



Pike River Implementation Plan RIS

NZIER report to the Ministry of Business, Innovation, and Employment
November 2013

About NZIER

NZIER is a specialist consulting firm that uses applied economic research and analysis to provide a wide range of strategic advice to clients in the public and private sectors, throughout New Zealand and Australia, and further afield.

NZIER is also known for its long-established Quarterly Survey of Business Opinion and Quarterly Predictions.

Our aim is to be the premier centre of applied economic research in New Zealand. We pride ourselves on our reputation for independence and delivering quality analysis in the right form, and at the right time, for our clients. We ensure quality through teamwork on individual projects, critical review at internal seminars, and by peer review at various stages through a project by a senior staff member otherwise not involved in the project.

Each year NZIER devotes resources to undertake and make freely available economic research and thinking aimed at promoting a better understanding of New Zealand's important economic challenges.

NZIER was established in 1958.

Authorship

This paper was prepared at NZIER by Chris Nixon.

It was quality approved by Derek Gill.

Thanks also to Sarah Spring.



L13 Grant Thornton House, 215 Lambton Quay | PO Box 3479, Wellington 6140
Tel +64 4 472 1880 | econ@nzier.org.nz

© NZ Institute of Economic Research (Inc) 2012. Cover image © Dreamstime.com
NZIER's standard terms of engagement for contract research can be found at www.nzier.org.nz.

While NZIER will use all reasonable endeavours in undertaking contract research and producing reports to ensure the information is as accurate as practicable, the Institute, its contributors, employees, and Board shall not be liable (whether in contract, tort (including negligence), equity or on any other basis) for any loss or damage sustained by any person relying on such work whatever the cause of such loss or damage.

Contents

1.	Draft Regulatory Impact Statement	2
	Pike River Implementation Plan	2
1.1.	Agency Disclosure Statement	2
1.2.	Problem definition and status quo	4
1.3.	Objective	6
1.4.	Coverage	6
1.5.	Regulatory Impact Analysis.....	7
1.6.	Consultation.....	21
1.7.	Impact	22
1.8.	Conclusions and recommendations	22
1.9.	Implementation	22
1.10.	Monitoring, evaluation and review	25

Tables

Table 1	Costs of the status quo	9
Table 2	Costs associated with new regulations	11
Table 3	Costs associated with emergency preparedness	15
Table 4	Costs associated with strengthening competencies within the mine	17
Table 5	Costs of worker participation.....	18
Table 6	Comparison of Royal Commission recommendations and alternative approaches	20
Table 7	Results and sensitivity analysis	21

1. Regulatory Impact Statement

Pike River Implementation Plan

1.1. Agency Disclosure Statement

This Regulatory Impact Statement has been prepared under the direction of the Ministry of Business, Innovation and Employment. It provides an analysis of costs and benefits of implementing the 16 recommendations of the Royal Commission on the Pike River Coal Mine Tragedy (the Royal Commission).

Cabinet agreed to implement the Royal Commission's recommendations in November 2012. Over 2013 the Ministry has undertaken an extensive process of industry consultation to determine the final details of how best practice¹ will be adapted to meet New Zealand conditions. This process is now largely complete, with only the development of certain codes of practice and related guidance to be completed by the Ministry.

The Ministry has grouped the costs associated with Royal Commission recommendations into five areas:

- (1) new regulations requiring processes for hazard management in mining operations (Royal Commission's recommendations 1, 2, 3, 4, 5, 6, & 7)
- (2) increased involvement by the regulator and oversight by a sector advisory board (Royal Commission's recommendations 1, 2, 3, & 4)
- (3) improvements in emergency preparedness by mines and in the provision of mines rescue services and emergency management of incidents (Royal Commission's recommendations 2, 13, 14, 15 & 16)
- (4) strengthened training and competency requirements for safety critical roles in the sector (Royal Commission's recommendations 8, 9, 10, & 12)
- (5) increased worker involvement in health and safety management (Royal Commission's recommendation 11)

This analysis focuses on economic, fiscal, compliance and social costs. Cultural and environmental costs are not covered.

Overall, the Royal Commission's recommendations result in a positive \$12.45 million net present value using an 8% discount rate. The main benefits from implementing the recommendations are the avoided loss of life associated with a major mine accident.

We have carried out sensitivity analysis on the key cost parameters within reasonable bounds, including increasing costs, reducing/increasing discount rates, reducing the value of statistical life, and increasing the cost of structural changes. In all cases, the benefits outweigh the costs.

¹ The reference point here is Australian regulations, which are considered to be international best practice, although reference was made to other jurisdictions such as the United Kingdom.

The cost benefit analysis (CBA) is subject to uncertainty due to the difficulty involved with predicting the likelihood and consequence of major incidents, both in the status quo and under the Royal Commission's recommendations. This means the benefit figures (largely the avoided loss of life and output) are difficult to predict with certainty, therefore we have not carried out sensitivity analysis on the benefits.

The CBA is premised on what is required to implement the Royal Commission's recommendations. This fundamentally shapes the Regulatory Impact Statement as we consider a very narrow range of options: the status quo and a scenario where the recommendations are implemented. We have not considered whether the Royal Commission's recommendations are economically optimal relative to other alternatives (aside from the status quo) – merely whether the costs outweigh the benefits.

The status quo (option 1) assumes one major accident every 30 years with 30 fatalities. This mirrors New Zealand's historical pattern of mine disasters followed by strong health and safety regulation that diminishes over time. This option has been ruled out by Cabinet.

The Royal Commission's recommendations (option 2) will introduce a higher standard of process-orientated regulation and sustain this over the longer term, to reduce the likelihood of a major mine accident over the working life of a mine (at least 40 years) – although it will not totally eliminate the risks. It differs from the status quo primarily in the way that standards are maintained over time, rather than being allowed to drift lower. Other points to note are:

- in both options, for the first 5 years the costs will be the same as operators and regulators improve safety levels
- all one-off costs are likely to occur in the first 5 years. Therefore, they do not affect the cost benefit analysis since the costs will occur in both options.

A number of the recommendations will impose extra costs on firms in the sector and other stakeholders such as the miners' union. These costs are less than the potential costs to society of a major mine accident. Most mining companies support the recommendations. They accept that the costs are a necessary part of doing business in a country that is committed to applying the best safety practices to mining operations.

There may be a potential impact on the ability of firms to innovate as they have done in the past because of the higher costs associated with a new health and safety regime. However, the new safety regime may also stimulate new ways to innovate as the industry improves its safety outcomes. The proposals will not impair private property rights, or override fundamental common law principles.

Kim Connolly-Stone
Director, Pike River Implementation Team
Labour and Commercial Environment
Ministry of Business, Innovation & Employment

1.2. Problem definition and status quo

1.2.1. Status quo

New Zealanders expect work place safety conditions to be of a standard that controls the risk of accidents. In industries such as mining, maintaining safety standards are especially important since the environment and operating conditions present a complex range of hazards. These range from occupational safety hazards that impact on individual workers through to catastrophic accidents that result in multiple injuries and fatalities, as well as economic, financial, social, and environmental damage.

Mining exploration and production companies operating in New Zealand are subject to and must comply with the duties set out in the Crown Minerals Act 1991, the Health and Safety in Employment (Mining-Underground) Regulations 1999, the Health and Safety (Mining Administration) Regulations 1996 and the Mines Rescue Trust Act 1992. The mining regulations are made under the Health and Safety in Employment Act 1992 (the Act) and provide for the management of hazards associated with mining operations. They are administered and enforced by the Ministry of Business, Innovation and Employment (the Ministry).

1.2.2. Problem definition

The Pike River mining tragedy focused attention on safety in high hazard industries. The 29 lives lost and the substantial economic and financial damage resulted in the Royal Commission on the Pike River Coal Mine Tragedy. The Royal Commission identified a number of shortcomings in the health and safety regulations and on the 5th November 2012, Cabinet agreed to implement the Royal Commission's recommendations, and further agreed that this should be extended to all mining.

The Pike River tragedy showed that the regulation and safety practices in the New Zealand mining sector were not consistent with international best practice.²

The Royal Commission documented in more detail the problems facing the industry in general. Firms, regulators and other stakeholders had the following deficiencies that created potential hazards:

- deficiencies and inconsistencies with hazard management processes in mining, tunnelling and quarry operations including a lack of clear standards and limited guidance available to operators. Specifically, this includes:
 - hazard management regulations were inconsistent with international best practice for the mining sector. No clear expectations and processes for the management of principal hazards were in place and this led to significant gaps in practice and accountabilities for mine operators e.g. management of methane and carbon monoxide, the hazards of electricity in combustible atmospheres and strata control

² Royal Commission Report on the Pike River Coal Mine Tragedy. The Royal Commission considered that Australian health and safety regulations are international best practice.

- critical systems failures occurred within the mine and its infrastructure e.g. ventilation, engineering and electrical. These failings were attributed to deficiencies in the regulations
- inadequate guidance was given to mine operators on how to manage hazards and meet their obligations under the Act and regulations.
- inadequate oversight of individual mining operations by the inspectorate, and of the sector as a whole by the regulator. Of particular importance was:
 - the health and safety inspectorate were unable to inspect mining operations to ensure minimum standards were consistently being met. Being unable to audit the systems and processes in place at the mine contributed to the failure
 - there was ambiguity in the phrasing of the minimum standards contained in the regulations that made enforcement difficult and created gaps in the coverage.
- deficiencies in emergency preparedness by individual mines and the provision of mines' rescue services and emergency responses to incidents. Specifically these included:
 - a lack of planning and provision for emergency preparedness that was exacerbated by limited mandatory requirements to plan, prepare and equip and test for an emergency
 - there was uncertainty and confusion about the roles of different emergency response agencies and who should lead the emergency response
 - there was uncertainty regarding the role of the Mines Rescue Service (MRS) in emergency response and the legislation did not support their role or provide adequate levy funding.
- deficiencies and inconsistencies were found in the training and competency for safety critical roles in the sector. This included:
 - a lack of expertise and the ability to critically evaluate certain key health and safety functions available to the mine operator including ventilation, electrical systems and line management responsibilities
 - inconsistencies in the standard of competency of safety critical roles that are prescribed for mine health and safety management, between mines, and between New Zealand and Australia
 - regulations that did not adequately prescribe duties, or set out accountabilities for key health and safety functions performed by mine management. There was confusion between the development and maintenance of on-going workplace health and safety management systems and day-to-day line management responsibilities.
- inadequate worker involvement in health and safety management processes and the absence of an independent check for workers were identified. Of particular concern were:
 - a low level of uptake of the employee participation provisions contained in the principal Act. This was attributed to the Act not containing sufficient prescription of processes and not providing

- powers commensurate to the role of employee health and safety representative in a workplace as hazardous as an underground mine
- employee participation provisions were seen as deficient and not providing for the needs of contract workers or providing an independent authority to which all workers could make their health and safety concerns known.

Since Cabinet has already agreed to implement the Royal Commission's recommendations we have not considered whether the package is economically optimal. That is, we do not consider a wide range of alternatives and determine which has the highest benefit cost ratio. We take the Royal Commission's recommendations as given, and evaluate their costs and benefits, relative to the status quo.

The new regulations are designed to control the risks of individual and multiple injuries and deaths over the long term. To do this requires an integrated package of health and safety measures that are subject to regular robust monitoring and verification and five-yearly reviews.

The safety measures are required as a package³ because any lessening of one part of the package is likely to negate its effectiveness. Without these measures, it is very likely in the long term risks will not be controlled to a standard expected by New Zealanders, i.e. the risks of a major accident increases.

1.3. Objective

The Royal Commission's package of recommendations is aimed at ensuring that the regulation of health and safety in mining and tunnelling creates a low-risk environment that is consistent with international best practice. This is aimed at controlling the risks while allowing businesses to operate. This standard will be seen as being achieved if the recommendations are implemented.

The key objective is to sustain the level of risk control over the long term in a high hazards context, rather than letting standards drift down over time. The more active regulatory approach is based on experience in the United Kingdom and Australia.⁴

1.4. Coverage

The Royal Commission's recommendations aim to ensure that the safety regulations for coal mining, other mines and tunnels are more consistent with best practice. They come as a package; since any withdrawal or watering down of one set of safety recommendations is likely to compromise all of the social benefits. Specifically, the package addresses the issues identified in the problem definition. This includes:

- developing new regulations for hazard management in mining operations
- increased involvement by the regulator and oversight by a sector advisory body

³ Apart from the proposed mechanism for the new Mines Rescue Trust levy, which has been separately assessed.

⁴ In particular the Piper Alpha Disaster in 1988 and the subsequent Royal Commission recommendations. Cullen, The Hon. Lord William Douglas (November 1990). The Public Inquiry into the Piper Alpha Disaster, Presented to Parliament by the Secretary of State for Energy by Command of Her Majesty. London: H.M. Stationery Office.

- improvements in emergency preparedness by mines and in the provision of mines rescue services and emergency management
- strengthening training and competency requirements for safety critical roles in the sector
- increased worker participation in health and safety management through a strengthened role for elected worker health and safety representatives and through union-appointed “check inspectors” with statutory powers.

The Implementation Plan is expected to become operational by December 2013.

1.5. Regulatory Impact Analysis

The Royal Commission’s recommendations are aimed at modernising New Zealand’s hazard management processes to minimise the long run possibility of low frequency high impact events. Current regulations for high hazard industries broadly have performance outcome requirements; whereas the Royal Commission states that best practice regulations describe processes. Specifically, the recommendations are designed to stop any erosion of safety standards in the face of regulatory budgetary pressures and the financial pressures experienced by owners/duty holders.

A key part of this package of recommendations is to ensure monitoring and evaluation processes are robust enough over the long term to underpin desired regulatory standards identified in the status quo as needing attention e.g. new regulations to bring health and safety standards up to international best practice, improve oversight of the most significant, or “principal” hazards within the sector with more monitoring and verification documentation processes, improved emergency preparedness, improved competencies within mining operations, and increased worker participation in health and safety.

1.5.1. Options

We have used a cost benefit analysis (CBA) framework to compare the two feasible options: the status quo (option 1) and implementing the Royal Commission’s recommendations (option 2). Since Cabinet has already agreed to the Royal Commission’s recommendations we have not considered whether the package is economically optimal (i.e. whether alternative options might deliver better benefit cost ratios). Even though option 1 has been ruled out by Cabinet we have used it as a point of comparison with the Royal Commission’s recommendations.

CBA has been used to identify the value of the Royal Commission’s package of proposals against a credible alternative. A particular issue with high hazard sector health and safety is preventing incidents that are infrequent but have high impact. Any number of alternatives could be used to characterise this but since the probability and incidence are unknown, we have settled on one alternative that draws on New Zealand’s regulatory and mine safety activity history.

We use a 40-year period for the CBA, broadly reflecting the average working life of a mine. The regulatory changes are required for 3 underground coal mines, 19 open cast coal mines, 2 underground metalliferous mines, 10 open cast metalliferous mines, and 7 tunnels.

We do not attempt to quantify any environmental or cultural costs and benefits of the options.

The differences between Option 2 and Option 1 (status quo) are:

- additional regulatory oversight ensures that there is no drift in health and safety standards after 5 years, which is expected to occur in Option 1. So there are higher costs to firms, regulators and other stakeholders in Option 2
- the major incident expected in Option 1 after 30 years is avoided in Option 2, so the benefits – largely the avoided loss of life and output – accrue from year 30 onwards.

Option 1: Status quo

No attempt has been made to forecast future safety events under a scenario where the Royal Commission recommendations are not adopted. Some degree of regulatory change is inevitable – what varies is the likely nature and extent of the regulations.

Therefore, we have created an artificial status quo that draws from regulatory and mine safety activity experience from the period between the Strongman Mine tragedy in 1967 and the Pike River Mine tragedy of 2010.

This is a model for evaluation purposes, despite Cabinet ruling this option out because the costs are considered too high. Under the status quo, mine regulation and mine safety will be maintained at the same level as the proposed Royal Commission-recommended regulations for the first five years.⁵ After five years, we assume a slow decay in regulatory oversight and mine safety management, to a point where another tragedy is likely. At what point a tragedy would happen is uncertain, but for the purposes of this artificial approach, a major accident is assumed to occur within 30 years of the last major accident. It would see 30 lives lost.

Costs

Table 1 sets out the costs incurred as a result of this accident. These are the costs the Royal Commission's recommendations are designed to avoid. These include loss of life, ill health and injuries, accident and emergency response, cost of enquiry, and economic loss of the mine.⁶ These avoided costs become the benefits that the costs of the Royal Commission's safety recommendations are compared against.

The costs have been developed with consultation with industry and Ministry experts.

⁵ Five years has been chosen because we expect those closely involved with decisions on safety at the time of a major tragedy (both regulators and regulated) would have been moved on with the loss of institutional knowledge and key relationships would not operate as effectively.

⁶ There have been a number of mine disasters in New Zealand. For example: the Huntly mine disaster (1914) killed 43 miners; the Dobson mine disaster (1926) killed 9 miners; the Huntly mine disaster (1939) killed 11 miners; the Strongman mine disaster (1967) killed 19 miners; and the Pike River mine disaster (2010) killed 29 miners.

Table 1 Costs of the status quo

Discount rate 8%

Cost item	Value in today's dollars	Description
Loss of life	\$11,200,000	30 lives lost multiplied by Value of Statistical Life in year 30. Based on \$3.77 m per life lost used in road transport.
Illness and injury		Not valued
Accident and emergency	\$199,000	\$1,000,000 in year 30
Cost of inquiry	\$184,000	\$2,000,000 in year 31
Economic loss	\$11,900,000	\$17.8 million per year in each year after the accident – year 31 to 40
Total	\$23,500,000	Numbers rounded, so do not represent exact sum
Notes (1): Assumes one accident in year 30 with the loss of 30 lives.		

Source: NZIER

Option 2: Implementing the Royal Commission's recommendations

In this section we have grouped proposals under 5 headings, assigned initial costs, and cross referenced them with the Royal Commission's recommendations. The costs are estimates since there is still uncertainty about how introducing best practice will impact on regulators, the mining industry and other stakeholders, given the unique geographical situation faced by New Zealand mines and the specific details required to control the risks of a catastrophic accident. For completeness we also briefly discuss other alternatives to the recommended regulations, although we do not model them in the CBA.

The Royal Commission have set out what they consider to be best practice in controlling risks. We are unsure if this is the optimal approach; however we believe it is the best on offer.

All of these costs also apply in the first 5 years of the status quo.

1. Developing new regulations for hazard management in mining operations

These proposed regulations are based on the Royal Commission's recommendations 1, 2, 3, 4, 5, 6 & 7. Implementing these recommendations requires structural changes to mines and an increase in documentation of safety activities. For large underground mines this includes:

- defining standards and improving ventilation control devices
- clarifying the restricted zone within which electrical equipment requires protection
- updating electrical safety requirements

- providing limitations, mandating practices, and recognised compliance pathways for construction equipment, installations, and distribution systems
- improving road safety in open cast mines
- other structural changes deemed necessary by the High Hazards Unit.

Beyond the first 5 years, safety modifications will have a significant cost impact only in large underground coal mines. Currently, New Zealand has one larger underground coal mine (Huntly East) and two smaller underground coal mines, which will be required to upgrade ventilation, restricted electrical equipment zones, update electrical safety and upgrade their documentation processes. Other mines, and tunnels will require improved road safety (open cast mines only) and upgraded documentation processes.

Increased documentation is required for development of principal hazard and safety management plans (PHMPs) and principal control plans (PCPs). PHMPs are prepared for each hazard while PCPs identify controls that address concerns about multiple hazards. Regulations will be set out for each category of hazard; the matters that need to be dealt with by the PHMPs and PCPs.

Table 2 sets out the costs of implementing the new regulations. All structural changes (apart from road safety in open cast mines) will be incurred by Huntly East only, while half the costs of documentation will be incurred by Huntly East. The remaining documentation costs will be shared by the rest of the mining sector.

Possible alternatives

For the structural changes proposed, there are few alternatives. The “gassy” nature of New Zealand coal mines suggests that under any scenario ventilation, restricting zones for electrical equipment and continual update of electrical safety standards are required. Most of these structural adjustments would occur under the status quo and there is little opportunity for partial implementation e.g. the location of one piece of electrical equipment outside an explosion risk zone jeopardises the effectiveness of all other safety improvements.

Where alternatives could be considered is in the reduction in documentation costs around hazard management. While this might reduce costs and not compromise safety in the short term, it is unlikely to support maintenance of safety standards over the longer term. Documentation allows for verification and monitoring of individual and system wide hazards and is crucial for the maintenance of safety as staff (and their institutional knowledge) come and go.

The structural changes being made are necessary and would have occurred under most scenarios. Documented safety requirements set out in the PHMPs and the PCPs are required to ensure durability and consistency of health and safety standards over time.

Table 2 Costs associated with new regulations

Discount rate 8%

Benefit item	Value in today's dollars	Description
Structural changes within the mine(s)		
Ventilation	\$1,704,000	One-off cost of \$7 million and on-going costs of \$500,000 per annum. Cost fall on the mine owners (currently only Huntly East)
Restricted zones for electrical equipment	\$487,000	One-off costs of \$2 million and on-going costs of \$400,000 per annum. Cost fall on the mine owners (currently only Huntly East)
Updating electrical safety	\$243,000	One-off costs of \$1 million and on-going costs of \$100,000 per annum. Cost fall on the mine owners (currently only Huntly East)
Introduction of mandatory practices and compliance pathways		One-off costs ¹
Improving road safety in open cast mines		One-off cost. \$2million per large open cast mine. Cost fall on open cast mine owners ¹
Documentation of Health and safety requirements		
PHMP	\$609,000	Assume all large coal mines require these plans (cost: \$125,000 for one coal mine). Other mines, and tunnels can manage and adapt current practice at a total cost of \$125,000 per annum). Cost fall on the mine owners. 50% on Huntly East and 50% on the rest of the industry
PCP	\$609,000	Assume all large coal mines require these plans (cost: \$125,000 for one coal mine). Other mines, and tunnels can manage and adapt current practice at a total cost of \$125,000 per annum). Cost fall on the mine owners. 50% on Huntly East and 50% on the rest of the industry
Total	\$3,6521,000	
<p>Note: (1) All of the one-off costs are likely to occur within the first five years. The costs will occur under the status quo and in a situation where the Royal Commission's recommendations are implemented. Therefore, they are not included in the cost benefit analysis. (2) Numbers rounded so do not necessarily sum. (3) Costs allow for a 2% efficiency gain from year 5, since we have assumed that mine operators and regulators will become more familiar with the health and safety system, improving efficiency.</p>		

Source: NZIER

2. Increased involvement by the regulator and oversight by a sector advisory body

The Royal Commission's recommendations 1, 2, 3, & 4 are geared at maintaining best practice in health and safety over the long term. The Royal Commission believed that durability of safety standards required:

- the removal of all ambiguity from regulation e.g. qualifications such as "all practical steps" will be replaced with mandatory provisions
- ensuring the provision of better information of safety information by the employer to the regulator
- amending the Crown Minerals Act 1991 to ensure earlier and increased involvement by the inspectorate before a mine commences operations
- introducing new process regulations consistent with best practice that are auditable by inspectors, employees and their representatives, and others with a role to play in safety
- creating new jobs within mines and tunnels responsible for the maintenance of health and safety management systems
- creating an independent advisory body to oversee safety. Its role is to ensure verification, monitoring and review occur on a regular basis.

The removal of the phrase "all practicable steps" is a good example of where the Royal Commission believed that a trade-off between increased economic activity and worker safety was required. For example, the way "all practicable steps" was interpreted at Pike River in relation to a second egress was not considered adequate by the Royal Commission. In the view of the Royal Commission, increased certainty of regulatory safety measures is needed to remove any doubt about detailed safety specification requirements.

However, this does not mean discussion and consultation about how best practice should be adapted to the New Zealand coal mining sector should not be on-going, particularly as advances in technology and the need to adapt best practice safety measures to the local environment may require different approaches to controlling the safety risks.

These changes and the creation of an independent body to oversee safety-monitoring and verification activities will be met out of existing baseline funding, and are therefore not included in the cost benefit analysis (CBA) calculations. Costs associated with creating new safety roles within the mine are covered in the section on strengthening training and competency requirements.

Possible alternatives

One clear alternative exists to this approach. This is for regulators to maintain a "hands-off" approach that allows the mine operators to decide on appropriate health and safety measures.⁷

⁷ The party who is considered as causing an event according to law and economics principles is the party who is best placed to make decisions that balance these costs and results in the least cost for society Yeabsley J (2009) Statement of Evidence High Court of New Zealand, New Zealand Fire Service Commission vs Marlborough Lines Limited CIV-2009-406-024.

The recommendations made by the Royal Commission and many other enquiries into high hazard tragedies overseas (e.g. the Piper Alpha tragedy) assert that this approach is untenable and will lead to further high damage accidents.

3. Improvements in emergency preparedness by mines and in the provision of mines rescue services (MRS) and emergency management

Improvements in emergency preparedness are based around three issues identified by the Royal Commission: emergency preparedness in mines, the Mines Rescue Service (MRS) and inter-agency responses to catastrophic failure. These are set out in recommendations: 2, 13, 14, 15 & 16.

A specific recommendation of the Royal Commission was the development of emergency management plans (EMP) in line with Australian practice. This includes using a common EMP template in West Coast mines that addresses emergency management compatibility, in function, and design; specific location of emergency equipment, exits etc.; and specific EMP content development for the site.

The MRS's functions have been clarified in the new Mines Rescue Act 2013 and in the mining regulations, including assisting in developing, reviewing, and testing mine operators' emergency management plans.

Inter-agency coordination is based around reviewing the application of the Co-ordinated Incident Management System (CIMS) to underground mining. A review of CIMS is underway led by the Ministry of Civil Defence and Emergency Management (MCDEM). MBIE is leading the development of a new interagency protocol for the management of major underground mining emergencies, which was tested in September 2013 and will be finalised by the end of 2013. New provisions have also been included in the new Mines Rescue Act to provide for a coordinated response to underground mining emergencies. In accordance with the Royal Commission's recommendations, these include providing for an incident controller (with mining expertise) to lead the decision making at a mine rescue or recovery operation.

Table 3 sets out the costs associated with emergency preparedness. These include health and safety training, provision for breathing apparatus (CABA), maintenance of health and safety systems, and testing systems.

Two of the larger costs are the establishment of a second intake/entrance⁸ and the establishment of seals to manage air flows within the mine and limit the escape of flammable gases from already worked areas of the mine.

For the first of these costs, mines have been granted a maximum of 10 years to meet new safety requirements. Costs are expected to fall between year 5 and year 10 and are made up of:

- a second intake/entrance most cost fall on the Terrace mine which requires a new 500 metre intake (@ \$5,000 per metre equally \$2.5 million)
- associated new seals for the East mine (\$2 million), Roa mine (\$200,000) and the Terrace Mine (\$250,000).

These are approximate costs only and are intended to illustrate the order of magnitude of addressing the Royal Commission's recommendations.

Possible alternatives

It is unclear what the alternative to this approach might be, apart from the business as usual scenario under the status quo. Emergency preparedness may not prevent a mine catastrophe; however, as part of a package of health and safety measures it assists in reinforcing the safety culture being developed. Therefore, to only partially implement an emergency preparedness system will signal to workers, management, regulators, and other stakeholders a lack of commitment to health and safety which over time could potentially spill over into other health and safety commitments, reducing their effectiveness e.g. having emergency drills on a regular basis and documenting any problems ensures safety issues are in the forefront of workers', mine management and regulators' thinking.

The development of EMPs and a CIMS-based emergency response protocol assist in keeping the health and safety messages at the forefront of all stakeholders' thinking and help maintain standards that controls risks.

⁸ Commonly called an egress.

Table 3 Costs associated with emergency preparedness

Discount rate 8%

	Value in today's dollars	Comment
Development of an EMP		Covered by PCP costs
Inertisation (sealing)	\$1,305,000	\$2.45 million for three underground coal mine. Mines have 10 years to install. Costs fall between years' 5 and 10
Nitrogen	\$81,000	\$100,000 per underground coal mine. Intermittent cost, once every 10 years
CABA (breathing apparatus)	\$365,000	\$50,000 per underground mine per annum (leased equipment)
Training	\$389,000	80 miners @ \$2,000 = \$160,000 annually
Changeover station (set up drill and vent)		\$500,000 for 2 mines. One-off cost ¹
Communications equipment		All 41 mines @ \$40,000. One-off cost ¹
Safety trained person	\$44,000	1 person for each shift (3) @ \$2,000
2 nd egress	\$1,331,000	Main cost for the Terrace Mine estimated at \$2.5 million. Costs fall between years' 5 and 10
Additional transport		\$300,000 per underground coal mine. One-off cost ¹
Alarms		\$40,000 per underground coal mine. One off cost ¹
Maintenance	\$73,000	\$10,000 per underground coal mine (3) per annum
Testing	\$998,000	\$10,000 per mine (41) per annum
Training	\$200,000	\$2,000 per mine (41) per annum
Total	\$4,787,000	
<p>Notes: (1) All of the one-off costs are likely to occur within the first five years. The costs would have occurred under the status quo and in a situation where the Royal Commission's recommendations were implemented. Therefore, they are not included in the cost benefit analysis. (2) Numbers rounded so do not necessarily sum. (3) We allow for a 2% efficiency gain from year 5 since workers, mine operators, and regulators will become more familiar with the health and safety system, improving efficiency.</p>		

Source: NZIER

4. Strengthening training and competency requirements for safety critical roles in the sector

Royal Commission recommendations 8, 9, 10, & 12 have led to proposals that will introduce new safety positions within mines. Specifically these positions are a:

- Site Senior Executive (SSE) position that is responsible for the maintenance of health and safety management systems, ensuring employee participation and meeting information disclosure requirements for employees. The SSE is accountable for the development and maintenance of all health and safety systems and would normally be the mine manager. The SSE will require new competencies (a certificate of competence) within two years of the regulations being introduced
- ventilation officer to ensure the safe workings of the ventilation system within a mine by ensuring the provision of a safe atmosphere in the underground environment. In a small mine, the ventilation officer and SSE roles may be combined
- electrical and mechanical officers will also be required in underground mines. This is to ensure that one person has direct responsibility for safety in these areas and documentation for verification purposes is kept up-to-date. All those performing electrical work will require additional competencies (based on the Australian UEE NEEM3, New Zealand and the EEHA relevant standard)
- induction competency. All unsupervised mine workers employed after June 2014 are required to have induction competencies. This is a minimum of a 2 day health and safety (level 2) MITO approved training course.

Responsibility for mine health and safety resides in the combination of these roles and existing statutory management positions, but with the new SSE position providing the highest degree of accountability. Each of the positions requires a certain level of competency (e.g., a mine manager certificate for an SSE). By creating these positions, the regulations will address the current lack of expertise, inconsistencies in standards between mines, and meet and verify prescribed regulatory standards.

The costs are set out in Table 4. All mining operations will require an SSE. However, most will be part-time equating to 10% of their job description (based on Ministry advice). Only underground mines require ventilation, electrical, and mechanical officers .

Table 4 Costs associated with strengthening competencies within the mine

Discount rate 8%

Benefit item	Value in today's dollars	Description
SSE	\$998,100	Part-time in large mines and 10% of the job in small mines, & tunnels. Per annum over 40 years
Ventilation officer	\$62,800	Part-time (25% of one person's job). Per annum over 40 years.
Electrical officer	\$292,000	Part-time in large mines and 10% of the job in small mines, & tunnels. Per annum over 40 years
Mechanical officer	\$292,000	Part-time in large mines and 10% of the job in small mines, & tunnels. Per annum over 40 years
Transition of new competencies		
Induction competencies	\$439,000	2 days training at \$550 per day for 164 workers (assumes 10% turnover in the industry).
SSE requires new competencies	\$14,800	Assume new SSE every five years: \$550 per day @ 20 days.
New competencies for those performing electrical work		Costs incurred over the first four years, therefore not included. Marginal cost thereafter.
Total	\$2,083,000	
Note: (1) Numbers rounded so do not necessarily sum. (2) We have allowed for a 2% efficiency gain from year 5 since workers, mine operators, and regulators will become more familiar with the health and safety system, improving efficiency.		

Source: NZIER

Possible alternatives

The alternatives are having no positions at all or having officers at a lower level in the organisation. Not having an SSE, for example, is similar to the status quo and over time we would expect safety standards to slip. Having officers at a lower level in the organisation relegates the importance of maintaining health and safety standards. The relevance of health and safety will become less important, not only for mine staff but also for regulators checking on safety. Therefore, we would expect health and safety standards to slip along the lines of the status quo.

Elevating the status of each officer signals that maintaining health and safety standards is of preminent concern. In this situation, it is more likely that health and safety standards will remain at best practice levels.

5. Increased worker participation in health and safety management

Increased worker participation is based on the Royal Commission recommendation 13. Following consultation with the industry, stakeholders (particularly the mine union and Ministry experts) it was decided that the best way to improve worker participation was to amend the Act to:

- ensure that contractors in the mining industry are covered by worker participation systems and requirements to ensure adequate training and supervision
- require all mines to have documented worker participation systems, not just where there are over 30 workers, or where it is requested by an employee
- modify the requirements concerning the results of health and safety monitoring so that this information is proactively made available to all mine workers, not just on request
- introduce new functions and powers for health and safety representatives
- establish the position of an industry health and safety representative.

The costs of this process are set out in the following table.

Table 5 Costs of worker participation

Cost item	Value in today's dollars	Description
Ensuring all workers covered by worker participation systems		Minimal cost expected
All mines require documented health and safety system		Responsibility of the SSE (costed elsewhere)
Proactively making health and safety information available		Part of documentation required for other cost items
New site health and safety representation	\$24,000	Designated worker. Training of \$10,000 per annum per mine
Establish position of health and safety representative	\$487,000	Cost to the union of \$200,000 per annum
Total	\$511,000	
Notes (1): Numbers rounded so do not necessarily sum. (2) We have allowed for a 2% efficiency gain from year 5 since workers, mine operators and regulators will become more familiar with the health and safety system, improving efficiency.		

Source: NZIER

Possible alternatives

There are few alternatives to improving worker participation in mine health and safety management. The proposed approach encompasses all workers, involves a motivated mine union, and has buy-in from all stakeholders. It is also very difficult to see how it could be done at a lower cost without compromising safety.

For example, an independent safety specialist could do the job of a health and safety representative, although there is a question of who would fund the position, possibly the mine operator or government.

The motivations for both an independent mine inspector and an official funded by the mine union are similar since both will strive to maintain safety standards that minimise risk and keep the mine functioning as a viable concern. However, a key question is acceptance and trust by workers of a safety representative. Since a safety culture in high hazards requires open communication channels between employee and employer (similar to pilots and doctors and their employer), a union official is more likely to foster this environment by encouraging greater participation in health and safety by workers relative to an independent safety inspector paid for by government or the employer.

Other alternatives might involve dispensing with documenting worker participation in health and safety systems. However, dispensing with documentation is unlikely to assist in monitoring and verification processes required in minimising risk over the medium to long term.

Summary

The package of Royal Commission recommendations have been adopted by Cabinet. They are considered to be the best option for controlling the long term risk of a catastrophic accident in New Zealand underground mines, open cast mines, and tunnels. While we believe this is the best option we are unsure whether this is the optimal solution.

Table 6 compares and contrasts the Royal Commission's recommendations with possible alternatives.

The cost and benefits of implementing the Royal Commission's recommendations are set out in Table 7. The benefits are the avoided cost of the status quo. In the central scenario, the benefit cost ratio is 2.13. This implies that – given our assumption about the regulations leading to the avoidance of a serious incident with 30 deaths – the costs of the regulatory changes recommended by the Royal Commission could be more than double expectations and still deliver net benefits.

A number of parameters are also tested to examine the robustness of the cost benefit analysis. This is because of the uncertainty surrounding the exact details of how best practice will be implemented are yet to be decided. To take into account this uncertainty we have in a sensitivity analysis varied the discount rate, halved the value of statistical life estimate, increased costs by 25% and increased mine costs under new regulations. In all cases the benefits outweigh the costs.

The costs and benefits remain indicative. Costs have become clearer with the finalisation of the regulations. While costs will become clearer still as standards in approved codes of practice are finalised over the next three years, the difference is not expected to substantially affect the cost benefit analysis.

Table 6 Comparison of Royal Commission recommendations and alternative approaches

Safety issues	Royal Commission recommendations	Alternative(s)	Comment
New regulations to ensure processes for hazard management	Structural changes required for large mines and documentation of hazard management plans	No alternatives to the structural changes. Documentation could be reduced	To maintain safety standards over the long term, documentation that assists in verification, monitoring and review is required
Increased involvement by the regulator and oversight by an advisory body	Reduce ambiguity in regulation, introduce process regulations, create new safety positions within mines, and create a new advisory board to oversee regulation	Create a hands-off approach and allow mine operators to set safety stands	The hands-off approach is untenable in high hazard industries, since the risks are misaligned
Emergency preparedness	Increase mine preparedness and increase inter-agency co-ordination	Introduce partial changes to an emergency preparedness system	Partial changes would signal a lack of willingness to embrace a health and safety culture and reduces potential spillovers to other parts of the health and safety system
Strengthening training and competency requirements within the mine	Creating the SSE, ventilation and other positions at high levels within a mine ensures health and safety remain a primary focus. Establishing a board of examiners	Reducing the health and safety positions to lower level management positions within the mine diminishes the importance of health and safety	Reducing the positions to low levels within the mine increases the risk that health and safety will be taken less seriously allowing standards to slip
Worker participation	Union representative can potentially foster worker participation and improved communication between staff and management Documentation processes also assist in verification of health and safety processes and actions	Independent monitoring could work. Question of who would pay for the service. Real problem of maintaining open communication between staff and management, as it is needed in high hazard industries	Union representation is likely to provide for a higher level of health and safety communication between staff and management Dispensing with documentation will not help with monitoring Documenting systems will also assist in the durability of the health and safety system

Source: NZIER

Table 7 Results and sensitivity analysis

Discount rate 8%

Central scenario	Costs and benefits in today's dollars	Comment
Costs	\$11,046,000	Costs associated with all five priority areas
Benefits	\$23,500,000	Costs avoided from having a catastrophe
Net benefit	\$12,450,000	
Benefit cost ratio (BCR)	2.13	
Scenarios (BCRs)		
Halve loss of life calculations	1.62	Reduces costs avoided
Increased costs by 25%	1.70	Increase in all costs
Mine adjustments cost more than anticipated	1.28	Cost of structural changes under new regulations is three times what is anticipated
Discount rate reduced to 6%	2.69	Benefits occur in year 30 onwards, therefore results are sensitive to discount rates
Discount rate 10%	1.64	Benefits occur in year 30 onwards, therefore results are sensitive to discount rates
Discount rate 1.5%	4.05	United Kingdom discount rate for health and safety measures
Notes (1): Numbers rounded so do not necessarily sum. (2) One-off costs associated with structural changes to mines, and tunnels are not included, since they are likely to occur in all scenarios. (3) We have allowed for a 2% efficiency gain from year 5 since workers, mine operators, and regulators will become more familiar with the health and safety system, improving efficiency.		

Source: NZIER

1.6. Consultation

The Royal Commission, as part of its deliberations, undertook extensive consultation with all affected stakeholders. Feedback from that consultation process has been considered as part of the Royal Commission's findings.

In response to recommendation 2 about the need for a new regulatory framework for mining health and safety, the Government established an Expert Reference Group (the ERG) of international and New Zealand mining/regulatory experts, emergency management experts, industry and union representatives. The ERG assisted MBIE to develop a new mining health and safety framework to meet international best practice. MBIE met monthly with the ERG in 2013, and ERG provided advice on working papers and regulatory proposals. Monthly meetings were also held with industry and union representatives.

In May to June 2013, consultation was held on a discussion paper *Safe Mines: Safe Workers*. Cabinet's commitment to implement the Royal Commission's recommendations this year also meant that a Bill to make changes to the Health and Safety in Employment Act 1992 (the Act) was introduced in June 2013 prior to the completion of consultations. Feedback from the consultations suggested some useful changes to what was proposed in the Bill, and these were included when the parliamentary select committee considered the proposed Bill. The public also had the opportunity to make submissions on the Bill at the select committee stage.

A key consultative requirement was how the Royal Commission's best practice requirements were to be adapted to the New Zealand mining sector. This was an iterative process on the detailed design of the regulations, with further consultation undertaken with industry on an exposure draft of the regulations in September 2013.

1.7. Impact

Groups considered to be affected by the recommendations include:

- the mine workers who are important beneficiaries since the regulations are designed to protect them and minimise risk
- the mine owners/duty holders will shoulder substantial short term costs (with and without the regulations) and longer term compliance costs to ensure safety standards are maintained at a level that minimises hazard risk
- the regulator will also face some costs in the short term from developing and implementing health and safety regulation
- the mine union will face some on-going costs associated with ensuring worker participation in mine health and safety activities
- the general public will also be assured that health and safety standards minimise the risk of accidents.

1.8. Conclusions and recommendations

Option 2 that implements the Royal Commission's recommendations is the preferred option of Cabinet. It offers a mutually reinforcing package of health and safety measures that will strengthen the management of high hazards in the mining, tunnelling and quarrying sector over the long term.

It sets out a proportionate response to improving health and safety measures, recognising the unique geographical situation faced by New Zealand mines and specifies in detail what is required to control the risks of a catastrophic accident. This option is preferable to the status quo and is consistent with international best practice.

1.9. Implementation

Change management

Cabinet directed the Ministry to develop the Pike River Implementation Plan (the Plan). This was first developed in November 2013 and the final plan dated October

2013 has now been published. The role of the Plan was to develop a response to the recommendations of the Royal Commission on the Pike River Coal Mining Tragedy. Cabinet has also decided that the focus of the regulations should be broader than just underground coal mines and include all underground mines, open cast mines, and tunnels.

Information

The overall objective of the Plan was to make immediate changes to New Zealand's mining regulations where possible and to start an active and immediate engagement with the Australian jurisdictions with a view to developing a more harmonised trans-Tasman mining regime. The Australian mining industry is seen as best practice.

The incremental introduction of the best of the regulatory approaches from the Australian jurisdictions was proposed, as likely to produce a better long term outcome for New Zealand's mining industry.

Regulators in Australia (and also the United Kingdom) have developed very good guidance material to support the development of regulatory processes. The Ministry is considering the material and will re-use it where possible in the development of approved codes of practice.

Implementation focus

1. New regulations

The focus of new regulations is on two areas:

- the development of PHMPs and PCPs that set out the defined hazard area
- the structural changes required for mines identified in the PHMPs and PCPs.

The identification of hazards and mitigation steps is an on-going process while the development of PHMPs and PCPs is required for documentation and verification purposes and will be in place when the regulation comes into force.

2. Increased regulatory oversight

Increased regulatory oversight requires changes in legislation, development of systems that provide better health and safety information that are auditable, the creation of new health and safety roles within mines and an advisory body to oversee monitoring, verification and review processes.

The statutory amendments have been made and other health and safety systems, documentation processes and auditing functions are being developed to support the introduction of the new regulatory framework for underground mining.

The new regulations will be supported by approved codes of practice and guidance, which are being developed from 2013 to 2015.

3. Improvements in emergency preparedness

The new interagency protocol for major mining emergencies will be finalised by December 2013. The new Crown agency, WorkSafe New Zealand, will maintain the protocol assisted by an advisory group. The protocol will involve annual emergency

response testing. The Mines Rescue Service is preparing templates and guidance to assist mine operators with their emergency management planning from early 2014.

4. Strengthening training and competency requirements

To strengthen health and safety competencies within the mines and evaluate the importance of health and safety, an SSE and new safety critical roles will be required at a senior level.

The SSE and other officers will be required to be in place two years after the regulations come into force.

5. Improved worker participation

Worker participation in health and safety initiatives is seen as crucial in the effort to minimise risks. To ensure participation:

- new roles have been created to support worker health and safety
- all workers underground are required to have adequate training, supervision, and participation in health and safety systems
- health and safety documentation standards have been improved.

Worker participation initiatives will be in place when regulations come into force.

Enforcement strategy

The Ministry's High Hazards Unit is responsible for executing the enforcement strategy. The High Hazards Unit will provide independent assurance that:

- hazards having the potential to cause major accidents and affect structural integrity of mines are properly managed through the PHMPs and PCPs
- occupational health and safety hazards are being properly managed through the SSE and other officers and with appropriate documentation
- emergency evacuation process (including documentation) are in place
- worker participation in health and safety is occurring at specified levels and that it is documented.

This will be done by scrutinising the mine operations prior to commencement and during operation; challenging the mine operators' approach and documentation where required; challenging the commitments made by the mine operators; and rejecting safety approaches where there are serious shortcomings. The union health and safety representative and the independent advisory board will also contribute to this process.

Qualified mine inspectors will be used to monitor compliance with legislation and on-going implementation and compliance with documentation required for PHMPs and PCPs and ensuring other health and safety systems are functioning at the required level. For example, they will check that SSEs are providing correct documentation, evacuation drills have been carried effectively, and worker participation processes have been developed.

The scope of the planned inspections will be informed by:

- the type of mine, tunnel or quarry being visited

- the commitments and responses made during previous inspections
- the outcomes of any incidents and investigations that have occurred since the last inspection
- the functioning of the documentation process for employee participation and the management of hazards
- input from relevant stakeholders.

The scope of the inspection will be developed by the inspector leading the inspection. This will be agreed in consultation with the Chief Inspector (Mining) as a part of the inspection planning process.

Where a major change occurs in the focus of the inspection, this should be discussed with the Chief Inspector where practicable. If other issues are noted by inspectors, these may also be taken into consideration, even though they may fall outside the original scope.

Inspection teams will usually consist of at least two inspectors. Inspections will prioritise those areas of each mine, tunnel or quarry that generate a significant portion of the risk associated with an activity, and those control measures that have the most influence on risk.

The High Hazard Unit has the resources and expertise to ensure that consistent standards are maintained.

1.10. Monitoring, evaluation and review

Monitoring, evaluation and review require consistent attention to enable durable regulatory standards in high hazard industries. For this to occur, an industry advisory group⁹ is proposed to provide strategic oversight of the new regulatory regime (similar to the Queensland and New South Wales model). Such a group would have an advisory role to the regulator.

We expect the advisory group to be involved in a review to be carried out at five yearly intervals after the commencement of the new regulations.¹⁰ The review must include effectiveness assessments of the overall health and safety management system including:

- PHMP, PCP, and specific controls developed to manage hazards
- worker participation and contribution to health and safety
- the regulator to bring about health and safety improvements
- the SSE and other safety critical roles contributing to hazard management
- the documentation processes required to build a health and safety culture.

As part of any review, consideration will be given to the number of near misses and minor accidents reported. Also, consideration should be given to any conclusions from investigations into major accidents overseas in comparable jurisdictions.

The industry advisory group will be an advisory panel to board of the proposed new Crown agent WorkSafe New Zealand and will not need legislative status.

⁹ The so called three pillars approach involving the employer/duty holder, worker involvement, and active regulator.

¹⁰ Five years has been chosen as a preferred timetable since it is in line with current best practice.

A separate body is also proposed for emergency preparedness. This requires a multi-agency approach including the Police, Mines Rescue. This will enable decisions to be made on the types of emergency training exercises that could take place in New Zealand in any one year.

The reviews must be completed within six months or in a period that the Minister of Labour allows.

A report on the review must be made available to the Minister of Labour.

The review will be funded out of the Ministry's baselines and will assist in ensuring that year-to-year budget pressures do not erode regulatory oversight and standards over time.

Evaluation is not required since five-yearly reviews are required.