

The CSIR's role in mining

Navin Singh

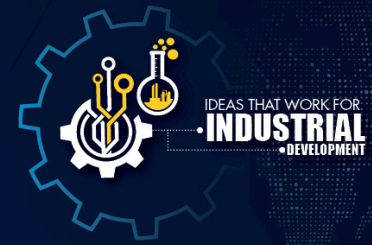
CAM Mining and Mineral Resources

CSIR

5th October 2017

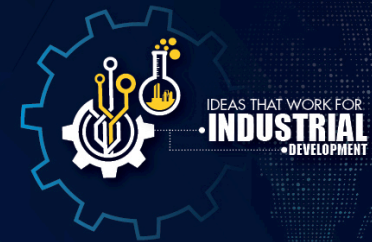
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our future through science

Outline of presentation



- **The value of mining in SA**
- **The challenges facing the mining sector**
- **The collective solution - Mining Phakisa**
- **Advancing the cluster**
- **The SAMERDI strategy**
- **CSIR in mining**
- **Conclusions**

Mining in South Africa - *the value*



Abundance of mineral wealth reserves

- All minerals
 - US\$ 4.7 trillion
- Non energy related minerals
 - US\$ 2.5 trillion

Source: Technology Innovation Agency 2015/2016

World number #1 in:

- PGMs (87.7%)
- Chromium (72.4%)
- Manganese (80%)
- Gold (12.7%)

- SA mining industry has been the cornerstone of the economy
- Mining led the first industrialisation in South Africa
- Contribution of 8% to GDP
- More than 13% of all expenditure on manufactured items came from mining
- 25% of exports
- 15% of FDI
- Dependency ratio of 1:15 for every mine employee



R286 billion
contribution to
2015 GDP



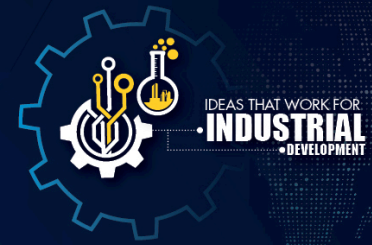
R116.7 billion
employee earnings



457 698
direct jobs created

Source: Chamber of Mines of South Africa

Mining in South Africa - *in crisis*



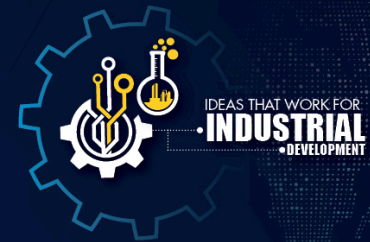
Status quo



“If we do nothing”



Mining in South Africa - collective solution



National objectives

- Zero Harm Industry,
- Globally competitive & Sustainable
- Need to maximise the mineral endowment
- A diversified strong economy
- Stimulate the local mining manufacturing sector



Key stakeholders

- Government (DST, dti, DPME, DMR)
- Mining companies
- OEMs
- Universities
- Research institutes
- Organised labour

Mining Phakisa outcomes

- Advancing the cluster
- Reviving investment into mining
- Sustainable communities
- Cluster employment
- Win-win beneficiation

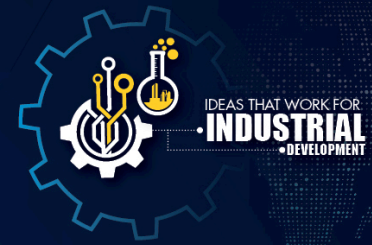


...to keep the industry afloat during the commodity price slump

....putting in place initiatives to place the mining cluster on a firm foundation

...to grow, transform & contribute to the economy

Advancing the cluster



Extend the life of platinum and gold mines in South Africa beyond 2025 & establish global leadership in narrow-reef, hard rock mining systems

Mining R&D programme

The establishment of focussed R&D solutions

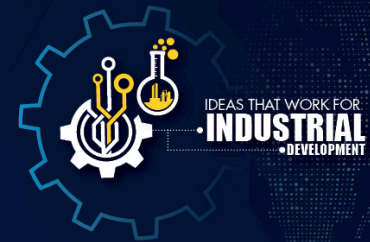
- Operational efficacy
 - Rebuild R&D capacity and capability
 - Collaborative R&D funding model
 - Institutional arrangement
-
- Mechanised mining system solutions
 - Integration of transformed R&D capability and capacity across SA
 - Roll-out prototype solutions into production
-
- Local R&D capability for narrow-reef mechanised mining solutions
 - Develop a hard rock cutting tool (>200 MPa)

Mining Equipment Manufacturing Development programme

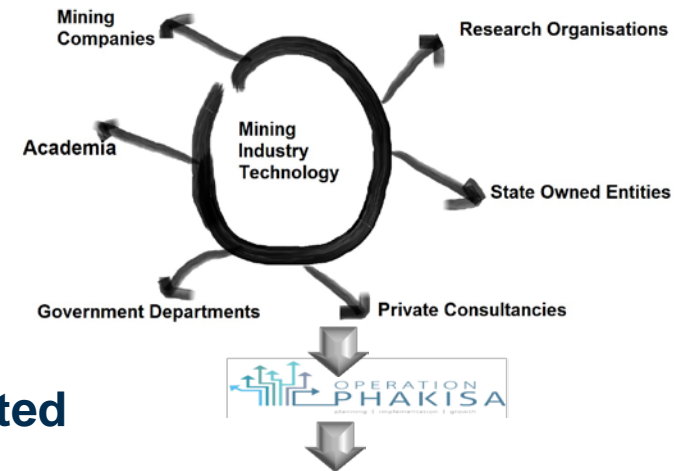
Providing locally manufactured equipment

- Establish mining manufacturing equipment cluster
 - Increase local content in current procurement
 - Partnering with global OEMs
 - MMEC incentive model to ensure local manufacturing
-
- Strengthen SA manufacturing capability
 - Incentivise global OEMs for local assembly
 - Develop Tier 2 & Tier 3 suppliers
-
- Local OEMs exporting narrow-reef hard rock mining systems

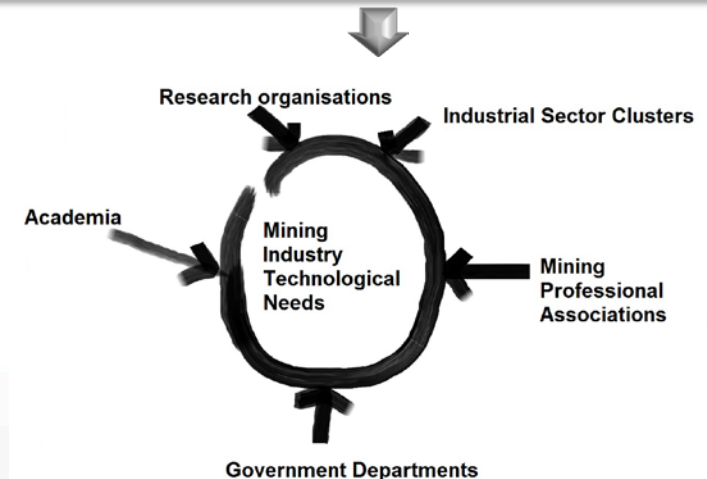
Advancing the cluster - *SAMERDI* strategy



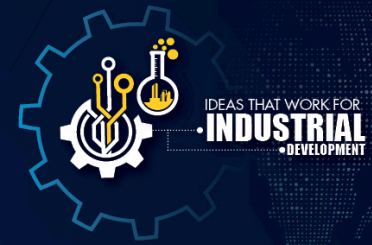
- Pre-Phakisa R&D in mining - there was no approved strategy – different foci and needs;
- Further fragmented due to competitive R&D funding environment;
- Post the Phakisa – SAMERDI strategy was adopted as the consolidated strategy for extraction;
 - **Focus on mines:**
 - Increase productivity and safety
 - Optimised use of input resources
 - Cost efficiencies
 - Increased LoM
 - **Rebuilding R&D capability**
 - Long-term programmes
 - Capacity building
 - Skills enhancement



“SOUTH AFRICAN MINING EXTRACTION RESEARCH, DEVELOPMENT & INNOVATION STRATEGY” (SAMERDI)



Advancing the cluster - SAMERDI strategy

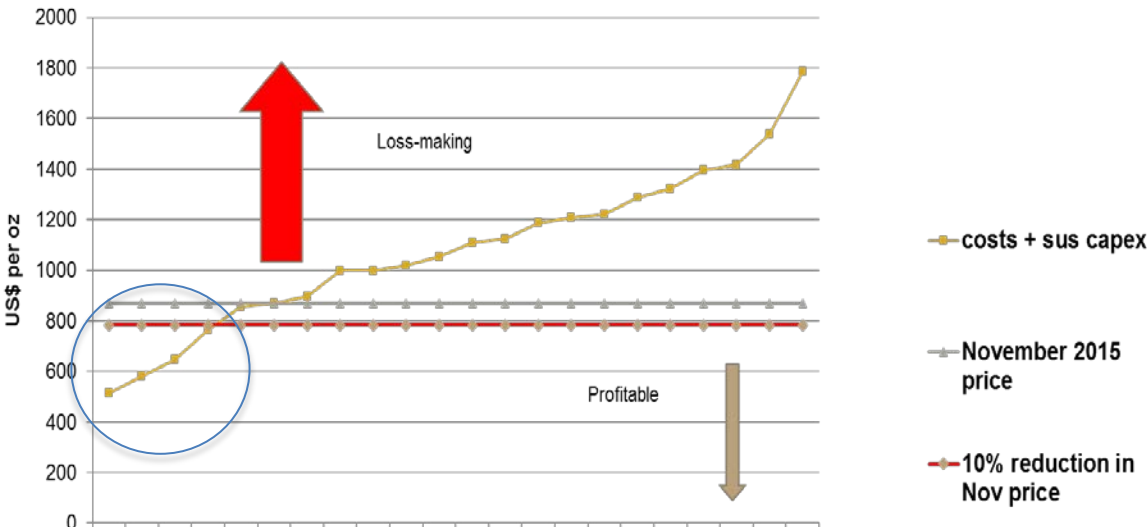


Current Mines

Mining is in crisis,

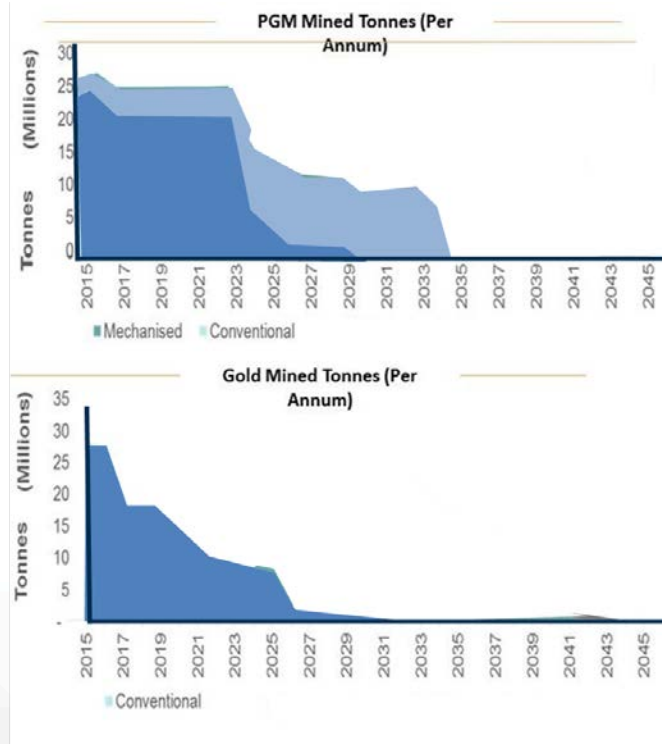
- safer,
- reduce costs,
- increase efficiencies

Platinum cost curve (cash costs plus stay in production capex) FY2015

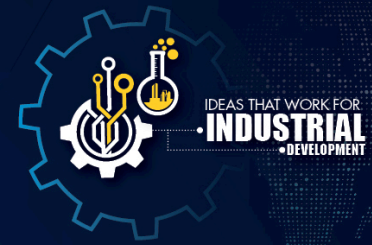


PGM Operations in South Africa

Source Chamber of Mines Phakisa 2015



Advancing the cluster - *SAMERDI* strategy



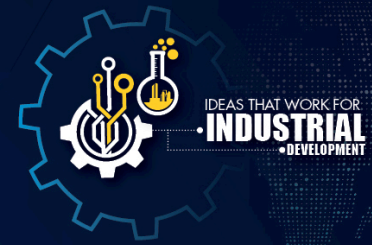
Current Mines – Longevity

More from the same with the same.

- Focus on mines with limited LoM
- Tweaks and optimisation without necessarily introducing large CAPEX requirements



Advancing the cluster - *SAMERDI* strategy



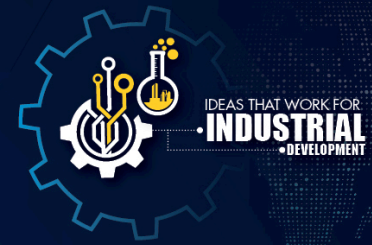
Mechanisation - Drill & Blast

Mechanisation across the process

- Zero Harm
- Significant productivity increase
- Specialised equipment for Au & PGM separately



Advancing the cluster - *SAMERDI* strategy



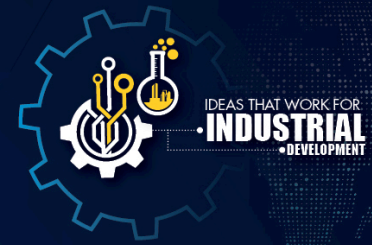
Non-Explosive Mining

Full 24/7 operations

- Revolutionary change to mining
- Remove dependency on explosives
- Extraction of only channel width – no waste



Advancing the cluster - SAMERDI strategy



Initiative	Rationale	Benefit
Advance Orebody	Ability to “see” ahead of the rock	<ul style="list-style-type: none"> • Increase safety • Increase efficiency by knowing where the reef is



Conventional current mining



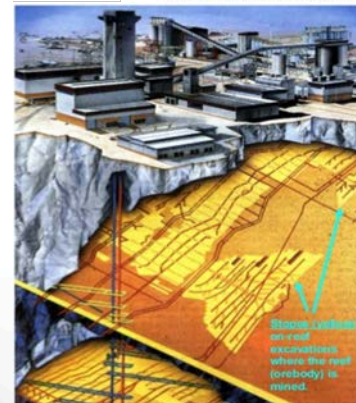
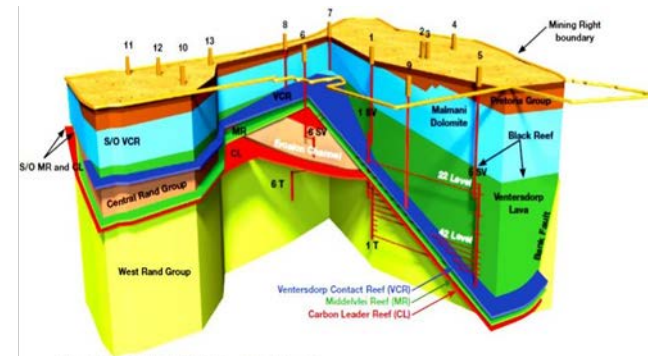
Longevity of current mining



Mechanisation (D&B)



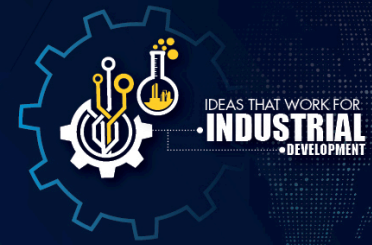
Continuous mining



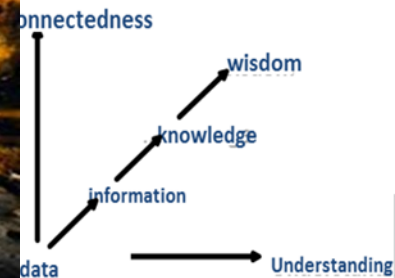
<http://www.bullion.org.za/MiningEducation/Images/Images/CrossSecMine.jpg>



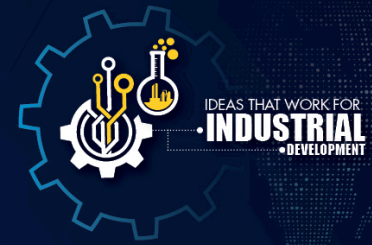
Advancing the cluster - SAMERDI strategy



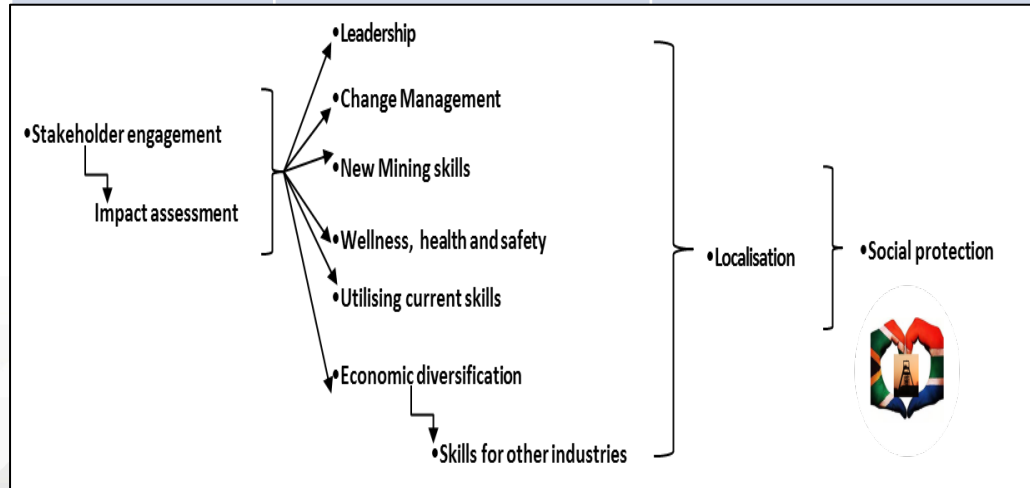
Initiative	Rationale	Benefit
Advance Orebody	Ability to “see” ahead of the rock	<ul style="list-style-type: none"> • Increase safety • Increase efficiency by knowing where the reef is
Real-time Information Management Systems	Converting information to knowledge and wisdom	<ul style="list-style-type: none"> • Information is immediately available to decision makers • Information is collected, processed and managed to allow for proactive and predictive decision

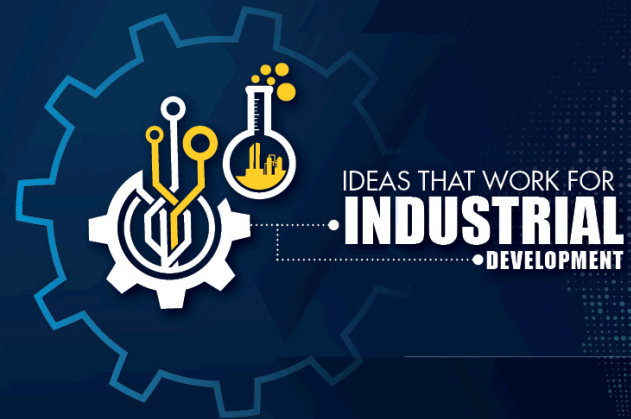


Advancing the cluster - SAMERDI strategy



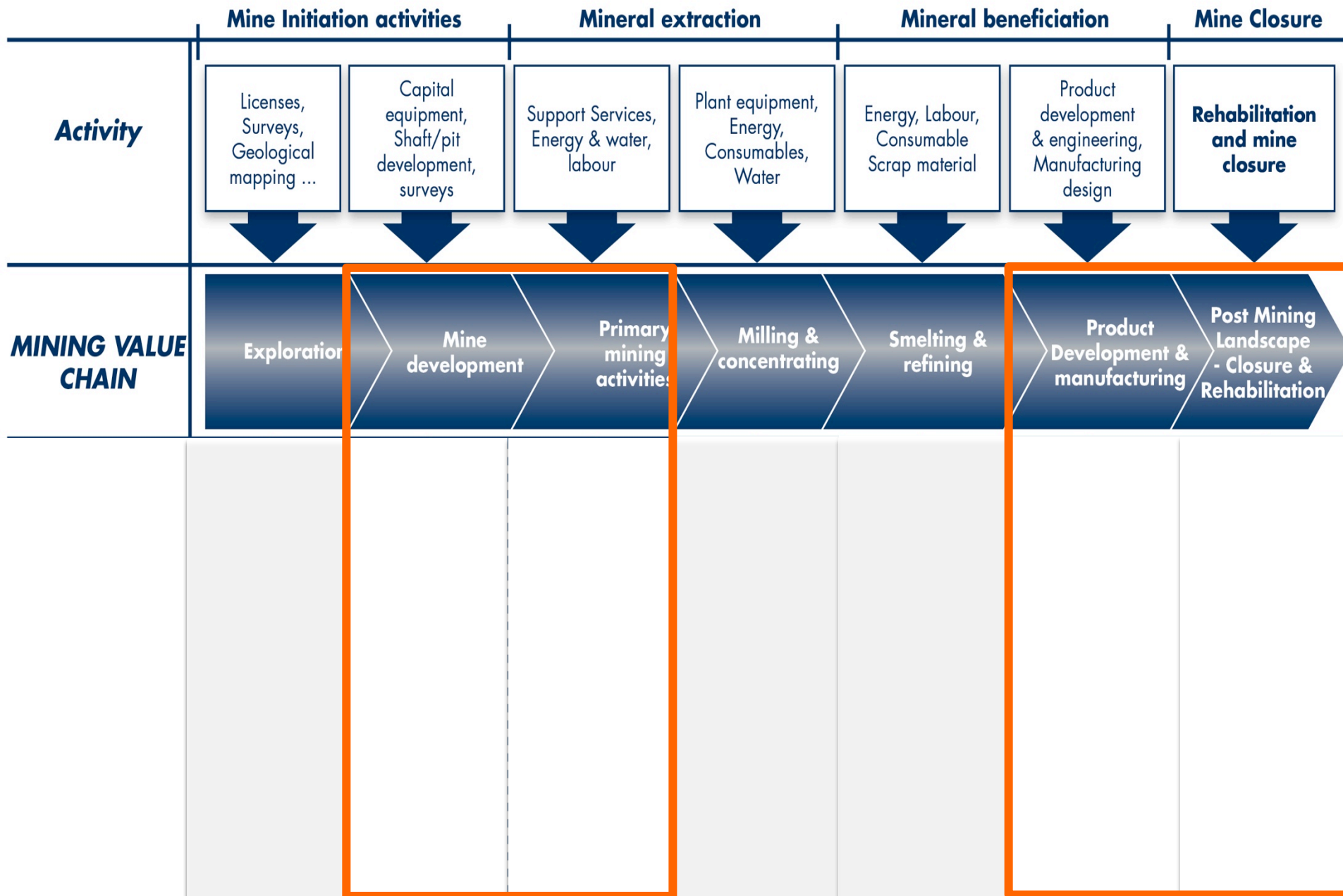
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Real-time Information Management Systems	Converting information to knowledge and wisdom	<ul style="list-style-type: none"> • Information is immediately available to decision makers • Information is collected, processed and managed to allow for proactive and predictive decision
Successful Applications of Technology	understanding why technologies either work or fail	<ul style="list-style-type: none"> • Understanding the pitfalls when technology is implemented • Change management



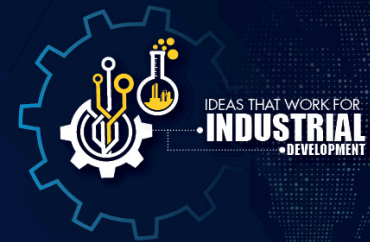


The CSIR's role in mining

Generic Mining Value Chain



CSIR role in mining

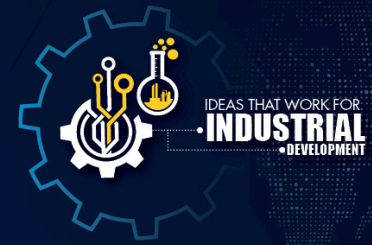


- CSIR contracted by DST to lead the implementation of SAMERDI strategy.
- Central player and driver of the SAMERDI Strategy.
- Mining industry has been identified as a pillar in *Project Synapse* on Industrialisation.
- Has multi, inter and transdisciplinary capabilities to provide diverse technological solutions.



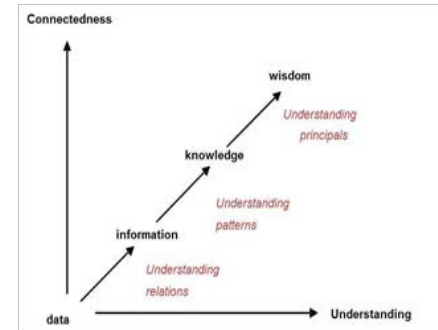
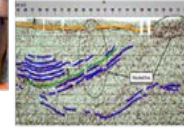
Mining coordination currently under the Industry Research Impact Area (RIA).

CSIR role in mining

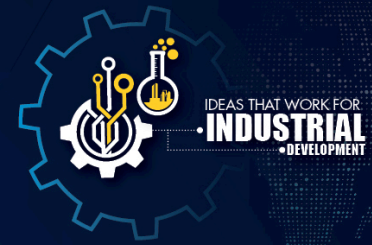


Examples of Mining R&D

1. OHS for MHSC's on Blasting vibrations and Statutory Equipment Monitoring;
2. Geotechnical offerings to Sasol, Impala;
3. Addressing post-mining projects in Limpopo with Anglo American;
4. Geophysics projects for various mines
5. Coaltech - Coal processing & Environmental studies
6. International Collaboration - China and EU



Mining matters!



Keeps you connected

- Copper (16 grams)¹
- Silver (0.35 grams)¹
- Gold (0.034 grams)¹
- Palladium (0.015 grams)¹
- Platinum (0.00034 grams)¹
- Ceramic magnetic switches containing rare earths²
- Indium²
- Titanium dioxide²
- Indium tin oxide²



¹ source – USGS <http://pubs.usgs.gov/fs/2005/3097/>

² source – NRC critical minerals report

New energy sources



- 335 tons of steel
- 4.7 tons of copper
- 13 tons of fibre-glass
- 3 tons of aluminium
- 1,200 tons of reinforced concrete

“If it’s not grown, it’s mined”

Source: Chamber of Mines of South Africa

Global infrastructure



Beauty and healthcare

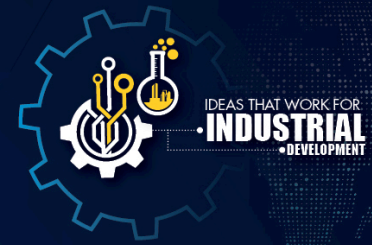


- Talc
- Mica
- Kaolin
- Calcite
- Titanium dioxide
- Zinc oxide



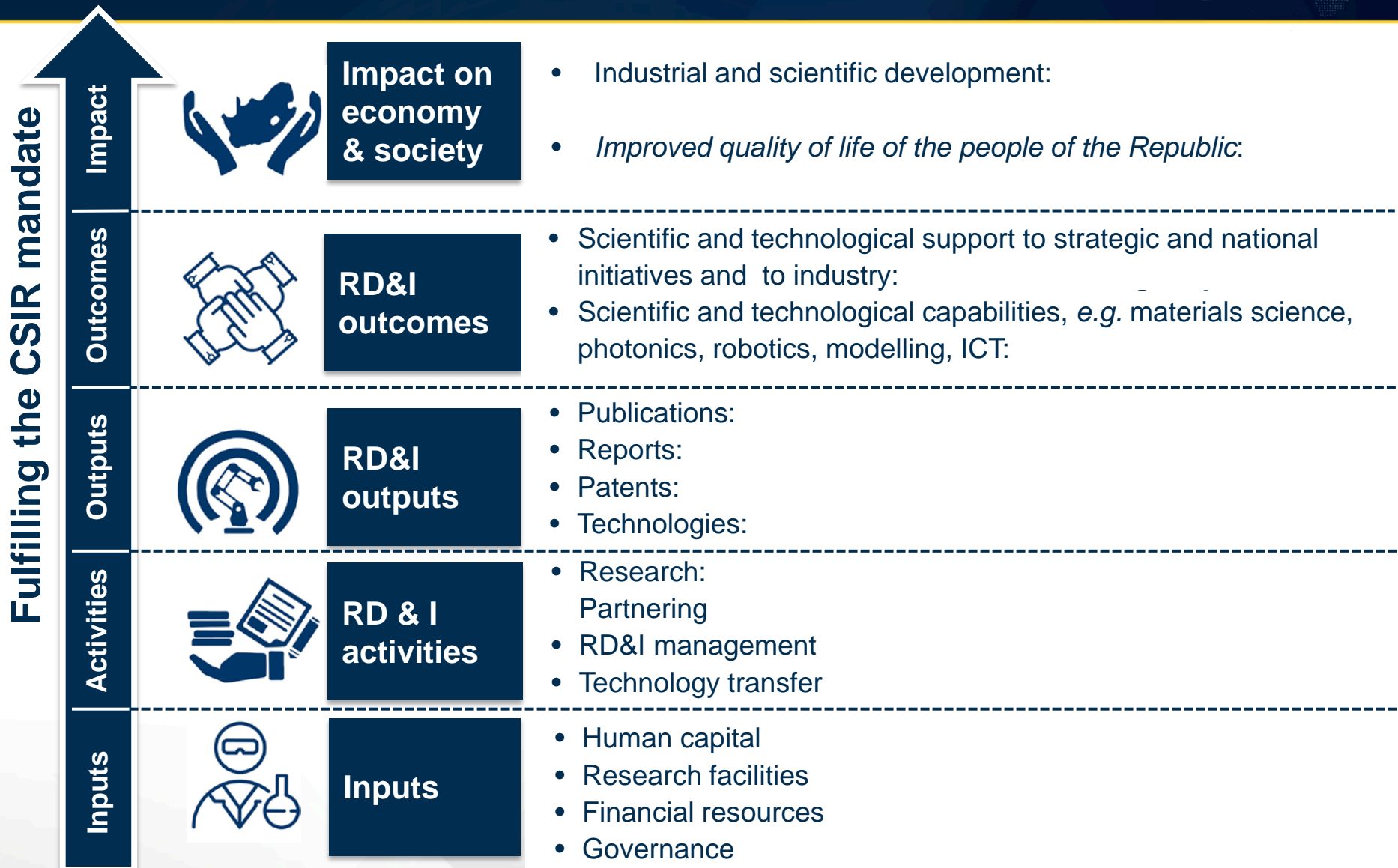
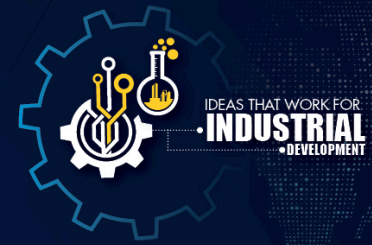
- Silica
- Limestone
- Aluminium
- Fluoride
- Titanium
- Petroleum

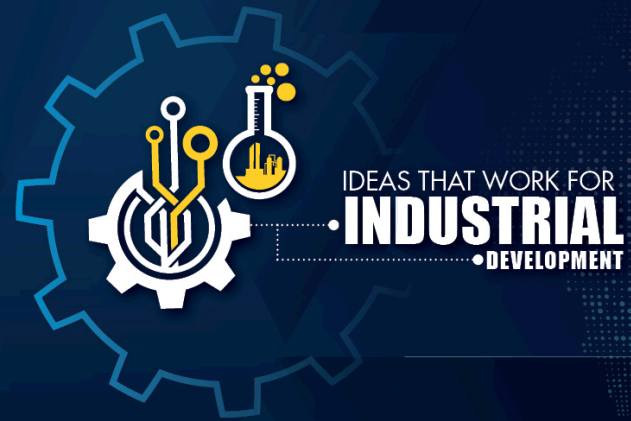
Mining matters - CSIR's role



<u>Sector Needs</u>	<u>CSIR response</u>
<p>Industry and Government has recognised Mining R&D is core.</p>	<ul style="list-style-type: none">• CSIR is rebuilding is mining capabilities for direct mining application.
<p>Modernisation of mining requires a range of solutions from tweaks to “<i>game changing</i>” approaches</p>	<ul style="list-style-type: none">• Has multi, inter and transdisciplinary capabilities to provide diverse technological solutions.• Central player and driver of the SAMERDI Strategy, funding over next three years (R 27 m, R 100 mil, >R 60 mil)• <u>Mining Precinct@Carlow Road</u> established• Mining Hub for R&D with DST, CoM, dti and CSIR in Public Private Cooperation.

Mining matters - CSIR's role





Thank you

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our future through science