECHNOLOGY (NUST)
MINERAL DEVELOPMENT OF PAKISTAN

- Countries earning major contribution to their GDP from their mineral sector;
- Despite the presence of large mineral deposits, Pakistan has been unable to get the required economic boost like the other developing mineral-based economies of the world.

Source: USGS, 2013
Reko Diq

- The Reko Diq Town-Chagai District, Baluchistan, Pakistan;
- Large copper mine with estimated reserves of 5.9 billion tonnes of ore grading 0.41% copper;
- The mine also has gold reserves amounting to 41.5 million oz
HOW IT STARTED?

The BHP Billiton & the TCC

Mistakes

- Non-compliance of leading practices
  - JVA, not a leading practice;
  - Extension of RL tenure beyond 6 years;
  - Grey areas in contracting over the extents of RL & prospecting;
  - Confusion over prospecting of single versus all discovered deposits;
  - Legal fiasco (SCP) forcing TCC to ICSID - 2011

- 2000, BHPB sold its shares to TCC
- 2006, TCC was taken over by Antofagasta PLC
- TCC mineral interests have been managed and operated by a 50:50 JV between Antofagasta and Barrick Gold.
- GoB has a 25% interest in the project.


- Agreement envisaged exploration by BHPM for 6 years over the Exploration Area, followed by preparation of a Feasibility Study to undertake mining of the proven mineral resource.
- According to the JVA, BHPM would have earned 75% interest on satisfactory completion of Exploration Program while BDA had 25% share in the JV, both in cost and profit.
- 2006, TCC was taken over by Antofagasta PLC
- TCC mineral interests have been managed and operated by a 50:50 JV between Antofagasta and Barrick Gold.
- GoB has a 25% interest in the project.
HOW IT STARTED?

- 2012 - Rector NUST/ Director SAGE conceptualized the development of a Modern Mining School

PAKISTAN-SPECIFIC

- NUST-WITS MoU – 2012 (Faculty building program)

SAGE – SEP 2017

- 3 x PhDs
- 1 x Post Doc
- 5 x MS
Pakistan has inferred copper and gold resources at Reko Diq and coal resources at Thar;

The World’s famous Tethyan copper belt enters Pakistan at Chagai Arc in Baluchistan Province.
MINERAL POTENTIAL OF PAKISTAN IN GLOBAL PERSPECTIVE

World Proven Copper Reserves

- 2016 Total 720 Billion tonnes
- Chile 210 Billion Tonnes (29%)
- Rest of the World 230 Billion Tonnes (32%)
- Peru 81 Billion Tonnes (11%)
- Australia 89 Billion Tonnes (12%)
- Other countries (10%)

World Proven Gold Reserves

- 2016 Total 57 Billion tonnes
- Australia 9.5 Billion Tonnes (17%)
- Rest of the World 16.7 Billion Tonnes (29%)
- Russia 8 Billion Tonnes (14%)
- South Africa 8 Billion Tonnes (11%)
- Other countries (5%)

Source: Mineral Commodity Summaries 2017, USGS
World Proven Coal Reserves

- USA: 251 Billion tonnes (22%)
- Rest of the World: 209 Billion tonnes (18%)
- China: 244 Billion tonnes (22%)
- Russia: 160 Billion tonnes (14%)
- Australia: 144 Billion tonnes (13%)
- India: 94 Billion tonnes (8%)
- Ukraine: 34 Billion tonnes (3%)
- Pakistan: 3 Billion Tonnes (0.2%)

2016 Total: 1139 Billion tonnes

World Proven Coal Reserves including Thar Coal Resources

- USA: 251 Billion tonnes (19%)
- Rest of the World: 209 Billion tonnes (16%)
- China: 244 Billion tonnes (18%)
- Russia: 160 Billion tonnes (12%)
- Australia: 144 Billion tonnes (11%)
- India: 94 Billion tonnes (7%)
- Ukraine: 34 Billion tonnes (3%)
- Pakistan: 186 Billion Tonnes (14%)

2016 Total: 1322 Billion tonnes

Source: Mineral Commodity Summaries 2017, USGS
Pakistan has the world's 3rd largest coal resources amounting to 186 billion tonnes. This is equivalent to 618 billion barrels of crude oil. To put it into perspective, it has oil resources comparable to Saudi Arabia.
THE IMPORTANCE OF MINERAL RESOURCES IN ECONOMIC GROWTH

- Iron-ore production (millions)
- World population (millions)
- Per capita consumption (10X kg/person)
- Gold production (tonnes)

Graph showing trends from 1900 to 2000.
The United States (US), which was a leading mineral-based economy in the period from 1890 to 1910, emerged as a global leader. In this period the US was the major exporter of almost all mineral commodities, which played a very important role in the development of US into a world leader.
WE ARE MINERAL CONSUMING ANIMALS

The number of mineral commodities in demand for products in society has increased noticeably in the last 80 years.
AND WE HAVE BARELY STARTED EXPLORING OCEANS!

oceanic crust – potential for ore deposits of manganese (Mn, Ni, Co, Cu), sulfide deposits & seafloor vents (Cu, Zn, Pb, Au, Ag)
Comparison of population growth rate of Pakistan with the World and selected developing countries.

Population age composition of Pakistan and its effects on unemployment.

Comparison of unemployment rate of Pakistan with the World and selected developing countries.
CONTROLLING THE UNEMPLOYMENT

Mining sector direct employment as a percentage of total employment
MINERAL DEVELOPMENT FOR GROWTH

HOW?
MINERAL DEVELOPMENT FOR GROWTH

- ATTRACTIVE MINING REGIME
- ENABLING INSTITUTIONAL FRAMEWORK
- IMPROVE PERCEPTION
  - INCREASE CONFIDENCE OF INTERNATIONAL INVESTOR
  - MAKE AVAILABLE AND SECURITY OF TENURE
- MINING CADASTRE SYSTEM
- INTEGRATION OF SECTOR

Policy and Institutional Regime
Mongolian GDP growth rates (annual %) from the time of start of IDA support and from the time of development of mining cadastre system as comparative to Pakistan in the same period.
The world exploration spending in a region or country is the direct indicator of country's mineral wealth and good regulatory framework.

- Canada – 16%
- Latin America – 13%
- Australia – 12%
- Sub Saharan Africa – 9%
MINERAL RIGHT (LICENSE) GRANTING TREND

Sub-Saharan Africa

Year

Total Number

0 500 1000 1500 2000 2500 3000 3500 4000 4500

- Reconnaissance License
- (PLR) Prospecting License
- (PL) Mining License (ML)
- Primary Mining License (PML)

Only GIS based System

Introduction of mining Cadastre System
PERCEPTION & ATTRACTIVENESS BY FRASER

Policy Perception Index  ➔  Investment Attractiveness Index

- China
- Kazakhstan
- Mongolia
- Myanmar
- India
- Afghanistan

Introduction of mining Cadastre System
Introduction of mining Cadastre System

<table>
<thead>
<tr>
<th>Country rankings</th>
<th>Mining and quarrying annual growth rate (%)</th>
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<tr>
<td>1. Zambia</td>
<td>15.7</td>
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<tr>
<td>2. Mozambique</td>
<td>3.0</td>
</tr>
<tr>
<td>3. Tanzania</td>
<td>1.2</td>
</tr>
<tr>
<td>4. DRC</td>
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<tr>
<td>5. Mauritania</td>
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<td>6. Angola</td>
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<tr>
<td>7. South Africa</td>
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<tr>
<td>8. Algeria</td>
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<tr>
<td>9. Guinea</td>
<td>-7.3</td>
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<tr>
<td>10. Ghana</td>
<td>-10.5</td>
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</tbody>
</table>
BENEFIT DRIVING

Attract responsible investments
Ensure legal compliance
Maximize revenue
Improve inspectorate functions
Ensure regulatory compliance
Manage full life-cycle
Support large scale sector
Manage perceptions
Our Mission

Out reach Mining Industry

Patronize a progressive way forward

SAGE Inaugural Seminar

MAKING IT A REALITY

MAKING IT A REALITY
MAKING IT A REALITY

SAGE Inaugural Seminar
National Strategy

Our Mission
Outreach: Mining Industry
Patronize a progressive way forward

KPK Province
1st
ADP Program
MCS Conceptualized
MAKING IT A REALITY

SAGE Inaugural Seminar
National Strategy
Making a Partnership

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KPK Province
1st
ADP Program
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Due Diligence
Comparative Analysis
Landfolio

Our Mission
Outreach Mining Industry
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Our Mission

- Out reach Mining Industry
- Patronize a progressive way forward

KPK Province

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- MCS Conceptualized

Due Diligence

- Comparative Analysis
- Landfolio
- Gap Analysis
- Fit for Policy
- Leading Practices

MAKING IT A REALITY
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Policy

Integration

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Due Diligence

Comparative Analysis

Landfolio

Gap Analysis

Leading Practices

Fit for Policy

CPEC
THE END GAME!

Graph showing the relationship between Corruption and Transparency.
WAY FORWARD

**National Priority**

Revoking 8th amendment;

**Improve perception** (Regulatory, fiscal & Legal regime)

**Modern Mining Contract** (Leading practices)

**Integration of Mineral Resources**

**Pledged Investment Cmts**

**Peru: Antamina Mining Agreement**

If the ML bidder falls short of the pledged investment commitment, it owes the govt a penalty.

**Model Mining Contract Structure**

<table>
<thead>
<tr>
<th>Structure</th>
<th>Weightage</th>
<th>Colour code</th>
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<tr>
<td>History</td>
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<tr>
<td>Parties’ obligations</td>
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<tr>
<td>Fiscal terms</td>
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<td>Contractual terms</td>
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<tr>
<td>Sustainable development</td>
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</tbody>
</table>

**Land folio**

Mining Cadastre System for security of tenure

**Spatial Centre of Economic Activity Model**
THANKS
Important considerations for selection of the countries comparable to Pakistan:-

- First, a developing country like Pakistan had to be selected; and
- Second, at least two countries must have Islamic background and law.
Internationally accepted organisational structure

Existing structure of the Ministry

Ministry of Petroleum and Natural Resources

CRITICAL ELEMENT 1: ENABLING INSTITUTIONAL FRAMEWORK

Shortcoming in the policy formulation tier:
- Policy formulation is being done at the technocratic level instead of the political level;
- Separate Wings are responsible for policy formulation of the Petroleum and Mineral sectors; and
- Investors are caught in an organisational dilemma between the different Wings at the Federal level and between the Federal and Provincial authoritative control.

The organisational structure of the Ministry needs to change so that it can be aligned with the leading international practices to provide an enabling environment for investments.
The development of mineral economy is not only dependent on mineral potential but also on organized systems including:

- An efficient legal and regulatory framework;
- Security of tenure;
- Investment risks; and
- Transparency and efficient administration, all of which create a favorable climate for investment.

MINING CADASTRE SYSTEM
BUILDING BLOCK 2: MINERAL DATABASE AND MINING CADASTRE SYSTEM

Basic principles for an efficient and effective mining licenses granting system

Clear Legal and Regulatory Framework

Ground Rules

By following the

Core Principles

Sustainable Development
Economic, Social and Environmental

Principal Institution
Granting Rights
Administering Mineral Titles

Mineral Cadastre System

Transparent and Non-discretionary Procedures

Well-defined Institutional Responsibilities

Enabling Institutional Framework

Mining Value Chain
THE NEW PAKMINING CADASTRE SYSTEM – GEOMETRICAL ARCHITECTURE

- Official cartographic map produced by the Survey of Pakistan (same projection system, geoids, and datum)
- PakMining Cadastral Unit (PCU)
- Every mineral license will always be made up of a certain number of PCUs; thus the dimensions of the sides of any polygon corresponding to a mining license and mining rights will always be in multiples of a single side of the PCU

A PCU is a quadrangular polygon with constant dimensions that is referred to and has a fixed position within a system of coordinates.
THE NEW PAKMINING CADA斯特RE SYSTEM – USER INTERFACE OF PAKMINING CADA斯特RE SYSTEM
THE NEW PAKMINING CADASTRE SYSTEM – INSTITUTIONAL FRAMEWORK

Ministry of Mineral Development

Inspectorate of Mines Health and Safety

Inspectorate of Land and Minerals rights

Sustainable Development directorate

Geological Survey of Pakistan (GSP)

Directorate of Mining Cadastre and GIS database

Ministry of Petroleum and Natural Resources
MANDATE AND FUNCTIONS OF THE DIRECTORATE OF MINING CADASTRE AND GIS DATABASE

Liaison between the MMD and the license holder

Receiving applications for new licenses, or renewal/extension or transfer

Producing updated cadastral maps on which existing minerals rights and mining activities are correctly plotted and Geo-referenced

Verifying licenses overlap, checking the eligibility of applicants, and making decisions to grant or refuse applications

Acting as a technical referee in the event of dissension between holders about the location of areas granted and resolving the disputes

Initiating procedures for the revocation, cancellation, or expiration of licenses in accordance with the mining laws and regulations

Collecting fees required for the submission of mineral rights applications.

Sustainable Development
Economic, Social and Environmental

PakMining Cadastre System

Core Principles
Ground Rules

Granting Rights
Administering Mineral Titles

Directorate of Mining Cadastre and GIS database
Inspectorate of Land and Minerals rights
Ministry of Mineral Development
Principal Mining Institution in Pakistan

Clear Legal and Regulatory Framework
Transparent and Non-discretionary Procedures
Well-defined Institutional Responsibility

By Executing

Keeping cadastral maps and registries open and accessible
RECOMMENDATIONS

➢ Recommendation 1: Enabling institutional framework to provide an investor-friendly environment

Mineral Development Advisory Committee (MDAC) → Ministry of Mineral Development → PakMining Cadastre System and GIS Database

- Inspectorate of Mines Health and Safety
- Inspectorate of land and Mineral Rights
- Sustainable Development Directorate

➢ Recommendation 2: Political economy is imperative for mineral development

- Continuity in the political system
- The economic benefits from mineral development should be transformed into national benefits
- Infrastructure development should be announced as national priority
- Mineral development should be integrated with CPEC
RECOMMENDATIONS

➢ Recommendation 3: Legal reforms in the mining sector

- One mineral policy covering all aspects of mining in Pakistan.
- Declare the promotion of investment in the mining sector as national interest and top priority.
- Special guarantees between the foreign investors and the State (Foreign Investment Statute (Decree-Law 600))

➢ Recommendation 4: Regulatory reforms in the mining sector

- All minerals should be the property of the State.
- Security of tenure protected in the legal framework through an Act.
- Registry of rights should be protected through establishment of Mining Cadastre system.
- Award of concessions should be through legal proceedings on merit decision through a unilateral administrative act on first come first serve basis.
Recommendation 5: Fiscal reforms in the mining sector of Pakistan

Royalty - ↓6.5% for five years to attract investment.
A progressive increase after 5 years.

Corporate Income Tax - ↓15% as an incentive for investors

Specific Mining Tax – Unchanged, however, specific mining incentive law

Government share in revenue – ↓ for 5 years, than progressive increase.
RECOMMENDATIONS

➢ Recommendation 5: Fiscal reforms in the mining sector of Pakistan

Pakistan should effectively appropriate the mineral rents, while leaving mining investors with sufficient return to compensate for the cost of capital and risk. Whereas a low-tax regime is of importance to mining investors, a predictable one will provide greater confidence.
Recommendation 5: Fiscal reforms in the mining sector of Pakistan

Investment of Mineral Revenues. All mineral revenues must be saved or reinvested in economic, social or human capital. This will lead to the conversion of mineral-wealth to economic, social and human capital.

- Saved
  - For example Pak Investment Fund
- Invest in
  - Economy
  - Social Capital
  - Human Capital
Recommendation 6: Stakeholders participation framework

All the six critical stakeholders identified in this research should be taken on board before launching this framework. Special attention must be given to the local community/populace of Baluchistan and KPK to incorporate their recommendations.
## RECOMMENDATIONS

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Impact area</th>
<th>Government</th>
<th>Mining industry</th>
<th>Local community</th>
<th>Local representatives</th>
<th>Law enforcing agencies</th>
<th>High influence on the policy</th>
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</table>

**Important stakeholders for developing and implementing a mineral policy in Pakistan:**

- First, the federal Government, because all the resources should belong to the State;
- Second, the Pakistan Army, because security and a safe-environment are of utmost importance for foreign-investment;
- Third, the local communities and their representatives;
- Last but not least, the mining industry itself.
3 environmental problems that arise as a result of mining:

- First, it changes the land use of the area, which imposes restriction on the further use of the land.
- Second, it changes the hydrological conditions of the land (surface, underground and downstream; and
- Finally, it changes the geo-technical conditions of the rock and its balancing forces.

Recommendation 7: Sustainable mineral development
RECOMMENDATIONS

➢ Recommendation 8: Mining Cadastre System and GIS Database

➢ Recommendation 9: Need for skills

NUST-WITS Collaboration Team
QUESTIONS?
THANK YOU!