



Implats – Impala Rustenburg operations

# SEISMIC MONITORING BEST PRACTICE FOGAP DAY-OF-LEARNING

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**MINERALS COUNCIL**  
SOUTH AFRICA

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- Introduction
- Phase 1 :
  - Review of some findings
- Phase 2:
  - Guideline compilation: Best practice for seismic monitoring objectives
  - Guideline demonstration

## PILLAR 2: Research and development

# Phase 1

- FOGAP Pillar 2
  - Seismic hazard warning systems
  - Local and international practice
  - Previous research in South Africa
  - Implementations / Limitations / Considerations

### Barring technology to identify and safely remove loose rocks



- Open innovation challenge - Reutech winner – R1m prize – Contract signed
- Loose rock removal – Exoskeletons, determining applicability in the pipe-line
  - High level FoG task team involved



### Improved and optimised seismic hazard rating and warning systems

- International review of Seismic systems & SA
- New ideas for short term seismic assessment

### System and technology for real time monitoring and proactive warning of instability

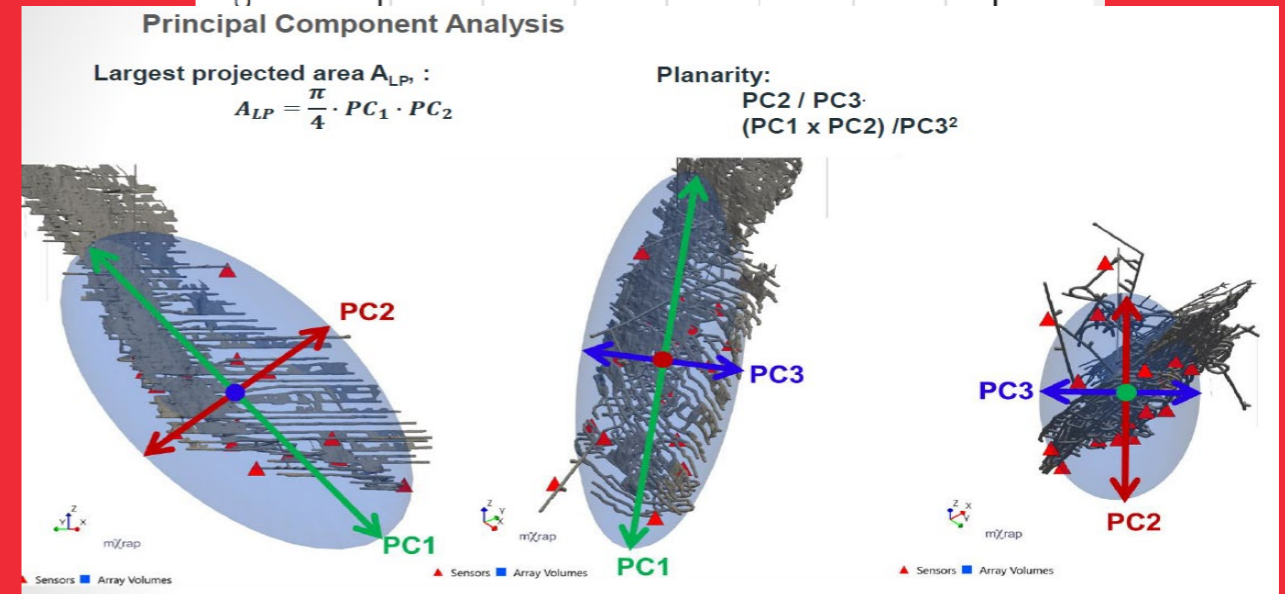
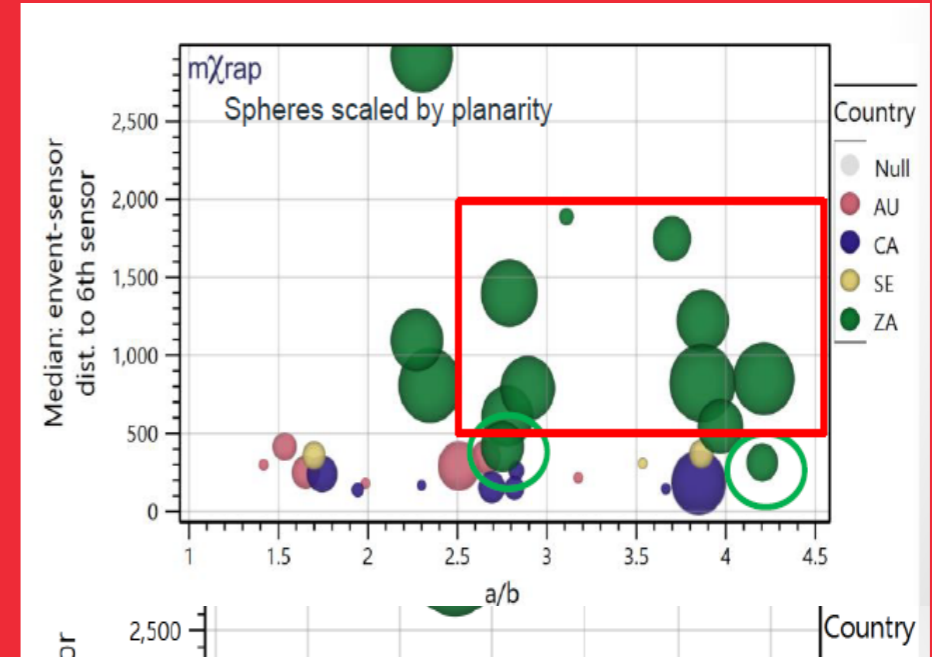
- Industry working group established
- Assessment of drill and blast damage



Improved drilling accuracy with jigs and rigs

# Phase 1 – Seismic networks

- Benchmarked against Local and International practices
- Networks:
  - Areal coverage
  - Planarity
  - Distance to 6<sup>th</sup> Sensor

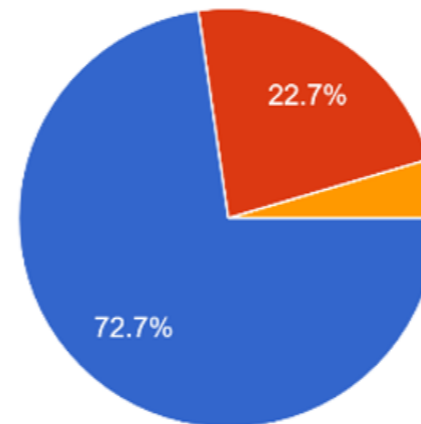


# Phase 1 – RSA Implementation and practices

- Seismic and Rock engineering
- Critical evaluation
  - Seismic procedures
  - Use of seismic data
  - Rock engineering training

What do you believe the role of the Rock / Geotechnical engineer is in assessing and addressing seismic activity on the mine:

22 responses



- The Rock / Geotechnical engineering department will review the seismic data analysis done by seismologists and use the seismologist recommendations in...
- The Rock / Geotechnical engineering department must plan their seismic system layout, conduct seismic data analyses, and have a deep understand...
- Seismic activity and the study of seismology should not be a Rock / Geotechnical engineering function. Th...

Rescue

Large event notifications, standby seismologist

86%

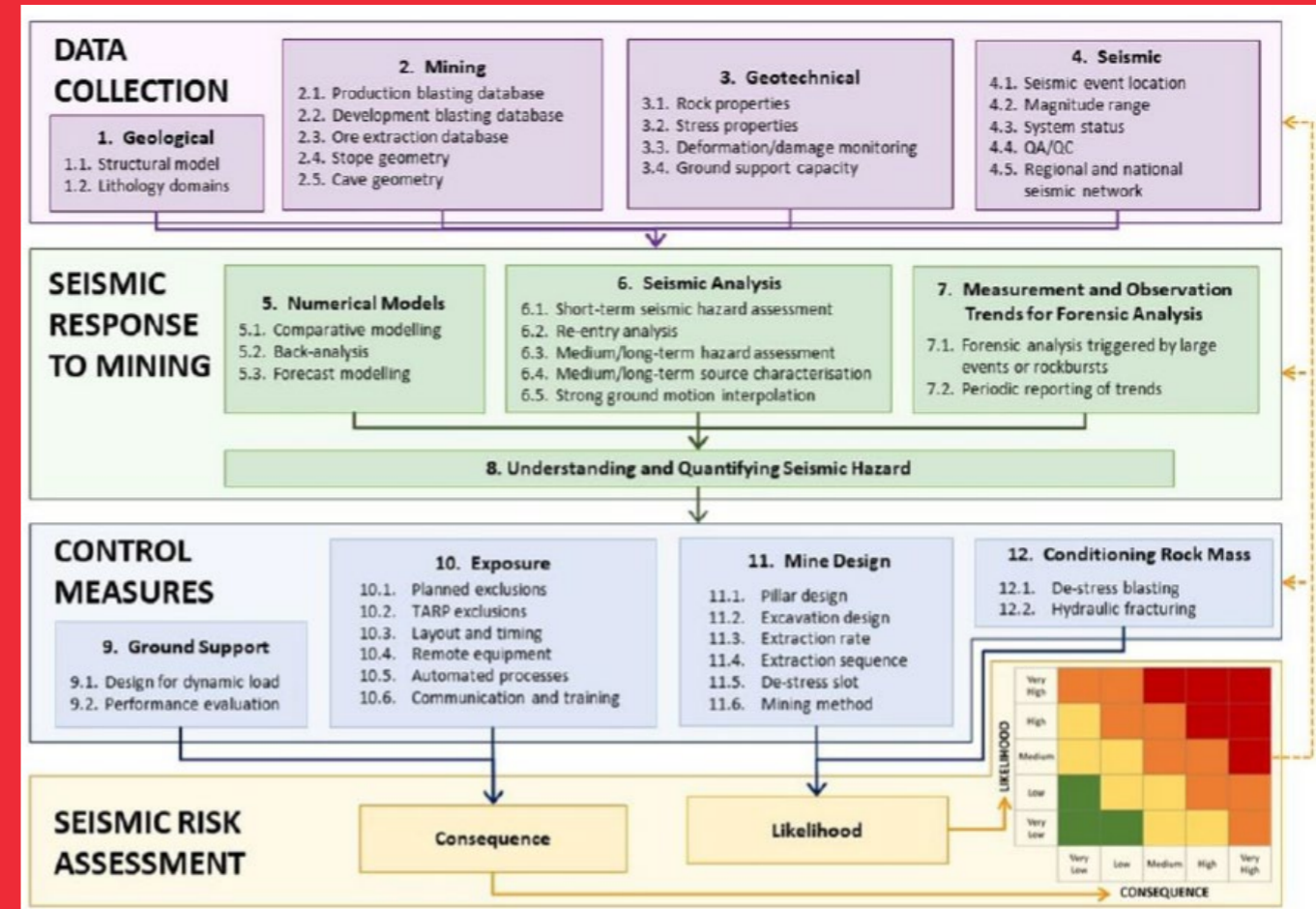
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# Phase 2


- Outcome (Phase 2)
  - Compile a Best practice guideline document based on research findings
  - Guideline that can guide decision-making regarding
    - Remedial / Preventative strategies and
    - Monitoring networks



(Potvin 2023)

*'An engineering approach to seismic risk management consists of **identifying** the active seismic sources in the mine, **characterising** each source in terms of hazard (or the largest event that each source is likely to produce), **estimating the potential** damage if the largest event were to occur and **implementing risk mitigating** measures to minimise the consequence, if this damage were to occur' (Hudyma & Potvin, 2010).*


# Best practice guidelines



### Foundation

Historical and current, local and international knowledge and experience.


Guideline Foundation



### Format

Move away from standard, prescriptive criteria to process driven decision making.

Guideline Format



### Implementation

Assist user to define and select relevant seismic criteria and mitigation strategies to ensure effectiveness in reducing seismic risk.

Guideline Implementation



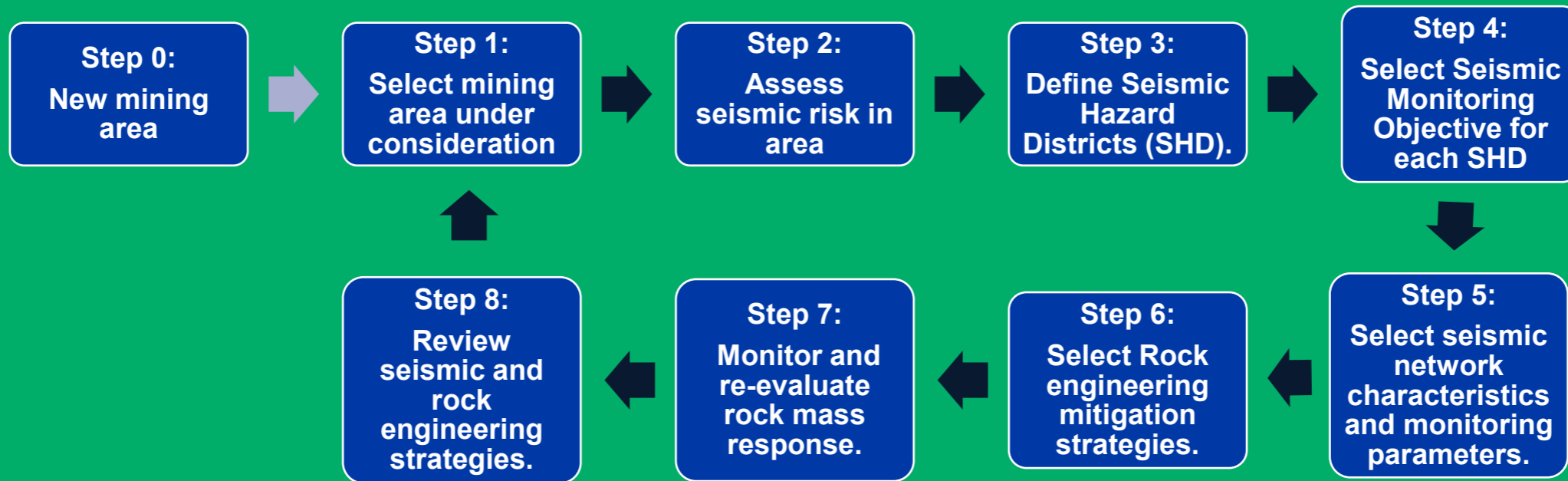
### Evaluation

Assess responsible implementation of good and effective systems and protocols and continuous measurement of success, learnings and improvements.

System Evaluation

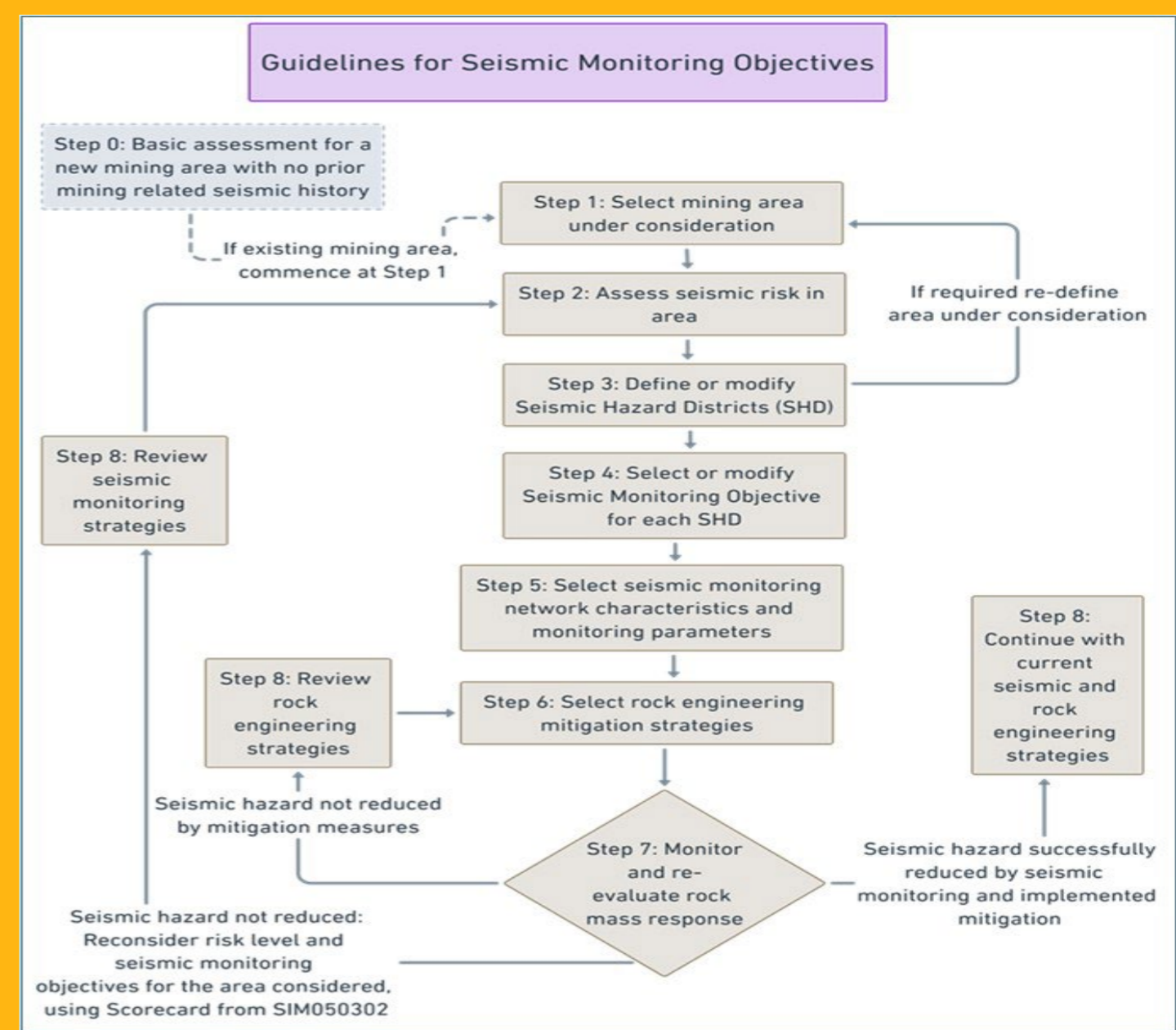
The Guideline suggests a **process** to **derive** appropriate seismic monitoring needs and mitigation solutions to a specific seismic concern.

# Best practice guidelines



# Best practice guideline

- Process description
- Nine (9) Steps :
  - Follow process steps in order
  - Gather data, analyse and record data, findings and decisions
  - Design, implement AND Monitor
  - Update / Change
- Comment by Industry ?
  - Possible enhancements or changes



# Guideline presentation

- Digital format
- Excel sheet for short term but its NOT the ultimate solution
  - Guidelines\_24.3.25



Anglo American Platinum – Dishaba Mine

# Thank you

# #MiningMatters

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