

Why Sustainability Matters in Mine Optimization

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What is sustainability?

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Sustainability is everywhere!

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SAFETY MOMENT - STROKE AWARENESS

Stroke Facts

- The key to minimizing stroke impact is early recognition
- If a stroke victim is treated correctly within 3 hours they can minimize or reverse the effects of a stroke.
- The key is to assist in recognizing strokes are to remember these '3' steps (ask the individual) STR

S = SMILE

T=TALK & SPEAK simple sentence (Coherently)

R= RAISE BOTH ARMS

If ANY of these 3-steps are impaired, seek immediate medical attention

“Contemplation of the world’s disappearing supplies of minerals, forests, and other exhaustible assets had led to demands for regulation of their exploitation. The feeling that these products are now too cheap for the good of future generations, that they are being selfishly exploited at too rapid a rate, and that in consequence of their excessive cheapness they are being produced and consumed wastefully has given rise to the conservation movement.”

- Harold Hotelling (1931)

Challenges

Mining projects face multiples uncertainties. Some risks are growing in importance over time, and the industry has yet to fully acknowledge these new risks in the way it operates.

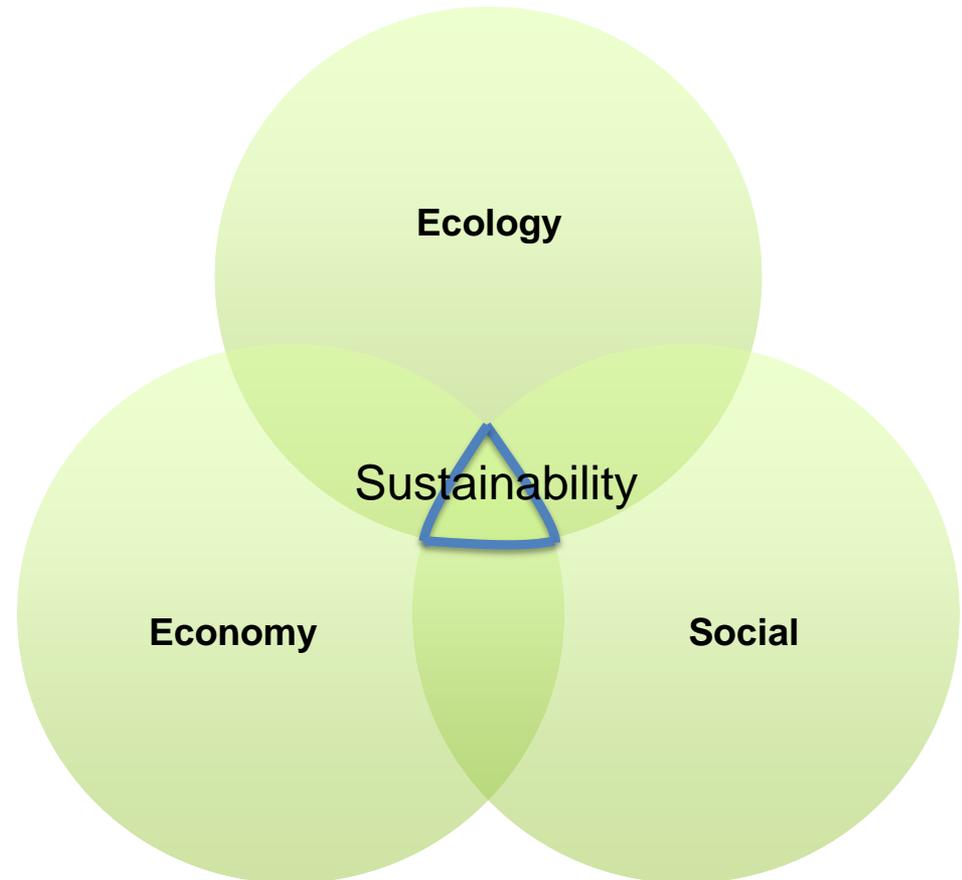
These growing risks are (non exhaustive):

- Capital cost escalation
- Access to mineral deposit
- Public opposition
- Variable mineral rent sharing scheme
- Labour shortage
- Price volatility
- Climate change

What is sustainability?

“All definitions of sustainable development require that we see the world as a system—a system that connects space; and a system that connects time”.

-International Institute for Sustainable Development



Mining optimization

Mine engineering process

Design

Geological information

Ore Body attributes

Ground structure

General Mine infrastructure

Planning

Reserves

Manpower

Performance

Fixed & Mobile assets

Simulations

Probability distribution

Time Studies

Mining data

Uncertainties

Economics

NPV

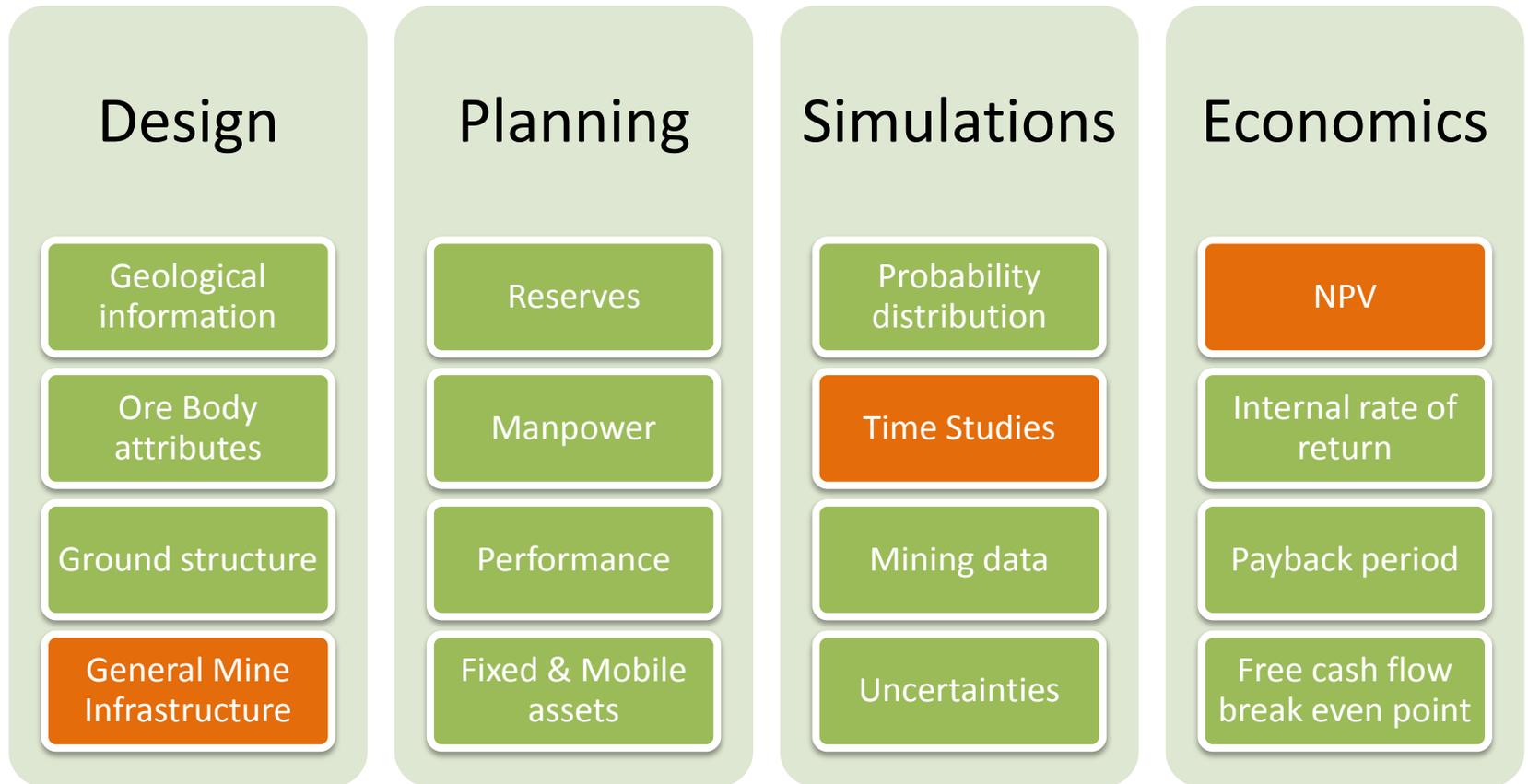
Internal rate of return

Payback period

Free cash flow break even point

Sustainability is everywhere...

Some examples





Example #1

General Mine infrastructure: Tailings

Tailings infrastructure not only has an impact on the economics but also on the environmental footprint and on social acceptance.

Many projects are getting blocked due to local and regional populations discontent and are related to the tailings disposal concept selection process.

The main population's concerns against tailings are about dust, underground water and dam integrity.

Many disposal techniques exist...

The selection of the tailings concept must be integrated into the project at the very forefront of the study phase.

- Pond storage
- Dry stack tailings
- Deep sea tailings
- Thickened tailings
- High density Paste fill

Conservation techniques may benefit to future generations with improved technologies reprocessing waste materials.

Example #2 Time studies

What does negatively impact labour productivity?

- Absenteeism?
- Accident?
- Lack of training?
- Lack of engagement?

What is the underlying source of these problems?

Some numbers... The Nunavik example

The Institut national de santé publique published a survey done in 2004 on the Nunavik population:

- 40% of the population is under 15 of age
- 22% of the active population has a high school diploma (87% in Canada)
- 60% of the respondents indicated they had used drugs in the past year (15% in Canada)
- 65% of pregnant women admit smoking daily; 44% reported consuming alcohol



How can the industry help?

Mining companies have taken an increasing support role in solving social issues.

Key initiatives and practices:

- Code of business conduct
- Vision and values
- Corporate Social Responsibility
- Leadership program
- Training initiatives in conjunction with:
 - Governments
 - Colleges and universities

Example #3 NPV

Are existing value indicators measuring the real value of a project?

- What discount rate should be used?
- How do uncertainties affect a project?
 - How do you measure uncertainties?
- Is the discounted cash flow a sound method?

Mining non-renewable resource demands clarity on the extraction strategy and its benefits

Evaluation techniques

They are additional evaluation techniques that work!

- Differential discounting (at the source)
- Real options

Discounted cash flows:

$$NPV = \sum_{t=0}^T \frac{(\text{Revenues}_n - \text{Operating costs}_n) - \text{Capital Expenditures}_n}{(1+r)^n}$$

Discounting at the source:

$$NPV_{\text{project}} = \sum_{t=0}^T \frac{[(\text{Revenues}_n \times RDF(R)_n) - \text{Operating costs}_n \times RDF(O)_n] - \text{Capital Expenditures}_n \times RDF(C)_n}{(1+rsklr)^n}$$

Enhanced economic clarity improves risk management, responsible development and profitability!

Conclusion

The mine optimization process is not linear.

The integration of the sustainable development principles adds an exciting dimension that will help create sustainability performance.

The integration process is not finite and remains open for improvements in all directions:

- Geology & Mining
- Economics & Finance
- Environment & Social



It's not a choice between our environment and our economy; it's a choice between prosperity and decline

- President Barack Obama (2009)



Sources

Ernst & Young: Business risks facing mining and metals – 2012-2013

KPMG: Expect the unexpected – 2012

IIED: MMSD+10 reflecting on a decade – June 2012

World economic Forum: Global risks 2012

International Institute for Sustainable Development

Nunavik Inuit Health Survey 2004

Conference Board of Canada



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WE CARE embodies SNC-Lavalin's key corporate values and beliefs. It is the cornerstone of everything we do as a company. **Health-safety, our employees, our communities, the environment** and **quality**: all these values influence the decisions we make every day. And importantly, they guide us in how we serve our clients and therefore affect how we are perceived by our external partners.

WE CARE is integral to the way we perform on a daily basis. It is both a responsibility and a source of satisfaction and pride by applying such important standards to all we do.



WE CARE about the health and safety of our employees, of those who work under our care, and of the people our projects serve



WE CARE about our employees, their personal growth, their development and general well-being



WE CARE about the communities where we live and work and their sustainable development, and we commit to fulfilling our responsibilities as global citizen



WE CARE about the environment, and about conducting our business in an environmentally responsible manner



WE CARE about the quality of our work.