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RISSB
RAIL INDUSTRY SAFETY AND STANDARDS BOARD
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Safe Decisions

A framework for considering safety when making decisions in the Australian Rail Industry

GUIDELINE

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Acknowledgment

This document is based on Taking Safe Decisions published by the Rail Safety and Standards Board (RSSB) (UK) in 2009. It also contains material from the second edition of Taking Safe Decisions which was published in July 2014. RISSB would like to acknowledge the significant research and consultation effort undertaken by RSSB in producing its guidance which has been relied upon in the development of Safe Decisions.

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Guideline Change Procedures

RISSB maintains the master for this document and publishes the current version on the RISSB website.

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Changes to this publication must be approved according to the procedure for developing management system documents.

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Overview

Almost every policy, investment or operational decision made by the Australian rail industry has an impact on safety. It is therefore vital that safety considerations are embedded effectively into the decision making process.

Safe Decisions has been adapted from Taking Safe Decisions which was first published by the Rail Safety and Standards Board (RSSB) in the UK in 2009 and updated in July 2014. It describes the Australian industry view of how decisions should be made that properly protect the safety of rail industry workers, passengers and others, satisfy the law and respect the interests of stakeholders, whilst remaining commercially sound. There are good decisions and poor decisions. Poor decisions can result in action under law regardless of why they were made or the evidence to substantiate the decision making process. In other words it is important that the outcome of decision making meets safety outcomes rather than focussing on the process.

The RSSB document was based on an extensive programme of research, analysis and consultation, which RSSB carried out to clarify how this balance is achieved. Utilising cross-industry input, the principles of the UK document have been examined under local conditions and *Safe Decisions* has been revised to reflect the Australian context. The following pages now describe a broad consensus view of how decisions that impact safety should be made.

In Australia duty holders should make decisions that properly protect the safety of rail industry workers, passengers and members of the public, satisfy the law, respect the interests of stakeholders and are commercially sound.

These different decision types have different implications and involve different considerations. The understanding and clarity that this document brings to the process may result in changes to what has previously been done in some parts of industry. Key clarifications are:

- Societal concern about risk impacts on government decision making. This document states that societal concern should not be taken into account by duty holders when deciding whether a measure is necessary to ensure safety so far as is reasonably practicable (SFAIRP). However, the impact of societal concern on an organisation's reputation might mean that the organisation takes account of it optionally for business reasons.
- A judgement about whether a measure is required to ensure safety so far as is reasonably practicable may be supported by either a qualitative risk analysis or a quantitative risk assessment which in some circumstances might include a cost-benefit analysis (CBA).

Safe Decisions describes these key principles in full and provides guidance on what they mean in practice for those making decisions that impact upon safety.

Safe Decisions consists of two parts:

- Part 1 - Principles
- Part 2 - The Decision Making Framework

Part 1 of the document should be of interest to both senior managers and safety practitioners. Part 2 provides guidance targeted at safety practitioners. In support of the guideline case studies which illustrate the principles will be published separately on the RISSB website and updated from time to time.

Glossary of Terms

Collective risk.
The collective risk is the aggregate risk, possibly to a range of different exposed groups, associated with a particular scenario or hazardous event. When undertaking an assessment (whether quantitatively or qualitatively) of whether or not a measure is necessary to reduce risk SFAIRP, the change in risk associated with the measure is a *collective risk* estimate.

Consequences.
Unless otherwise indicated, this document uses the term consequences to mean safety consequences which are the number of fatalities, major injuries and minor injuries resulting from the occurrence of a particular hazardous event or outcome.

Duty holder.
Any party with duties under the Rail Safety National Law.

Fatalities and weighted injuries (FWI).

The FWI weightings equate injuries of differing degree with a fatality, which allows all of the risk on the railway to be totalled and contrasted in comparable units. The weightings quoted in the following table are taken from the RSSB Guideline Taking Safe Decisions as applied in the UK and are based on extensive research. They are a useful guide in the absence of any generally accepted ratios in Australia and are recommended by RISSB.

Unit of Loss	Fatalities	Major Injuries	Reportable Minor Injuries	Non-Reportable Minor Injuries
Weighting	1	10	200	1000

Source – Taking Safe Decisions (RSSB UK 2009)

Where:

- A fatality is defined as death within one year of the causal incident.
- A major injury is defined as injury to a passenger, workers or member of the public where the injury resulted in hospital attendance for more than 24 hours.
- Reportable minor injuries are physical injuries to passengers, workers or members of the public that are not major injuries.
- Non-reportable minor injuries are physical injuries to passengers, workers or members of the public that are not major injuries and are not reportable.

It should be noted that many organisations in Australia will have calculated their own FWI ratios based on their experience.

Frequency.
The frequency of an event is the number of times it occurs, or is expected to occur over a specified period of time (e.g. the number of events per year).

Gross Disproportion.
Analysis might reveal the cost of a particular risk control measure to be greater than the benefit it would deliver. For anything other than safety investment it might not make sense to proceed, but in 'safety' the Rail Safety National Law (RSNL) (section 47) encourages duty holders to err on the side of caution. The RSNL requires risk controls to be implemented unless their cost is much greater than (or grossly disproportionate to) the safety benefit in terms of risk reduction. There is no strict definition of the level where costs become grossly disproportionate to the benefits; an organisation must make a judgement for itself and to the satisfaction of its stakeholders (discussed further in the ONRSR's guidance mentioned in SFAIRP below). Things to consider when making that judgment include the uncertainty in the analysis of costs/benefits, and the scale of potential consequences should there be an occurrence.

Hazard.
A source or a situation with a potential to harm someone (death, injury or illness) or damage property or the environment.

Hazardous event.
A hazardous event is an event that has a potential to harm someone (death, injury or illness) or damage property or the environment (e.g. a derailment, collision or fire).

Individual risk.
Individual risk is the probability of fatality per year to which a hypothetical individual is exposed from the operation of the railway. Individual risk is a useful notion when organisations are seeking to understand their risk profile and to prioritise and target safety management effort.

Industry.
This primarily comprises organisations who work on, or for, the railway; especially those with a duty under the harmonised Work Health and Safety Laws, the Rail Safety National Law, and/or applicable state laws. This excludes the Regulator(s).

Likelihood.

The likelihood of an event is the estimated probability that it will occur. This can be expressed quantitatively or qualitatively.

Reasonably Practicable.

The meaning of 'reasonably practicable' is defined in section 47 of the Rail Safety National Law as '…that which is (or was at a particular time) reasonably able to be done in relation to ensuring safety, taking into account and weighing up all relevant matters, including –

(a) the likelihood of the hazard or the risk concerned occurring; and

(b) the degree of harm that might result from the hazard or the risk; and

(c) what the person concerned knows, or ought reasonably to know, about -

(i) the hazard or the risk; and

(ii) ways of eliminating or minimising the risk; and

(d) the availability and suitability of ways to eliminate or minimise the risk; and

(e) after assessing the extent of the risk and the available ways of eliminating or minimising the risk – the cost associated with available ways of eliminating or minimising the risk (including whether the cost is grossly disproportionate to the risk).'

Risk.

Risk is a product of the estimated likelihood of an event and the consequence of that event. The expression of risk can be either qualitative or quantitative.

The above definition is consistent with ISO31000 which includes the notion of consequences and likelihood in determining the risk of an event occurring.

SFAIRP.

Under Section 46 of the Rail Safety National Law Duty Holders are required to:

a) eliminate risks to safety so far as is reasonably practicable;
b) If it is not reasonably practicable to eliminate risks to safety, to minimize those risks so far as is reasonably practicable.

The Office of the National Rail Safety Regulator has provided guidance in its published guideline 'Meaning of duty to ensure safety so far as is reasonably practicable' which can be found at:

http://onrsr.com.au/resource-centre--document-finder/publications/guidelines

In this guideline for the sake of brevity we shall refer to this requirement as the 'need to reduce risk SFAIRP'.

Societal concern.

Societal concern refers to the concern and anxiety that the public feels about different types of risk. This concern might not reflect the true level of risk, is influenced by dread and other subjective or emotive feelings, and might change considerably following the occurrence of an accident. Societal concern about risk can result in pressure on the railway that is disproportionate to any objective evaluation of risk. It is not taken into account in the industry's determination of whether measures are reasonably practicable and is therefore not part of the industry's legal duty. However, societal concern *can* impact an organisation's profitability and performance, and therefore may be a factor in a commercial judgement.

Value of a Statistical Life (VoSL).

Sometimes the decision to proceed (or not) with a particular project is informed by a business case which will weigh up the benefits of the project, versus the costs. Usually a business case will convert the costs and benefits to a common unit of measurement for the analysis, e.g. financial (dollars). Where the project is expected to impact on safety then such a business case will normally consider those impacts too; the VoSL is a tool to help include safety considerations in decisions like these. When considering safety impacts in isolation; if the cost of a particular measure (that might be expected to avoid a hypothetical fatality) is less than the VoSL then that measure is generally considered 'reasonably practicable' (see SFAIRP above) Importantly however, even if the cost of that measure was more than the VoSL it may still be required by law as long as the cost is not 'grossly disproportionate' (see above).

Worker

Worker includes employees, contractors, labour hire employees and volunteers.

1 Principles

1.1 Background

In the Australian rail industry, almost every policy, investment or operational decision has an impact on safety; therefore, consideration of safety must be embedded effectively into such decisions. *Safe Decisions* outlines the principles that duty holders in the rail industry apply in order to do this. These principles are applied so that decisions made properly protect the safety of rail industry workers, passengers and members of the public, satisfy the law, respect the interests of stakeholders, and are commercially sound.

The principles applied to decisions are:

- Railway organisations want their workers to work, and passengers to travel, in a safe environment.
- Safety is good for business: it is in the commercial interests of railway organisations to be, and to be seen to be, safe. Many decisions which impact upon and improve safety are actually made voluntarily for commercial reasons. These decisions are often complex and involve issues like performance, profitability and the long-term reputation of the organisation. They are made by organisations through choice and may go beyond strict legal duty.
- Safety is a legal duty: decisions that affect safety must comply with the law and not leave railway organisations exposed to criminal penalties or liable to civil actions. Railway organisations assess how to meet their legal duty by applying professional judgement and analysis of risks and costs. Actions required to be made to meet a legal duty are mandatory.

Followed consistently, the principles result in sensible decision making, which helps duty holders to continually strive to reduce risk, whilst not allowing a culture of risk aversion to affect decisions. This approach allows duty holders to reduce risks and to protect workers, passengers and the public whilst acting as responsible custodians of the resources that are invested in the industry. These principles apply directly to the decisions of a single railway organisation and when two or more organisations work together to manage a hazard that they share.

Safe Decisions stresses that the principles applied by duty holders are distinct from those applied by the lawmakers when making policy decisions. This reflects the differences in its authority and responsibilities from those of the industry. The government can mandate measures on the rail industry that reflect *societal concern* in addition to the underlying level of accident risk. The government mandates these measures on the industry as specific legal requirements, although the industry may not itself have identified them as being reasonably practicable by application of the principles identified in the Rail Safety National Law.

1.2 Duty Holder Principles

There are a number of considerations which ought to be applied by duty holders to any decision which affects safety. If a measure is legally required, then it must be implemented. However, often in the rail industry, decisions are made which impact upon safety but are not legally mandated. A duty holder might choose to implement measures that go beyond what is reasonably practicable for a variety of commercial reasons but it is not legally obliged to do so. The duty holder may therefore choose not to implement such measures, or may decide to

remove them at a later date (as long as it can be demonstrated that the remaining measures satisfy the duty holder's obligation to ensure safety, SFAIRP).

Figure 1 illustrates the obligations and responsibilities that an operator in the Australian rail industry might have and how they relate to each other. Some are general and apply to organisations in any sector, but others are specific to the railway. Some railway specific obligations also apply to organisations that are not rail transport operators. Consequently it is important that organisations in the railway supply chain understand them because they impact on the products and services that rail operators require.

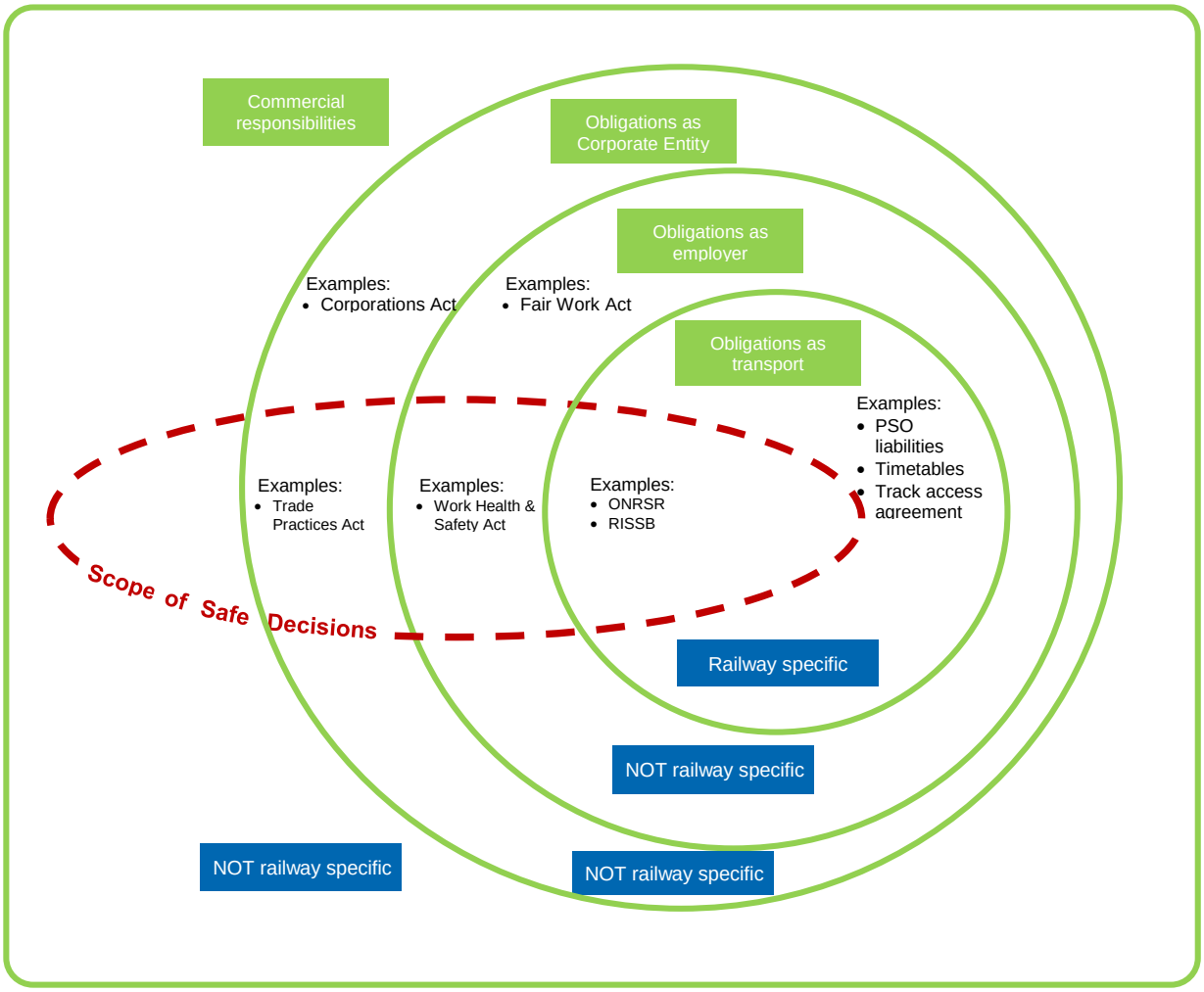

Figure 1: Responsibilities and obligations of a rail transport operator in Australia

1.2.1 Application of Business Principles

Most decisions in the rail industry are made to meet sound business objectives, rather than simply any legislative requirement. These objectives are often complex and take account of a wide range of factors, including safety, performance, customer service and cost.

Safety can impact upon business considerations in many different ways. *Societal concern* about accidents might have real commercial impacts. The damage to an organisation's reputation from being associated with an accident can be substantial. Loss of confidence in an organisation's safety performance can significantly affect both freight and passenger business

and hence revenues. In such a situation, there may be pressure to apply elevated risk control measures to regain customer confidence, which may affect performance. Public and media perception that an organisation has a poor safety record, whether justified or not, can also affect the attitude of potential and current employees and result in low organisation morale. These perceptions can also affect shareholders and therefore impact directly on an organisation's worth.

Often, major commercial decisions in the rail industry concern investment, renewal and the introduction of new technology, including, for example, new rolling stock or signalling systems. These are complex business decisions made to improve performance, reliability and customer service. Whether or not to go ahead is rarely a question of legal necessity on safety grounds alone. However, safety is always a key concern; such investment provides a key mechanism by which safety is improved in the industry.

Fundamentally, safety makes good business sense. For a variety of commercial reasons, a railway organisation may wish to take an approach to control a specific risk to protect its workers or its passengers to a level greater than that which the law would require or that generally applies to those same individuals elsewhere in society.

1.2.2 Application of Legal Principles

Railway organisations must be careful to ensure that they make all decisions that are necessary to meet their legal duties. To do this there are, broadly, three steps to follow.

First, any specific safety measures required by law are identified and implemented.

Secondly, each railway organisation must identify the scope of its undertaking and the hazards that result from its activities. The Rail Safety National Law and the harmonised Work Health & Safety Law impose duties to ensure the safety of people affected by the undertaking so far as is reasonably practicable. The scale of risk arising from all hazards should therefore be evaluated.

Thirdly, in order to determine what is reasonably practicable to ensure safety, a reasoned judgement must be made that balances estimates of safety benefits against estimates of costs (time, money, effort and inconvenience). There are two elements to what is reasonably practicable. A duty holder must first consider what can be done – that is, what is possible in the circumstances to ensure safety. The duty holder must then consider whether it is reasonable, in the circumstances to do all that is possible. This means that what can be done should be done unless it is only reasonable in the circumstances for the duty holder to do something less.

There are various ways in which it can be determined whether or not this test has been met. For example, if there is established good practice, and it is valid and appropriate in the circumstances, the practice is likely to be reasonably practicable.

Where no established good practice exists, judgement must be based on an estimation of costs and benefits. Balancing costs and safety benefits can be undertaken qualitatively or quantitatively. In many cases, simple inexpensive controls can be adopted on the basis of qualitative analysis, using professional judgement.

However, a more quantitative approach, using formal cost-benefit analysis, may be used to support a judgement when:

- The risks and/or controls are complex;
- The costs are high, either for a single location or when applied to similar situations across the whole network; and,

- There are a number of alternative options and it is not immediately clear which is the most effective and efficient.

Where risks are difficult to quantify, a similar depth of analysis might be applied using qualitative techniques, such as structured workshop assessments supported by expert judgement.

Any determination of what is reasonably practicable should be subject to a final sense check, asking whether it is objectively reasonable to implement the safety measure in these particular circumstances. This check involves taking a step back to see if any decision indicated by the assessment seems sensible and appropriate. This judgement is a wholly objective one – it does not take into consideration *societal concern* or any other intangible or subjective factors.

It is important to acknowledge the lead time between the decision to adopt a new safety measure and the introduction of that measure into service. This is particularly important for complex, engineered safety measures with development phases ranging from several months to years. In such circumstances, the duty holder must determine whether it is reasonably practicable to introduce interim safety measures. This may involve for example, restricting operations to minimise exposure to the associated risk, or implementing temporary controls to remain in place until the long term solution is available.

It is acceptable to remove risk controls if, following robust analysis, the duty holder makes a judgement that it has satisfied its duty to ensure safety, SFAIRP without those controls in place. This situation might arise in the light of changed circumstances (such as the introduction of other control measures) or improved understanding of the level of risk. Similarly, as circumstances differ between locations, control measures which have been found to be reasonably practicable to ensure safety in one particular location should be tested to ensure that their application is suitable to other similar locations before being implemented.

In order to demonstrate that a decision is sound, it should be documented together with the reasoning that supports it, including the reasoning to support where options were not adopted.

1.2.3 Principles of Risk

When setting priorities for the development of further risk control measures, it can be useful to consider both individual and collective risk.

Individual risk is a useful notion when duty holders are seeking to understand their risk profile and to prioritise and target safety effort. It estimates the net effect on safety of a range of different control measures from the perspective of hypothetical individuals. If a category of individual is identified as having a relatively high level of individual risk further investigation would be warranted. The duty holder might consider the effectiveness of the various existing measures that control risk to that individual and also consider if any additional control measures are required. However any determination of whether each measure was necessary to reduce risk SFAIRP would ultimately be based on the change in collective risk rather than any individual risk estimate.

In some cases, the risks may be considered so low as to be insignificant and adequately controlled. In these cases it is unlikely that further controls would be reasonably practicable, although the law still requires further risk reduction to be considered and the implementation of any further measures which are deemed to be reasonably practicable to ensure safety.

There may be some population groups where the risks to individuals is assessed as being or approaching unacceptable. In these cases, a high priority is allocated to the active development and evaluation of options for further risk reduction. Those that are reasonably practicable to

ensure safety are implemented. If there are no risk reduction options, or the residual risk is still unacceptable then the duty holder should not engage in that activity.

In summary, the legislative requirement to reduce risk so far as is reasonably practicable applies equally to all segments of the population regardless of the particular levels of risk to which they are exposed as individuals.

However, the priority and effort applied to analysing risks and evaluating potential measures for further risk mitigation increases in line with the level of individual risk. Further explanation of what this means in practice is provided in section 2.3.1.

1.2.4 Other Considerations

There are several important considerations that can improve the quality of decision making:

- It is not necessary to undertake detailed analysis in support of all decisions.
- Problems can be over-analysed, resulting in information overload (analysis paralysis). Competent people can make good sensible decisions on the basis of available information very effectively. Very often, this is the sensible way to proceed. However, the decision made and the rationale behind the decision still need to be recorded and documented.
- Don’t rely upon instincts when making emotive decisions.
- To make good decisions people need to be wary not to latch onto the facts that support the option they already suspect is the best (confirmation bias). Useful ways to protect against this is to seek to identify information in support of alternative options, and involve other people in the decision making process.
- Be prepared to walk away from projects that don’t meet objectives
- This is known as the ‘sunk cost fallacy’. Sometimes, for example, it is better to accept that a project is not likely to achieve its original objectives and it is more sensible to bring it to a premature close.

This document stresses the need for decisions to be supported by agreement and discussion between different experts and stakeholders. In a workshop environment, like-minded individuals sometimes talk themselves into extreme positions. In situations where everyone is in agreement, it can be worth playing a devil’s advocate role to test the consensus of the group.

Social pressure can influence decisions. In such circumstances, arguments in support of a position should be tested to ensure that the decision is sound.

2 The Decision Making Framework

2.1 Introduction

In part one, we outlined the high-level principles for making decisions in the Australian rail industry. In part two, we suggest a framework for translating those principles into practical action.

Safe Decisions is based on the fundamental principle that decision makers need actively to make decisions that impact upon safety and should not let inaction occur by default. Even if (ultimately) the correct decision is to do nothing, it is important to undertake an appropriate degree of analysis in support of a decision and to be clear about the reasons why a particular way forward has been chosen.

A framework for making decisions that affect safety is set out. The framework does not describe a mechanistic process; rather, it suggests the stages that the decision maker might choose to follow and identifies the issues that need to be taken into account at each stage. This framework provides a structure to help a decision maker consider the options open to them, analyse these options at an appropriate level of detail and reach a clear judgement on the basis of the analysis.

The sequence of steps and the logic are the same whether the decision is made by local or senior managers over a period of days or by the board of an organisation, possibly in consultation with the Regulator and Government, over months or even years.

2.2 Overview

Different types of decisions are made in the rail industry. For example:

- Duty holders may decide to make a decision because they judge that it is necessary in order for the organisation to meet its legal duty.
- Duty holders may decide to make a decision because they believe that it makes commercial sense for their business.

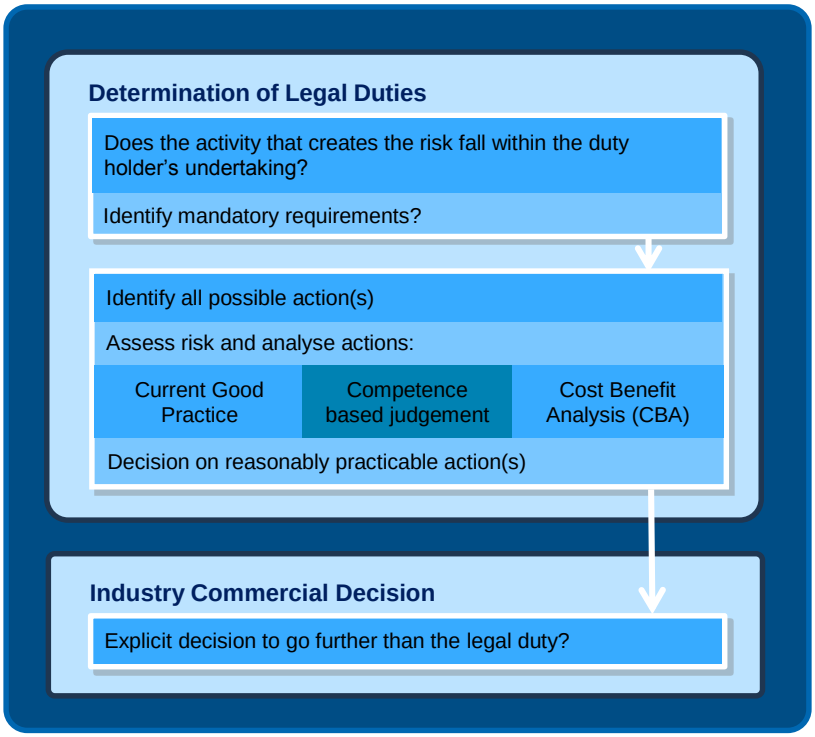

Figure 2: Different types of decision and their relationship to legal duties

This document describes a process that duty holders can apply when making decisions. It does not describe how government policy decisions are made, other than to clarify that such decisions are distinct from those made by duty holders. Figure 2 shows how the legal duty relates to the decision making process we subsequently describe in section 2.2.

2.2.1 Work Health and Safety Act

Duty holders must comply with any mandatory requirements. There are various actions that duty holders must undertake to ensure that they are fulfilling their legal duty with regard to safety. The primary legislation regarding safety in the workplace is the Work Health & Safety Act (WH&S Act) or equivalent legislation in each state or territory.

The Model WH&S law imposes a duty on a person conducting a business or undertaking (PCBU) to ensure, so far as is reasonably practicable (SFAIRP) the safety of its employees as well as any other person exposed to risk from that undertaking. This duty requires duty holders to identify all activities arising within the scope of their undertaking, assess the risk created by these activities and ensure SFAIRP the safety of those exposed to that risk.

If a duty holder judges that a measure is legally required, it must undertake that measure.

2.2.2 Rail Safety National Law

For the rail industry, additional duties are set out in the Rail Safety National Law (RSNL) which has now been adopted by all states and territories except Queensland which will join shortly. The RSNL also imposes a duty to ensure, so far as is reasonably practicable (SFAIRP) the safety of employees as well as any other person exposed to risk on the railway.

The WH&S Act is the primary legislation and where there is any conflict it has precedence. However, both the WH&S Act and the RSNL impose criminal penalties for breach of a safety duty.

An organisation might also choose to implement measures that go beyond the legal duty for commercial, reputational or other reasons. This is a voluntary decision – the organisation is not legally obliged to do so. There are many such decisions in the rail industry.

It is critically important that duty holders record why a particular decision has been made as well as the evidential basis for that decision. This document provides guidance to help duty holders generate the evidence to make their decision on the basis of clear criteria and then record the decision made.

It should be noted that decisions made by policy makers are not subject to a test of reasonable practicability but if mandated by legislation, they shall be applied irrespectively.

2.3 The Decision Making Framework

The framework shown in Figure 3 consists of four sequential logical steps with feedback:

- Scoping: what is the nature of the decision, who should make it and what are the possible courses of action?
- Analysis: how do rules and good practice, quantitative and qualitative analysis, targeted engagement and strategic analysis help in decision making?
- Decision: based on analysis and understanding of the problem, what decision should be made and for what reason?
- Review: does the decision make sense? Over time, what does experience reveal about the decision?

This framework describes how to put the principles described in *Safe Decisions* into practice

Although the framework presented in Figure 3 is presented as a linear process, it is in fact iterative. At each stage of the process, the decision maker might uncover new information or gain improved understanding which would cause them to question previous assertions and assumptions.

Further detail is provided on how to apply each stage of the decision making framework in the sections which follow.

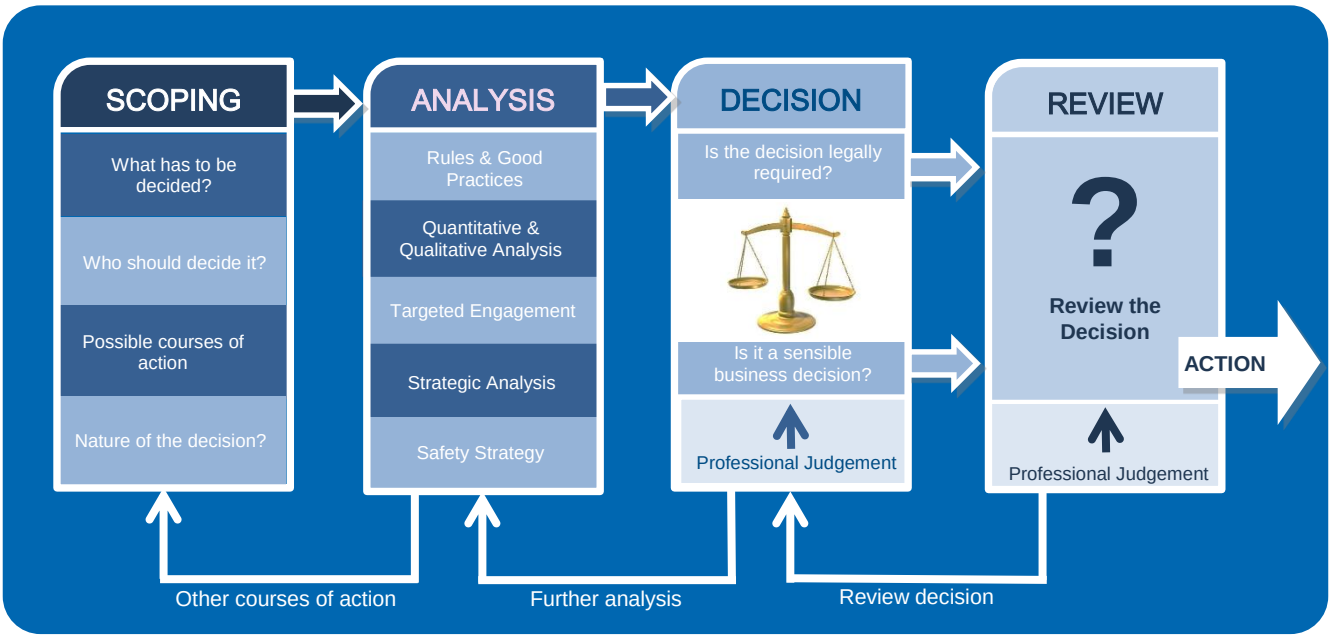

Figure 3: Diagram summarising the stages of the decision making framework

2.3.1 Scoping

The need for a duty holder to make a decision that impacts on safety might arise in a number of different ways. For example, and this is not exhaustive:

- An incident, either internal or external, might cause a duty holder to reconsider or re-evaluate the levels of risk from certain hazards.
- An accident investigation might identify a weakness in organisation procedures or processes and system deficiencies
- A previously unknown hazard might be identified in a risk assessment or identified through an incident or audit report
- New technology might become available which can be implemented to improve performance and reliability of the railway and hence impact upon safety.
- Equipment approaching the end of its life, or that does not meet the relevant standard, triggers decisions about how it should be renewed.
- New legislation might be passed mandating a certain approach.
- Local complaints might arise that draw the duty holder's attention to a specific safety issue.
- A systematic periodic review or benchmarking exercise may identify better practice.
- The duty holder might become aware that a particular group is exposed to a comparatively high level of individual risk.
- Operating conditions may change or Safety Performance Indicators (SPI's) might show an adverse trend.

Once the need for change has been identified, the options are identified and analysed.

When considering a change appropriate resources must be devoted to identifying and exploring options at an early stage. This is to ensure that incorrect options are not chosen by default when projects are initiated and early work begun. The additional cost associated with introducing a new safety measure late in a project when it could reasonably have been identified at an earlier stage should not be used to justify rejecting the measure.

Scope of undertaking

Each railway organisation must identify the scope of its undertaking and the hazards that result from its activities. The duties imposed by the WH&S Act (or equivalent legislation in each jurisdiction) and the Rail Safety National Law is to ensure the safety of the people affected by the undertaking so far as is reasonably practicable. The scale of risk arising from all hazards should therefore be evaluated.

2.3.1.1 Determining the Nature of the Problem

The first step in the scoping of the decision is to analyse and understand the nature, size and complexity of the problem and the resources that are needed to resolve it. Figure 4 shows some of the factors to consider when scoping the problem, their influence on how the decision should be made, and whether any change is likely to be significant.

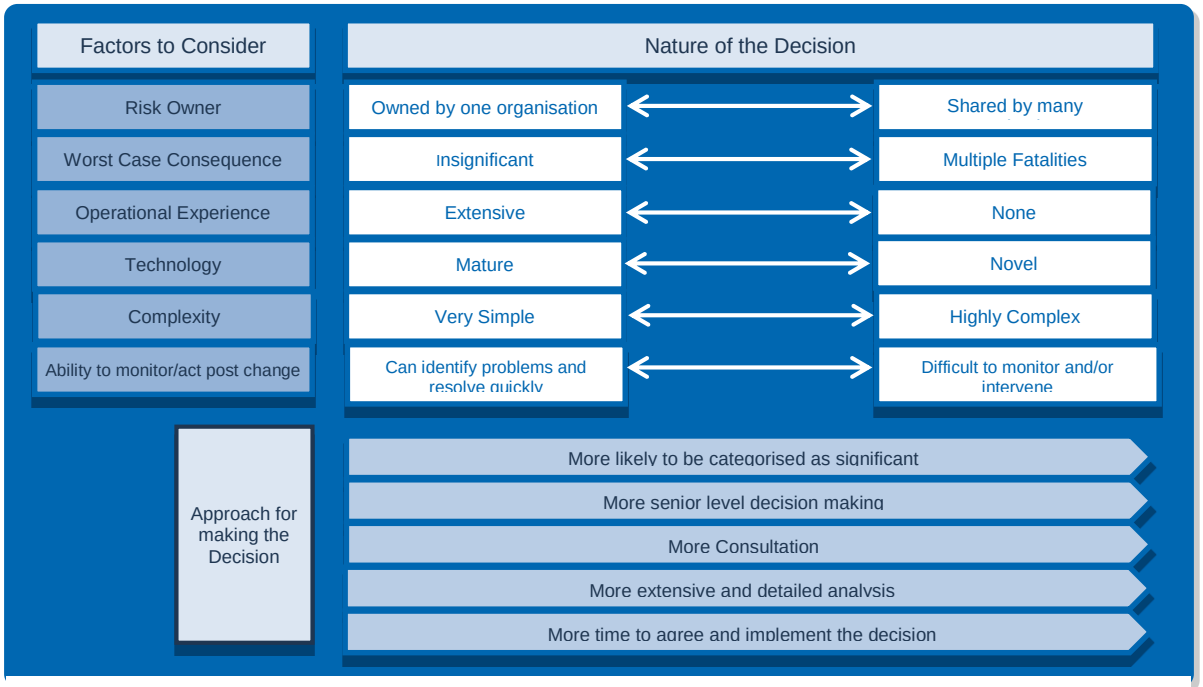

Figure 4: Considerations in problem scoping

At this point, it is sensible to ask what criteria might be applied to make the decision so that the analysis can be targeted to provide the evidence needed. Is it likely that certain risks need to be addressed to ensure that the organisation is meeting its legal duty? Are there sensible business reasons for implementing a measure? These considerations will come to the fore when the decision is made (see section 2.3.3).

2.3.1.2 Deciding Who Should Make the Decision

Decisions should usually be made by the person closest to the subject who has sufficient authority and expertise. Many routine decisions are, and should be, made by front-line operational workers.

Routine decisions are usually well understood and there may be established good practice. Decision makers should consider all modes of operation (normal, abnormal, degraded and emergency) as the authority and expertise required for the decision may change. At the other extreme, some decisions are of a scale and scope that affect the industry as a whole and are made collectively. There is a wide range of decisions between these two extremes. All potential decision makers should know the scope of their authority and the organisation's principles for decisions that affect safety, so that they may be delegated to the appropriate level. Not all workers will consciously apply this particular framework, but the underlying principles should still be apparent in the approach that they take to their particular decision problem.

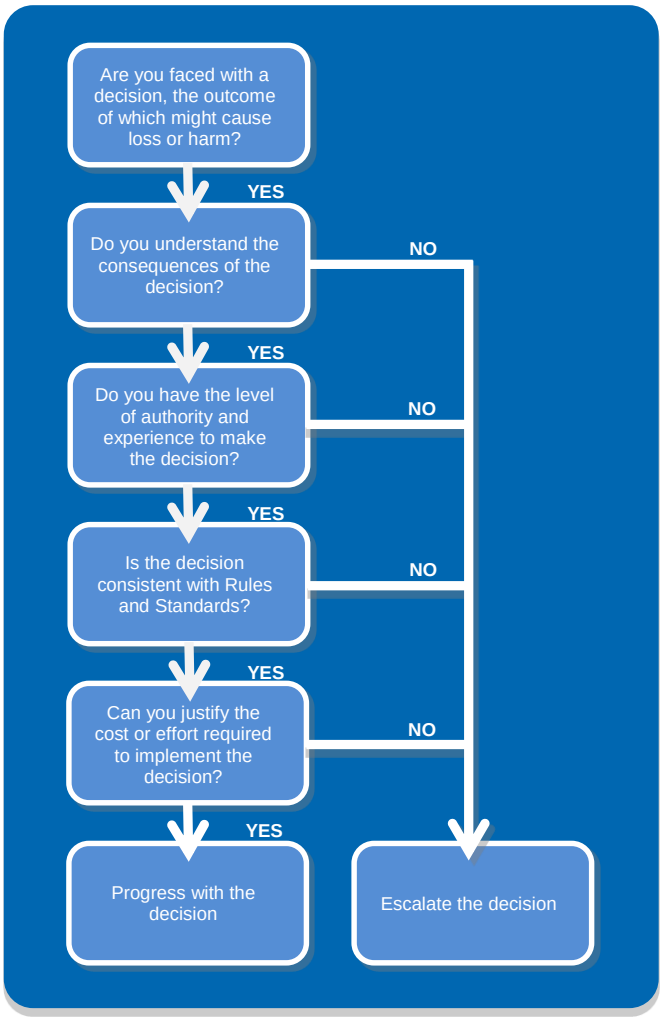

Figure 5: Escalating decision to the appropriate level of authority

The questions that decision makers need to ask to determine whether they have the authority to make the decision are illustrated in Figure 5.

2.3.1.3 Deciding on the Options for Resolving the Problems

The decision maker should consider the various options for resolving the problem. The aim is to consider or list all of the possible choices of action, including 'do nothing'. The decision to 'do nothing' should be recognised as a conscious choice, rather than the default outcome of inaction. Each of the options is then investigated in the analysis that follows.

2.3.2 Analysis

Analysis informs decisions and provides evidence to show that they have been soundly and consciously made. In this framework, we describe four categories of analysis and evidence: rules and good practice, quantitative and qualitative analysis, targeted engagement and strategic analysis. At each stage there is a need to analyse each of the options to the extent that is necessary to identify which one to pursue. Finally in the analysis we consider various safety criteria to ensure that the selected option is compliant with our safety strategy.

2.3.2.1 Rules and Good Practice

Rules

In some circumstances in the rail industry, particular actions and responses to risk are mandated. In this document, the term 'Rules' refers to all of the prescriptive, formal, legal and contractual requirements with which the railway must comply. There may be specific legal requirements relevant to the management of railway risk. Duty holders need to consider whether rules are appropriate to their particular circumstances. If they believe that rules are not appropriate then any deviation should be the result of a considered decision that follows the correct process.

Good practice

Good practice refers to measures, actions, procedures or specifications considered appropriate by professionals based on either experience of their application or a consensus view. Good safety practice is likely to represent reasonably practicable risk reduction however duty holders must make sure that this is the case in their particular context. Other risk controls may also be required to reduce risk SFAIRP. A significant benefit of applying good safety practice is that it may make the assessment of risk controls more efficient / robust, as well as providing quick and effective guidance as to how to proceed in a particular set of circumstances.

Duty holders need to determine what good practice exists in relation to the decision at hand. For example, in Australia RISSB has developed a range of products for the rail industry that represent good safety practice. Together these products form the Australian Code of Practice (ACOP) and include:

- Australian Railway Standards
- Australian Network Rules & Procedures (ANRP)
- Railway Codes of Practice
- Railway Guidelines

RISSB is an accredited standards development organisation and develops and maintains the ACOP for the Australian rail industry. In doing so it must follow a stringent development process that draws extensively on industry subject matter experts to ensure it delivers the best solutions for the whole industry. Although not mandatory RISSB's products are gaining broad acceptance across industry as it recognises the value in the harmonisation of practices. Irrespective of what

standard is used, the organisation must review the appropriateness of the standard before adopting it.

The less formalised good practice is, the greater the onus placed on the duty holder to determine how far it goes toward reducing risk, and if it does so SFAIRP. Good practice should only be used if it is applicable to the given circumstances. If this is not the case, then the reasons why it is not applicable should be recorded. Good practice does not stand still – new good practices emerge over time (in response to incidents, in light of better information, or as new technology or techniques become available). Where good practice has moved beyond being just an effective solution to being an established de facto way of working, it becomes close in status to a formal rule. Organisations which did not wish to apply it would need to be confident that it does not, in fact, represent a reasonably practicable approach in its particular circumstance.

A measure is not necessarily good practice just because it has been implemented by a duty holder at a particular location or set of locations on the network. The circumstances in which the measure is applied are likely to differ from location to location. Alternatively, it may be the case that, in applying the measure, the duty holder decided to go beyond what was reasonably practicable. Ultimately, whether the measure should be applied depends on whether it is judged to be reasonably practicable, taking account of the specific circumstances of the given operation, its cost of application and the risk reduction it achieves (see section 2.3.3.2).

2.3.2.2 Quantitative and Qualitative Analysis

This section summarises the concepts behind risk and techniques for its estimation and analysis. It is quite common, however, for a combination of these approaches to be employed in order to reduce subjectivity. Guidance can also be found in the International Handbook for Engineering Safety Management (iESM Handbook) which describes an approach to managing risk arising from engineering change and maintenance.

Risk

Risk is expressed as the product of the likelihood of an event and the consequences of that event, where the likelihood is quantified as the estimated number of events occurring per year, and the consequences are quantified as the fatalities or fatalities and weighted injuries (FWI) expected given the outcome of that event.

The frequency of a hazard or an accident, and the severity of its likely consequences, can be estimated using knowledge about the previous history and rate of occurrence of similar events. For example, if a duty holder has experienced approximately 100 ‘slips, trips and falls’ in each of the last three years, resulting in approximately 100 reportable minor injuries in each year, they might estimate their risk from slips, trips and falls to be approximately 0.5 FWI per year (based on a ratio of 1 fatality to 200 reportable minor injuries).

However, in making such estimations, the analyst must consider how representative the occurrence rates and severities of past events are to estimates of future risk. For example, the duty holder might revise the risk estimate for ‘slips, trips and falls’ described above to a lower per year figure on the basis that the circumstances had changed, for example if they had recently improved the flooring surface in the stations which they operate. Or they may increase the risk estimate if they were anticipating greater patronage, for example due to the opening of several new stations.

Uncertainty

As accidents and their consequences are difficult to predict, the estimation of risk is an inherently uncertain process. Uncertainty is particularly prevalent when trying to estimate the risk associated with high-consequence, low-frequency events such as train collisions. There are two reasons for this. These incidents:

- Are rare so there is, by definition, little past data to use to develop estimates of risk.
- Can result in a wide range of consequences, the severity of which can vary greatly.

Conversely, the risk associated with high-frequency, low-severity incidents can be ascertained more easily, as there should be more historic data available to support risk estimation. The degree of uncertainty in risk estimates should be considered and factored into any judgement that the risk estimates are used to inform.

Quantitative risk assessment

The estimation of risk is sometimes undertaken numerically using a Quantified Risk Assessment (QRA). This will comprise analysis supported by available data and the use of expert judgement.

QRA is particularly useful where some comparison of risk before and after an intervention is required, such as the implementation of a new system or control measure. Similar uncertainties and assumptions will be present in both assessments. Therefore, there will be a degree of error offset that will help to ensure that comparative results are meaningful. QRA is also undertaken to provide safety demonstrations, such as a determination that risk has been reduced SFAIRP (see section 2.3.3.2). QRA is useful because it provides a more objective basis for decision making, and requires an analyst to study potential accident causal sequences in detail. This helps with the identification of measures to prevent these mechanisms occurring.

However, there are some pitfalls that any decision maker using the outputs of such an assessment to inform a decision needs to be aware of. In particular:

- Stating numerical risk estimates can sometimes lead to a false perception that the figures are precise and accurate.
- Risk can vary greatly depending on the particular situation or location. The assumptions underpinning a risk assessment need to reflect the particular circumstances in which the risk is considered. Anyone using such analyses to inform a judgement should be aware of the weaknesses, sensitivities, and assumptions of the model so that they can be factored into the judgement that the QRA influences.

Qualitative risk analysis

In the rail industry, quantified risk assessment is often unnecessary. Risk can often be estimated quickly and effectively using judgement and experience, especially for front-line operational decisions, which are generally made by workers on the basis of their competence and experience.

In other circumstances, risk is difficult to estimate using a quantitative approach. A safety system may be functionally complex or might comprise controls whose failure rates cannot be estimated with confidence. In other cases the safety related activities might be conceptually removed from the accident sequence meaning that their impact on risk is unclear.

Therefore, a qualitative assessment may be used as a more appropriate method of analysing and understanding risk. A process of structured professional judgement is applied to facilitate the analysis. Some common characteristics of professional judgement can be identified:

- The effort and rigour of analysis are proportionate to the complexity and importance of the decision.
- The necessary skills and competence are used to support each judgement in the process.
- A person or group is identified as responsible for making the decision, taking account of all relevant judgement and analysis.
- The evidence on which the decision was based, and the reasoning used to interpret that evidence, are recorded. The records will again reflect the complexity and scale of the decision, (ranging for example from meeting minutes to a full safety case).
- A degree of independent review or challenge may be necessary.

There are several possible techniques and approaches. Examples include:

- Workshop-based assessments,
- Relative ranking of risks using qualitative categories, for example ‘high’, ‘medium’ or ‘low’.

Development of a reasoned written argument, expressing judgements about risk levels and appropriate responses based on professional experience.

2.3.2.3 Targeted Engagement

There are three main reasons for involving stakeholders in the decision making process.

First, an understanding of stakeholder needs is essential for effective decision making. In complicated situations, the decision maker can only assess the full scope of issues by specifically identifying the stakeholders affected and understanding their various perspectives.

Secondly, thorough consultation and discussion with stakeholders can ease the implementation of a measure. If stakeholders’ views are given due consideration, they will tend to be more willing to align themselves with the course of action subsequently taken, even if it is not their desired outcome.

Lastly and perhaps most importantly, it is a legal requirement under Part 5 of the WH&S Act (especially Divisions 5.1 and 5.2) and this duty is echoed in the RSNL (Part 1, 3(2) (j) and Part 3, Division 3, Subdivision 1, 50(3)).

Engagement might take different forms depending on the scope and scale of the issue and could include:

- Local engagement with those parties most affected.
- Wider consultation with passengers and freight customers who regularly use a line or service.
- Cross-industry consultation to agree an industry wide response to a particular risk.

Those stakeholders most impacted by the safety elements of the decision should be considered a greater priority for consultation while the decision may merely be discussed with those not directly impacted in order to assist with the ease of implementation.

Relevant interested parties to consider might include:

- Operators
- Maintainers
- Customers
- Technical experts from other organisations
- Employees
- Community groups
- Emergency services
- Suppliers
- Shareholders
- Unions
- Political leaders
- Regulators
- Media / opinion makers

When making decisions, engagement with stakeholders will usually involve understanding their concerns and how they could impact upon the business or profits of the organisation (see section 2.3.3.3).

If a measure was legally mandated, each organisation should assess the level of consultation required with those affected to explain the circumstances and ease implementation.

2.3.2.4 Strategic Analysis

For decisions of significant scope, complexity or novelty strategic analysis is required. Such decisions will, by definition, be those where there are genuine options about how to proceed. Therefore, such analysis aligns with decisions made for business reasons (section 2.3.3.3). Strategic analysis is crucial in making sure that the decision outcome aligns with an organisation's values, strategies and goals. This document is not intended to provide a comprehensive process for making such decisions. These decisions will draw upon the experience, understanding and acumen of an organisation's management team.

Strategic analysis is about looking at the decision in the round, taking into account the wider interests of the organisation or organisations involved and of the railway in general. It requires mature consideration by those with the expertise and experience to appreciate the wider commercial and political implications of the decision being made.

Where there are decisions which impact upon safety, but which are not legally required, then strategic analysis of the way forward might take into account consideration of *societal concern.* Public perception following accidents can have damaging effects on an organisation's business performance.

Strategic analysis might also include consideration of project (rather than safety) risk, asking questions such as:

- Is a particular solution practically possible and achievable?
- Is technology capable of application in the proposed environment?

- Are there significant risks of overrun which would impact upon the railway service?
- Do we need to make a decision now, to ensure that we retain sufficient options later in the project lifecycle?
- Is the solution applicable universally, or do different locations / organisations require different risk controls to ensure safety SFAIRP.

Organisational boundaries

Many risks arise from the interaction of parts of the network that are managed by different duty holders. Therefore duty holders need to work together to manage safety. Organisational boundaries have the potential to complicate safety management and duty holders need to be aware of the potential for this to raise problems.

In such circumstances duty holders will need to reach agreement about how to proceed, and a forum may be needed to facilitate the necessary discussion and agreement. There are several formal vehicles for this co-operation such as access agreements (between infrastructure managers and train operating organisations), and interface agreements (between railway organisations and road authorities). In some situations it is likely that informal, or ad-hoc vehicles would need to be established.

2.3.2.5 Safety Strategy

At this stage, in the change process the organisation needs to be confident that an option will, when delivered as a project, consist of measures that ensure safety SFAIRP.

For any reasonably large project, there are likely to be design details that are not agreed until after the decision to proceed has been made. When analysing options, the decision taker undertakes a high level assessment of the risk using the available information.

Major change is often taken to meet commercial objectives. However, even if it is not the main driver, safety needs to be considered early on because it provides the opportunity to design in reasonably practicable safety enhancements: additional requirements become increasingly expensive the later in the project life cycle they are identified. This is illustrated in Figure 6. The options need to be specified and analysed at a sufficient depth so that the decision maker can be as confident as possible that costly new requirements will not materialise later in the project. It is not acceptable to argue that a measure is not necessary to ensure safety SFAIRP on the basis of excessive cost if that measure could and should have been identified at an earlier point in the project when its implementation would have been required.

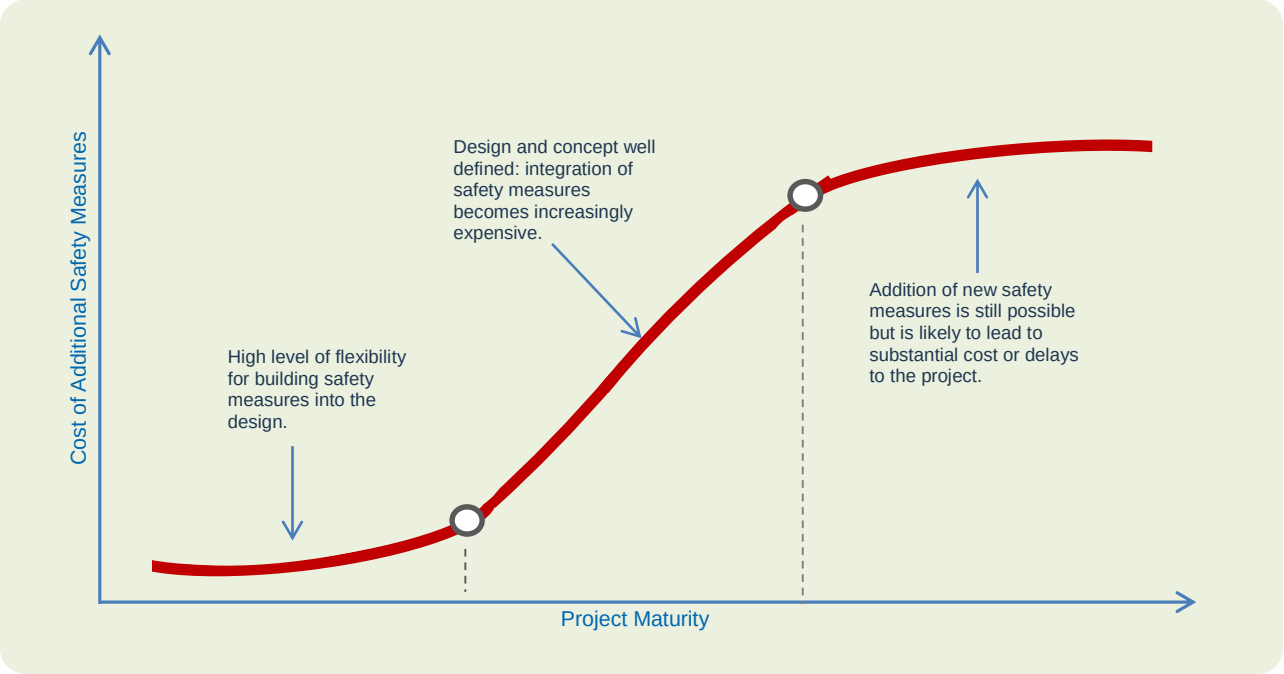

Figure 6: Project maturity and the increasing cost of additional safety measures

High level risk analysis carried out at this stage will include some consideration of the extent to which the hazards will be covered by standards and, where there is existing operational experience, the way in which risk is managed in similar circumstances. Once an option has been selected, this early analysis leads into the risk management process for making a change that is described in the following pages.

For a small and well understood change, it might be possible to clearly define all the required safety measures at the option selection stage. If the change is being made in response to safety monitoring concerns then the decision is more likely to be about whether or not to introduce additional safety measures. In this case, the options and additional safety measures are the same thing, although it will be necessary to plan how to make the change and assess any adverse effects on other hazards.

2.3.3 The Decision

The third stage in the process is the actual making of the decision. This should be executed on the basis of the evidence generated and information gathered by previous analyses.

2.3.3.1 Commercial Responsibilities and Legal Obligations

The choice of which option to pursue will often be a commercial decision. The decision will be made by the board or managers based on their acumen and judgement and informed by analysis. The analysis might take the form of a simple balance sheet where the positive and negative attributes are considered or a full business case cost benefit analysis (CBA). Decisions made for commercial reasons are voluntary and the criteria for making them are distinct from those applied to meet legal obligations.

Figure 7 summarises the key concerns and criteria applied to industry decisions. Where a decision has a safety impact the decision maker must first decide whether or not it has a legal duty to act. The legal criteria are clear and specific and relate to evidence and information about the risks and costs associated with different options. If a measure is found to be legally required, because there is prescriptive legislation or if adopting the measure is judged by the duty holder to be reasonably practicable, it must be applied.

However, if a measure is not necessary in order to meet the legal duty, an organisation may still decide to apply it on the basis that it is sensible from an overall business perspective. The factors included in the business decision will be decided by the duty holder but encompass a wider range of factors than the SFAIRP consideration. The criteria applied to the commercial decision will depend on the organisation's policies, values, priorities and resources.

Business decisions are optional where they are considered to go beyond what is reasonably practicable to ensure safety.

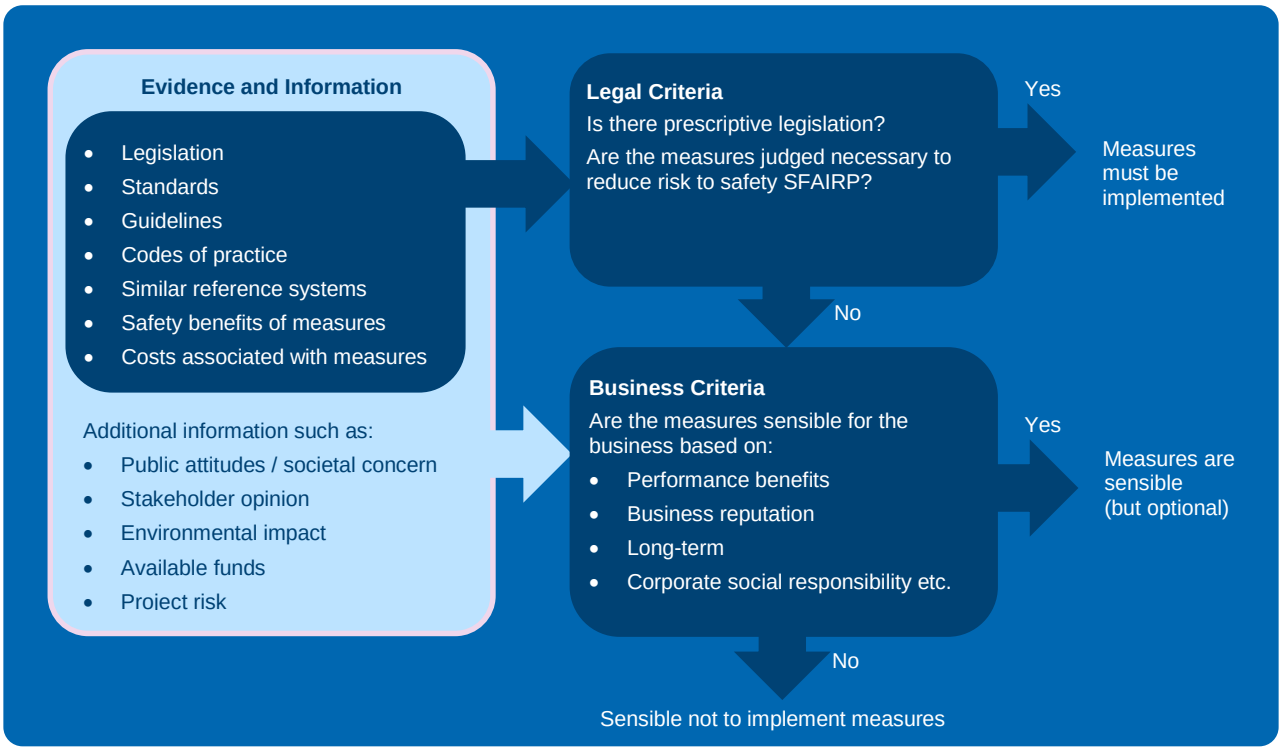

Figure 7: Evidence and information that supports industry decisions and the legal and business criteria applied

2.3.3.2 Industry Determination of Legal Duty

Part one of *Safe Decisions* discussed the requirement for rail organisations to:

- Comply with any specific legislation.
- Estimate the risks from all activities arising within the scope of their undertaking.
- Ensure, so far as is reasonably practicable, the safety of those exposed to that risk.

These requirements set the criteria for deciding whether or not a particular measure must be implemented by a duty holder in order to meet its legal duty.

Mandatory requirements

Railway organisations should be aware of any mandatory requirements relating to railway safety. These requirements would be described in specific Australian legislation or regulations (which should be applied at the time that it comes into force). Mandatory legal requirements must be complied with. *Safe Decisions* may provide assistance in the implementation of these requirements but should not be used to make decisions that are contrary to mandatory requirements

Test for reasonable practicability

There is a general duty under Section 46 of the Rail Safety National Law to ensure safety so far as is reasonably practicable (SFAIRP). This requires the duty holder to eliminate risks to safety SFAIRP, and if it is not reasonably practicable to eliminate risk to safety, to minimise those risks SFAIRP. This consideration is a key input to the decision making process and, where safety controls are being considered, can determine what decision should be made.

If an activity is deemed to be reasonably practicable, it must be undertaken by an organisation in order to discharge its legal duties. Conversely, if it is not reasonably practicable, there is no legal requirement to apply it.

In section 1.2.2, three factors which can inform a judgement about reasonable practicability (to varying degrees in different circumstances) were described:

- Good practice.
- Competence-based judgement.
- Cost-benefit analysis.

The relevance of good practice to the test of reasonable practicability was outlined in section 2.3.2.1. Essentially, where good practice relates to safety, and where it is relevant and applicable, it is likely to represent a reasonably practicable approach to ensuring safety. However duty holders must make sure that this is the case in their particular context.

Judgements often need to be made fairly quickly and a detailed analysis of risks, costs and benefits may not be considered to be practical or necessary given the likely risk or expense. In such cases a judgement might be made based on competence and experience.

Where risks are complex (and difficult to estimate), costs are potentially high and there is no relevant existing good practice, there may be a need to undertake both a risk analysis and/or a cost-benefit analysis, in order to support a decision. The cost-benefit analysis would form a key input into any judgement as to whether a particular measure reduced risk SFAIRP.

Using cost-benefit analysis in SFAIRP demonstration

A cost-benefit analysis can be used to develop an explicit application of the test of reasonable practicability. On the one hand is the cost of a potential measure and on the other the ‘quantum of risk’ and the safety benefit associated with it. The quantum of risk is a *collective risk* estimate. The VoSL can be used to translate the safety benefit to a financial value.

There are potentially other costs and savings that might be included in a CBA in support of SFAIRP decisions. A duty holder would need to make a judgement as to whether costs or benefits relate to the measure under consideration.

Decisions often involve investments in measures where costs and benefits will accrue over a number of years. Therefore, all relevant future costs and benefits must be calculated in present-value terms. A discount rate is chosen to do this, and net present value calculated.

The comparison of costs and benefits is generally presented as a ratio. If the cost is clearly less than the safety benefit, this provides a strong indication that the measure is likely to be reasonably practicable to ensure safety, and there would have to be a clear and convincing argument why such an option would not be adopted. Conversely, where the cost is several orders of magnitude larger than the safety benefit, this would support a judgement that the measure is grossly disproportionate and therefore not reasonably practicable. Note however that where a safety measure could have been easily included in the early design stage but was not – the fact that it is much more expensive to retro fit the measure does not support a judgement that the measure is grossly disproportionate and therefore not reasonably practicable. However, the judgement is more complicated when the difference in size between the cost and safety benefit is somewhere between these two extremes. The decision maker will then need to consider, in particular, the level of confidence in risk and cost estimations made.

The decision maker might err on the side of caution where risk estimates are subject to uncertainty – as is often the case with low-frequency, high-severity accidents like train collisions (see section 2.3.2.2). Best estimates for risks, costs and benefits should be used, if necessary with higher and lower uncertainty bounds. Sensitivity analysis might be necessary in some cases – i.e. testing how sensitive risk estimates are to variation in the key assumptions.

In a SFAIRP analysis, the benefits of investment should be calculated over the life of the asset in question. Where a franchise is due to finish, prior to the point at which a potential investment would be justified on cost–benefit grounds, then the investment costs may need to be shared by the duty holder, the asset owner and future franchisees who share responsibility for the management of the risk.

As reflected in the ONRSR guidance: Meaning of duty to ensure safety so far as is reasonably practicable financial strength or weakness is not relevant to determining the appropriate degree of care. Reasonable practicability is an objective test and the specific circumstances of the duty holder are not relevant considerations.

Removal of risk controls

It is permissible to remove/reduce risk controls that can no longer be shown to be reasonably practicable. This situation could arise if:

- The cost of the control significantly increased,
- The safety benefits reduced (due to the effect of other controls) or
- It was found that the control clearly exceeded what was required by the duty holder to ensure safety SFAIRP.

Decisions to remove risk controls should be justified by a thorough assessment of the risks and a carefully considered SFAIRP case.

2.3.3.3 Making Decisions for Business Reasons

Many decisions in the rail industry are made for business reasons. This document does not provide detailed guidance on how to interpret information to make decisions for business reasons. Instead, it stresses that such decisions commonly arise, and clarifies that the criteria for making them are distinct from those applied for legal reasons. These types of decisions are voluntary and typically depend on the judgement and acumen of an organisation’s board or managers.

CBA is only an input into the overall decision making process and is used to inform a judgement. In some circumstances, an organisation might choose to invest in a measure that reduces risk more than is necessary to ensure that risk is reduced SFAIRP. Analysis might

suggest that the risk reduction of a particular measure isn't reasonably practicable even if a CBA presents an overall positive cost-benefit argument. In this case, safety would not be the key driver for the measure but rather it would be driven by other business reasons.

2.3.4 Review

2.3.4.1 Reviewing the Decision

The final stage of the framework is to stand back and ask: 'does the decision make sense?' That is, does the decision meet the three fundamental goals of being:

- Rational, meaning the decision has been made for sound reasons and is not arbitrary.
- Equitable, meaning that due regard has been given to everyone's interest.
- Defensible, meaning that it can be explained if challenged.

The duty holder should satisfy itself that the three goals have been met. A simple question for the decision maker to ask is: 'how would the decision sound if it were challenged during cross-examination in Court or at a shareholders meeting?' The media may also challenge the decision so if any of the reasoning on which the decision is based is unsound, those challenges will find and expose the weaknesses. But if the reasoning is sound, there is a good starting point for explaining it, even if the arguments are subtle and complex.

2.3.4.2 Documenting the Decision

A decision to do nothing should not be allowed to happen by default. Both the decision and the way it is reached should be documented so that they are transparent. Documenting the decision ensures that there is no doubt as to what was decided and provides an evidence trail if the decision is subsequently challenged. Management decisions are always codified in some form of written record, for example in a:

- Memo
- Business case
- Organisation policy
- Work instruction
- Meeting record

It is important that not just the outcome, but also the reasoning on which a decision is based, is recorded. The record should include:

- A clear statement of the issue.
- The options that were considered (including 'do nothing' if this was one of them).
- The results of all of the assessment and analysis undertaken including: any assumptions that were made; the data on which the assessments were based; the minutes of any review meetings and any other information that shows how the risks were assessed.
- The option that was selected, with the key reasons why it was preferred.
- The options that were rejected, including the key reasons why they were not pursued.
- How the decision was to be put into practice – for example as an organisation policy, rule or work instruction, or details of any briefing given to workers.
- The parties involved who took part in reaching the decision.

Of course, the type or amount of documentation required to support the decision will vary in accordance with the scale, complexity and potential impact of the decision. A relatively low impact decision effecting only a small part of the operation would not be subject to the same documentation requirements for a significant capital investment decision.

2.3.4.3 Ongoing Systematic Review

When a decision is made, it is based on certain assumptions about initial levels of risk, costs, and the effectiveness of a particular approach or measure. By monitoring how a decision is implemented and its effectiveness these assumptions can be revised. Ideally this review should be systematic so that a standardised approach is taken when carrying out post implementation reviews. This additional insight and understanding might lead to the decision being revisited or might influence other similar decisions in the future.

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