

APPENDIX B: RECOMMENDATIONS

1.1. Embedding of Data-Driven FCM for Scenario Planning

It is recommended that mining executives embed the process of scenario planning within their organisations for strategic foresight. Furthermore, the use of the FCM developed in this project will assist quicker and more data-driven decisions to be made and will ensure a systemic understanding of the complex system behaviour within the SA mining industry.

The cost of embedding a scenario planning process within a mining operation should not be excessive as most mines already employ long term planners and strategic departments. The only cost will be to allocate specific resources to research on KDF's and their values.

Other detriments may be that the FCM developed in this project may be too generic for one mine, as it was developed for the entire SA mining industry, therefore upfront adjustments and research will have to be employed to tailor the model to fit the unique operating conditions of the mine. The generic FCM provided by this project does however give mines a solid base to start from as the macro elements are included.

The action plan for a mine to embed the process of data-driven scenario planning is to follow these steps:

1. **Model Definition:** Setup a strategic foresight team and formulate a base system diagram from research, starting with the FCM developed in this project. The core system boundaries, key value questions and foresight horizon must be clarified.
2. **Data Collection:** Analyse and define causal relationships and their weights. This may be done from research and conducting further surveys within the organisation and its closely related associates.

3. **Model Validation:** Transfer the FCM and causal relationships' data into an adjacency matrix and validate the model through sensitivity tests and face validity tests.
4. **Simulation and Analysis:** Simulate plausible scenarios by changing the mix of transmitter node state vectors. Perform in-depth analysis on the results on the scenarios and develop narratives.
5. **Wind Tunnelling:** Test the organisation's current strategies against the plausible scenarios for robustness in a Wind Tunnelling approach. Discard strategies that are not successful in multiple scenarios and refine other strategies to encompass a sufficient number of scenarios. Selected strategies can now be executed.
6. **Repeat:** Revert back to Step 1 and redefine the system model regularly. Follow the process continually (i.e. annually) to embed the process of scenario planning and further refine or divert strategies as new "weak signals" or industry disruption occurs.

1.2. Adopt a Country Focus

The results of this project show that the successes of mines in SA are closely tied to the success of the economy, i.e. GDP, FDI, etc. It is therefore recommended that mining companies adopt a country focus instead of an industry focus to ensure that collaboration with SA government, labour and competitors is conducive to the success of these companies.

The negotiations on wages, royalties, etc. needs to be unique for each country, taking into account the specific factors that drive value in that country and an internationalised or standardised approach will not necessarily provide the same collaborative results.

This recommendation is key for mining executives to guard against potential negative drivers, such as nationalism and government demands. The notion of being proactive and working with the country's stakeholders is recommended to unlock further value for mining companies operating in SA.

The cost of this recommendation is potentially to incur higher labour costs, royalties and regulatory costs, but the benefits include the right to own mines in SA, GDP Growth, FDI and export revenues.

The action plan for this recommendation does not involve discrete steps but should be viewed as a collaborative approach between government, business and labour to furthering the interests of mining within SA. This may include policies, i.e. Mining Charter, wage negotiations, royalty and exchange rate protection and allowance for automation to change the workplace.

1.3. Strategic Foresight for Mining Feasibility Studies

Traditional mining feasibility studies don't always make use of strategic foresight techniques, but typically design, engineer and develop the study based on a single version of the future, i.e. financial model is based on a single \$/tonne forecasted price. Granted, sensitivities and ranges are applied in feasibility studies, but these are valued from the base of a single future – minimum and maximum NPV from the base value.

It is recommended that data-driven scenario planning, as performed in this project, is done as an input to mining feasibility studies. Once the multiple of plausible future scenarios is understood then the strategy and options available to the feasibility study gains context and is guided by a lucid systematic approach.

The benefits of performing data-driven scenario planning, as in this project, before conducting a mining feasibility study is that future discontinuities are visualised and potential opportunities and threats in the mining industry are accounted for in the feasibility study.

The cost of this recommendation is an additional time delay to get a new mine (green fields) or expansion of a mine (brown fields) to market. The feasibility study team will need to engage with scenario planning specialists in order to get this input before starting with the feasibility study, or the team would need to develop future scenarios by employing the technique of this project. Further costs may be

incurred by disruption to the feasibility study as new scenarios emerge during the process.

The action plan to provide scenario planning and strategic foresight as an input to mining feasibility studies is as follows:

1. **Initial Input:** Develop data-driven scenarios and perform Wind Tunnelling for selected strategies within the feasibility study. Refine the strategies for robustness and start conducting the feasibility study.
2. **Revised Input:** Monitor the selected plausible scenarios for changes, as well as any new scenarios that are relevant and include these insights into the mining feasibility study. Especially when different study phases (i.e. concept, pre-feasibility, feasibility, etc) are conducted with long periods of time in-between, or when new “weak signals” occur, the scenarios need to be revised and amended to the feasibility study.
3. **Operational Input:** Once the feasibility study is complete and when the mine becomes operational, then the scenarios may be handed over to the operational team for ongoing scenario planning.

1.4. Key Recommendation

The field of strategic foresight and scenario planning is vast and even transpires the mining industry. The key recommendation from this project is that the technique of using a FCM and Adjacency matrix can be used in any industry, application, or future-oriented environment to better prepare for the future. It is recommended that this technique is used by any strategist or futurist to develop future scenarios in a data-driven manner and make decisions based on this semi-quantitative approach.