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## *Safety and Health*

*for Africa – from  
Africa*

***Risk management and OHS –  
The Importance of Human Factors***

# Outline

- Context
- What is Risk Management
- Key issues / decisions in risk management
- The hierarchy of controls?
- People are fallible
- Error in complex organisations
- How are major risks addressed?
- What options?



# Context

## Our mineral wealth –reserve rank

- Chrome ore (1st)
- Platinum group metals (1st)
- Vanadium(1st)
- Vermiculite (1st)
- Gold (2nd)
- Manganese ore (2nd)
- Titanium minerals (2<sup>nd</sup>)
- Fluorspar (4th)
- Coal (5th),
- Diamonds (5th)

*Unsafe working conditions, if unchecked lead to tremendous human suffering -DME*

*They (mining companies) should not and cannot put profits before human lives. We expect CEOs of mining companies to take personal charge and responsibility with regard to safety in their operations.” Minister Bulyewa Sonjica (2008)*

*State shuts AngloGold Ashanti mine after workers die*

*Baptism of fire for new Gold Fields CEO*

*Bodies of illegal miners brought to surface*

*Platinum mines vow to improve safety*

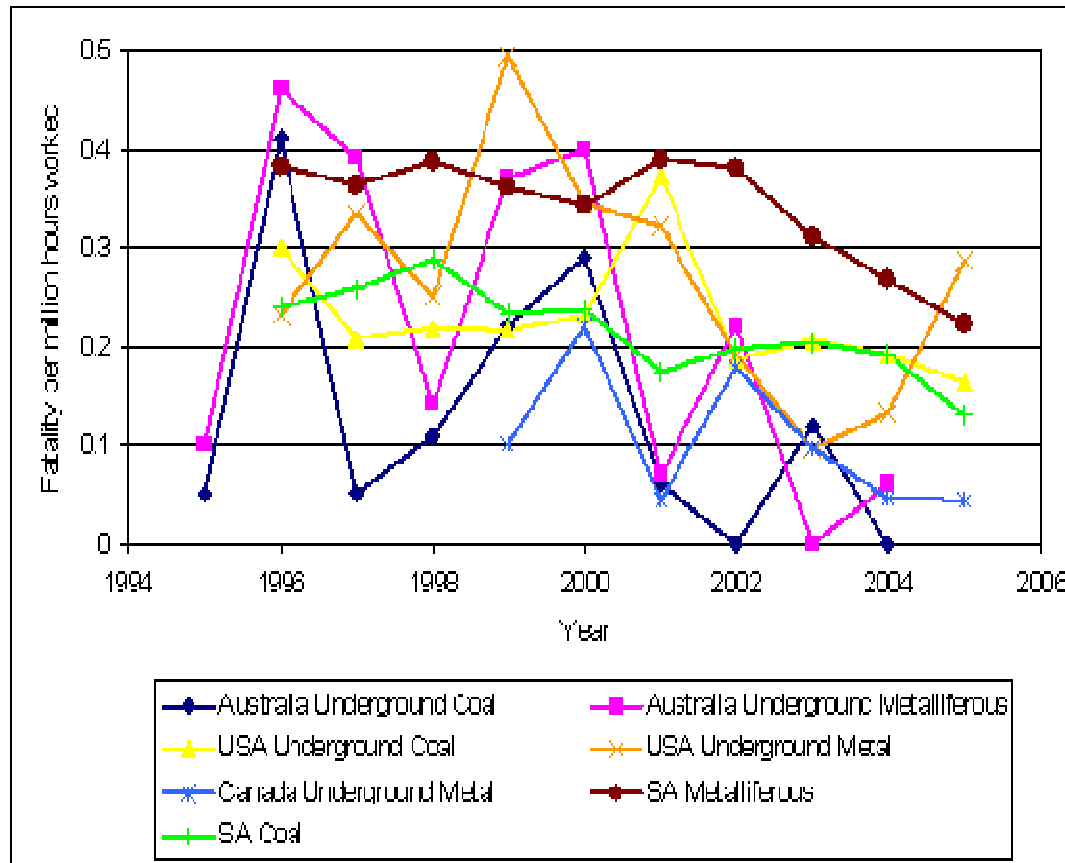
**ZERO HARM**  
**Safety is our first value**

# Context

- Roben's Report (1972) criticised:
  - Safety and physical condition bias
  - Absence of provision for OHS
  - Prescriptive legislation
  - Reactive approaches
- Mine Health and Safety Act (1996)
  - Primary responsibility with employer
  - RM approach to OHS mandatory
  - Worker rights (info, participate, training, withdrawal from hazardous workplaces)

# Context

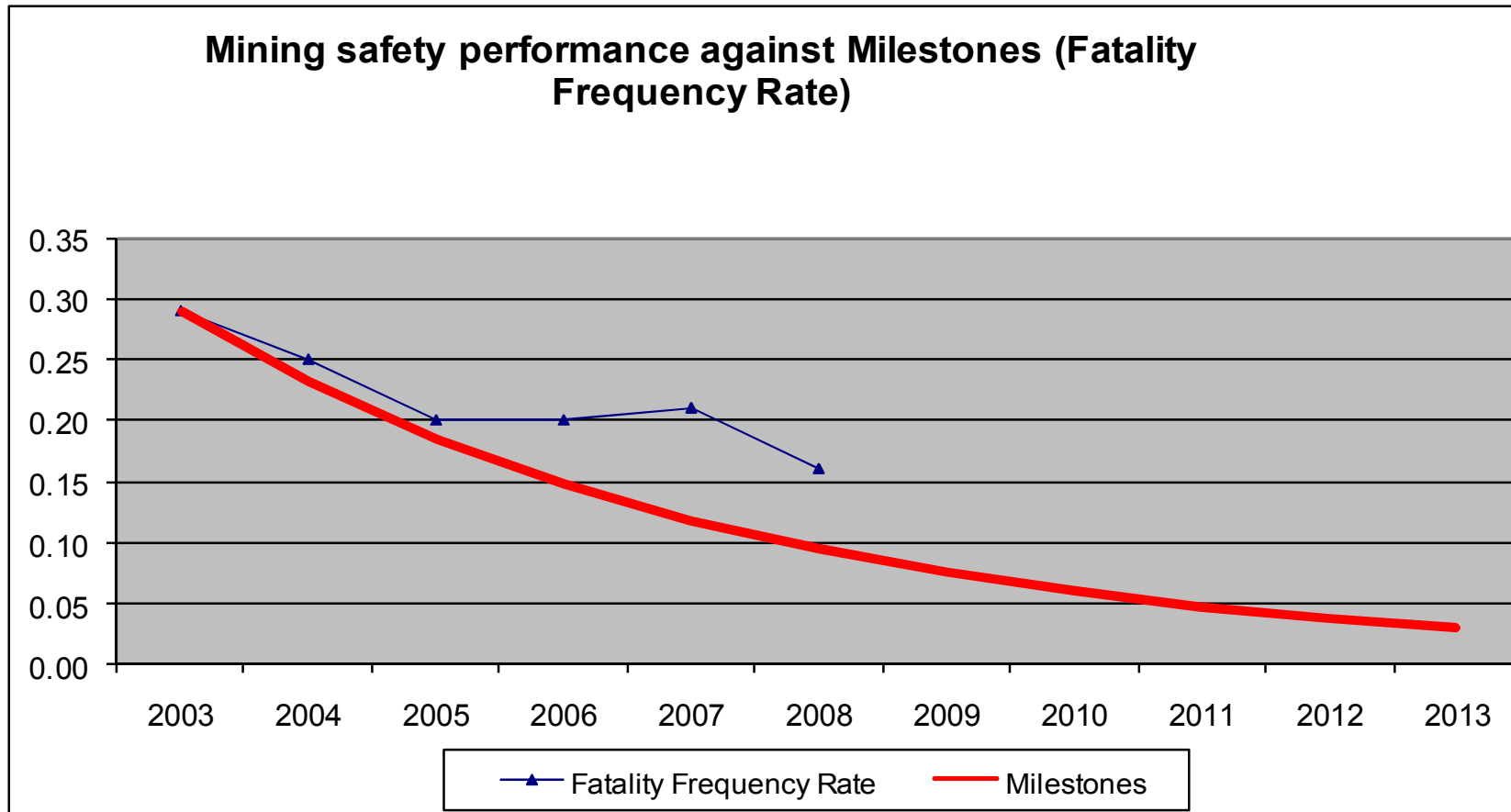
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- 6,43 % miners over exposed to airborne pollutants
- Noise (3.88 per 1000)
- Silicosis (4.2 per 1000)
- TB (PTB, 4500 in 2007, STB 520 in 2007)
- HIV

Source: DME

# Context

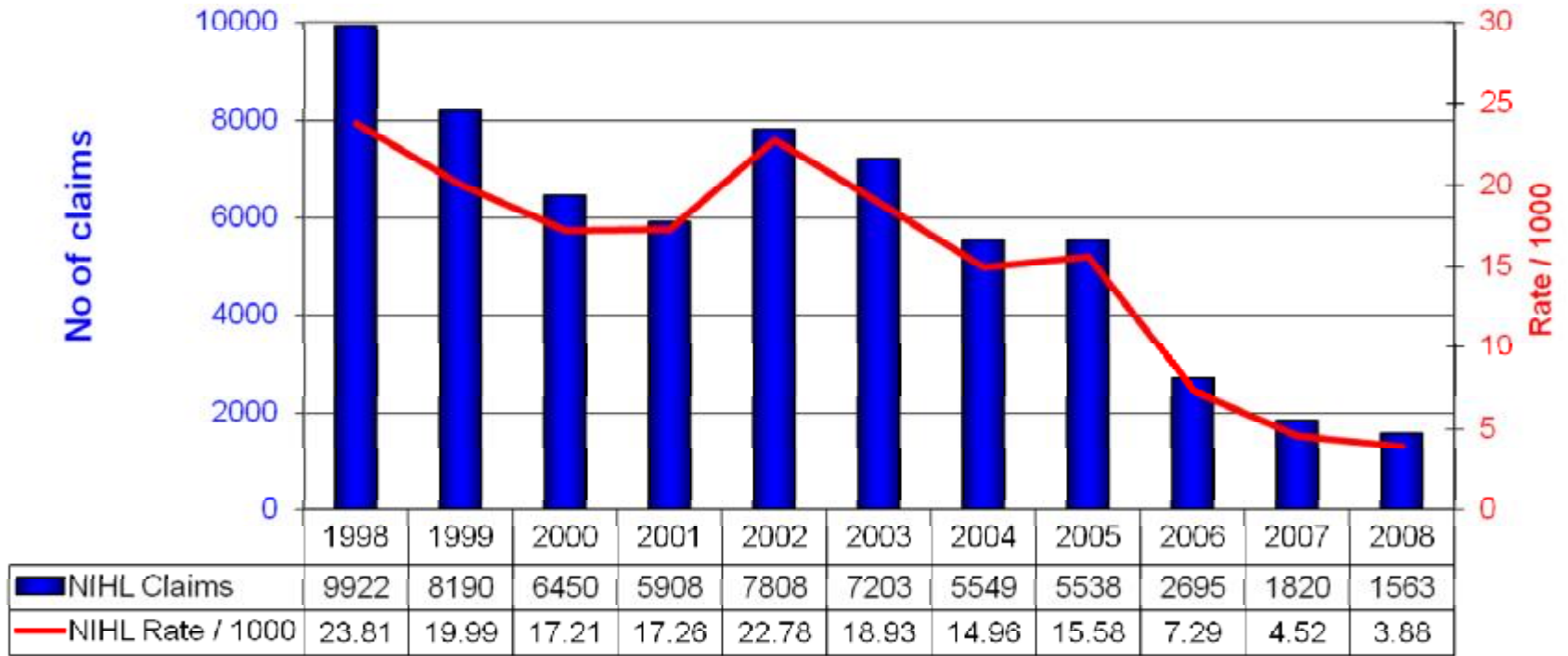


Source: COM

# Context



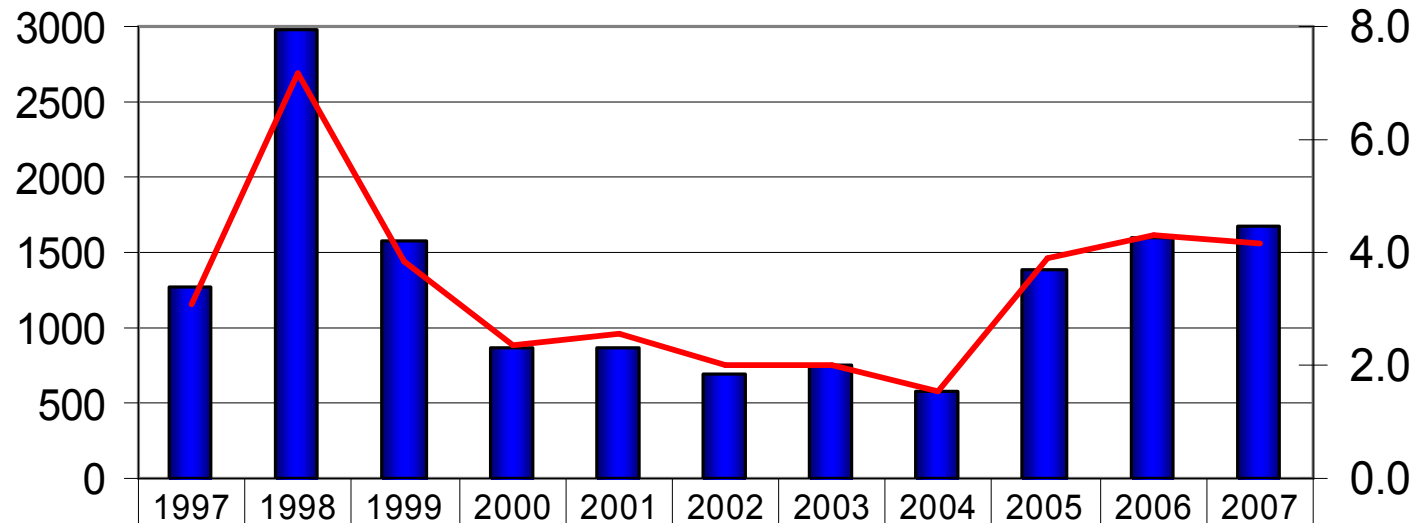
### Noise Induced Hearing Loss All Commodities





■ NIHL Claims    — NIHL Rate / 1000

# Context

### Silicosis cases all commodities



 Silicosis cases new	1273	2990	1578	875	875	683	754	572	1392	1597	1673
 Silicosis rate / 1000	3.1	7.2	3.9	2.3	2.6	2.0	2.0	1.5	3.9	4.3	4.2

 Silicosis cases new  Silicosis rate / 1000



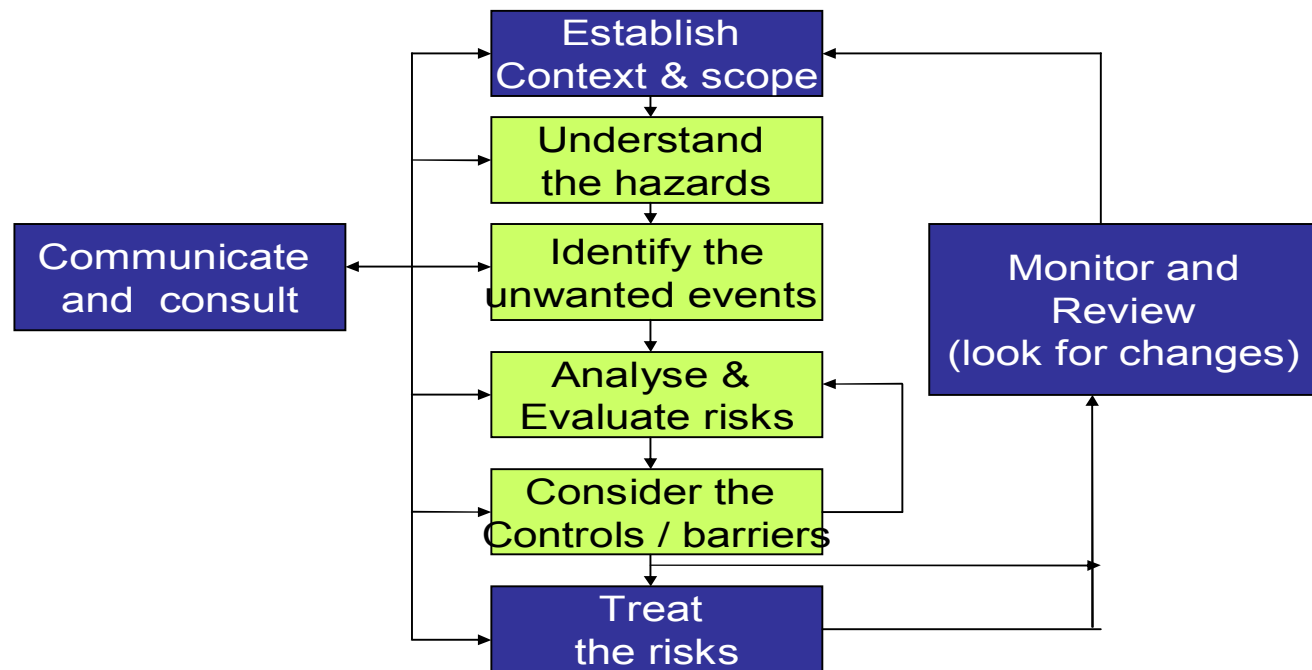
# What is Risk Management?

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- **R = f (likelihood x consequence)**
  - **Anticipatory**
  - An Art and Science
  - Based on logic and engineering
  - Determines: How likely? How serious?
- and*
- Stakeholder, societal, employee expectations
  - Technology available
  - Workplace culture
  - Acceptance and confidence in value of Risk Management

# Risk Management Process

## Minerals Industry Risk Management Process (modified version of AS4360:2004)



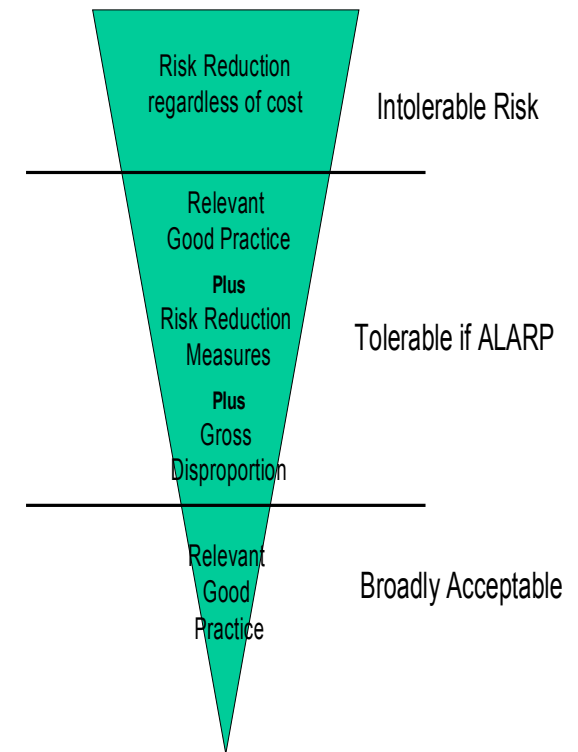
**Update the RA guideline of 2001!**

# What can we tolerate?

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- *The higher the level of inherent risk, the greater the need to demonstrate that the controls are effective for achieving ALARP.*
- *There is limited suitable data for calculating whether a mine worker's risk related to a specific hazard or event is 1 in 1,000 or 1 in 10,000. This makes establishment of ALARP by quantitative risk analysis methods difficult.*
- *Alternatives are to estimate risk with controls in place using semi-quantitative methods or establish that controls provide effective levels of risk reduction.*

**HEALTH AND SAFETY EXECUTIVE (HSE), UK**



Source: HSE

# What is tolerable?

		Negligible	Marginal	Critical	Catastrophic
Probability Range ↑	Certain				
	Likely				
	Possible				
	Unlikely				
	Rare				
	Consequence Range →				

# Hierarchy of Controls

2009  
-  
2012

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Elimination

Substitution

Engineering

Administrative

PPE

Most effective

Least effective

***More rigorous application needed !!!***

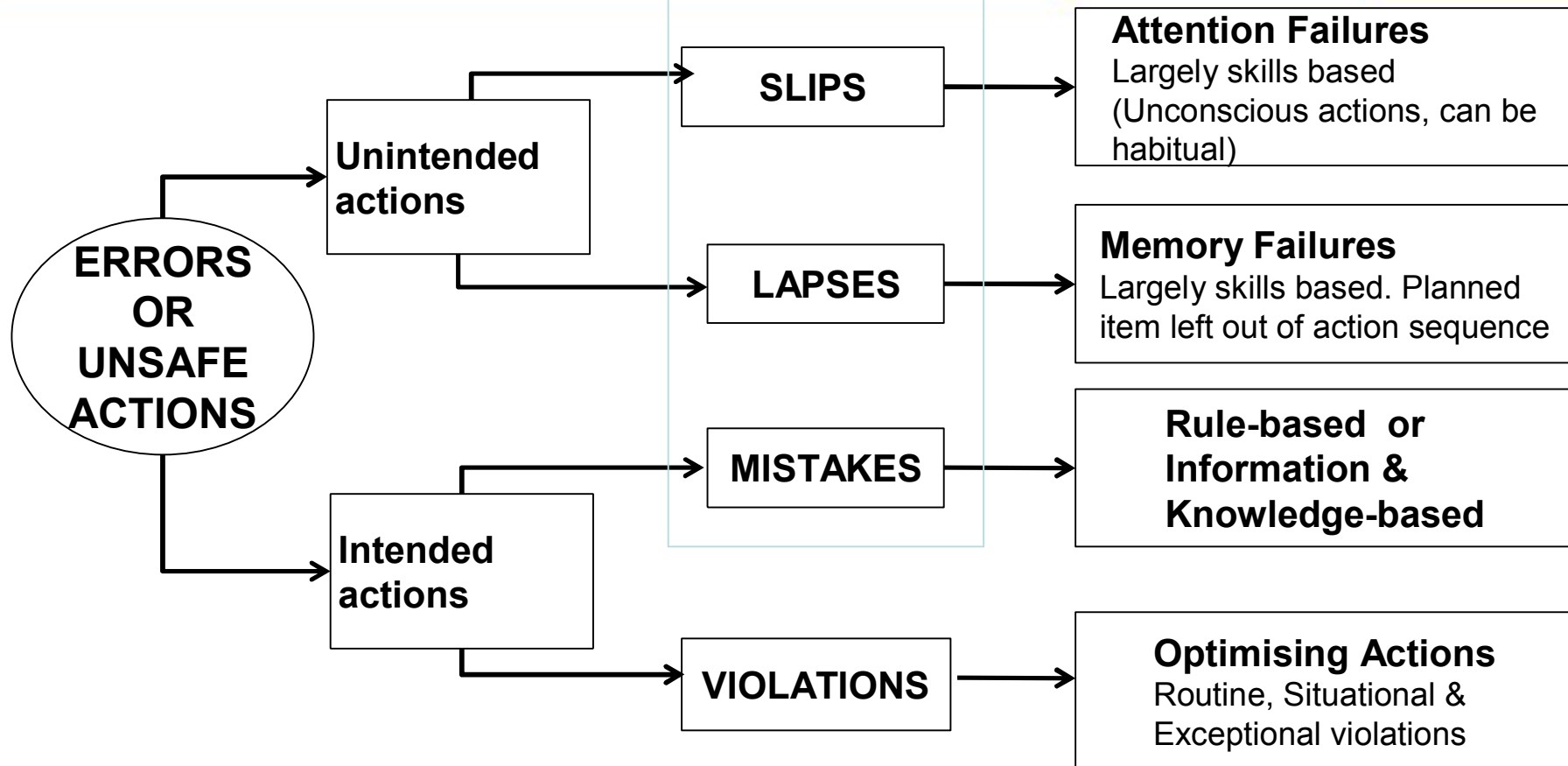
# People Are Fallible

Basic Error Types

2009

2012

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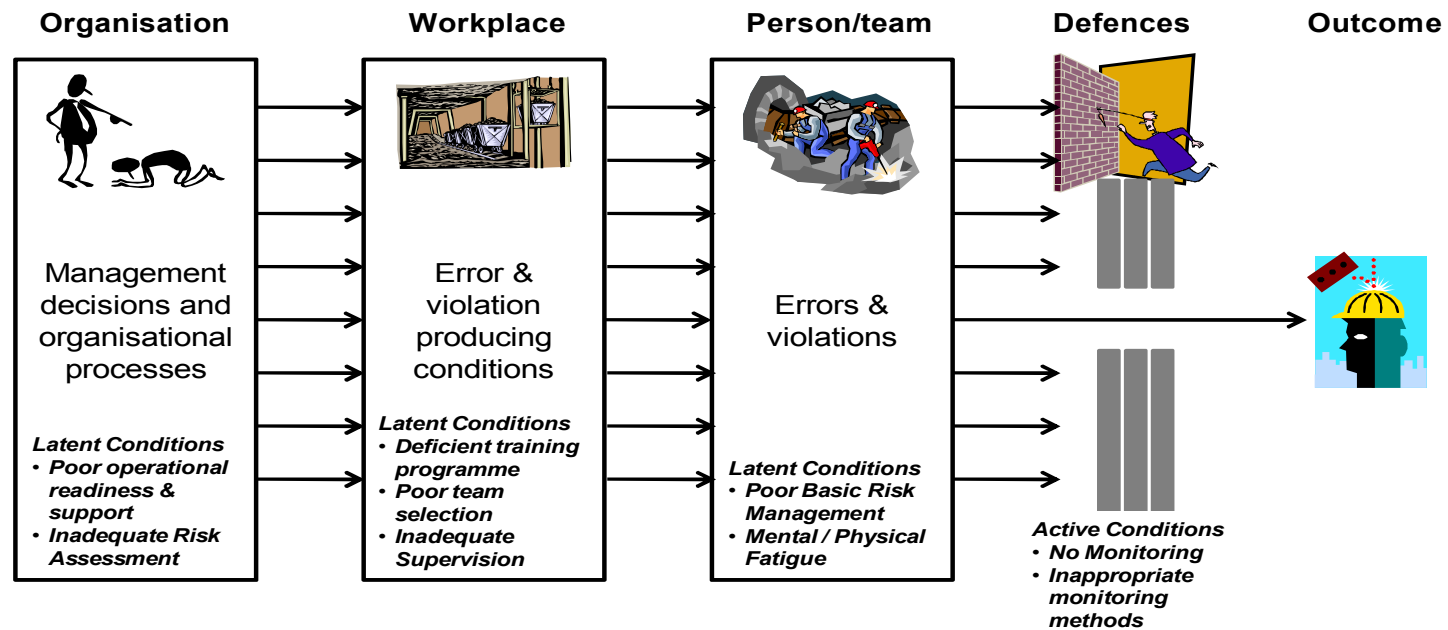
**An opportunity to shift blame culture to just culture?**

(Source: Reason.J 1990  
"Human Error")

# Errors Sources Everywhere



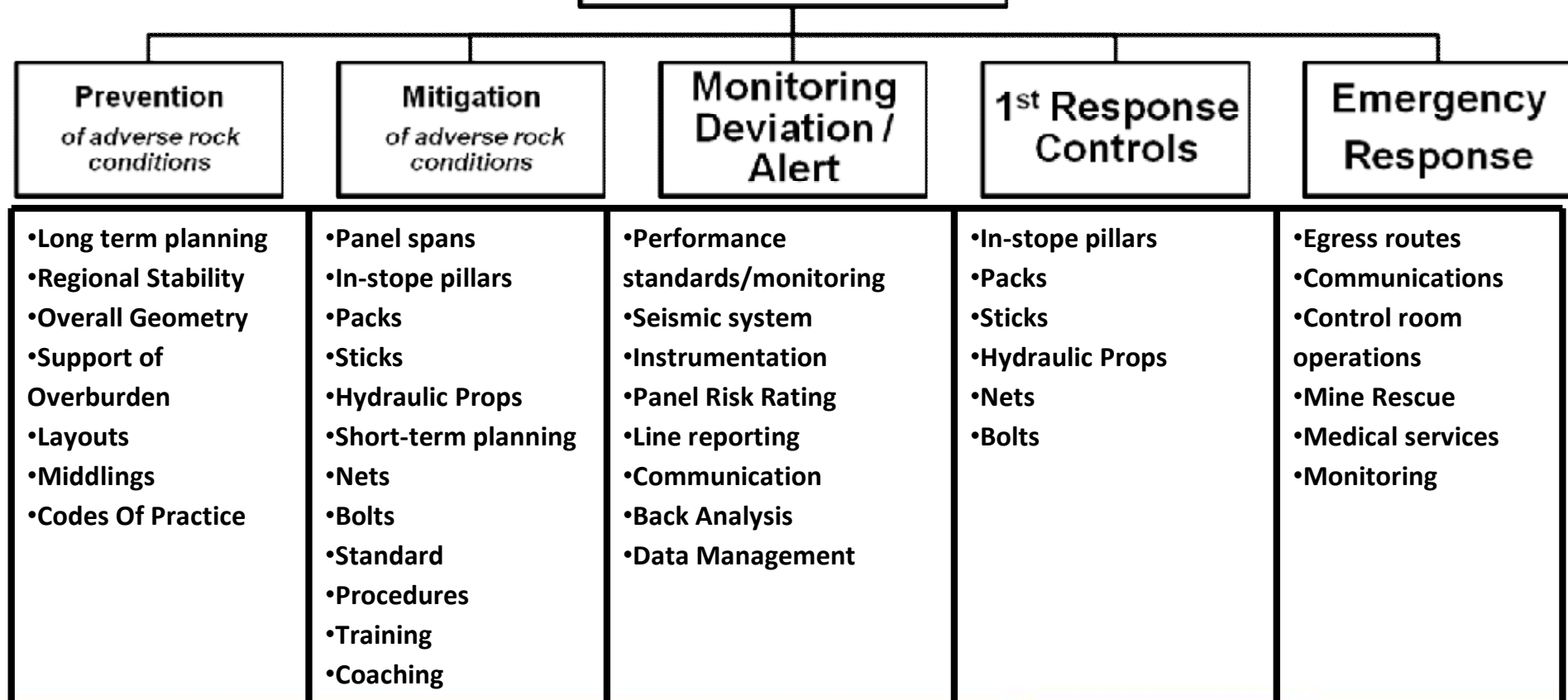
## Simplified model (after Reason)



**An opportunity to better understand how accidents occur?**

# Addressing Major Risks

## FALL OF GROUND (Including seismicity)





# Technological Change is Difficult

- Resistance to Change (45%)
- Cost (55%)
- *Workforce Not Seeing the Benefit (45%)*
- Technological Challenges (35%)
- *Lack of Management Buy-in (30%)*
- Training Capacity (25%)
- *Production Pressures (20%)*

- *Lack of Workforce Buy-in (20%)*
- Lack of Skills and Education (20%)
- *Organizational Culture (20%)*
- Social Barriers (20%)
- *Time (20%)*
- Inappropriate Incentives (15%)
- *Generation Gap (10%)*
- Other (25%)

# What Options?

- **Comprehensive picture of what is going on?**
- **Establish the “ground rules”**
  - *What can we tolerate? /What is “zero harm”*
- Existing Mining
  - **Confirm Priorities**
  - **Focus on improvement**
    - *Apply major hazard control framework*
    - *Apply hierarchy of controls*
    - *Understand and address human error*
    - *Re-engineer where necessary*
  - **Make decisions on intolerable risk**
- Future Mining
  - **Confirm good / best practice at mine design stage**



**Thank You !!**

