

# **School of Earth and Mineral Sciences**

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# Outline

- General Introduction
  - African Paradox
- School of Earth and Mineral Sciences
  - Revamping Mineral Education and Research
  - Academic Staff /Infrastructure Development
  - Progress to date
- Challenges
- Concluding Remarks

**It all begins with Mining..**

If you cannot **grow** it,  
you have to **mine** it.

# Geology..

Before you mine,

You have to discover it

# Contribution of Mining to Economic Development

2.7  
Lbs  
Clay

32,000  
Lbs Salt

923 Lbs  
Zinc

1.65 million  
Lbs Stone &  
sand

1.6 ton  
Copper

82,000  
gallons  
Petroleum

1.78  
Troy Oz  
of Gold

68,000 Lbs  
Cement

590,000  
Lbs Coal

61,000  
Lbs Other  
5.8 million  
Cu ft  
Natural Gas

6,000  
Lbs  
Bauxite

20,500  
Lbs  
Phosphat

1,000  
Lbs Lead

42,000  
Lbs Iron  
Ore



# The African Paradox

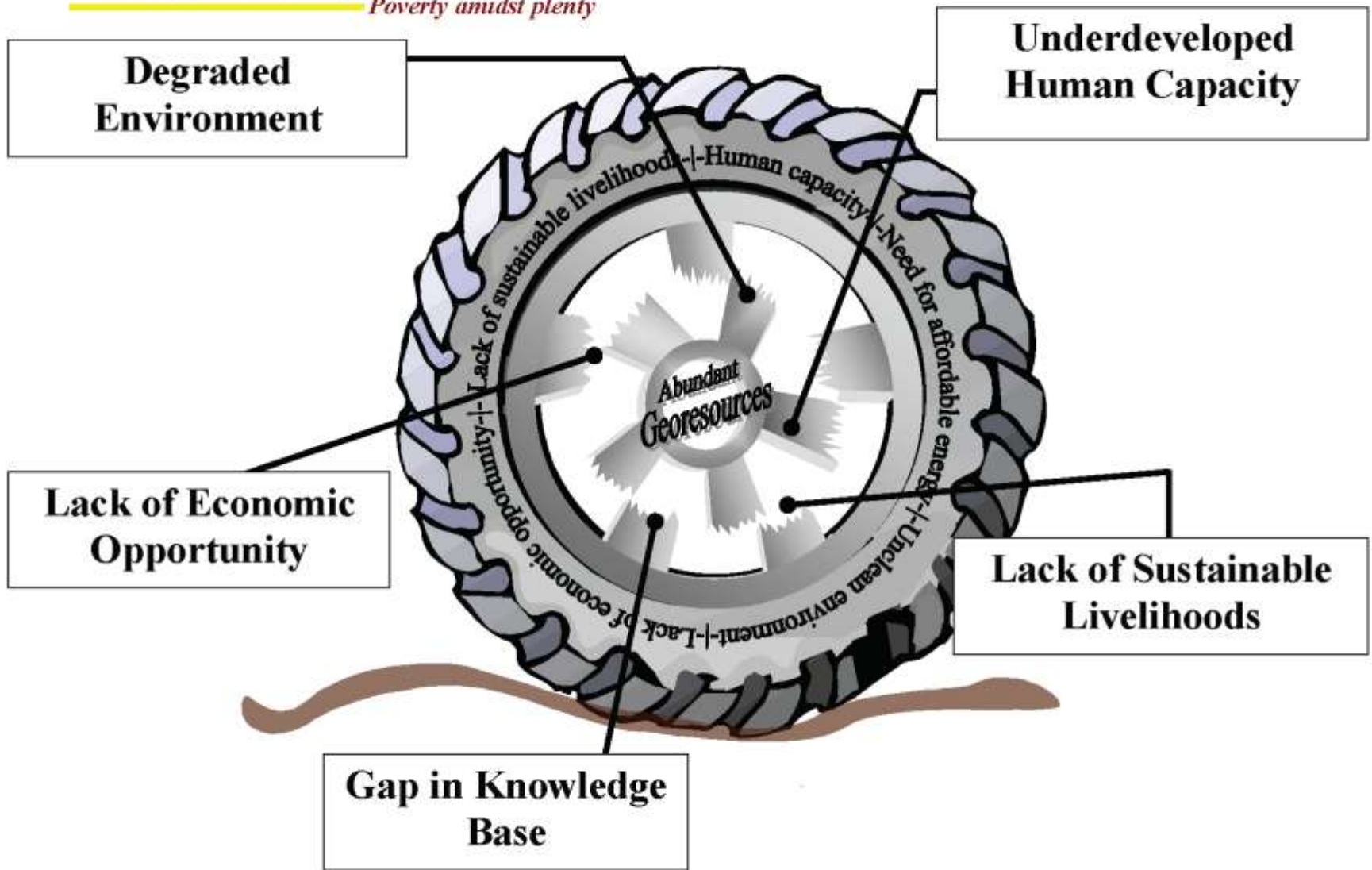
“The **mining sector** will be the centerpiece of our **economic recovery** and **growth**. It should generate growth spurts across sectors, reignite that economic miracle which must now happen... More **mineral deposits remain unknown**, unexplored... Above all we need to move purposefully towards **beneficiation** of our raw minerals.”

**Cde R.G. Mugabe**

*Inauguration speech, August 22, 2013*

# The Paradox

*Poverty amidst plenty*



**Degraded Environment**

**Underdeveloped Human Capacity**

**Lack of Economic Opportunity**

**Lack of Sustainable Livelihoods**

**Gap in Knowledge Base**

**Abundant Georesources**



# Sustainable Management of Georesources

- The Paradox
- Capacity Building is Key
- Education is the Solution

# Education: Foundation for a Prosperous Society



*“Our progress as a nation can be no swifter than our progress in education. The human mind is our fundamental resource.”*

**John F. Kennedy**  
(1917 - 1963)

# AESEDA Solution

Let's fix it!



**Integrated Technical Education**  
Develop novel Georesources Engineering Management (GEM) curriculum that integrates core physical sciences and engineering principles with social sciences constructs. GEM will produce a socio-environmentally conscious workforce that can enable the *georesources* industry within new environmental paradigm and help develop and support new business ventures.

**Entrepreneurship**  
Integrate entrepreneurship into technical curricula (GEM). GEM products will have the entrepreneurial skills needed for effective participation in business development and economic activities.

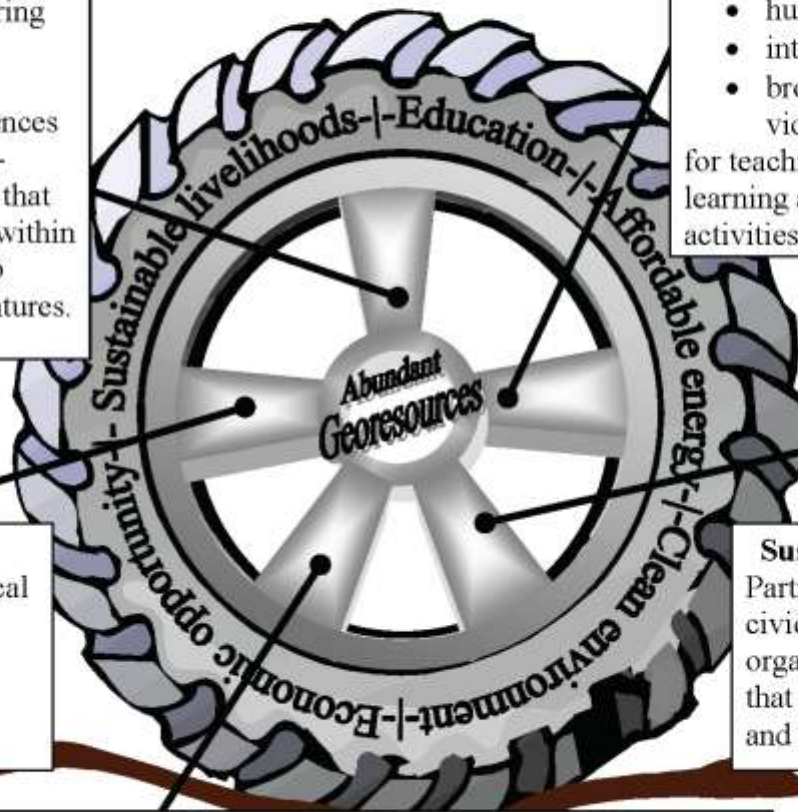
**Creation of Knowledge**  
Build infrastructure and capacity for basic research and scientific investigation that will lead to clear identification of the salient causative factors and develop solution strategies.

**Institutional Capacity**  
Develop and support:

- human capacity
- integrated laboratory facilities
- broadband connectivity and videoconferencing facilities

for teaching, research, distance learning and community development activities and international

**Sustainable Development Policy**  
Partner with government agencies, civic groups, and international organizations to formulate policies that favor sustainable development and transparent business practices.

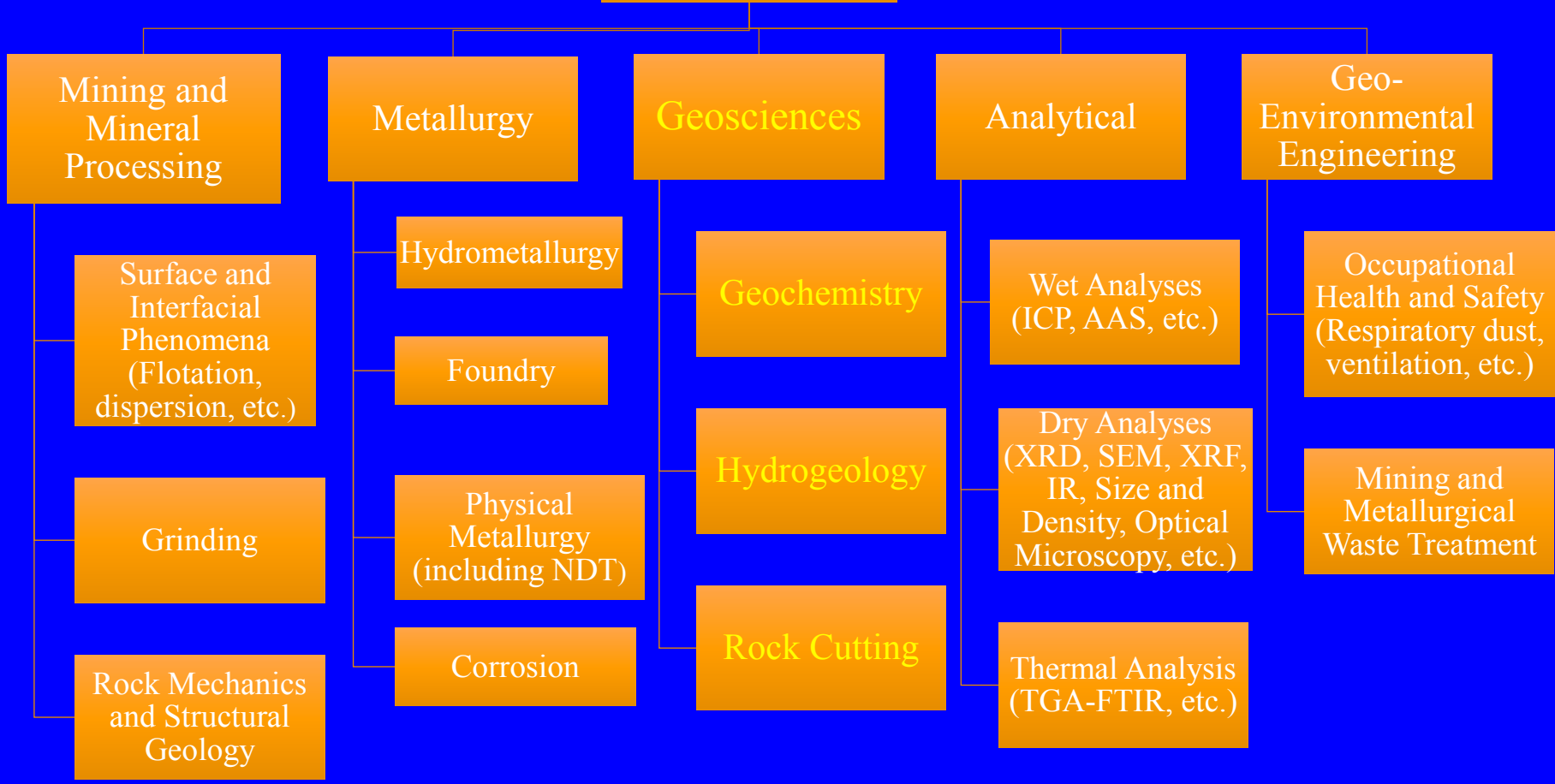


# School of Earth and Mineral Sciences

- MOU between UZ and Chamber of Mines of Zimbabwe signed September 13, 2017
- Approval for School given on December 12, 2017
- Industrial Advisory Board
  - Chamber of Mines of Zimbabwe
  - University of Zimbabwe
  - Government (MMMD)
  - Geological Society of Zimbabwe
  - Southern African Institute of Mining and Metallurgy



# Laboratories in Proposed School



# **Revamping Mineral Education at UZ**



# Geology, Mining, Metallurgy and Institute of Mining Research

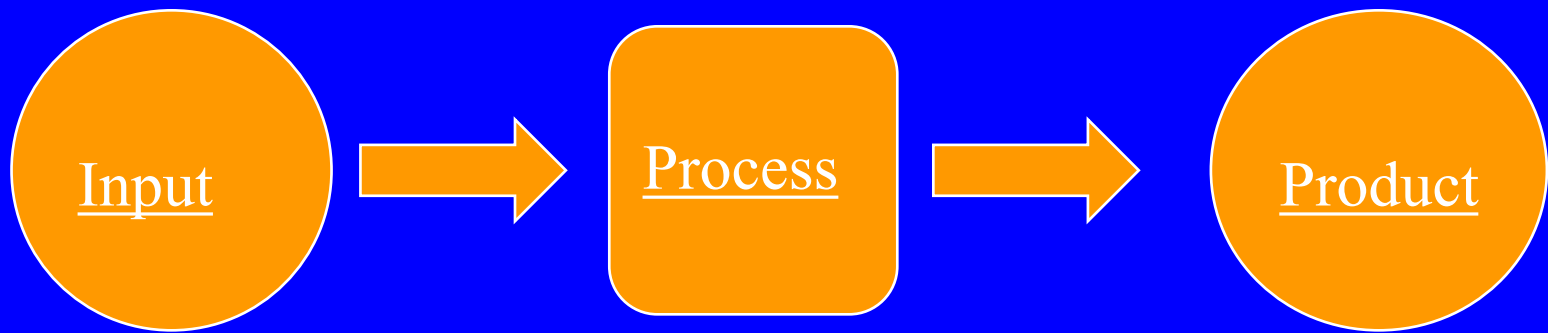
- Teaching, Research and Service
  - Renovation of teaching laboratories and research infrastructure
  - University – Industry Consortium
- Human Capacity Development
  - Academic manpower
  - Industry manpower requirements
- Curriculum Review

# University/Program Ranking

**University or program is only as good as  
the quality of:**

- **Students**
- **Academic Staff**
- **Infrastructure**
- **Support technical services**

# Training Process



Students

Classroom

Laboratory

Attachments

Research

Graduates

# Academic Staff (10/5/2017)

<b>Academic Staff</b>	<b>Geology</b>	<b>Mining</b>	<b>Metallurgy</b>
Professor	0	1 (PC)	1*
Other	2	1+5	1+3
<b>Staff Development Fellowship</b>			
• Ph.D	0	0	2
• MS/M.Phil	0	3	3
Vacancies	13	1	0
Temporary FT	8	1	4

# Academic Staff

- **In-breeding issue:** Staff with with diverse educational backgrounds
- **Depth and breadth:** to cover areas of the curriculum, service to industry
- Gender balance

**Staff Training Strategy for Departments**

# Staff Development Strategy

- Geology: 12 Ph.D. (6 Africa, 6 outside Africa) **\$1020K**
- Metallurgy: 6 Ph.D. (3 Africa, 3 outside Africa) **\$510K**
- Mining: 8 Ph.D. (3 Africa, 5 outside Africa) **750K**

**Total: \$2,280K**

# Infrastructure

Equipment Category	Cost
Large Common	2,092K
Mini Pilot Plant Flotation System	699K
Geology Laboratories. (305K)**	435K
Metallurgy Laboratories	566K
Mining Laboratories	790K
<b>Total</b>	<b>\$4,573K</b>

# Large Common Equipment

## Materials Characterization Laboratory

- Research SEM with mineralogic software, sample preparation suite.
- XRD
- XRF
- TG-FTIR
- ICP-MS
- AAS
- Particle size analyzer
- BET surface area
- Sulphur and Carbon analyzer



# Mini Pilot Plant

- CFM-12 cell mini flotation plant
- Flotation columns
- PLC/HMI based data acquisition and logging system with PC-based human machine interface (HMI)
- Batch rod mill
- Regrinding pin mill
- Integrated lime addition/pH adjustment system

# Geology

- Hand-held XRF for field work (2)
- Pulverizer
- **Stereo zoom microscope (2)**
- **Student microscopes (30)**
- **Research microscope (1)**
- Diamond saw blades (6)
- Other laboratory consumables (heavy medium, polishing powder/chemicals).

# Metallurgy

- Tensile tester
- Spark spectrometer
- Impact/universal hardness tester
- Pycnometer
- Metallurgical microscope with software
- Cutoff machine
- Metal fusion furnaces
- Consumables

# Mining

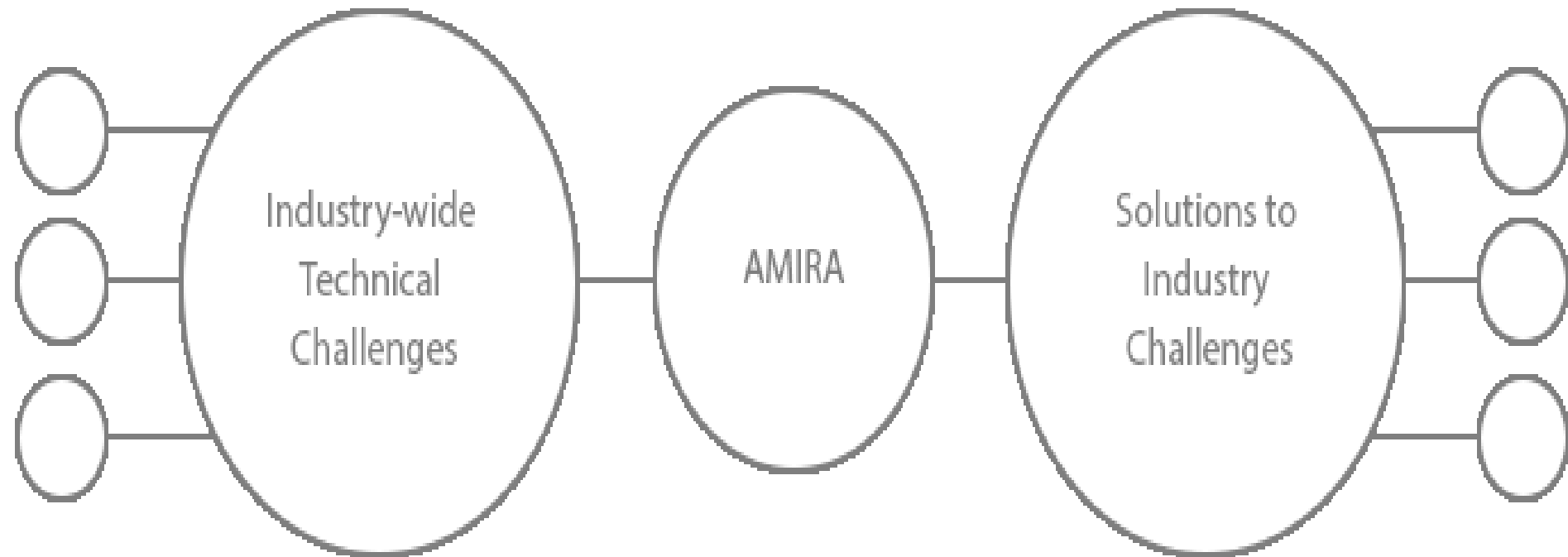
- Ventillation laboratory
- Various grinding mills (HPGR, ball, etc.)
- Central vacuum system
- Various separators (magnetic/electrostatic)
- Weighing scales (varying sizes/precision)
- Water purification system
- Drying ovens
- Dust collection system
- Spiral circuit/miscellaneous equipment

# UZ-Industry Consortium

## **AMIRA-type Model**

- Identifies research and development opportunities of interest to Member companies, and develops research projects that will realize these opportunities
- Six areas: Geosciences, Mining Engineering, Mineral Processing, Extractive Metallurgy, Sustainability, Multidisciplinary
- Companies provide funding for research

# Amira Model



# Projects

- Oxidized PGM
  - Flotation
  - Hydrometallurgical approach
- Grinding media production
- Flotation column research
- Exploration
- By-product processing and utilization

# Challenges

- Filling vacant academic and technical positions in the different units
- Training and Retention of academic staff
  - Trust fund to supplement salaries of staff in School
  - Funding to support professional travel
- SWOT Analysis



### Strength

- **Strong industry support.**
- **Strong UZ buy-in (>\$500K invested in human capital development to date).**
- **Renaissance of Zimbabwe economy tied to fortunes of mining industry.**
- **Supports government policy on industrialization.**

### Weakness

- **Staffing issues**
- **Lack of functional teaching and research laboratory facilities.**
- **Poor public sector financial support to UZ.**

### Opportunity

- **No research institution supporting developments in the mining industry.**
- **Developing a Centre of Excellence (COE) to service the mining industry in Zimbabwe and sub-region.**
- **Potential for discovery and recovery of new mineral resources.**

### Threat

- **Funding competition with PAMUST**
- **Drop in commodity (base metal) prices.**
- **Lack of buy-in and support of initiative from the other mining houses.**
- **Retention of trained faculty beyond their bonded period.**

# Concluding Remarks

- The establishment of closer UZ – Industry partnerships to develop and evaluate new technologies.
- **Building human and institutional capacity to service the mineral industry**
- Modernize laboratory and analytical facilities at UZ to deliver high quality service to mineral industry

# Thank you!

