Why is Mining like Insurance?

Or, How does a Mining Engineer become a Risk Engineer?

Sydney Branch AusIMM Sept 2025

Mike Arundel, MAusIMM

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Show of hands

- Most claims: Coal vs Metal
- More $$ claims: Surface vs Underground
- More variability: Commodity prices vs Insurance premiums

- Utmost Good Faith vs AS2124/AS4000

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Agenda

- Insurance concepts
- Risk Engineering role with Underwriting
- Loss Estimates definitions
- Risk Quality ratings
- MFL or not MFL?

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Insurance Who's Who

- Insured
- Insurance Broker

- Underwriter
- Risk Engineer
- Claims Manager

- Loss adjuster
- Re-insurer

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Insurance concept

- A Promise to pay

- Uncertainty equivalence: At point of discovery drillhole, will there ever be a mine?
  At the start of the policy, both Insured and Underwriter are uncertain…
  (Why?)

Premium =

- Loss Ratio (direct claim cost) +
- Operating expense +
- Acquisition cost +
- Profit

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Quota Share

	Policy No.	Share	Contact Email	Claim Ref:	Payment on Account (No. 1) AUD 5,000,000 allocated as:
Insurer 1		15%			750,000
Insurer 2		15%			750,000
Insurer 3		11%			550,000
Insurer 4		2.5%			125,000
Insurer 5		10%			500,000
Insurer 6		10%			500,000
Insurer 7		10%			500,000
Insurer 8		15%			750,000
Insurer 9		6.5%			325,000
Insurer10		5%			250,000

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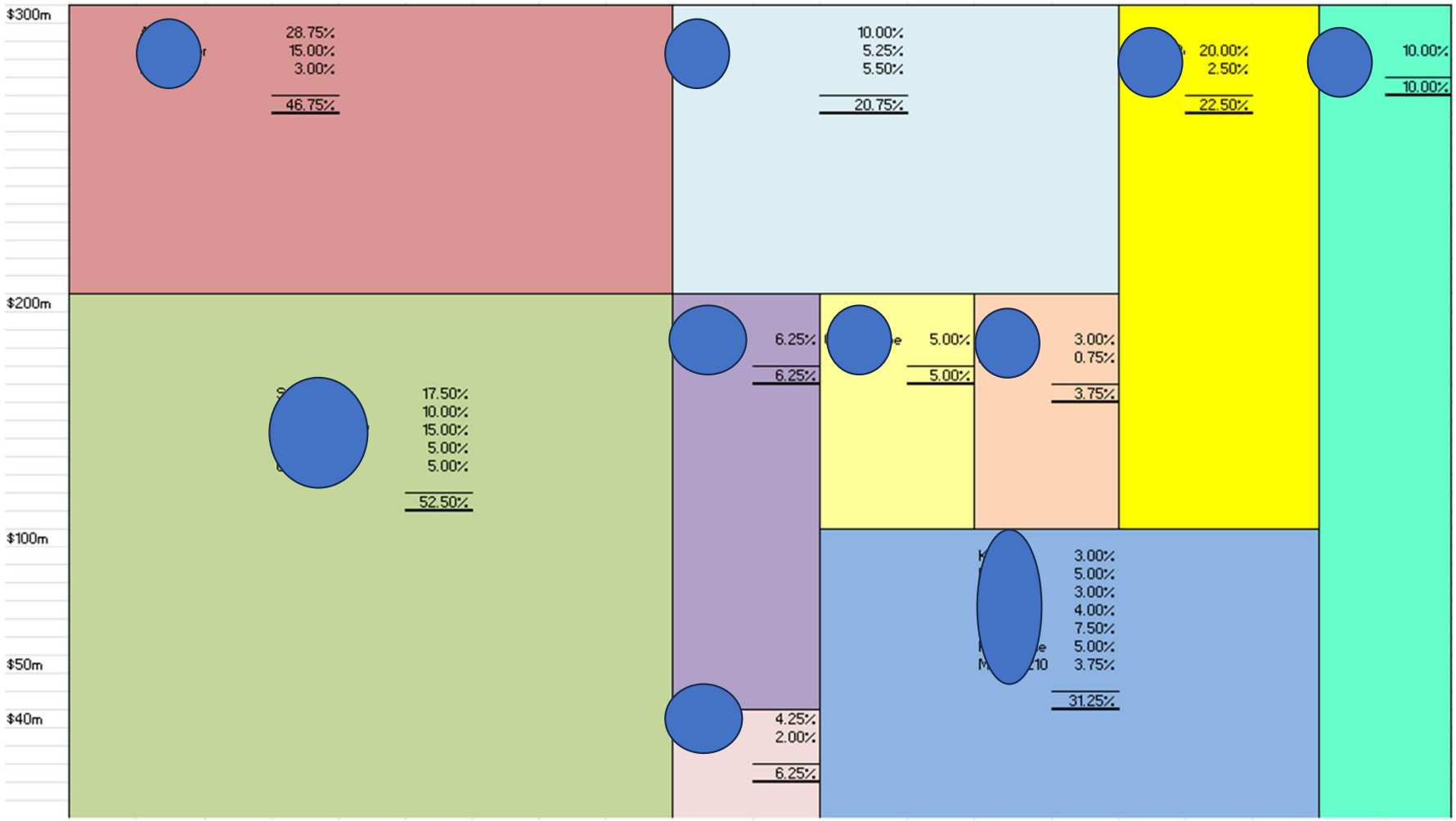
Complex layers **mud map**



Why is Insurance like Mining

- Community perception
- Changing risk exposures
- Input cost rises
  - Re-insurance at 20year highs,
  - repairs costs up 30%-40%
  - taxes and duties (QLD coal royalties??)
  - diesel cost
  - Steel for plant expansions
  - Grey waterfall of talent retirement

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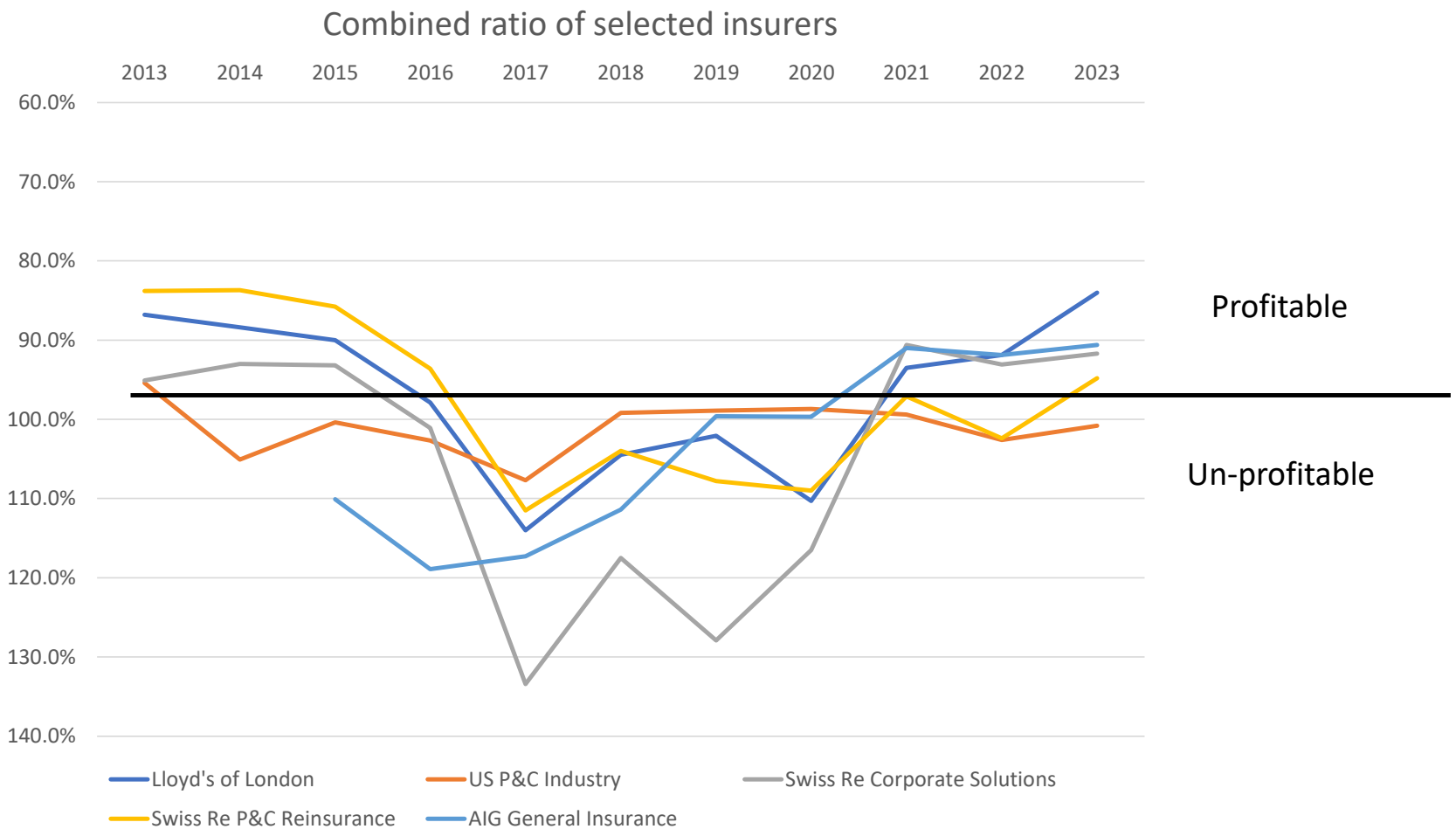
Winning isn’t normal!



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Winning isn’t normal!

Swiss Re. Mining Portfolio Losses - % Breakdown $$ by causation

- 9% Machinery Breakdown
- 14% Tailings
- 15% Fire
- 17% Structural Integrity
- 20% Geotech
- 23% Nat Cat

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What problem are we trying to solve?

WARREN BUFFETT'S UNDERWRITING DISCIPLINES

- Understand all exposures that might cause a policy to incur losses
- Conservatively assess the likelihood of any exposure actually causing a loss and the probable cost if it does
- Set a premium that, on average, will deliver a profit after both prospective loss costs and operating expenses are covered
- Be willing to walk away if the appropriate premium can't be obtained

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Winning Together

BHSI risk engineering team 2x NZ, 12x in Aust – Sydney, Melbourne, Perth

Customer focused

A day in the life of a risk engineer

Last 12 months:

- 12 site Surveys
- Assorted Desktop reviews
- 17 Customer/broker meetings
- 31 CPD activities

Portfolio Analysis

BHSI Australia Mining Portfolio highlights

- 90 policies
- About $40M premium
- Smallest capacity account $4.5M, Largest over $70M
- Total capacity deployed $2.3bn AUD
- Typical line size 15%

- Average UG sublimit to LoL x7
- Average Tails sublimit to LoL x8
- Average Machinery s/l to LoL x4

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Loss data project

- Library of losses
  - Over 900 sites,
  - More than $800Bn USD insured values,
  - Above $5Bn USD of Claims
- Match to TIV, adjust for deductibles and SIR
- Match to program limit
- Sort by Country/Occupancy/inherent risks
- BI is 70% of Claim $$
- 2010 NOT a good year, 2013 also a shocker

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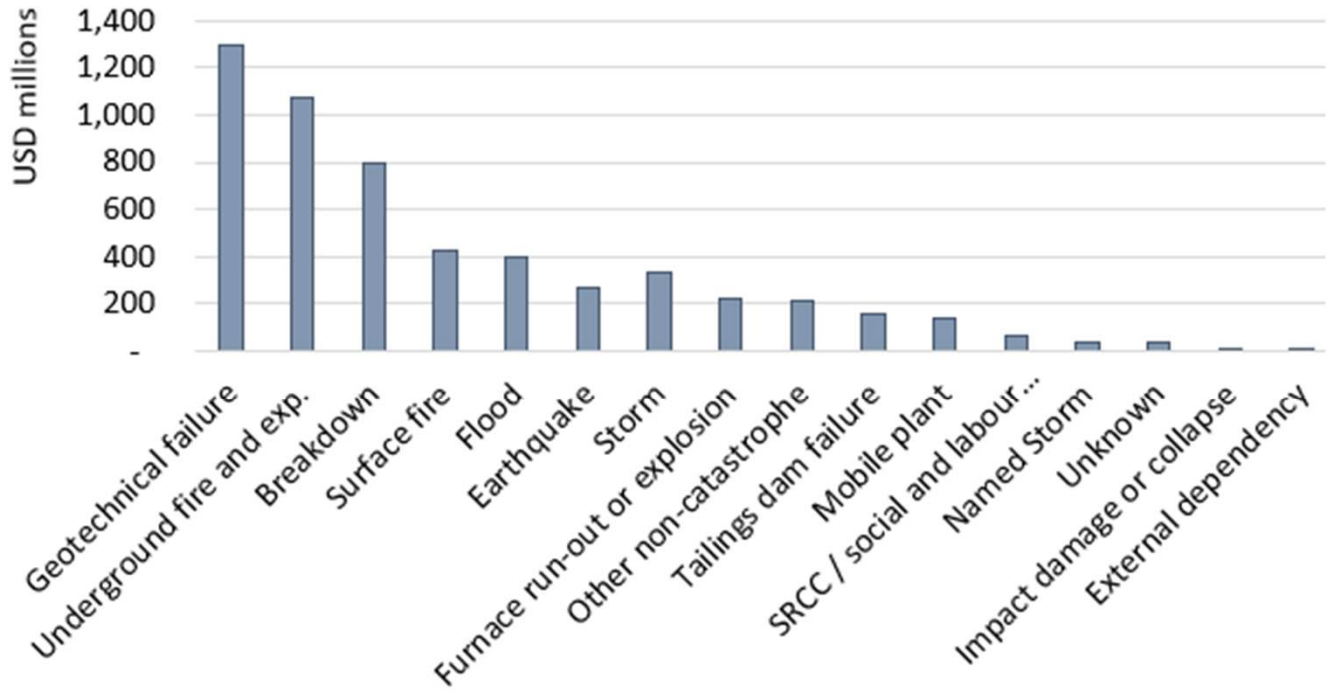
Show of hands recap



Data notes

Geotechnical events (e.g. mine seismicity) are not considered nat. cat. events (i.e. are not coded as earthquake).
Chart and table data are inflated and commodity price-adjusted to July 1, 2020

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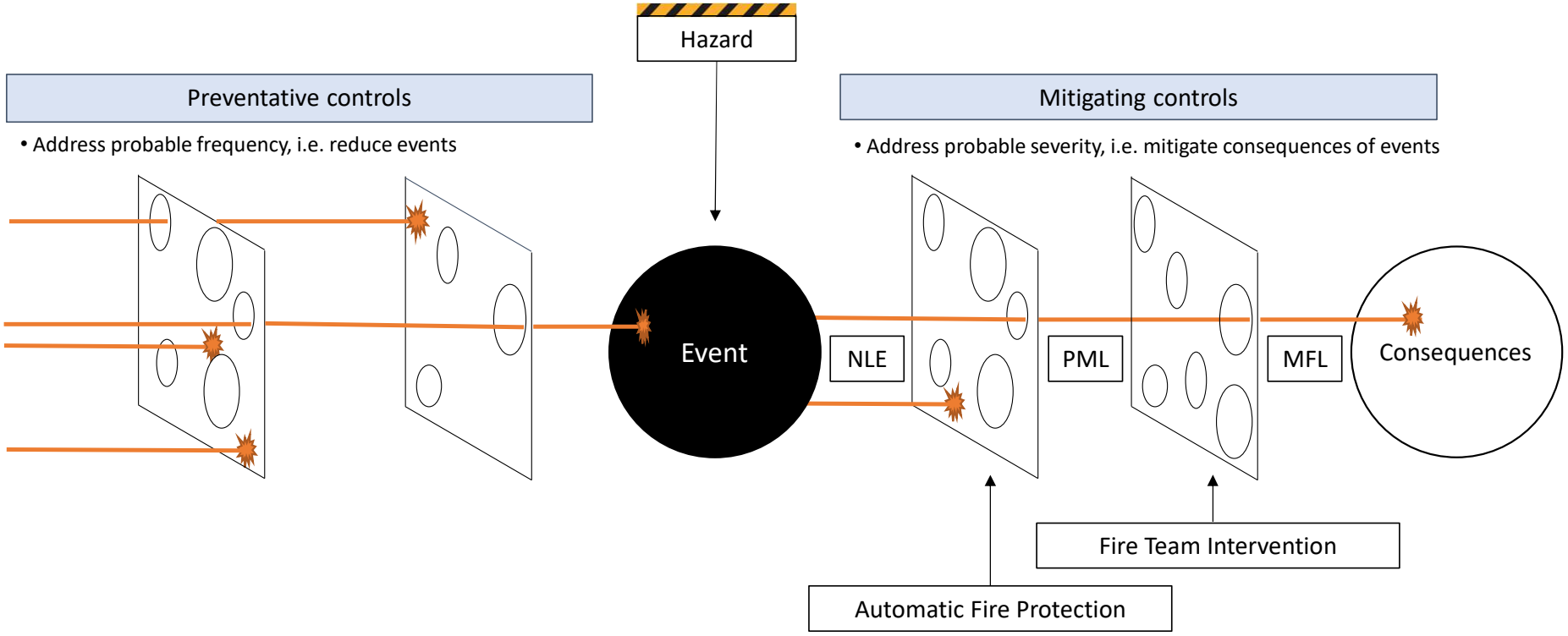
- ISR (Industrial Special Risk) is certainly not a plain English policy!

- Property Insured;
- Extent of Covers;
- Property Exclusions;
- Perils Exclusions;
- And, Write-backs

Bowtie concept

The use of the bowtie concept supports the assessment of whether NLE = PML, and PML = MFL; as the engineer rates the default controls, it becomes apparent whether the controls support a differentiation between NLE, PML and MFL.

For example, for a fire scenario, the scoring of automatic fire protections defines whether NLE = PML, and the scoring of emergency response then defines whether PML = MFL.



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What's a Loss Estimate?

NORMAL LOSS ESTIMATE

The Normal Loss Estimate (NLE) is defined as the largest monetary loss resulting from a single event under normal conditions with all active and passive protection systems operating as-is and fire department responding as planned. Credit for production make-up is given only for well-established Disaster Recovery or Business Continuity Plans.

PROBABLE MAXIMUM LOSS

The Probable Maximum Loss (PML) is defined as the largest monetary loss resulting from a single event under adverse conditions with a major active protection system impaired, but remaining systems operating as is and fire department responding as planned. Credit for production make-up is given only for well-established Disaster Recovery or Business Continuity Plans.

MAXIMUM FORESEEABLE LOSS

The Maximum Foreseeable Loss (MFL) is defined as the largest monetary loss resulting from the most severe event with all active and passive protection systems impaired and no fire department response.

The 5 X 5 Risk Matrix

Australian Risk Appetite

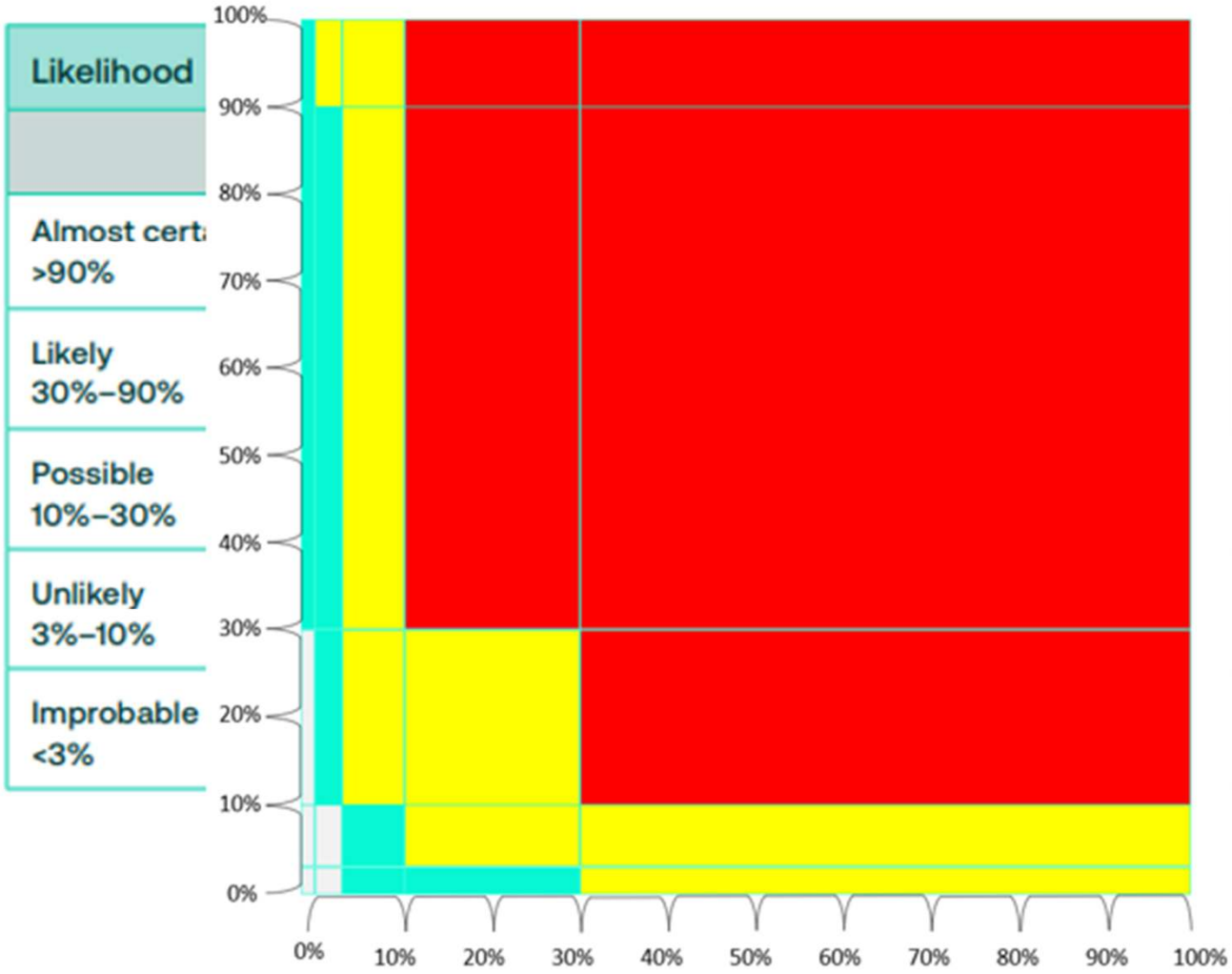
Consequence

Likelihood	Lower than a lizard's	Don't be a sook	She'll be apples	Fair Dinkum	Rooted
Dead Set	She'll be right	She'll be right	She'll be right	Faaark	Faaark
Nah Yeah	She'll be right	She'll be right	She'll be right	She'll be right	Faaark
Yeah	She'll be right	She'll be right	She'll be right	She'll be right	She'll be right
Yeah Nah	She'll be right	She'll be right	She'll be right	She'll be right	She'll be right
Nah	She'll be right	She'll be right	She'll be right	She'll be right	She'll be right

by Eric Pinkerton on Twitter

@ericpink

The risk ranking process revisited



High	Major
23 (High)	25 (High)
21 (High)	24 (High)
18 (Significant)	22 (High)
14 (Significant)	19 (Significant)
10 (Medium)	15 (Significant)

With thanks to Peter Standish, RiskMentor

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Winning isn't normal!

Old way of insurance risk assessing:

COPE
Construction
Occupancy
Protection
Exposures

(Good for tarriff books – fixed rates, broker/underwriter relationship is key.

A better way:

Who's on the team?
Have they done it before?
Can they do it again this time with everyone making a buck on the way?

Opportunity to think about Accumulations, Supply Chain risks, sub-limits, Property and/or Perils Exclusions in the ISR wording.

Inherent risk vs Managed risk

COPE review – the old way

Construction risk assessments are a whole topic in themselves!

COPE review – Materials of Construction

Please – no more EPS switchrooms!

COPE review – Occupancies like SXEW

Oct 2001 (2nd fire) event shown here. Fuel consumed in 36 hours – 1,000m3 kerosene.

9 months BI

And don't forget the shaft loss at OD: https://www.bhp.com/news/media-centre/releases/2009/10/olympic-dam---update

COPE review – Occupancy incl Tailings

https://thenarwhal.ca/mount-polley-mine-expert-recommendations-not-implemented-report/

Image supplied by Newcrest

Photo of the Northern and Southern (forefront) Tailings Dams at Cadia

COPE Review - Protection

Image supplied by Atlantic Ltd

Hot Work fire (AGAIN!!)

Despite an active ERT response, still a major loss.

PD was 10% of sums insured
BI first estimate 9 months, but during time of loss iron by-products no longer profitable
Plant had never reached nameplate
BI cover was standing charges with unusual drafting so standing charges increased during loss.

FM Global report that 27% of Claims on mines are fire, and Hot Work is 50% of Fire losses.

Audience participation: MFL or not MFL?

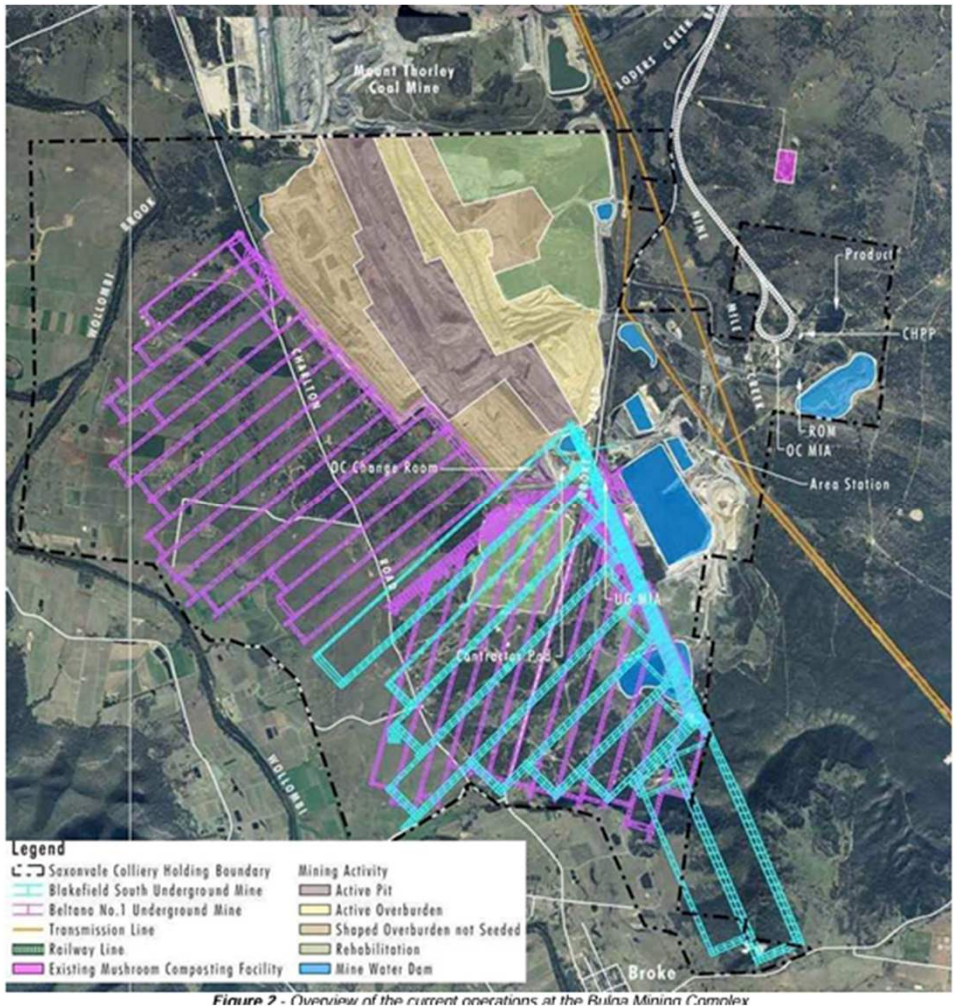

Figure 2 - Overview of the current operations at the Bulga Mining Complex

Investigation Report

Fire and explosion on Longwall No 1 Tailgate at the Blakefield South Mine 5 January 2011

Bulga Underground Operations was working a seam at Blakefield South Mine that was completely new to them.

Bulga Underground Operations has not invoked a Level 1 response for Blakefield South Mine in accordance with the SCMP… June, Oct. and Nov. surveys [..] identified …
…the Level 1 TARP had been exceeded.

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Audience participation: MFL or not MFL?

Photos of Dragline at Mosaic's mine in FL, now on Mining Mayhem

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Audience participation: MFL or not MFL?

https://www.abc.net.au/news/rural/2011-11-11/department-wont-relax-mine-water-regulations/6175640

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MFL or not MFL?

- Reported as $350M expenditure + significant management time
  - Ensham's Energy Efficient Opportunities Public Report
- 12 month BI, town of Emerald also suffered flood damage – loss of accom for recovery crews

- FOI application by Lead insurer for information between site and Mines Dept regarding levees
- Claim denied on basis of non-disclosure, concerns about cover of Levees as unisured assets
  - NB link between what is damage, what perils are covered

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Audience participation: MFL or not MFL?

Photos found on facebook, credited to John Thompson

MFL or not MFL?

An interesting claim when the 1st slump happened 26th Oct, with a policy renewal date of 31st October.
Wall failed mid-Nov.

Which policy year?
(some difference to the panel of insurers)

https://www.mtgibsoniron.com.au/wp-content/uploads/11-11-2015-2015-Annual-General-Meeting-CEO-presentation.pdf

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It’s all about the Cat!

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It’s all about the Cat!

ICA Historical Catastrophe List

July 2025

CAT Nan	Event Name	Financial Year	State	Type	Year	ORIGINAL LOSS VALUE	NORMALISED LOSS VALUE (2022)
CAT995	Eastern Sydney Hailstorm	FY98	NSW	Hail	1999	$ 1,700,000,000	$ 8,845,700,000
CAT746	Cyclone TRACEY	FY74	NT	Cyclone	1974	$ 200,000,000	$ 7,397,400,000
CAT894	Newcastle CDB Earthquake	FY89	NSW	Earthquake	1989	$ 862,000,000	$ 6,542,200,000
CAT221	SE Queensland and NSW Floods	FY21	NSW and SEQ	Flood	2022	$ 6,375,616,815	$ 6,375,616,815
CAT671	Cyclone DINAH	FY66	FNQ	Cyclone	1967	$ 33,500,000	$ 6,189,500,000
CAT741	Brisbane Floods	FY73	SEQ	Flood	1974	$ 68,000,000	$ 5,258,600,000
CAT672	Bushfire	FY66		Bushfire	1967	$ 40,000,000	$ 4,103,600,000
CAT852	Brisbane Hail Storm	FY84	QLD	Hail	1985	$ 180,000,000	$ 3,745,900,000
CAT073	East Coast Low	FY06	NSW	Storm	2007	$ 1,480,000,000	$ 3,394,600,000
Undeclared	Cyclone ELAINE	FY66	SEQ	Cyclone	1967	$ 12,000,000	$ 2,744,400,000
CAT904	Northern Sydney Hailstorm	FY89	NSW	Hail	1990	$ 319,000,000	$ 2,720,200,000
CAT832A	Ash Wednesday Bushfire (VIC)	FY82	VIC	Bushfire	1983	$ 138,000,000	$ 2,707,000,000
CAT093	Black Saturday Bushfire	FY08	SA	Bushfire	2009	$ 1,070,000,000	$ 2,567,100,000
CAT102	Melbourne Storm	FY09	VIC	Storm	2010	$ 1,044,000,000	$ 2,536,300,000
CAT112A	Brisbane Flooding	FY10	SEQ	Flood	2011	$ 1,356,000,000	$ 2,450,400,000
CAT144	Brisbane Hailstorm	FY14	SEQ	Hail	2014	$ 1,391,556,200	$ 2,430,500,000
CAT195	2019/20 Bushfires (NSW,QLD,SA,VIC)	FY19	SEQ	Bushfire	2019	$ 2,319,164,486	$ 2,405,400,000
CAT173	Cyclone Debbie	FY16	FNQ	Cyclone	2017	$ 1,774,598,765	$ 2,348,300,000
CAT673	SEQ Hailstorm	FY66	SEQ	Hail	1967	$ 18,000,000	$ 2,242,400,000
CAT731	Cyclone MADGE	FY72	FNQ	Cyclone	1973	$ 30,000,000	$ 2,126,800,000
CAT114	Cylone Yasi	FY10	FNQ	Cyclone	2011	$ 1,412,239,000	$ 2,100,700,000
CAT201	January Hailstorms	FY19	SEQ	Hail	2020	$ 1,681,889,372	$ 2,025,300,000
CAT185	NSW Hailstorm	FY18		Hail	2018	$ 1,357,939,813	$ 1,743,900,000
CAT103	Perth Storm	FY09		Storm	2010	$ 1,053,000,000	$ 1,726,100,000
CAT911	Sydney Region Storms	FY90		Storm	1991	$ 215,400,000	$ 1,708,400,000
CAT153	East Coast Low	FY14		Storm	2015	$ 949,615,700	$ 1,662,500,000
CAT233	Christmas Storms	FY23		Flood	2023	$ 1,607,357,649	$ 1,607,357,649
CAT133	QLD Flooding Ex Cyclone Oswald	FY12	FNQ	Cyclone	2013	$ 987,000,000	$ 1,581,300,000
CAT191	FNQ Monsoonal Flood	FY18	FNQ	Flood	2019	$ 1,267,963,959	$ 1,563,500,000
CAT118	Melbourne Xmas Day Hailstorm	FY11		Hail	2011	$ 728,640,000	$ 1,561,000,000
CAT252	Ex-Tropical Cyclone Alfred	FY24	NSW, QLD	Flood	2025	$ 1,401,614,221	$ 1,401,614,221
CAT864	Western Sydney Hails Event	FY86		Hail	1986	$ 104,000,000	$ 1,315,300,000
CAT032	Canberra Bushfire	FY02		Bushfire	2003	$ 350,000,000	$ 1,272,000,000

https://insurancecouncil.com.au/wp-content/uploads/2025/08/ICA-Historical-Normalised-Catastrophe-Master-Updated-July-2025-1.xlsx

Maitland floods – quite often

Figure 1: A schematic of the Hunter Valley coal chain (HVCC), showing rail track and the locations of mines and coal loading facilities

https://www.facebook.com/share/p/19PNnMz1uW/

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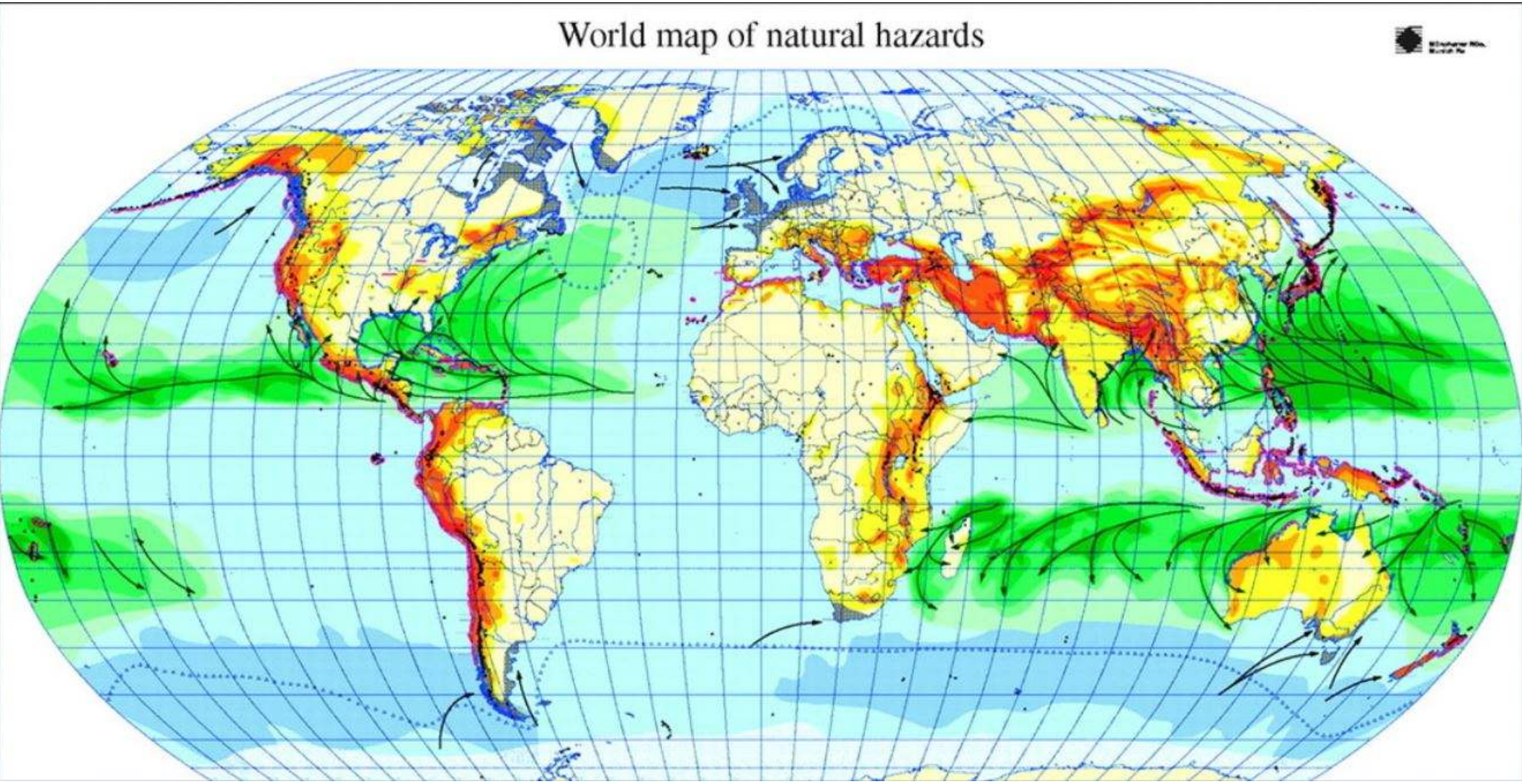
QLD coal logistics

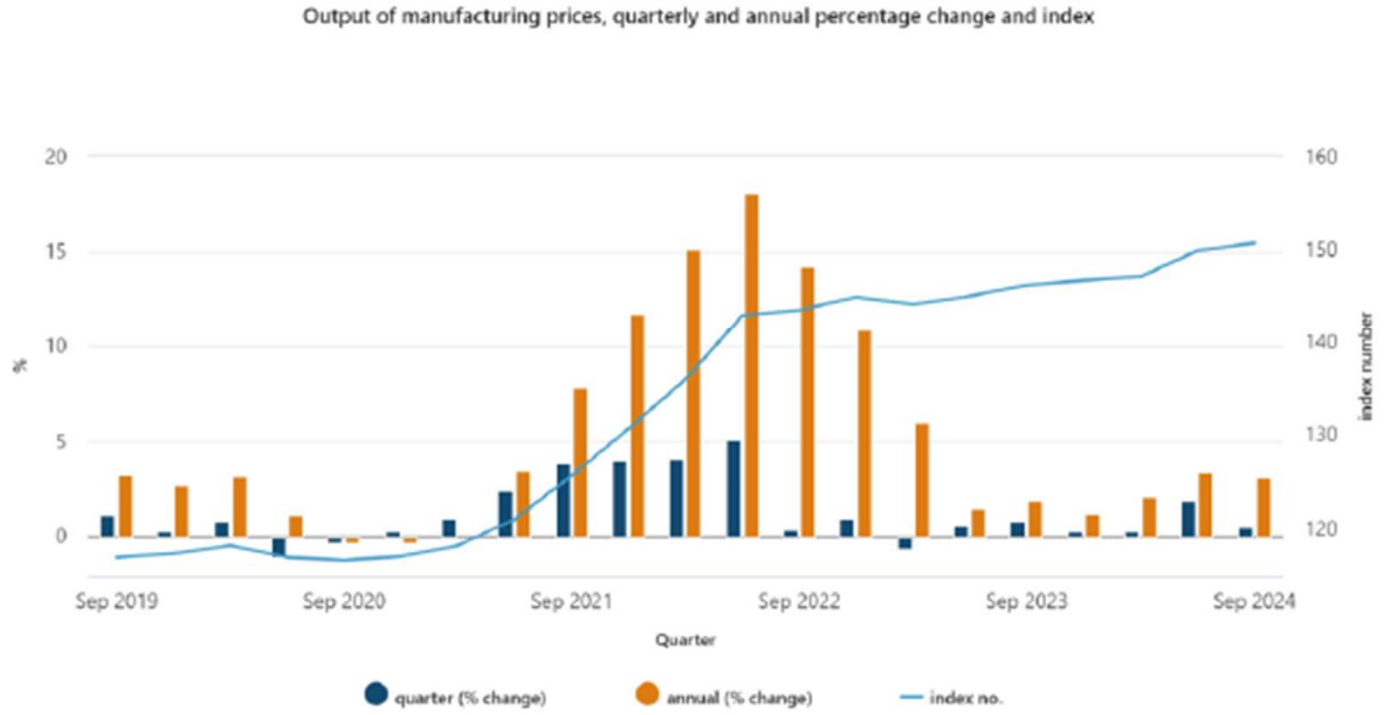
	Normal rail route to Port	Options	BI share (examples only)
Mine A	Goonyella corridor, via Black Mountain to Hay Point	Yes - Reverse in loop, go north through Collinsville to Abbot Point. (too far north to go to Gladstone)	15%
Mine C	Goonyella corridor, via Black Mountain to Hay Point	Yes - Use triangle at Moranbah to access Abbot point via Collinsville. Probably impractical to go to Gladstone.	20%
Mine E	Goonyella corridor, via Black Mountain to Hay Point	Yes - Use Coppabella triangle to access Abbot point through Collinsville.	5%
Mine G	Goonyella corridor, via Black Mountain to Hay Point	Partial - Reverse in loop then south to Gladstone	15%
Mine I	Goonyella corridor, via Black Mountain to Hay Point	Yes - Reverse in loop then south to Gladstone (trains can use German Creek mine with 2way loop points).	30%
Mine K	Via Rockhampton to Gladstone ports	No	5%



https://www.munichre.com/en/insights/natural-disaster-and-climate-change/50-years-natcat.item-16ab4064b532a6d70ae3b9fd839645c4.html

Claim cost increases

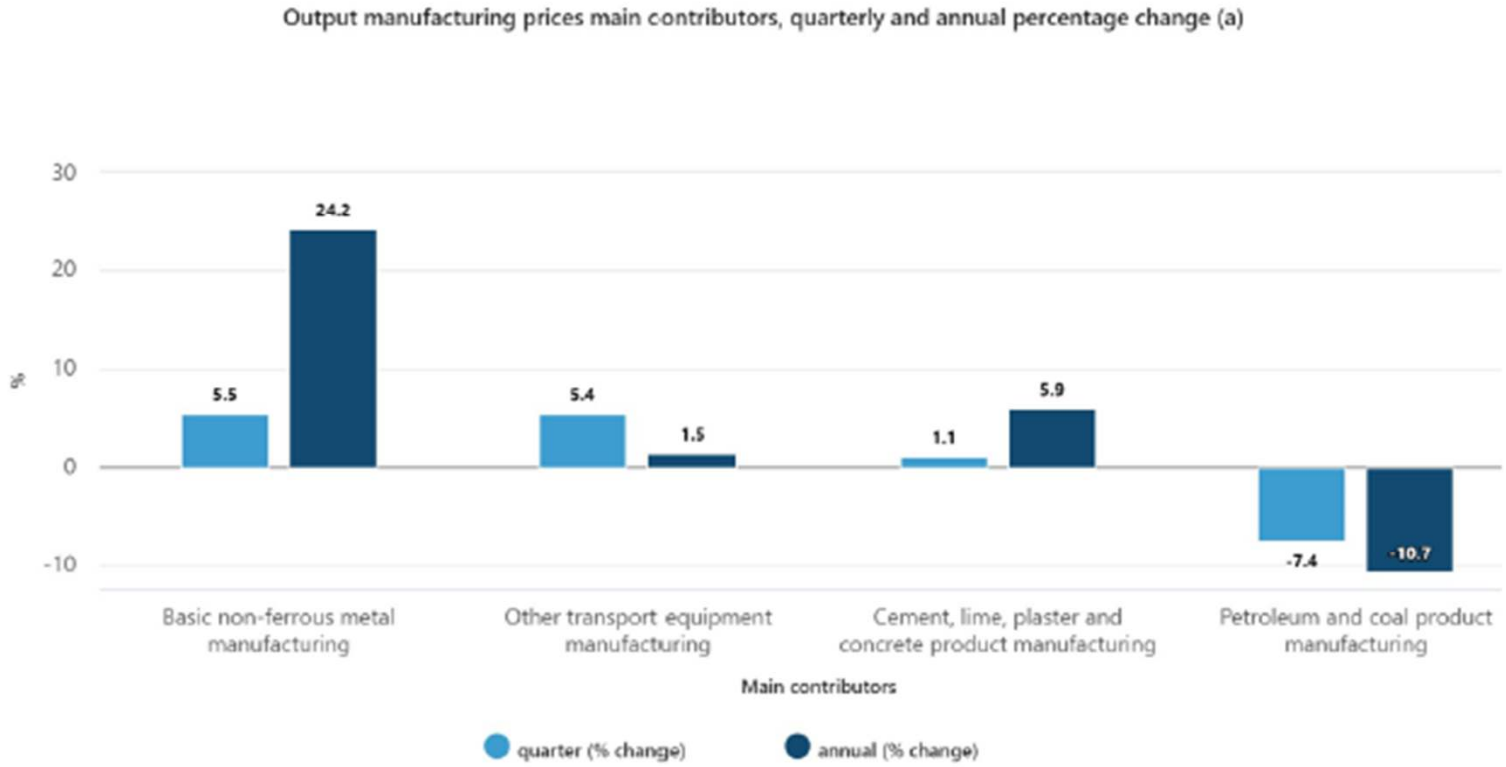
- Output Manufacturing prices rose .5% over the Sept Qtr. and 3.1% over the past 12 months.



Source: Australian Bureau of Statistics, Producer Price Indexes, Australia September 2024

Claim cost increases

- Main Contributors to index price changes:



a. Main contributors are ordered by quarterly contribution to index movement

Source: Australian Bureau of Statistics, Producer Price Indexes, Australia September 2024

Audience participation: MFL or not MFL?

Could be an MFL for Plant and Equipment policy

Audience participation: MFL or not MFL?

Tarmoola pit slide in 2004, bought by Sons of Gwalia (acquired Pacmin in 2001).
Hedge book + major pit slide = Unhappy combination

Mine is running again (Vault Minerals)

Top Photo on Flikr by Stuart Smith
https://www.flickr.com/photos/studiaphotos/49666937237

Mobile plant go-lines: MFL or not MFL?

11 bays with tyre separators – TBC Cat789 or Komatsu 830??

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Better arrangement for Go-lines

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Workshop accumulations

https://www.mineralresources.com.au/news/onslow-irons-road-most-travelled

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Capability and Character

What does the mining company we want to insure look like?

- Inward focus for daily priorities;
- Outward focus for big ticket risks (showstoppers);
- Learning from others;
- Not afraid to hear bad news, and alert for changes from the current situation;
- Thinking ahead so not fighting fires day to day;
- Responding to risk recommendations.

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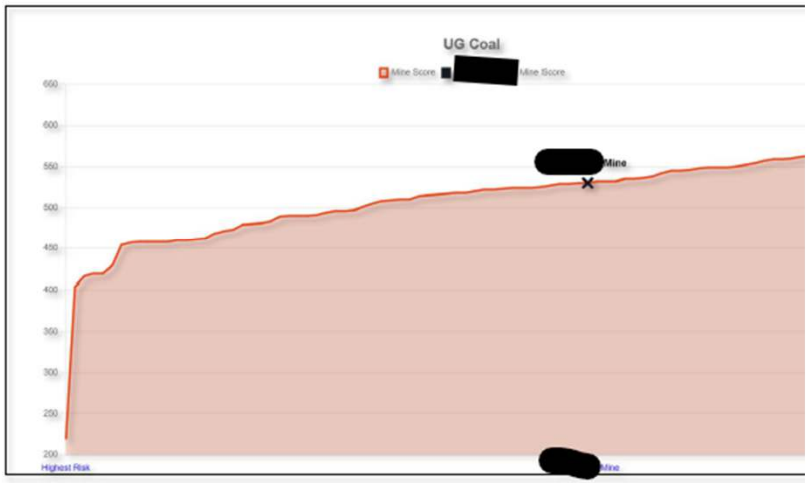
Simplicity over Complexity

1.6 Comparative Scores (Between other sites - within its sector)



See Section 2.1 for details of comparison calculations

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Winning isn't normal

- Who's on the team?
- Have they done it before?
- Is the deal fair to all parties?
- Can you give examples of things going wrong?
- What are you changing/improving at site (and why?)

Because:

- Its People are who will shortcut procedures
- Its People are who will defeat interlocks
- Its People are who will ignore alarms

Housekeeping standards

At least one of these conveyors shows signs that (some) regular cleaning is happening

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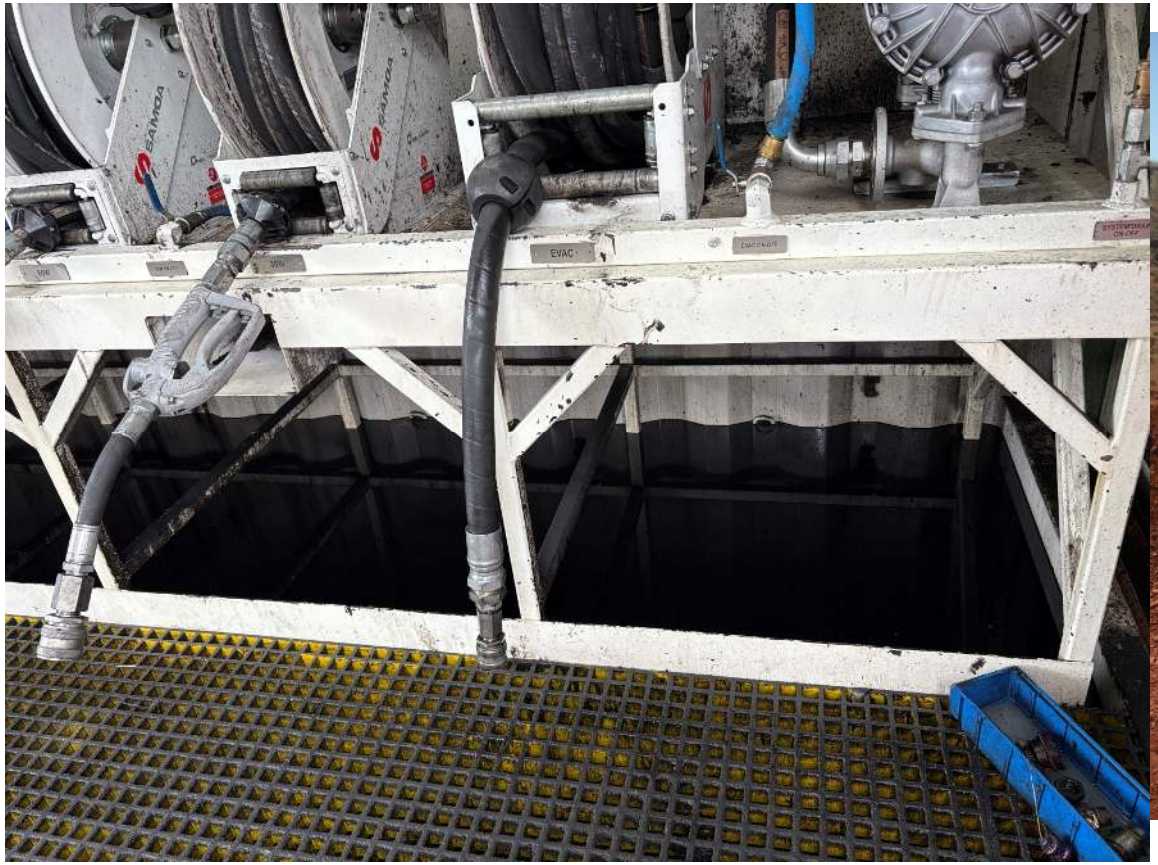
Housekeeping standards



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One example of production pressures vs Safety

- Putting this another way, the mine management was constantly being held accountable for the production, via monthly performance reviews and by the system of remuneration, but there was no corresponding mechanism holding management accountable for how well it was managing [the] risk
- What seems to have happened is […] the advice of the technical expert in Brisbane was overridden by the mine's management, in order to maintain the production schedule.
- Grosvenor had five different ventilation officers in the 19 months prior to the accident. My inquiries indicate that appointees soon realised they didn't have the resources and influence to enable them to do job, and so, resigned.
- https://www.parliament.qld.gov.au/Work-of-Committees/Committees/Committee-Details?cid=173&id=4194

Audience participation: MFL or not MFL?

The mine was new and the owner, Pike River Coal Ltd (Pike), had not completed the systems and infrastructure necessary to safely produce coal.

The drive for coal production before the mine was ready created the circumstances within which the tragedy occurred.

https://pikeriver.royalcommission.govt.nz/Volume-One---Overview

MFL or not MFL?

Pike River claim settled

19 September 2011

A consortium of European insurance companies has agreed to pay out $NZ80 million ($64.32 million) to the receivers of the Pike River Coal company.

The sum falls short of the capped NZ$100 million ($80.4 million) insurance held by Pike River Coal and covers the damages and interruption of business caused by fatal explosions at the New Zealand mine in November 2010.

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Winning isn’t normal

- Mining has volatility
  - Don’t let the Reinsurer tail wag the dog
- Needs deep knowledge of the industry, markets, and personalities
- Don’t forget history of the pits/industry
- Change is a constant (and not necessarily a risk)
- Underwriter must be able to demonstrate the value an insurer brings

Closing remarks

Don Alhambra The end is easily foretold,
When every blessed thing you hold
Is made of silver, or of gold,
You long for simple pewter.
When you have nothing else to wear
But cloth of gold and satins rare,
For cloth of gold you cease to care —
Up goes the price of shoddy.
In short, whoever you may be,
To this conclusion you'll agree,
When every one is somebodee,
Then no one's anybody!

W.S. Gilbert The Gondoliers; or, The King of Barataria


BEING WANTED AND BEING NEEDED
RESPECT
SIMPLICITY OVER COMPLEXITY
CUSTOMER FOCUSED
INTEGRITY
A FOREVER BUSINESS
HAVE A SENSE OF URGENCY, DON'T BE IN A RUSH
PITCHING AND CATCHING
EXCELLENCE
CAPABILITIES AND CHARACTER
BHSI
WINNING TOGETHER
POSITIVE INTENT
PASSION
WINNING ISN'T NORMAL
LONG TERM FOCUSED
COLLABORATION
INDIVIDUAL EXCELLENCE IN A TEAM FRAMEWORK
A POWERFUL PLATFORM DRIVEN BY EXCEPTIONAL PEOPLE
GOING WIDE AND GOING DEEP