Parker Centre

Parker Cooperative Research Centre for Integrated Hydrometallurgy Solutions

Risk Communication: A Framework for Technology Development and Implementation in the Mining and Minerals Processing Industries

FINAL REPORT

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A Risk Communications training module has been developed as part of this project. If you would like further information on the training module, please contact The Centre for Social Responsibility in Mining at +61 7 3346 4003.

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GLOSSARY

Audience	See stakeholders
Availability bias	A heuristic according to which individuals tend to overestimate the likelihood that an event will occur if they can recall past instances
Business risk	Refers to high-level risks at the corporate or enterprise level. Typically, it refers to aspects of business planning that may represent a threat to the survival of a company or prevent it from achieving its goals. The most common examples or business risk relate to operational activities that mat impact on workplace health and safety, the environment, community health, the regulatory regime, production, reputation and the ability to access finance
Care communication	Care communication is risk communication about health and safety risks
Consensus communication	Consensus communication is risk communication to inform and encourage groups to work together to reach a decision about how the risk will be managed (prevented or mitigated0.
Crisis communication	Crisis communication is risk communication in the fact of extreme, sudden danger.
Event	Occurrence of a particular set of circumstances. The event can be certain or uncertain and can be a single occurrence or a series of occurrences
Frequency	A measure of the number of occurrences per unit of time
Gradual risk	A risk event that occurs over a long period of time and is representative of many types of pollution of the environment. For example, slow leaks from hydrocarbon containment, acid seepage or emissions to the atmosphere
Hazard	A source of potential harm
Heuristics	Simplifying strategies used by decision makers; often a source of error
Loss	Any negative consequence or adverse effect, financial or otherwise
Operational risk	Risks that are focused on addressing aspects of an operation which may be more systematic to the mining process and the day-to-day operation of a mine
Probability	A measure of the chance of occurrence usually expressed as a number between 0 and 1
Project level risk management	refers to risks that are specific to a particular project. Effective risk management at the project level comprises two streams, risk assessment and risk communication.
Psychology	The scientific study of the behaviour of individuals and their mental processes
Representativeness bias	A heuristic whereby individuals judge an event in terms of their perception of its absolute frequency, ignoring its relative frequency
Residual risk	Risk remaining after implementation of treatment
Risk	The chance of something happening that will have an impact on objectives. A risk may have a positive or negative impact. Risk is measured in terms of a combination of the consequences of an event and their likelihood and is often specified in terms of an event or circumstance and the consequences that may flow from it
Risk analysis	A systematic process to understand the nature of and to deduce the level of risk that provides the basis for risk evaluation and decisions about risk treatment
Risk assessment	is the overall process of risk identification, risk analysis and risk evaluation. Risk assessment at the project level concerns three risk areas, technical risk, marketing risk and social risk.
Risk avoidance	A decision not to become involved in, or to withdraw from, a risk situation

Risk communication	an interactive process of exchange of information and opinion among individuals, groups and institutions. It is a dialogue in which multiple messages are discussed. These messages do not refer only to the nature of the risk but also to the concerns, opinions or reactions of individuals to risk messages and to legal and institutional arrangements for risk management' (National Research Council, 1999: 2).
Risk control	Existing process, policy, device, practice or other action that acts to minimise negative risk or enhance positive opportunities.
Risk criteria	The terms of reference by which the significance of risk is assessed. Risk criteria can include associated cost and benefits, legal and statutory requirements, socioeconomic and environmental aspects, the concerns of stakeholders, priorities and other inputs to the assessment.
Risk evaluation	A process of comparing the level of risk against risk criteria. Risk evaluation assists in decisions about risk treatment
Risk management	The culture, processes and structures that are directed towards realising potential opportunities while managing adverse effects (Standards Australia/ Standards New Zealand, 2004: 4).
Risk reduction	Actions taken to lessen the likelihood, negative consequences, or both, associated with a risk
Risk register	A record of the outcomes of risk identification and assessment processes in a systematic way – usually set out in a table – and defines risk scenarios, assessment outcomes, risk control actions and responsibilities
Risk retention	The acceptance of the burden of loss, or benefit of gain, from a particular risk. Legal or statutory requirements can limit, prohibit or mandate the sharing of some risks. Risk sharing can be carried out though insurance or other agreements. Risk sharing can create new risks or modify an existing risk
Risk treatment	Process of selection and implementation of measures to modify risk. The term 'risk treatment' is sometimes used for the measures themselves. Risk treatment measures can include avoiding, modifying, sharing or retaining risk.
Social risk	The range of potential impacts on a project that may result from its interaction with communities and stakeholders.
Sociology	The scientific study of society, social institutions and social relationships, including the development, structure, interaction and collective behaviour of organised groups of human beings
Stakeholders	Those people and organisations who may affect, be affected or perceive themselves to be affected by a decision, activity or risk
Strategic risk	Those risks that relate to the interdependence between an operation's activities and the broader business environment
Technical risk	Refers to loss arising from activities such as design and engineering, manufacturing, technological processes and test procedures. This is the areas of risk that is most familiar to managers, technical personnel and researchers working within the minerals processing industry.
Threat	The possibility that vulnerability may be exploited to cause harm to a system, environment, or personnel

EXECUTIVE SUMMARY

This report presents the outcomes of a research project into social risk, risk communication and new technology projects in the minerals industry. The project was undertaken because there is a growing awareness within the minerals industry that the failure to identify, and act upon, social risk situations represents a significant threat to the uptake of new projects, processes and technologies. This threat is all the more significant because there is very little in the way of applied tools and frameworks that can guide companies in the implementation of good practice in the area of social risk management. The purpose of this report is to fill that gap.

Based on an extensive review of the social science literature around risk management and risk communications, and substantial practical experience assisting organisations to manage social risks in the mining industry, we have developed a framework for the assessment and management of social risk at the project management level. The framework introduces three key concepts: a definition of social risk, an evaluation model for identifying the components of social risk, and a social risk management process that coordinates social risk assessment and risk communications activities.

The key messages for managers identified in this report are:

- The identification and management of *social risk* - the range of potential impacts on a project that may result from its interaction with communities and stakeholders – is as critical to business success as management of technical and other business risks.
- Understanding the range of risk perceptions is the key to anticipating the public response to new technology projects.
- Social risk assessment is not a 'one off' procedure. Ongoing monitoring of social risks enables a more accurate assessment of social responses to new technology projects because it provides opportunities to reassess the risk situation and reframe risk messages to adapt to changing circumstances.
- The **social risk analysis framework** introduced in the report has been designed to provide managers with a tool to help think through potential social risks and make better informed decisions with regard to social risk management.

Social risk is an area of risk management that has been poorly understood and often mismanaged. The framework, tools and case studies in this report are intended to raise awareness of the importance of managing social risk and to provide project managers with guidance in minimising exposure to social risk.

1. INTRODUCTION

This report presents the outcomes of a research project into social risk, risk communications and new technology projects in the minerals industry. Minerals companies are increasingly using risk analysis to identify and manage factors that may impact adversely on their businesses. However, the focus of risk assessment is still primarily on health and safety, environmental and financial risks, with the sphere of 'social risks' continuing to receive relatively little attention. This has resulted in companies and operations being 'blindsided' by unexpected negative community reactions to planned process improvements.

There is a growing awareness within the minerals industry that the failure to identify and act upon social risk represents a significant threat to the uptake of new projects, processes and technologies. In today's market, community expectations, regulatory controls and access to information via the media and internet have increased community capacity to influence industry and this influence can have significant implications for the uptake of technical processes. In particular, if public concern is aroused about a technology and/or a proposed new use of by-products, this can result in negative publicity for companies, delays in obtaining regulatory approval, increased litigation, substantial reputational damage and, in extreme cases, loss of the 'social license to operate'. The challenge for the industry is to reduce the likelihood of this occurring in the future by improving its risk management and communication practices.

Project objectives

The research literature on social risk clearly demonstrates that public perceptions of risks do not necessarily correspond with objective risks (i.e. the 'scientific evidence'). How individuals and community groups perceive and respond to innovations is shaped by a variety of non-technical factors such as their personal value systems, previous experiences, levels of trust in different information sources, and openness to change. The risk communications literature, on the other hand, provides insight into the range of communication tools and strategies that enable effective communication with all external stakeholders – be they research bodies, government institutions, local communities or any other type of organisation .- If research and industry personnel can understand and anticipate these factors that shape stakeholder perceptions and have the tools to communicate effectively with these different 'publics', they will be better placed to secure public acceptance of new technologies.. The key objective of this project is to develop a framework and tools to enhance the capacity of research and industry personnel to anticipate, evaluate and manage social risks associated with the introduction of new processing technologies and/or uses for by-products.

Outcomes

The agreed deliverables for this project were:

- A framework and tools to assist in the identification, evaluation and management of social risk.
- Case study examples of difficulties that have been encountered in obtaining community acceptance of new hydrometallurgy processing technologies, highlighting the learnings from these case studies.
- Guidelines on strategies for communicating with communities and other external stakeholders about new hydrometallurgy processes and by-product uses.

- The provision of training to industry personnel and Parker Centre researchers on the application of these tools and guidelines.

This report contains the evaluation framework, tools and case studies that have been developed to assist in the identification, analysis and communication of social risks. A Risk Communications training module has also been developed to sit parallel with this report. The intended audience for the training module is research scientists and industry representatives whose scope of responsibilities may encompass new technology development and implementation. The module is intended to raise awareness of risk communications and social risk assessment and how these fit within broader risk evaluation frameworks.

2. METHODOLOGY

The research method adopted for this project combined two strands:

- desktop research to guide the development of the framework and tools for the project and to identify case study examples, and
- a series of interviews conducted with industry, scientific, and community participants to identify key issues in relation to the management and communication of social risks.

During the desktop review stage, the first step was to review current Australian and international literature on risk management and risk communication. Next, existing models of risk evaluation and risk communication were identified and evaluated in terms of their relevance to the minerals industry and minerals processing technologies. Finally, case studies to illustrate key aspects of social risk and risk communications were identified for inclusion in the training module.

A number of one-on-one interviews were also conducted, primarily with key stakeholders as part of the development of the case study profiles contained in this report.

Limitations to the study

A significant limitation to this study has been the lack of publicly available information on social risk incidents in the minerals processing industry. While there is considerable anecdotal evidence of instances of social risk and failures in risk communications, no organisations were prepared to make this information publicly available, thereby restricting access to industry-specific case studies.

On a more positive note, one of the key outcomes of this research project has been the identification of common problems in the area of social risk management across industry sectors. There are many case studies that demonstrate failure to identify social risk, lack of stakeholder engagement and poor risk communications processes across industry sectors. In other words, social risk arises not so much because of specific industry factors but rather the failure to understand and respond appropriately to human perceptions of risk and the community's need for certain types of information. The case studies selected for this report demonstrate aspects of social risk and risk communications that will resonate with a range of industry sectors.

3. THE CONTEXT FOR SOCIAL RISK ANALYSIS

The risk society

Contemporary society is preoccupied with the notion of risk, to the point where one commentator (Quiggin, 2007), has suggested that risk will be the central idea of the early 21st century, just as globalisation was the dominant idea of the 1990s. The term 'risk society', comes from eminent sociologist Ulrich Beck, whose seminal work, *The risk society* (Beck, 1992) has had a transformative impact on the way we think about risk. Our everyday world is constantly changing, and technological innovation affects all aspects of our daily lives encompassing new discoveries and developments in medicine and agriculture, communications and manufacturing. It is the work of Beck, more than any other thinker, that has served to raise awareness of the complex relationships between risk, science and technology, and the nature of contemporary society.

The rapid diffusion of technological innovations has also led to increasing concerns about their impacts on public health and safety and on the environment. Thanks to global communications, we now have greater access than ever before to information about new products and technologies and their potential risks; poor product design, dangerous waste disposal practices, industrial hazards and inadequate testing procedures. Moreover, a number of highly publicised failures in the management of technological risk (Bhopal, Chernobyl, Exxon-Valdez and Brent Spar) have served to increase public perceptions that technology, rather than being a symbol of progress, is making the world a riskier place in which to live.

Exposure to social risk is a fact of life for businesses operating in the area of new technologies. Public controversy has surrounded the introduction of every new technology since the 1970s; civil nuclear technology in the 1970s, the introduction of genetically modified foodstuffs in the 1990s and now the introduction of nanotechnology (Kearnes, Grove-Wright, MacNaghten, Wilson & Wynne, 2006). At the institutional level, there have been many activities initiated by corporations, government agencies and the scientific community that are intended to control, contain or minimise these risks. However, those who are involved in decision making around the identification of risk and how it should be managed frequently hold divergent views, leading not only to increasing public perceptions of risk but also diminishing trust in those very institutions that are held accountable for the protection of the citizens.

Risk perceptions

Differing perceptions of risk are a key factor in understanding why organisations consistently fail to manage social risks in relation to new technologies. Lay people are very dependent on information from scientific experts and government agencies, so accepting and using new technologies implicitly means believing and trusting assurances from official bodies that these technologies are desirable, feasible and worthwhile, and that they pose no significant harm to users or threat to public safety (Flynn, 2007). However, what constitutes an 'acceptable risk' from the point of view of the lay public or scientific communities can vary significantly.

Scientists and governments have tended to assume that if the public were better informed about scientific matters, lay people would adopt a more 'scientific' or rational approach to

risk assessment and align their views with the scientific community. However, attempts to engage in public consultation over controversial technological innovations – nuclear power, GM food - have clearly indicated that the lay public continues to hold very different perceptions of risk from the scientific community.

'It's like déjà–vu, all over again'

There is now a considerable body of evidence to demonstrate that companies across a range of industry sectors consistently fail to identify potential social risks, or to respond appropriately to community concerns surrounding the introduction of new technologies. Time after time, project proponents respond with surprise when an innovation they regard as a technical solution to an important problem is met with resistance, rejection or outrage by members of the public. In trying to understand why the same problems seem to recur, Wolfe and Bjornstad (2008: 159) suggest that three fundamental questions need to be addressed:

1. Why is the same technology sometimes accepted and sometimes rejected in apparently similar circumstances?
2. To what extent can we accurately anticipate societal responses and acceptability?
3. How can, or should, society make better-informed decisions?

The approach adopted in this report is to focus on three concepts that may provide some answers to these questions. First, understanding **risk perceptions** is the key to anticipating the likely responses to new technologies. Second, ongoing **monitoring of social risks** and **risk communications** enable a more accurate assessment of social responses to new technologies. Finally, the **social risk analysis framework** introduced in the report is intended to provide managers with a tool to make better informed decisions with regard to social risk management (see section 4).

The business case for managing social risk

While it is apparent that there is much still to learn about societal responses to risk and the introduction of new technologies, it is also true that poor management practices in the past have tended to exacerbate the problems. In particular, the lack of a systematic approach to managing social risks had led to negative project impacts for many organisations. Poorly managed social risks can be damaging to a company's financial bottom line and to its social license to operate. Negative outcomes can include:

- project delays or abandonment
- reputational damage
- decreased operational revenues and escalating project costs
- lack of user acceptance of the new product/technology
- major modifications to project scope or technological applications due to stakeholder pressure
- consumer boycotts of company products
- exposure to legal action
- plant or site security problems.

Companies operating in the areas of mining and minerals processing are particularly exposed to social risk. These operations use and create a wide range of hazardous materials that can potentially cause environmental degradation and serious human health effects (Minerals Council of Australia (MCA), 2008). The challenge for companies is to demonstrate social

awareness and build community and regulator confidence that both technical risks and stakeholder concerns are being effectively managed. This is the only way to fulfil the company's legal obligations and justify its social license to operate. Moreover, effective management is only possible if the technical understanding of environmental and human health risks is communicated effectively to stakeholders.

The business case for implementing a systematic approach to social risk management extends beyond the need to protect an organisation's financial performance and its social license. The good news for risk managers it that risk management approaches that give sufficient credit to the importance of social issues can be a source of competitive advantage. Further, social risk evaluations are increasingly a requirement of some project financiers. Project stakeholders are not just a source of risk for projects. Establishing good relationships with stakeholders and focusing on their concerns can generate significant opportunities for a project and its proponents. These include:

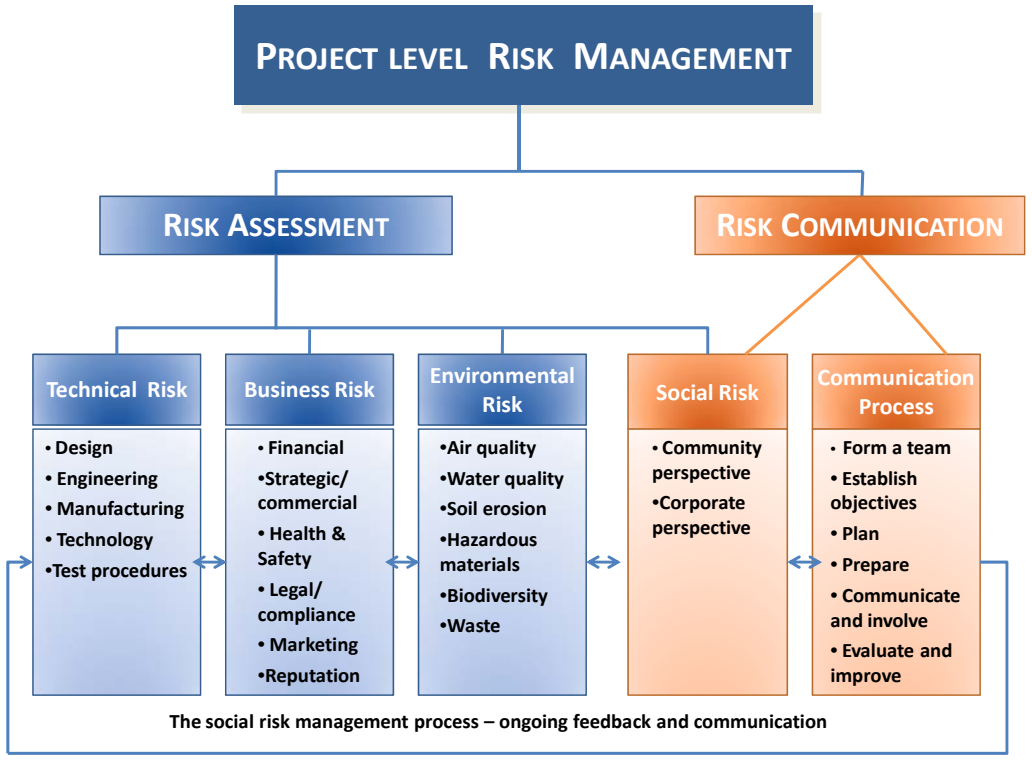
- better project outcomes through stakeholder input
- streamlined approval processes
- government and regulatory support
- timely project completion
- easier access to project finance
- improved operational revenues through customer support
- increased likelihood of support for subsequent projects or future expansions
- value creation for the proponent organisation
- enhanced contribution to sustainable development (Engineers Against Poverty (EAP), no date).

4. CONCEPTUAL FRAMEWORK FOR SOCIAL RISK MANAGEMENT

The purpose of this framework is to introduce a conceptual model for risk management at the project level. In this model, risk management is seen as including two critical components, risk assessment and risk communication, both of which occur in a general social context that will influence decisions made during the risk assessment and risk communication phases. The model identifies the three main types of risk that need to be evaluated as part of the risk management process for a project. These areas are technical risk, business risk and social risk.

The second component of risk management is the process of risk communication. The arrows in the diagram indicate the necessity for two-way communication throughout the risk management process between those responsible for conducting the different types of risk assessment, and between the company and its external stakeholders, via a formal risk communications process (see Figure 1).

Figure 1: Conceptual framework for risk management at the project level



Risk assessment

Risk assessment involves the identification, analysis and evaluation of risk at four levels, general business risk, technical risk, environmental risk and social risk. **Business risk** incorporates a range of potential risks, such as:

- *Financial risk.* Will investment in this project succeed in bringing a return? What is the likelihood that it will make a loss on the original investment? Will we have adequate cash flow to finance operations?
- *Strategic /commercial risk.* What is the current or prospective risk to earnings and capital arising from changes in the business environment and from adverse business decisions? Is there competitive advantage to be obtained from pursuing this

project?

- *Health and safety*. What are the risks to our employees/ contractors in pursuing this project?
- *Legal/ compliance*. What legal constraints are there to this project? Are there aspects that are likely to affect our ability to comply with existing legislation/ standards?
- *Marketing.* Is there a demand for this product/technology? How will our competitors respond? How long will it take to bring this product to market? Do we have the right marketing strategy?
- *Reputation*. How will this project be regarded by our stakeholders? Are negative outcomes liable to damage the reputation of the company?

Many of these risks are assessed in relation to overall corporate risk so that approaches to assessment will be addressed in the same way as that the organisation assesses its overall risk profile and are not the subject of this report.

Key message: Social risk can be regarded as a form of business risk, which, for the purposes of this report, we define as *the range of potential impacts on a project that may result from its interaction with communities and stakeholders*. We differentiate this from **social harm,** which is caused when a group or community experiences significant negative impacts, or even fear of impacts, as a result of the business activity. Social risk often goes unrecognised and is poorly understood by risk analysts and managers alike. Yet the failure to identify social risk and address it via effective stakeholder engagement and risk communications can lead to the derailment of new technology projects.

Technical risk refers to risks that are specific to the project. It refers to hazards that may arise from activities such as design and engineering, manufacturing, technological processes and test procedures. This is the area of risk management that is most familiar to managers, technical personnel and researchers working within the minerals processing industry.

Finally, **Environmental risk** refers to potential hazards that may have a negative impact on the environment. These are hazards that potentially threaten

- Air quality (emissions, noise pollution, dust)
- water quality
- soil quality (bare land that erodes, soil contaminants)
- local biodiversity.

Waste management practices and the handling of hazardous materials are common sources of environmental risk.

Risk communication

The second component of risk management is risk communication. Risk communication has been defined as (National Research Council, 1989, p. 2):

> *... an interactive process of exchange of information and opinions among individuals, groups and institutions. It is a dialogue in which multiple messages are discussed. These messages do not refer only to the nature of the risk, but also to concerns, opinions or reactions of individuals to risk messages and to legal and institutional arrangements for risk management.*

Risk communication is a scientifically-based endeavour with the key objective of engaging with external stakeholders. It has evolved to bridge the gap between expert and non-expert perceptions of risk and promote fuller understanding and, where appropriate, acceptance of the risks associated with social and environmental hazards.

The social risk management process

The social risk management process involves the coordination of the social risk assessment with the company's risk communication processes. As far as internal company processes are concerned, it is important that results of a social risk assessment are documented and reported to relevant management to be incorporated in the annual planning and budgeting cycle. This reporting should be part of the organisation's overall risk management system. A risk management system captures the process for decision making and implementation of actions in response to known risks.

The other aspect of the social risk management process is communicating with external stakeholders. This involves ensuring that:

- stakeholder engagement is a priority from the outset of the project
- appropriate communication processes and opportunities for two-way feedback with external stakeholders are in place , and
- carefully defined risk communications messages are sent at each stage of the project life cycle.

Purpose of the framework

The objectives in developing a framework for risk management at the program level are to:

1. Introduce the concept of social risk. Social risk is generally overlooked in traditional risk assessment procedures. This framework conceptualises social risk as one of the key areas for risk assessment throughout the project life cycle, which should be managed with the same attention to detail that it accorded to technical and other business risks.
2. Raise awareness of social risk as a significant aspect of risk management.
3. Demonstrate the links between general business risk, technical risk and social risk. An effective risk assessment process involves ongoing monitoring and evaluation of each of these risks throughout the project life cycle.
4. Focus attention specifically on the relationship between *social risk*, the *social risk management process and stakeholder engagement practices, including risk communications*.

The key to managing social risk lies in good risk communications practices, beginning with the identification of key stakeholders, identifying their concerns and maintaining ongoing communication and dialogue throughout the project life cycle. The relationship between risk assessment and risk communications is captured in the social risk assessment process.

5. SOCIAL RISK

What is social risk?

Social risk can be defined as *the range of potential impacts on a project that may result from its interaction with communities and stakeholders*. Social risk has emerged as a significant source of strategic business risk because it is poorly understood and inadequately managed. This is because social risks are frequently difficult to predict and identify and the seriousness of their impacts has traditionally been underestimated. However, there are now enough examples of mismanaging social risk (the Exxon Valdez oil spill, Brent Spar) and poor risk communication practices (the British government's response to 'Mad cow disease' – the Bovine Spongiform Encephalopathy crisis) to indicate that social risk management has become a priority area for business.

Some industry sectors are exposed to social risk by the very nature of their business activities; especially the extractive industries (forestry, mining, oil and gas extraction) and new technology ventures. In the case of the mining industry, for example, the development of a new mine, means that communities located in the vicinity may be exposed to health and environmental risks previously unknown to them. Minerals extraction involves environmental degradation as the landscape is stripped and blasted to extract the ore. Health hazards are posed by the use of toxic substances that are necessary to process the ore, and social problems, (AIDS, prostitution, economic inequality) can arise with the large scale in-migration of miners into local communities. All of these upheavals in local communities will lead to exposure to social risks for the mining company involved. How well the company meets these challenges, addresses stakeholder concerns and is able to ensure stakeholders are aware of the benefits as well as the potential risks of the project, is a measure of the effectiveness of its approach to the management of social risk.

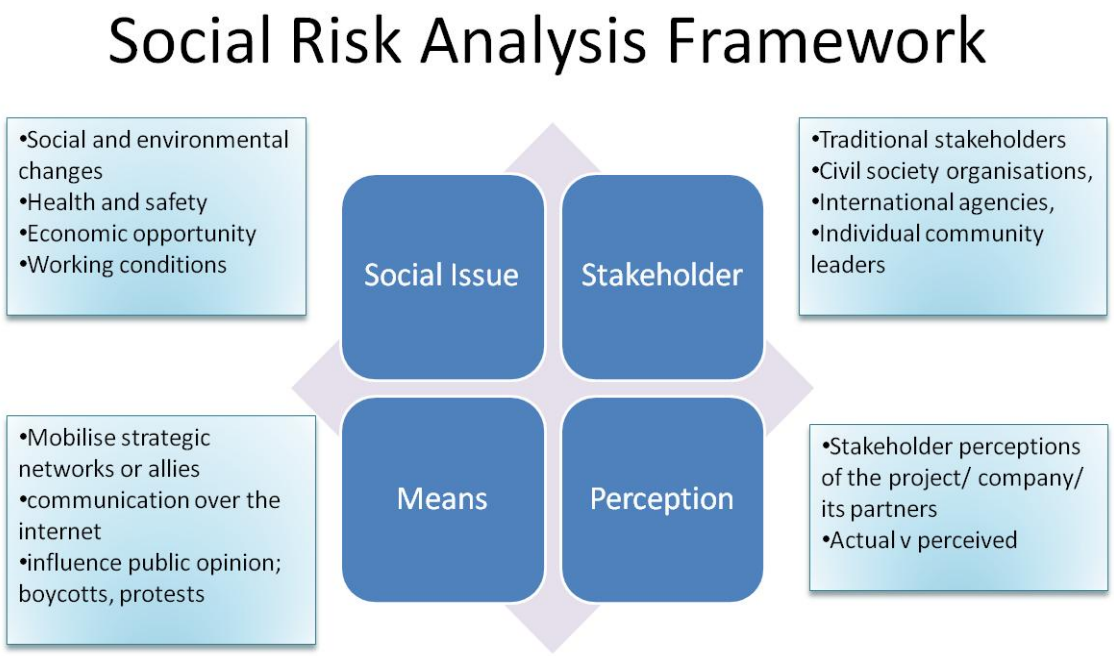
The social risk analysis framework - when does a social issue become a social risk?

Social issues become social risks when stakeholders perceive that aspects of a project pose a risk to the security, safety, health or environment of their communities. Social risk can be seen as comprising four components, all of which need to be apparent before a social risk eventuates (Bekefi, Jenkins and Kytle, 2006). These components are:

- *An issue*. Broader social issues that are seen as significant at the local level, in relation to the proposed project. Social issues include potential threats to the working conditions of employees, to the environment, to the community's health and safety and to its economic opportunities.
- *A concerned stakeholder.* A stakeholder or group of stakeholders who are particularly concerned and motivated to express their objections to the project.
- *The perception* of the project or the organisation associated with it.
- *The means to act.* Stakeholders with access to the resources (time, money, media access) to do damage to the project or its proponents. The four components of social risk are illustrated in Figure 2.

Key message: Taken collectively, the four components of social risk (issue>stakeholder>perception>means) form the basic **Social Risk Analysis Framework.** This framework provides front-line project managers with a *simple schematic to aid and facilitate first-step* evaluation and assessment of social risks. This schematic has been applied to the case studies contained in this report to illustrate how these components may combine to shape a social risk event.

Figure 2: Social Risk Analysis Framework: the components of social risk



Source: Adapted from Bekefi, Jenkins & Kytle, 2006

The issue

Issues like climate change, disease pandemics (e.g. AIDS) and mass urbanisation (shanty towns, pollution, ethnic/racial divides) are taking on heightened significance globally. However, while most managers recognise these broad social changes, they have been slow to recognise the link between societal attitudes towards these issues and their impacts on community perceptions at the local level.

There are a number of social issues that concern society as a whole and have implications for different types of industries. For example, *health and safety concerns* are common social concerns when manufacturing plants, smelters, mines or nuclear reactors are being commissioned, expanded or decommissioned. Health concerns also affect perceptions of the safety of new developments in the field of biotechnology and genetic engineering. *Environmental protection* and the protection of *cultural heritage* sites are common concerns for communities when large scale infrastructure projects are being developed (e.g. mine and dam construction, new forestry logging programs) and *social problems* (alcohol, gambling, AIDS, prostitution), which often accompany the influx of workers involved in major infrastructure projects. Finally, *economic inequalities* may arise in communities when a new industry or technology is introduced, for example, when a new mine is constructed.

Stakeholders

Companies have traditionally regarded their stakeholders as people and institutions with whom they have financial relationships, namely, shareholders, employees, customers, suppliers, business partners and key influencers such as government, regulatory authorities and financial market analysts. However, social risk generally stems from organisational failure to identify other relevant stakeholders. Individuals or groups, such as non-government organisations with environmental, human rights or social justice concerns, who see themselves as having a legitimate 'stake' in organisations with which they have no financial connection. These organisations, ranging from large NGOs with global reach (Oxfam, Greenpeace) to local community groups, such as trade unions, women's groups, consumer groups, human rights and environmental activists, now wield considerable power within civil society. The failure to identify these important stakeholders is one of the main reasons that companies are 'blindsided' when social risks arise.

Perceptions

Stakeholder perceptions of risk are informed by access to information (or lack thereof) from a variety of sources; the media, personal communication, internet sources and project proponents. Negative perceptions are more likely to arise in the absence of regular information or communication from the company itself, or by miscommunication (wrong message, wrong audience, bad timing). Often, this failure to communicate with influential stakeholders can have disastrous effects, as exemplified in the Brent Star case study.

Means

The final component in creating social risk is when a stakeholder has access to the means to disrupt corporate activities. Stakeholders may possess a variety of means to influence corporate conduct but powerful stakeholders are those who have the ability to mobilise strategic networks and to gain media access to influence public opinion. Especially since the advent of the internet, even relatively small stakeholder groups have the capacity to reach out to like-minded individuals or groups throughout the world and to galvanise public opinion. With the advent of cheap information and communications technologies, even local disaffected stakeholders can rapidly gain support from larger NGOs and the means to organise and disseminate information about planned boycotts, public protests, or demonstrations.

An enterprise leaves itself exposed to social risk if it fails to identify:

- important social issues within a community (concerns about health and safety, environmental degradation) that pertain to its products or services
- stakeholders who may perceive the enterprise as placing their communities at risk
- stakeholders who have the means to disrupt the enterprise's business activities or its reputation.

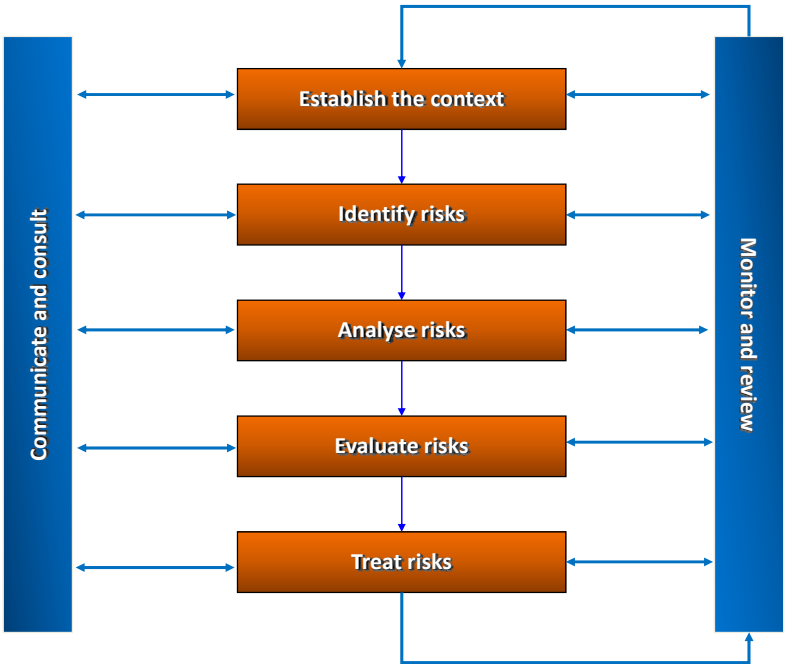
The Australian Standard Risk Management Process

Once a social risk has been identified using the Social Risk Analysis Framework (Figure 2), advanced risk evaluation processes that comply with the Australian Standard Risk Management Process are to be applied. Based on the Australian Standard Risk Management Process (AS/NZS4360: 2004), social risk assessment involves; (1) establishing the context, (2) identifying risks, (3) analysing risks, (4) evaluating risks, (5) treating the risks. Ongoing

communication and consultation, monitoring and review occur at each stage of the risk assessment process.

This model has been adopted for the analysis of social risk because it is well understood by risk practitioners and can be integrated within an organisation's existing risk management framework. The process is illustrated in Figure 3.

Figure 3: The risk assessment process (AS/NZS4360: 2004)



The first stage in conducting a social risk assessment is to establish the specific *context.*

Key message: Risk evaluations occur throughout a projects development life-cycle. Incorporating social risk into the standard risk evaluation framework (safety, commercial, business risk evaluation) will help research scientists or company specialists "flag" points at which they may bring-in specialist risk communications advisors to assist the project team evaluate and respond to potential project social risks. For further information and guidance on risk assessment and evaluation see the Handbook on Risk Assessment and Management published by the Department of Resources, Energy and Tourism as part of the Leading Practice Sustainable Development Program for the Minerals Industry and available at <http://www.ret.gov.au/resources/mining/>.

In the case of new technology projects, questions that need to be considered may include:

- Who are the likely or potential stakeholders and who is likely to be impacted by this project?
- What do external stakeholders know about the project?
- Does the commissioning or implementing company or operation have existing relationships with local communities that may influence community perceptions?
- Is the relationship a positive one, or is there a legacy of previously poor relationships?

It is critical to identify and engage with key external stakeholders from the outset of the project, if these issues are to be understood.

The second and third stages require *identification and analysis* of the risk. Figure 2, which introduced the components of social risk, is a useful framework for identifying and analysing social risk. By identifying the current *social issues* relevant to the project, its key *stakeholders* and their *perceptions* and likely reactions to the proposed project it is possible to evaluate the likely degree of risk to which the company may be exposed. Again, communicating with stakeholders is important when identifying and analysing risks as different stakeholders in the project, e.g. supply chain partners, fence line neighbours, environmental groups, will have different perceptions of the most significant risks and the most effective way of managing them.

Having identified any potential sources of social risk, the fourth stage requires risk managers to undertake a formal risk *evaluation.* Risk evaluation is the process of estimating the likelihood and consequences of a risk and comparing it against a defined risk acceptance threshold. The objective is to determine the significant social risks that must be managed, and to screen out minor risks that currently do not warrant further consideration.

The process of social risk evaluation is similar to that of any other form of risk evaluation and tools commonly used in other forms of risk assessment, such as risk matrices, can be employed to evaluate social risk. In fact, for effective evaluation, it is important that social risk assessment processes are aligned as closely as possible with other risk assessment practices within the organisation.

Treating the risk is the final stage of the process. In the case of social risk, the treatment involves ongoing stakeholder engagement via a robust risk communications strategy, to reach acceptable solutions to the management of the risk which may include redesigning the project or even, in extreme circumstances, stopping the project.

6. RISK COMMUNICATION

What is risk communication?

Risk communication is an **interactive process** of exchange of information and opinions among individuals, groups and institutions (National Research Council, 1989). It is based on the assumption that ongoing dialogue is the most effective way of building consensus on how to **prevent, mitigate or respond to social risk**. From the perspective of project risk managers, this means that they have a responsibility to ensure:

- that knowledge of significant risks to employees and the public is effectively communicated
- a shared understanding of project risk and how it should be managed is developed with stakeholder input.

There are three main forms of risk communication that capture different levels of risk. These are care communication, consensus communication and crisis communications (Lundgren, 1994).

- **Care communication** is risk communication about health and safety risks; risks where the danger and most appropriate management approaches have already been determined through scientific research and are generally accepted by the audience.
- **Crisis communication** is risk communication in the face of extreme, sudden danger – an accident at a nuclear power plant, the impending break in a dam wall, the outbreak of a deadly disease.
- **Consensus communication** is risk communication to inform and encourage groups to work together to reach a decision about how the risk will be managed (prevented or mitigated).

Consensus communication, as a means of mitigating or responding to social risk, is the focus of this report.

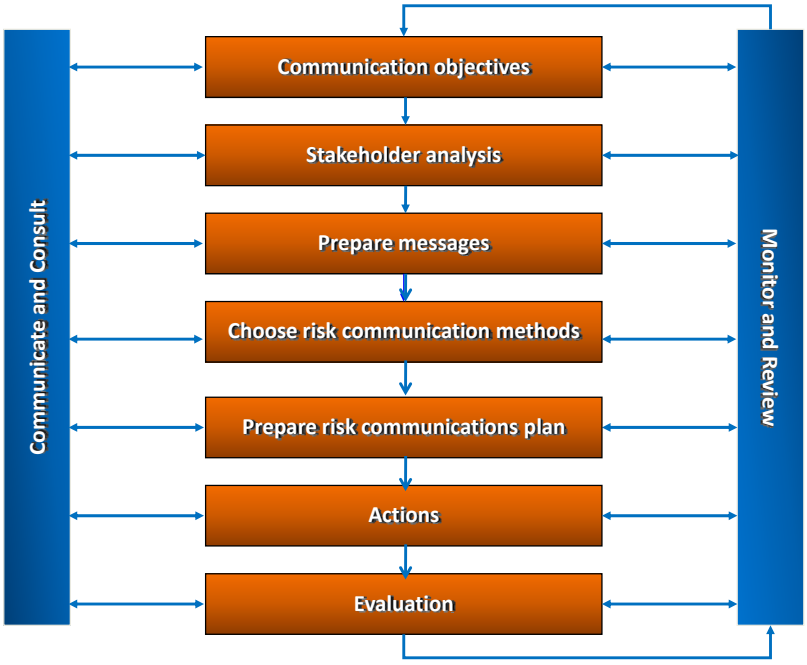
The risk communication process

A number of risk communication models have been developed over the years that are tailored to the needs of different industry sectors. (See Appendix 1 for a comparison of these models). These models cover essentially the same processes, albeit using different language. The main stages in risk communication involve establish communication objectives, understand stakeholders and their likely reactions, prepare messages and select the communication mechanisms most likely to achieve the communication objectives and facilitate an open dialogue with stakeholders, evaluate the success of the communications strategy, and incorporate stakeholder feedback into project planning.

The model adopted for the purposes of this report is derived from of the Minerals Council of Australia's *Framework and steps for risk communication in the context of risk management* (MCA, 2008: 21). This particular model has been selected because it captures the key elements of other risk communication models and because it has been devised specifically to meet the needs of the Australian minerals and minerals processing industries.

The risk communication steps in this model are: (1) establishing communication objectives, (2) conducting a stakeholder analysis, (3) preparing communication messages, (4) choosing the most appropriate risk communication methods, (5) preparing a risk communication plan, (6) implementing the plan (actions), and (7) evaluating the risk communication process. Ongoing communication and consultation, monitoring and review occur at each stage of the risk communication process. The risk communication process is illustrated in Figure 4.

Figure 4: The risk communication process



Source; MCA, 2008: 2

Communication objectives

The first stage in the risk communication process involves determining communication objectives. Is it the purpose of the communication to build rapport, provide information, encourage involvement in decision making or motivate stakeholders to action? The following checklist is a useful aid for determining the purpose and objectives of the communication.

CHECKLIST FOR DETERMINING PURPOSE AND OBJECTIVES

The purpose and objectives of my risk communication effort are based on:

- ☐ Associated legal requirements
- ☐ Organisational requirements for
  - o Public involvement
  - o Release of information
  - o Development of communication materials and processes
- ☐ Type of risk communication
  - o Care
  - o Consensus
  - o Crisis
- ☐ Newness and visibility of the risk
- ☐ Audience requirements
- ☐ Functional relationships between my organisation and the audience
  - o Employer to employee
  - o Organisation to community

The purpose and objectives are agreed upon by:

- ☐ Those assessing the risk
- ☐ Those managing the risk
- ☐ Those communicating the risk
- ☐ The purpose and objectives of the agreement have been documented

(Source: Lundgren, 1994: 69)

Stakeholder analysis

The second stage is to conduct a thorough stakeholder analysis. Stakeholder analysis enables an operation to identify:

- *the group/coalition* to which a stakeholder belongs
- their level of *interest* in the project
- their *position* on the social risk identified
- the level of *influence* (power) they hold (World Bank, 2001)

The first task in conducting a stakeholder analysis is to identify who the key stakeholders are or, in the case of some project developments, who the key stakeholders *may* be. There are many different stakeholder groups, all with different perspectives on the risks and benefits of particular projects. To engage effectively, therefore, it is necessary to be aware of interest groups or potential interest groups, and to recognise their different priorities. With this information it may be possible to assess the capability of stakeholders to block or promote a project, their ability to join with others to form a coalition of support or opposition, and their capacity to direct discussion and negotiations. Understanding these issues is critical to managing social risk.

The other function of stakeholder analysis, and the focus of this report, is to promote stakeholder engagement and advance the **consensus model** of risk communication. The more thorough the stakeholder analysis and the more opportunities for face-to-face communication that are provided, the more likely it is that a genuine two-way model of communication will develop.

Prepare messages

The third stage in the risk communications process involves the preparation of the communication message. What precisely is the message you wish to communicate? Is it intended to inform or persuade an audience, to build consensus or to deliver an urgent piece

of information? The complexity and urgency of the message will influence the choice of risk communication methods.

Choose risk communication methods

The fourth stage is to choose the communication method that will best meet the purpose and objectives of the communication and the needs of the audience. Audiences comprise many stakeholders with different needs, so it is likely to find the medium that is appropriate to each group. The basic categories communication methods are:

- Written information
- Oral communication or dialogue
- Visual messages
- Audience interaction
- Computer-based applications

The benefits and disadvantages of each method are summarised in Table 1.

Table 1: comparison of risk communication methods

Communication method	Examples	Advantages	Disadvantages
Written	• Newsletters • Fact sheets • Brochures • Newspaper articles • Trade journal articles • Technical reports	• Include detailed information • Relatively inexpensive to produce • Suitable for audiences who are more comfortable with print media or want documentation to take away for later reference	• May be difficult for some audiences to understand • Length (too short or too long) can deter some readers
Oral	• One-one one discussions between an employer and employee • Presentations to clubs and citizens groups • Talks in educational settings	• Identifiable company representative • Personalises risk information, which can improve credibility • Provide immediate feedback in terms or audience responses (spoken or body language)	• Easily misunderstood • Angry listeners may turn the event into a political forum • Give audiences nothing to refer to later
Visual	• Posters • Display • Direct advertising • Tours and demonstrations • Videotapes • Television	• visual images are memorable • can be placed where audiences live, work and socialise • good for raising awareness of an issue	• carry limited information • can't answer questions • Lose impact if over-used.
Audience interaction	• Advisory committees • Focus groups • Community-operated environmental monitoring • Formal hearings where audience members can testify	• The audience can see for themselves exactly what is known about the risk, how it will be managed and how decisions are reached • The audience can participate in decision making, leading to lasting, more equitable and more acceptable decisions	• Costly • A long-term strategy • Not suitable for transmitting urgent information • Inappropriate for managers who wish to control the decision-making process
Computer-based applications	• Telemedicine • Online risk assessment tools that enable audiences to evaluate a range of risk factors related to particular projects	• Can disseminate large amounts of specially tailored data and information • Can be rapidly updated • Can incorporate oral and visual messages (graphics, audio, video)	• Require sophisticated computing facilities • Unsuitable for dissemination of mass information • Expensive to set up • Technology may intimidate some people • Cannot be accommodated in short-term schedules

Source: Derived from Lundgren, 1994

It is likely that an effective risk communications strategy will incorporate several of these methods.

Prepare risk communications plan

The fifth stage is to develop a risk communications plan. The detail involved in the plan will vary according to the complexities of different organisational structures and the social risk identified. However, it is generally recommended that a formal plan, with official sign-off, be developed. The advantages of a formal communication plan are:

- It provides clarity on the methods and approach adopted
- If it has management signoff, it may be useful in terms of setting out priorities and getting timely approvals from other sections/departments of the organisation
- It is easier to evaluate the effectiveness of risk communication efforts if there is a formal plan that can be related directly to the purpose, objectives and action items documented in the plan.

The contents of a typical risk communications plan are outlined in figure 5.

Figure 5: Draft risk communications plan

Introduction

Purpose of the plan

Scope of the plan
Background on the risk
What is the risk?
Who is affected by it?

Authority
Under whose authority is the risk being communicated?

Purpose of the risk communication effort

Specific objectives

Audience profile
How audience information was gathered
Key audience characteristics

Risk communication strategies

Schedule and resources
Detailed schedule that identifies tasks and people responsible
Estimated budget
Other resources (equipment, meeting rooms, etc)

Internal communication
How progress will be documented
Approvals needed/received

Sign off page
Names, job titles and signatures of key staff acknowledging they have read and agree with the plan.

Source: Lundgren, 1994, p. 102

Actions

The sixth stage of the process is to implement the risk communication plan by assigning tasks to individuals who will be held responsible for their completion., and setting a timeframe for their completion.

CHECKLIST FOR SETTING ACTION ITEMS

The action items have been developed after consideration of:

- ☐ Legal requirements
- ☐ Number and timing of organisational reviews
- ☐ Purpose of the risk communication effort
- ☐ Objectives of the risk communication effort
- ☐ Schedule of the risk assessment
- ☐ Activities within the organisation
- ☐ Community activities
- ☐ National activities
- ☐ The stage in the decision-making process to which the audience is oriented
- ☐ If the purpose of the risk communication is to *inform and engage with community*, the planning schedule allows for the
  - o Introduction of risk
  - o Additional information given over time
- ☐ If the purpose of the risk communication effort is to *build consensus and establish a dialogue*, the timeframe allows for the dissemination of risk information in support of the consensus building process
  - o Before project implementation
  - o During project implementation
  - o After project implementation
- ☐ Someone has been allocated the task of completing each action item

Source: Derived from Lundgren, 1994: 99)

Evaluation

The final stage of the risk communication process is evaluation of the risk communications effort. This means identifying whether or not risk communications have been successful in meeting the communication objectives set at the beginning. There are additional factors to evaluate, however, that provide useful information for refining future risk communication efforts. These include:

- Did the audience understand the content of the communication?
- Did the audience agree with the recommendation or interpretation contained in the message?
- Do people facing a higher level of risk perceive the risk as greater or show a greater readiness to take action than people exposed to a lower level of risk? Perceptions of the level of risk may, for example, reflect proximity to the points of technical implementation.
- Do audience members exposed to the same level of risk have the same response to the risk?
- Does the audience find the message helpful, accurate and clear? (Weinstein & Sandman, 1993).

7. SOCIAL RISK MANAGEMENT

Social risk management *aligns risk assessment practices with risk communications efforts.* At the simplest level, this means ensuring that social and technical risk assessment processes are coordinated with risk communication activities. The stages of the social risk assessment described in section 5 should inform, and be coordinated with, the stages in the risk communication (section 6).

Key message: Risk assessment and risk communication activities are generally delegated to experienced practitioners who have access to various tools and templates that enable them to complete each of the steps in the risk assessment and risk communication processes. It is the role of the project manager or delegated authority to oversee and coordinate the activities of these two professional areas.

Social risk management is illustrated in Figure 6.

Figure 6: Social risk management

Source: MCA, 2008, p.2.

Coordinating risk assessment and risk communication is perhaps the most challenging aspect of social risk management. It requires managers to make decisions and coordinate activities across different areas of management control, in situations where social risks and

stakeholder attitudes may be difficult to gauge. This section of the report is devoted to answering important questions that may arise when undertaken social risk management.

Who is responsible for identifying and managing social risk?

It is the responsibility of the project manager or delegate to manage the coordination process between those conducting the risk assessment for the project and those responsible for communication to the public. Generally speaking, most organisations have separate business units for conducting risk assessment and the community relations and communication functions.

Key message: It is *not* the responsibility of the person carrying out the risk assessment to communicate with stakeholders. Risk communication is a specialist field and the communications role needs to be carried out by someone who knows the project's stakeholders, or potential stakeholders, and who is an experienced communicator.

The role of risk management systems

It is very important for project managers to ensure that those conducting the technical and social risk assessments are communicating regularly with each other. It is also important that the results of the social risk analysis are documented and reported to relevant management to be incorporated in the annual planning and budgeting cycle. This reporting should be part of the organisation's overall risk management system. A risk management system captures the process for decision making and implementation of actions in response to known risks. It is the role of the risk manager, or other appropriately qualified individual, to assume overall responsibility for ensuring that any actions agreed to manage risk are carried out.

Agreed risk responses are recorded by most organisations in a *risk register,* which is a component of a company's overall risk management system. It is recommended that social risks be documented and managed the same as any other sort of risk. Risk management is a dynamic process, so the risk management system needs to be regularly updated to ensure that risk responses remain adequate for the risks identified, and also to identify any changes to the risk profile that may indicate emerging threats or new opportunities. It is important to ensure that the way social risks are recorded and managed is the same way as other risks.

The other essential component of the risk management process is to ensure that regular communication occurs between risk analysts and those in the organisation who are responsible for communication with external stakeholders. Many projects have encountered difficulties when different sections of the organisation release different, and often contradictory, messages to the public about potential risks surrounding the project. It is important to have a centralised communication source, responsible for stakeholder communication. It is the responsibility of risk communicators to ensure:

- any proposed communications to the public are discussed with other members of the project team, to ensure that an agreed message is presented to the public, and
- community feedback on the project is communicated in an accurate and timely manner to the risk management team.

How do we minimise exposure to social risk?

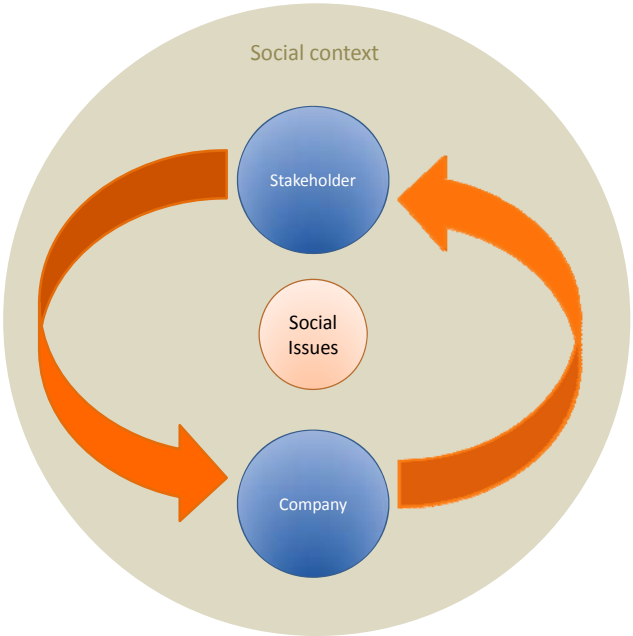
A key premise of this report is that *active engagement with community stakeholders around social issues from project initiation to project* closure is the most effective way of mitigating social risk. The more project proponents understand the concerns of local communities in relation to current social issues, the more likely they are to be able to find ways of addressing community concerns before they escalate into social risk situations.

Stakeholder engagement

If enterprises are to minimise their exposure to social risk, they need effective stakeholder engagement strategies. Good project management involves regular stakeholder engagement from the commencement of any new project. The ability of stakeholders to influence the project outcomes and cost is highest at the beginning (Project Management Institute, 1996). As the Brent Spar case study illustrates (Section 9), the costs associated with initiating stakeholder engagement processes later in the project life cycle, and of implementing changes, increase exponentially.

Early engagement with the project's external stakeholders is essential to good social risk management practice. As illustrated in figure 7, communication between stakeholders and the company should be an ongoing process, which is designed to provide project managers with a broad understanding of the social context in which they are operating. From the risk management perspective, the focus of these conversations will be on identifying social issues that may impact on the roll out of the new technology project.

Figure 7: Stakeholder engagement around social issues



Approaches to stakeholder engagement

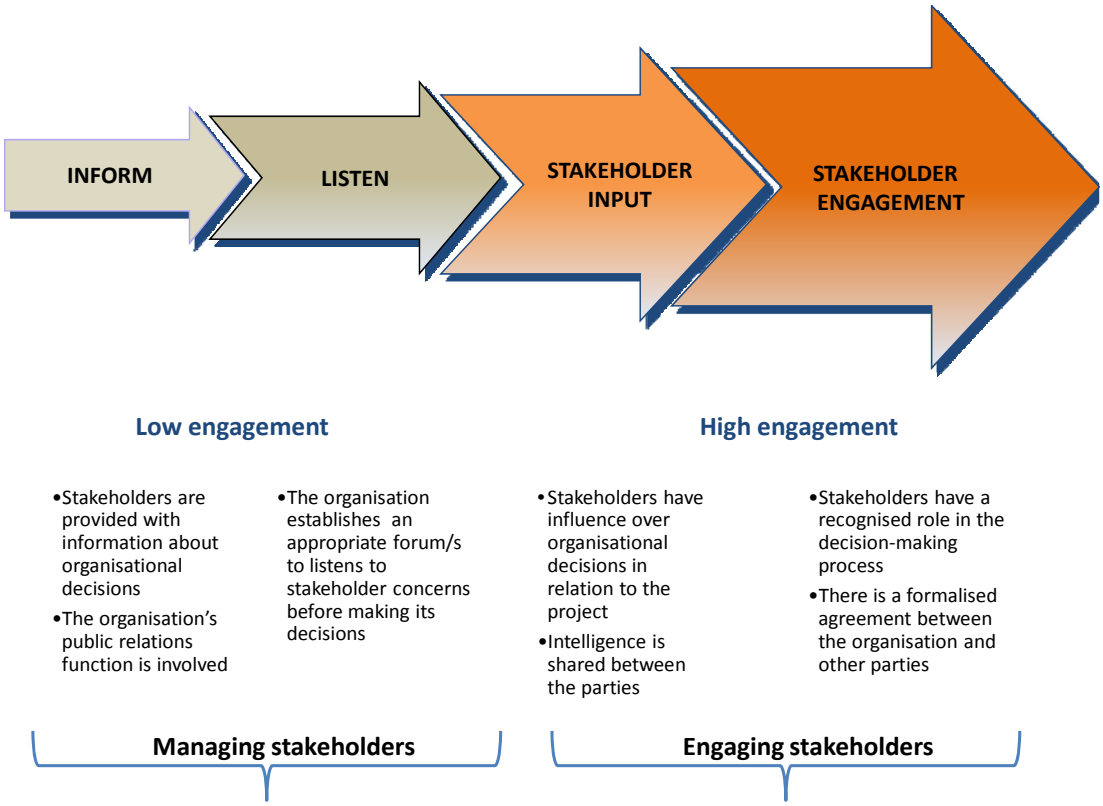
Traditionally, stakeholder engagement has been a rather mechanistic process, with a focus on disseminating *information to* stakeholders, rather than *engaging with* them to discuss concerns and potential solutions. This top down management process may be useful for disseminating information about a project but is not effective in building relationships with stakeholders who may have an interest in, or be opposed to, an operation or technology.

Stakeholder engagement involves two-way dialogue between organisations and their stakeholders to reach a shared understanding of project risks and opportunities. The different levels of stakeholder engagement are illustrated in Figure 8.

Low level stakeholder engagement strategies are best described as *stakeholder management activities*. Common practices include using the organisation's Community Relations function to inform stakeholders about corporate plans and, at the next level of engagement, providing public forums for stakeholders to share their views, but without necessarily having any power to negotiate change or influence outcomes.

Higher level *stakeholder engagement* encourages active stakeholder consultation, including information sharing and encouraging stakeholder input into the decision-making process. At the highest level of engagement, stakeholders play an active role in shaping corporate decisions and there is consensus on how corporate and community objectives can be aligned as the project moves forward.

Figure 8: Stakeholder engagement model



- The benefits of a higher level engagement strategy are clear. First, it enables the identification of social issues that are potential sources of social risk to the company. Second, it provides opportunities for building stronger relationships with different stakeholders. One example of a potential social risk turned into an opportunity via committed stakeholder engagement strategy is illustrated in the McDonalds case study.

MINI CASE STUDY: MCDONALDS

In 2001, a coalition of 13 NGOs challenged McDonald's about the overuse of antibiotics in animal feed in its supply chain. The World Health Organisation and American Medical Association had linked this practice to increasing antibiotic resistance in human bacterial infection. In response, McDonalds acknowledged that its heavy use of growth-stimulating antibiotics threatened human health and publicly stated its commitment to addressing this issue.

In 2003, McDonalds partnered with the NGO Environmental Defense to create a new purchasing policy to curb antibiotic use in poultry production. To create the policy, the partners worked with a diverse coalition of organizations that had a considerable stake in the process, including drug manufacturers, academic scientists and members of the medical community. The outcome from this process was a global purchasing policy for McDonald's that:

- Eliminated the use of medically important antibiotics as growth promoters in poultry
- Outlined clear guidelines for the appropriate use of antibiotics
- Created a purchasing preference scheme for suppliers who further reduced antibiotics use
- Created a program for certification of supplier compliance
- Reduced an estimated 17,900 pounds of antibiotics used annually by McDonald's suppliers
- In 2006 McDonald's top supplier, Tyson Corporate, announced that it had reduced antibiotic use by over 90% and the top four poultry companies in the U.S. all reported eliminating the use of human antibiotics to promote growth in chickens

(Source: Environmental Defense Fund Innovation Exchange, 2008)

Principles of effective stakeholder engagement

There is an established body of knowledge of how to design and implement effective stakeholder engagement processes (see Annotated bibliography for details). Common themes that are particularly relevant to a social risk management perspective are: (EAP, n.d.):

1) Quality engagement: It is not sufficient to have a stakeholder engagement process in place – the quality and timing of the engagement are also critical. It takes time to get to know people and their concerns. The preparedness to engage in regular face-to-face communication is one indicator of an organisation's commitment to ongoing stakeholder engagement.

Quality engagement requires:

- taking time to understand the concerns of different stakeholders. Conducting a comprehensive stakeholder analysis (see below) is one example of a high quality stakeholder engagement process.
- providing meaningful information in a format and language that is readily understandable and tailored to the needs of project stakeholder group(s)
- providing information in advance of consultation activities and decision making
- disseminating information in ways and locations that make it easy for stakeholders to access it
- Ensuring that the project representatives managing the engagement process have, or can access, the right skills, experience and attitudes for the job.

2) Early engagement: Engage from the earliest opportunity and communicate frequently.

3) Integrate community engagement with the project design process: There are many aspects of a new project that are likely to require public consultation and participation. It is to the benefit of the efficient management of the project to integrate these processes and to

ensure consultations are scheduled appropriately within the project planning process. In the case of new technology development, where implementation sites or stakeholders are not known, it may be beneficial to undertake exploratory consultations to ascertain *potential* community responses. This process should be conducted by an appropriate specialist working in conjunction with research scientists or technologists.

4) Respect: Showing respect for local traditions, languages, timeframes, and decision-making processes is the key to building successful relationships. Showing respect also means:

- Allowing two-way dialogue that gives both sides the opportunity to exchange views and information, to listen, and to have their views heard and addressed.
- Ensuring inclusiveness by reaching out to minority groups. Disadvantaged and vulnerable groups, such as women, the poor or ethnic minorities, may difficult to identify or reach because they do not have power in the community. However, they often have the most to lose from large scale projects and negative impacts on their welfare, even when unintentional, can generate both significant human cost and negative publicity for project proponents.
- Ensuring engagement processes are free of intimidation or coercion.
- Ensuring clear mechanisms exist for responding to people's concerns, suggestions and grievances.

5) Addressing key issues: Finally, when communities have issues or concerns that are important to them, it is essential to address them, *even if the issues are very difficult for the company to deal with.* This may extend to the incorporation of public feedback into project development, either via adaptation, amendment, or even, in extreme cases, cessation of project development. Failure to address serious concerns will compromise the stakeholder engagement process and is likely to cement negative impressions of the company and the project from the outset.

An example of an effective community engagement strategy is illustrated in the Portland Aluminium case study.

MINI CASE STUDY: PORTLAND ALUMINIUM'S COMMUNITY ENGAGEMENT STRATEGY

In 1994, Portland Aluminium sought approval to increase sulphur dioxide emissions by nearly 30 per cent so that it could increase production at its aluminium smelter in Portland. Members of the community were opposed to any increase in emissions with the central issue being the effect of sulphur dioxide on health. There was a widespread belief that asthma levels were high in the Portland area. There were also similar concerns about the levels of sore and itchy eyes and skin irritations, as well as odours and acid smells.

Portland Aluminium stated that, with increased emissions, the use of taller stacks would improve air quality at ground level by allowing sulphur dioxide to disperse higher into the atmosphere. Many residents had concerns about the reliability of air monitoring within the Portland area and believed they were not given complete information about the potential health effects associated with aluminium production.

In response to these concerns, the Victorian Department of Human Services established a Health Professionals Advisory Committee which included local health professionals, a respiratory physician and Department representatives. The role of the committee was to organise and oversee an independent health study to assess the potential for any adverse health effects from the proposed increase in sulphur dioxide emissions from the smelter. A proactive program of community consultation was established and local residents were interviewed and given the opportunity to raise key areas of concern. The committee then ensured that these concerns were addressed in the study's terms of reference.

The Victorian EPA then granted Portland Aluminium approval to replace the low stacks at the smelter with six tall stacks and to monitor their emissions for 12 weeks. The findings of the health study and the results of monitoring of emissions from the old stacks and new, tall stacks were to be evaluated before the application to increase sulphur dioxide emissions was granted.

The health study involved a literature review and a health survey. To determine whether there was an increase in asthma and itchy eyes in Portland, the consultants surveyed residents of Portland and Warrnambool (a similar population) using a questionnaire which covered a range of health symptoms. The study also reviewed the measurements of ground level concentrations of sulphur dioxide that resulted from emissions from the older low stacks and the new tall stacks, after they were built.

The literature review found that there was no evidence that sulphur dioxide caused people to become asthmatic but it did cause symptoms such as wheeze to occur more often. The survey showed that other health symptoms such as itchy eyes, cough, stuffy noise, sore throat and skin rash were more common in Portland but there was no significant difference in the proportion of people with asthma and wheeze, although both cities had high rates. Monitoring data for 1995, 1996 and 1997 showed that the one-hour 'acceptable level' for sulphur dioxide at ground level was exceeded four times over this period. However, monitoring of emissions from the new tall stacks showed much lower levels.

The monitoring results were used to predict the ground level concentrations of sulphur dioxide that would occur with the proposed 30 per cent increase in smelter emissions. The levels in Portland and surrounding areas were predicted to be well below the standard.

The results of the study were discussed with the community at a public meeting and a report of the study was circulated. The study concluded that there was no evidence that the proposed increase in sulphur dioxide emissions from the taller stacks would be detrimental to health.

The report was well received by the community. Portland Aluminium was given EPA approval to increase sulphur dioxide emissions from the smelter and ongoing monitoring of air pollutants would be a condition of the licence.

(Source: Commonwealth of Australia, 2004)

How should we respond to community hostility towards a project?

While stakeholder analysis enables us to determine community attitudes towards different social issues, it does not necessarily explain why stakeholders adopt the positions they do on certain issues. A critical challenge for risk managers is to understand why communities express concerns about projects or processes that, from a technical perspective, can be seen as relatively risk free.

Key message: Failure to address the gap between lay and expert perceptions of risk is the most common reason for the escalation of social risk.

Expert and non-expert perceptions of risk

This difference between expert and non-expert opinion derives from a fundamental dilemma: the risks that kill people and the risks that alarm them are often fundamentally different (Covello and Sandman, 2001). There is virtually no correlation between the ranking of hazards according to statistics on expected annual mortality and the ranking of the same hazards by how upsetting they are. These differences in opinion derive from different perceptions of what 'risk' actually means. To risk assessment experts, risk is a multiplication of two factors: magnitude (how serious the consequences of the activity) and probability (how likely it is to happen).

Community perceptions of the risk have been described as 'hazard plus outrage' (Sandman, 1993). The non-experts' view of risk reflects not just the danger of the action (hazard) but also how they feel about the action and, even more important, how angry they feel about the action.

These different perceptions mean that both experts and non-experts often fail to take into account significant factors that affect each other's perceptions. Sometimes, this may not be important. For example, if expert and non-expert assessments of risk are in agreement. i.e. if both agree that the risk is substantial (high hazard and high outrage) or insubstantial (low hazard, low outrage) the fact that both parties have approached the assessment from different perspectives need not cause problems. However, if the two assessments do not agree (high hazard and low outrage; low hazard, high outrage) then controversy is more likely to arise (Lundgren, 1994). The implication for those who are communicating risk is that a bald presentation of the technical facts will not necessarily give the audience the information they want.

Stakeholder perceptions

The first step in avoiding, eliminating or managing community hostility towards a project is to understand why people react the way they do. The golden rule for risk communication is to accept that experts and non-experts have different perceptions of risk, and no amount of education or exposure to 'expert' opinion will be effective if communities concerns are not addressed.

The second step is to find out why people are feeling outraged. Communities can be hostile when they:

- do not regard the organisation delivering the risk message as credible
- regard the message being delivered as patronising or designed to placate them
- feel their main concerns are being ignored
- believe that change is a bad thing. Many people feel threatened by proposed changes to their existing way of life

- disagree with corporate, industry or government judgments of the acceptable magnitude of a certain risk
- don't understand the process or the data being communicated.

There are also social and psychological factors that influence how people process information about risk. These include:

- decision heuristics
- public apathy
- overconfidence and unrealistic optimism that leads people to ignore risk information
- difficulties in understanding probabilistic information
- the public's desire and demand for scientific certainty
- peoples' reluctance to change strongly-held beliefs
- individual social/psychological determinants of how the actual magnitude of risk is judged (Covello and Sandman, 2001).

When community perceptions are understood and valued and risk communications framed to address stakeholder concerns, public acceptance of potential project risks is more likely. Table 2 provides a comprehensive list of the psychological factors that influence individual perceptions of risk.

Table 2: Factors affecting the perception of risk

Attribute	Description	Less Acceptable	More acceptable
FACTORS RELATING TO PERSONAL VALUES			
Ethical/moral nature	Risks from activities believed to be ethically objectionable or morally wrong are judged to be greater than risks from ethically neutral activities	Foisting pollution on an economically distressed community	Side effects of medication
Fairness	Risks from activities believed to be unfair or to involve unfair processes are judged to be greater than risks from fair activities	Inequities related to the placement of industrial facilities or landfills	Vaccinations
Personal stake	Risks from activities viewed by people to place them (or their families) personally and directly at risk are judged to be greater than risks from activities that appear to pose no direct or personal threat	Location of an airport	Disposal of waste in remote areas
Trust	Risks from activities associated with individuals, institutions or organisations lacking in trust and credibility are judged to be greater than risks from activities associated with those from a credible source.	Industries with poor environmental track records, e.g. mining	Regulatory agencies that achieve high levels of compliance among regulated groups, e.g.; TGA
Voluntariness	Risks from activities considered to be involuntary or imposed are judged to be greater, and are therefore less readily accepted, than risks from activities that are seen to be voluntary	Exposure to chemicals or radiation from a waste or industrial facility	Risks inherent in smoking, sunbathing, or mountain climbing
FACTORS RELATING TO INDIVIDUAL TOLERANCE OF RISK			
Controllability	Risks from activities viewed as under the control of others are judged to be greater and are less readily accepted, than those from activities that appear to be under the control of the individual	Releases of toxic chemicals by industrial facilities	Risks inherent in driving a car, riding a bicycle or skiing
Dread	Risks from activities that evoke fear, terror, or anxiety are judged to be greater than risks from activities that do not arouse such feelings or emotions	Exposure to AIDS, disease pandemics,	Exposure to common colds or the flu, or domestic accidents, e.g. falling down stairs
Familiarity	Risks from activities viewed as unfamiliar or exotic are judged to be greater than risks from activities viewed as familiar	Nanotechnology	Exposure to household cleaners
Human vs. natural origin	Risks generated by human action, failure or incompetence are judged to be greater than risks believed to be caused by nature or "Acts of God"	Industrial accidents caused by negligence, inadequate safeguards, or operator error, e.g. Bhopal	Cyclone, volcanic eruption
Uncertainty	Risks from activities that are relatively unknown or that pose highly uncertain risks are judged to be greater than risks from activities that appear to be relatively well known to science	Biotechnology and genetic engineering	Open heart surgery, effects of anaesthesia
Understanding	Poorly understood risks are judged to be greater than risks that are well understood or self-explanatory	Effects of long-term exposure to low doses of radiation	Pedestrian accidents

FACTORS RELATING TO EFFECTS AND CONSEQUENCES OF RISK EXPOSURE			
Attribute	**Description**	**Less Acceptable**	**More acceptable**
Benefits	Risks from activities that seem to have unclear, questionable, or diffused personal or economic benefits are judged to be greater than risks from activities that have clear benefits	Genetically modified crops	Jobs; monetary benefits derived from the construction industry
Catastrophic potential	Risks from activities viewed as having the potential to cause a significant number of deaths and injuries grouped in time and space are judged to be greater than risks from activities that cause deaths and injuries scattered or random in time and space	Plane crash, terrorist attack, nuclear meltdown	Car accidents
Delayed effects	Risks from activities that may have delayed effects are judged to be greater than risks from activities viewed as having immediate effects	Long latency periods between exposure and adverse health effects, e.g. asbestosis	Poisoning from snake bite
Effects on children	Risks from activities that appear to put children specifically at risk are judged to be greater than risks from activities that do not	milk contaminated with radiation or toxic chemicals; pregnant women exposed to radiation or toxic chemicals	Workplace accidents
Effects on future generations	Risks from activities that seem to pose a threat to future generations are judged to be greater than risks from activities that do not.	Adverse genetic effects due to exposure to toxic chemicals or radiation	skiing accidents
Reversibility	Risks from activities considered to have potentially irreversible adverse effects are judged to be greater than risks from activities considered to have reversible adverse effects	Birth defects from exposure to a toxic substance	Sports injuries
Victim identity	Risks from activities that produce identifiable victims are judged to be greater than risks from activities that produce statistical victims	A worker exposed to high levels of toxic chemicals or radiation, a child who falls down a well; a miner trapped underground)	Statistical profiles of automobile accident victims
FACTORS RELATING TO THE RISK CONTEXT			
Media attention	Risks from activities that receive considerable media coverage are judged to be greater than risks from activities that receive little publicity	Accidents at nuclear power plants	on-the-job accidents.
Accident history	Risks from activities with a history of major accidents or frequent minor accidents are judged to be greater than risks from those with little or no such history	Leaks at waste disposal facilities	Recombinant DNA experimentation)

Stakeholder engagement in ongoing monitoring programs

Another recent development in corporate community relationships that directly addresses sources of conflict between the proponents of mining projects and local communities is the development of environmental monitoring programs that involve community groups in the monitoring process. The Regional Aquatics Monitoring Program and the Wood Buffalo Environmental Association in Alberta, Canada, are examples of collective approaches to

monitoring and reporting. Both of these organisations monitor the impacts of the oil sands industry on water and air sheds in the region of Wood Buffalo. These multi-stakeholder organisations have a membership that includes resource companies, environmental, indigenous and community organisations and government agencies. The data generated from the regional monitoring programs is shared with stakeholders and the public. Both organisations periodically present aggregated data as community updates (RAMP et al., 2008). A well-designed and executed monitoring plan, supported by a comprehensive communication plan, is critical to foster dialogue, consensus and trust between the mine and the community (Bebbington & Williams, 2008).

Barriers to effective risk communication

It is also important to acknowledge that, even when great progress has been made in identifying and addressing community concerns about potential project risks, there may still be problems during the risk communication process. Obstacles to effective risk communication are created by organisational barriers, by public perceptions and by extraneous factors that impact on communicator and audience alike. Examples of each of these potential barriers is described below.

Organisational barriers

From the perspective of those charged with the responsibility of delivering an organisation's risk communication messages there can be many organisational restraints that prevent them from carrying out their role effectively. Common barriers include:

- *Inadequate resources*. Organisations prioritise analysis over risk communication and frequently allocate minimal resources to the communications function.
- *Difficult review and approval procedures.* Organisations also constrain risk communications by establishing review and approval procedures that are either inappropriate or time consuming. In crisis situations, or where particularly hostile stakeholders are involved, risk communicators need to be able to respond quickly and proactively.
- *Conflicting organisational requirements.* Organisational policies regarding the release of confidential information, and which information channels should be used, may conflict with the goals of good risk communication. These problems can generally be avoided with pre-planning.
- *Insufficient information to plan and set schedules.* Detailed information is needed to prepare communications plans and to set schedules for the release of information. Important information includes legal/compliance obligations, organisational requirements, how the risk communications plan fits in with scientific developments and the technical risk assessment process and coordinating actions with government and other stakeholders. The credibility of the risk communications plan depends on reliable data, effective planning and clear messages
- *Negative attitudes towards stakeholders.* Unwillingness to see the public as an equal partner and a conviction that the lay public cannot understand science and should therefore leave risk management 'to the experts' will inevitably lead to risk communications messages that only succeed in creating community outrage and mistrust.

Stakeholder barriers

Stakeholder distrust of the company or the project can act as a powerful blocker of risk communications messages. Issues of trust and credibility are critically important and

generally require immediate management intervention to address. Stakeholders are suspicious and distrustful of risk communications efforts when:

- there is disagreement among experts
- a lack of coordination among risk management organisations
- experts and spokespersons are inadequately trained in risk communication skills
- risk communicators demonstrate insensitivity to community expectations of effective communication, public participation, dialogue and community outreach
- there is evidence of mismanagement and neglect, and
- a history of frequent distortion, exaggeration, secrecy or worse on the part of risk information providers.

Constraints for communicator and audience

Finally, there are barriers to effective risk communication that pose challenges for communicators and audiences alike. There are:

- *Incomplete data.* The inherent uncertainly, complexity and incompleteness of much scientific data means that it is extremely difficult for risk managers to determine the potential harm posed by new technologies to health, social welfare or the environment. Many gaps remain in relation to our understanding of these risks, making it difficult, if not impossible to separate cause from effect. As a result, the result of most the outcomes of most risk assessments are best seen as estimates, with varying degrees of uncertainty about the actual nature of the risk. This is a difficult message for risk communicators to deliver to stakeholders.
- *Selective reporting by the news media.* Journalists are highly selective about reporting risk and particularly inclined towards stories that involve people in unusual, dramatic, confrontational, negative or sensational situations. In short, they tend to focus their attention on issues that play to the same outrage factors that the public uses in evaluating risk.
- *The changing knowledge base for communicators and stakeholders.* New scientific developments, the readily accessible sources of new information about projects that is provided by the media and public disagreement between experts mean that risk communications professionals need to be flexible, adaptable and in a position to respond proactively to new information. The ready availability of information means that the public's knowledge base is constantly expanding and risk communicators need to be prepared to meet these challenges.

BOX 5: SEVEN CARDINAL RULES OF RISK COMMUNICATION

1. Accept and involve the public as a legitimate partner
2. Listen to the stakeholders
3. Be honest, frank and open
4. Coordinate and collaborate with other credible sources
5. Meet the needs of the media
6. Speak clearly and with compassion
7. Plan carefully and evaluate performance

Source: adapted from National Environment Protection Council, 1999

8. BRENT SPAR CASE STUDY

The Brent Spar story

The Royal Dutch/Shell group of Companies, known as Shell, is one of the largest multinational oil companies in the world. In the 1970s, it invested heavily in the exploration of major oil and gas deposits in the North Sea. It was a profitable investment since Shell Expro (a 50%-50% joint venture between Shell and Esso) discovered a number of rich oil fields, including the Brent fields.

The Brent Spar was a very large floating oil storage buoy that was used for the storage of oil from the Brent 'A' platform and acted as a loading facility for the Brent Field. It was put into operation in 1976 and decommissioned in 1991. After the decommissioning, Shell UK commissioned no less than thirty studies to find out the BPEO (Best Practice Environmental Option) for its disposal. After a thorough examination of these options, Shell decided to implement the deepwater disposal option.

On the basis of the findings of these consulting studies, Shell UK asked the UK Department of trade and Industry for permission to dump the buoy in the deep sea and started formal consultations with local governments, conservation bodies and fishing interests. In 1995 the UK government announced its intention to approve the deepwater disposal option. In accordance with international regulations, this intention was communicated to OSPAR governments (the Netherlands, Norway, Germany and Denmark), the other twelve EU nation states and the EU itself. Since, within the normally allocated time limit no objections were raised, the UK government gave its approval to proceed with the deepwater disposal option.

Before this license could be issued, Greenpeace took action. Greenpeace was opposed to the deepwater disposal option and staged a dramatic occupation of the Brent Spar, which was captured on video for television audiences. These images were distributed around the world, leading to very negative publicity for Shell. Despite the occupation, however, the UK government granted the disposal license.

Nobody was prepared for the expressions of public outrage that followed. MPs in Germany and Belgium protested against the disposal plan and condemned the UK government, as did the opposition parties in the UK. When the UK government launched legal action to defend its position, Greenpeace called for a boycott on Shell activities in continental Europe. Greenpeace supporters began leafleting gas stations and motorists and some Shell service stations in Germany reported 50% loss in income. In further developments, other protesters threatened to damage 200 Shell service stations; subsequently 50 were damaged, with bullets being fired in one instance and two fire bombings reported.

On June 15th, 1995, Chancellor Kohl protested to the UK Prime Minister at the G7 summit and the following day, Greenpeace activists re-occupied the Brent Spar. At this stage, even though Shell had retained the support of the UK government, the company bowed under public pressure and reversed its decision on deep-water disposal and began a series of public consultations to find a new solution. Ultimately, the Brent Spar was dismantled. (Source: Zyglidopoulos, 2002)

What went wrong?

With the advantage of knowledge about social risk and effective risk communications, it is easy to see what mistakes were made by Shell and how the company lost the media war with Greenpeace. First, Shell failed to identify the social risk related to the decision to dispose of the Brent Spar at sea. Second, the company demonstrated a lack of understanding of the perceptions and values of different stakeholders groups – environmental activists, politicians and even other business units within Shell. Finally, the Brent Spar crisis 'is a classic example of risk communication gone wrong' (Löfstedt & Renn, 1997: 131).

Failure to identify social risk

What makes the Brent Star controversy interesting is that it was an environmental 'non issue' until the buoy was occupied by Greenpeace activists (Löfstedt and Renn, 1997). Shell had undertaken an appropriate level of risk analysis to analyse the technical, safety and environmental aspects of its disposal. What Shell did *not* conduct was a social risk analysis. The company *failed to identify Greenpeace as a stakeholder* and, as a consequence, its forecasting in relation to the Brent Spar was missing a critical element that ultimately forced the company's hand to reverse what it had identified as a best practice outcome.

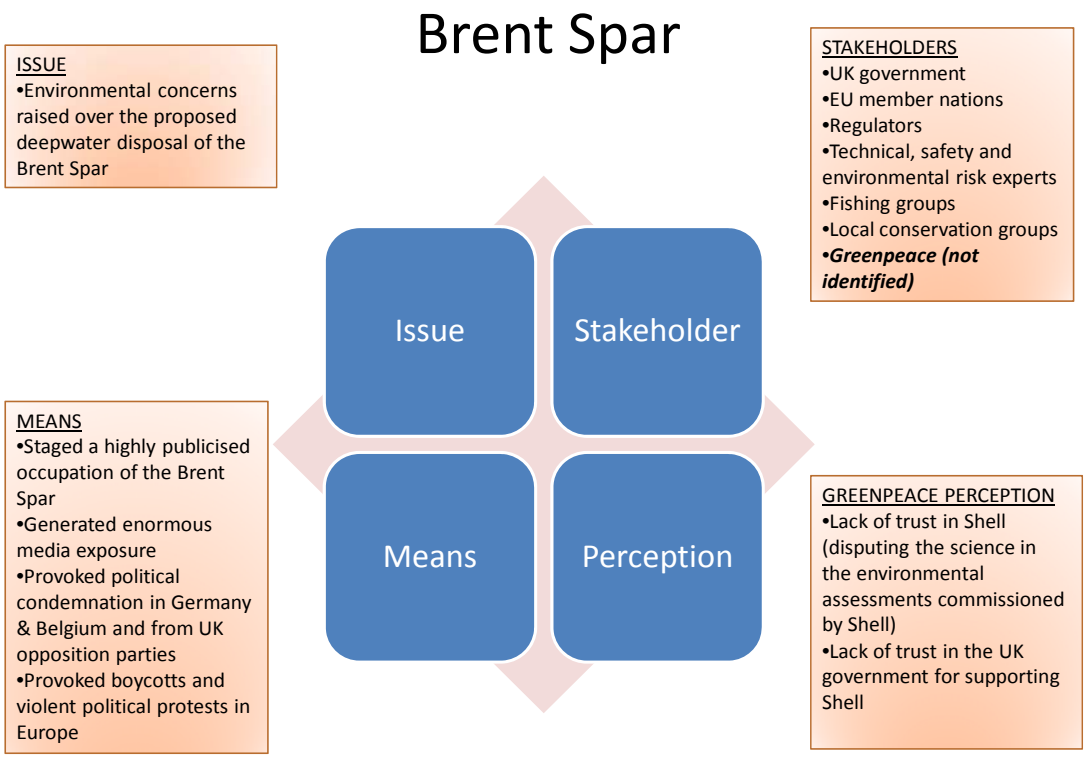
The failure to identify Greenpeace as a key stakeholder represents a failure in social risk management. There was ample evidence available to Shell at the time that Greenpeace was a powerful force in the environmental community. In 1996, Greenpeace International claimed 2.9 million supporters in 158 countries worldwide, with offices in 32 countries (Jordan, 2001). Its method of operation was well known and in 1995 'it was in the league of the Coca Colas, Shell and IBMs in terms of computer awareness' (Jordan, 2001: 126). The Greenpeace method of operation was also well known:

> *...whereas the Quaker tradition of protest had been to bear personal witness to events, Greenpeace tried to make the world bear witness through news releases, radio reports, and above all, photographs...As Greenpeace sailed into nuclear testing zones, or later manoeuvred small inflatable dinghies in front of whaler's harpoons and beneath the bows of ships loaded with toxic waste, cameras brought its message to the 'global village' of the TV screen. Greenpeace was the first citizen's group to realise the potential of the moving image.*

Source: Pearce,1991, p 19, cited in Jordan, 2001, p 16).

The sea was Greenpeace's home territory and the dumping of toxic chemicals in the ocean had been a major preoccupation in Europe since the 1980s. On the basis of this evidence, it would seem that Greenpeace's approach to the Brent Spar was entirely predictable and Shell committed a major strategic error in failing to identify the NGO as an important stakeholder in the matter of the Brent Spar disposal. The components of the social risk faced by Shell are mapped in figure 9.

Figure 9: Applying the social risk analysis framework to the Brent Spar case



Failure in Shell's risk communications program

Once Greenpeace grabbed public attention by the dramatic occupation of Brent Spar it had gained the upper hand in the media battle that followed. Shell's risk communication program failed for three primary reasons;

1. the company was held in low public esteem
2. the promoters of the crisis gained the support of the media
3. Shell failed to develop an effective counter-information strategy ((Löfstedt and Renn, 1997).

First, Shell was viewed in an extremely negative light by the public. It was seen as 'big business', a powerful multinational, only interested in minimising costs. Greenpeace, on the other hand, played David to Shell's Goliath. It was the small, defenceless band of brave activists who fought and 'slew' the corporate dragon. This was an image loved and perpetuated by the media. The lack of faith in 'big business' generally, and in mining and oil companies in particular, placed Shell at a disadvantage in the media campaign the followed.

Second, there were several weaknesses in the communication strategies of both Shell and the UK government.

1. They both adopted a 'top down' rather than a dialogue approach to communication. Both were portrayed as arrogant and stubborn in the media
2. Shell was not seen as trustworthy, whereas Greenpeace was. Shell was unable to remove this perception, in part due to the conflicting messages that were being sent from Shell UK and Shell in Germany. Shell did not speak with one voice, while Greenpeace did, thus strengthening their argument.

3. Shell could not counter the symbolic meaning of dumping at sea. Once an act is perceived by the public as morally wrong (dumping waste in a pristine environment), it is enormously difficult to challenge the preconception.
4. Shell failed to consult with the scientists who knew something about the deep sea and the consequences of dumping the Brent Spar. The company failed to use the scientific evidence available to it to counter Greenpeace's claims.
5. Media coverage was largely dominated by footage provided by Greenpeace. Greenpeace had taken the initiative and produced highly visible actions, Shell was forced to react and defend itself and was never successful in countering the impact of televised media.

Counting the costs

The damage to Shell, financially and it terms of corporate reputation, was enormous. The projected cost of deep sea disposal was £17-20 million but in the end the total cost of dismantling the Brent Spar amounted to £41 million (Shell, no date). The greater cost, however, was suffered in the damage to corporate reputation. The company had lost the trust and confidence of the public, leading to a drastic change in Shell's approach to managing environmental issues. In 1997, as a clear consequence of the Brent Spar case, Royal Dutch Shell created a fifth core business, Shell International Renewables (Jordan, 2001). Since that time, the company has been making conspicuous efforts to be seen as environmentally benign. In March, 1999 it was reported that Shell was spending $25 million in a public relations campaign (Profits and Principles) aimed at preventing a recurrence of past PR 'nightmares' like Brent Spar (Jordan 2001: 20).

9. CASE STUDIES

The Stuart Oil Shale case

The Stuart Oil Shale project was a joint venture between an Australian company, Southern Pacific Petroleum/Central Pacific Minerals, and a Canadian based multinational, Suncor, to commission a $250 million experimental oil shale plant and mine near the Central Queensland port city of Gladstone, Australia (SKM, 1998). Oil shale is a sedimentary rock that is mined for the production of fossil fuels. Oil shale is typically extracted through surface mining. The shale is mined and crushed before it is heated in a process called retorting, where the solid kerogen within the rock is mobilised and converted into gaseous petroleum products, which are hydrogenerated to produce naptha and fuel oil.

Airborne emissions released from the project led to health complaints and community opposition, with the conflict contributing to the eventual closure of the facility, hundreds of millions of dollars in lost capital and many hundreds more lost in potential future production. The declaration of the region as a 'state development area' by the Queensland Government resulted in the closure of the nearby Targinnie community and the resumption of properties. Recent attempts by the successors of the Stuart Project to develop another Central Queensland deposit were met with a 20-year moratorium by the Queensland State government, a direct legacy of the original conflict (Qld Parliament, 2008).

The Stuart Oil Shale Project was planned as a three-stage development. Stage 1, a research and development stage, involved the construction and commissioning of a technology demonstration plant. Construction of Stage 1 was completed in 1999. Stage 2 was to involve the up-scaling of the Stage 1 technology, while Stage 3 was proposed to replicate the Stage 2 plant into a commercial scale project. The Stuart deposit is located 15 km north of the city of Gladstone, just 3-4 km east of the community of Targinnie, and 5-6 km north of the community of Yarwun. The community of Targinnie was made up of approximately 150 properties, some rural residential, others deriving an income from fruit growing (mainly mangoes and paw paws).

What went wrong?

The identification and communication of social risks

From the earliest stages the project did not anticipate social risks, either to the community or to the project. The Stage 1 Environmental Impact Statement (EIS) published on behalf of SPP/CPM, in early 1993, did not consider social impacts in any detail. The EIS did not scope social and economic impacts, beyond an analysis of the impact of jobs and housing, did not include a profile of the community and according to the local State Member of Parliament the "public consultation process did not exist in a true form" (Cunningham, 2002; Environsciences, 1993).

Prior to the construction of the development, public community meetings were held in association with the Stage 1 EIS. The impression the community held about the development, derived from the community information sessions and communication materials produced by the company, was that the project would not pose any risks to the community. One resident of Yarwun described the characterisation of the project as "you

won't even know we're here" (Noonan, 2002). A communications document to the community, separately confirmed by multiple interviewees, stated that 'you won't hear us, see us or smell us' (at interview, 2008).

While the proponents of the project may not have anticipated adverse impacts, characterising the risks of the project in this way was not consistent with information on the process of oil shale extraction and processing available at the time (Graham, 1980), nor with the eventual practice of the plant. The characterisation of risks in the public information sessions and communication materials was also not consistent with the technical description of the project as presented in the Final Stage 1 EIS. The EIS presented a more straightforward assessment than what was communicated directly to the community (Environsciences, 1993). Very few community members generally take the opportunity to familiarise themselves with the technical material presented in impact statements, and this was the case in this instance. The EIS concluded, however, that the "proponent does not present any significant risk to the general community in terms of public health" (Environsciences, 1993, 7:31).

The approach to the communication of risks described above would characterise the project well into the Stage 2 approvals process. Understating the potential impacts of the project created a false impression, distorting expectations. The less than frank assessment offered during the early community engagement process become an ongoing point of contention and exposed the proponents to a potential breach of trust when impacts were eventually experienced. Without robust community engagement, an in depth understanding of the community, its demographics, and how an industrial project might impact on them the proponents were left unprepared to respond effectively to potential community issues as they arose. The loss of trust, furthermore, left a lasting legacy that hampered resolution of the conflict when emissions were later reduced.

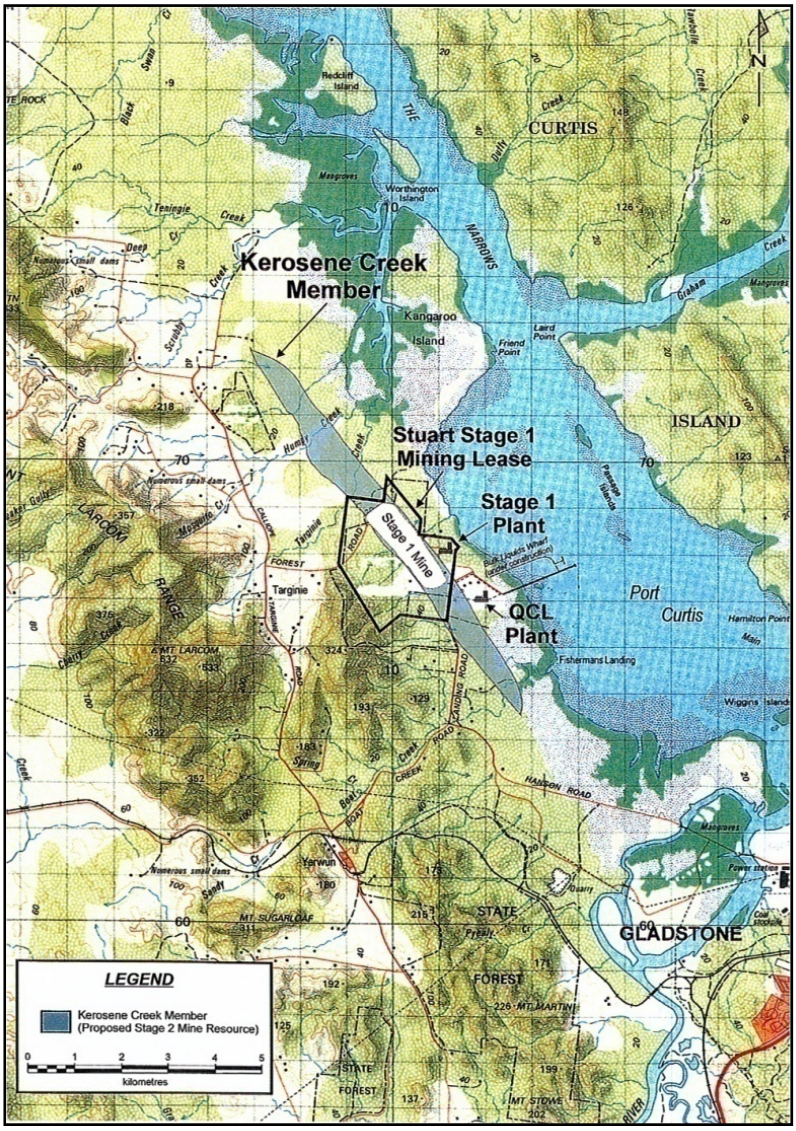
Timely stakeholder engagement

In December of 1995 Canadian based multinational oil company Suncor agreed to partner with SPP/CPM to develop the Stuart Project. Suncor became the project operator. A mining lease was granted in August 1996, construction began in 1997 and commissioning began in April of 1999. As the project moved toward commissioning the proponents sought approval for the Stage 2 upscale of the pilot plant. A draft of the EIS was released in September of 1999 and was open for public comment.

The Stage 2 assessment process and consultation were significantly more robust than what had occurred during the Stage 1 approval. Community consultation and information sessions were held in association with the EIS, including a session on local environmental issues such as odour and noise. Suncor took over responsibility for the consultation process from SPP/CPM during construction. Local consultation predominantly consisted of liaison with landholders and resolution of the concerns of fruit growers about the potential impact on groundwater. The Draft Stage 2 EIS was accompanied by a public relations campaign. A consultant was engaged by the developer to provide support to the Yarwun-Targinnie community in the preparation of a response to the EIS.

Figure 10: Location of the Stuart Oil Shale Project

The community of Targinnie is located to the immediate west of the project site. Yarwun is located to the south. The Kerosene Creek Member refers to the geological sequence that hosts the ore body. The QCL plant is a nearby cement factory.



There was a noticeable shift in the quality and branding of communication material in this period. Information sheets and even the EIS progressively took on a more professional look and public relations style. The proponents continued, however, to present the possibility of risks to the community as remote. The Initial Advice Statement for Stage 2, for example, released in November 1998 made no mention of the potential for odour or local air pollution in its description of the potential environmental impacts (SPP/CPM, 1998)[1]. The Executive Summary of the Draft Stage 2 EIS, published in September 1999 also failed to mention the potential for odorous emissions or for corresponding health effects. Noise impacts were predicted to be an issue at only a small number of locations (SPP/CPM, 1999).

[1] The statement did indicate that monitoring would be undertaken of odour around the ship loading facilities and the processing plant (SPP/CPM, 1998).

The timing of the Stage 2 EIS was also problematic. The Draft EIS did not contain data from the operation of the pilot plant. The first oil was produced from the pilot in August of 1999, just one month before the release of the Draft Stage 2 EIS. The community was being asked to consider the potential impacts of upscaling the pilot plant before becoming familiar with its operation. The lack of data from Stage 1 would come to severely hamper the progress of the Stage 2 approval.

The communication materials (fact sheets, press releases, newsletters) provided to the community continued to downplay the potential impacts and risks posed by the project. The information was not based on the experience of the Stage 1 demonstration plant. There was no mention in factsheets on air quality of the potential for odour from the operations (see SPP/CPM and Suncor, 1998b, 1999a). The proponents did not anticipate significant impacts from the project to arise and tailored communications toward persuading the community of this point of view. The proponents were confident that the experimental plant would perform to expectations and the commissioning would proceed smoothly. The community were generally cooperative and supportive of the project at this point, though there were some concerns held by fruit growers about the potential impact of the mine on groundwater quantity. Six days into the public comment period for the Draft Stage 2 EIS and just a few months into the commissioning of the pilot plant an upset of the plant released a cloud of emissions from the project site. This event would reshape company-community relations and the future of the project as a whole.

Emphasis on issue management

On the afternoon of Saturday October 2, 1999, a plume of black smoke was generated during the 'hot' commissioning of the plant. The plume descended into the Targinnie valley where it was trapped for six hours until it was dispersed by the afternoon breeze. Residents living in the vicinity of the mine and processing plant were exposed to the pungent emissions from the plant and experienced health impacts, including irritation of mucous membranes (tingling lips and tongue, dry and irritated throat, burning skin, sore and stinging eyes, runny nose, sinus problems), headache and nausea. The demonstration plant was temporarily shut down and the Stage 2 EIS delayed.

Suncor was not prepared for such an event. They did not have a process for responding to the situation or a communication plan, apart from a site based plan for emergencies and evacuation. As a consequence the response of the company was slow and uncertain. When the response did come it was defensive and lacked an understanding of community perceptions. The communities of Yarwun and Targinnie were left in a situation of uncertainty. After a week of uncertainty Suncor held a community meeting. The events of October 2nd were described in technical detail. The community was looking for simple and straightforward answers. Community concerns were exacerbated when the operator initially denied that it was the source of the odour and challenged the veracity of the health complaints. An occupational physician was employed by the company to undertake health checks.

In the months that followed the community relations staff attempted to address community concerns as subsequent plant trials generated similar odour events. In the absence of an existing and ongoing face-to-face relationship the relationships were hampered by a lack of trust and staff found it difficult to establish credibility. Plant runs were accompanied by a letter to residents advising of the timing and duration of forthcoming events, and providing detailed technical information on the purpose of the run, its characteristics and the results. Residents were offered to temporarily relocate for the duration of plant test runs. Those

that decided to stay were supported by a 24 hour response and field team to investigate complaints. The company established an internal group, known colloquially as 'the odour team', to provide direct on the ground community support during commissioning runs and developed rapport with community members.

Figure 11. Aerial view (south) of the Stuart Oil Shale Project
Stuart Oil Shale Project (foreground), Queensland Cement Ltd. (mid ground) and Gladstone City (background). Targinnie is located to the right of photo. Source: QER

Figure 12. Oblique aerial view (south-east) of the Stuart Project
Stuart Project (foreground) and Queensland Cement Ltd. (midground). Source: QER

Figure 12. Oblique aerial view (north) of the Stuart Oil Shale Stage 1 plant (circa 2008).
Source: QER

Daily bulletin board updates and regular posting of air quality data (2000-2001) were provided at community locations and plant operations data (2000-2002) were made available to better inform the community. Site open-days and information sessions were held and one on one interaction with community relations staff to address residents concerns. A community representative body (Yarwun Targinnie Representative Group) was supported and co-established by the operator (Moore, 2003). The group assisted the developers to build a relationship with the community, sort through their issues with the project, focus their concerns and come up with some practical ways to move forward.

Direct letters to residents from Suncor also immediately followed plant runs. For example, a letter dated 27 May, 2000 acknowledged that complaints about odour and noise had been received and "that some discomfort is still being reported and Suncor is working diligently to address these issues and work through our emissions mitigation plan as quickly as possible" (Clow, 2000b). Other letters advised that there was a very low risk of short, medium or long term health effects associated with plant emissions (Clow, 2000a) and that the “commissioning runs have produced a level of emissions which are currently unacceptable to Suncor and the community". The communications messages within these letters demonstrated a slow transformation from the initially defensive position of the company to express acknowledgement of the inconvenience placed on local residents.

The impacts on public health, however, continued to be disputed. Managing Director of SPP/CPM James McFarland, in June 2000, was reported to have said that the odours were a nuisance that did not pose a risk to human health (Anonymous, 2000). The media and public debate also challenged the companies. *The Courier Mail*, a staunch supporter of the development, openly criticised the company response:

> *..the basis of the company's problems has been its inability to grapple with the on-the-ground public relations of soothing community and political concerns. Because of that it has appeared inept and stumbled from one crisis to another since commissioning of the plant in 1999 (McCarthy, 2002a).*

In September, 2000, Suncor announced that it would defer the commercial development of the Stuart Project until operational issues, including the emissions and noise issues were resolved (AAP, 2000). In January, 2001, the Queensland Government committed to an independent technical review of the Stuart Oil Shale project citing the community health

concerns. In February, Greenpeace released a report, *Stuart Oil Shale Project: A toxic experiment,* claiming that wastes from the Stuart project contained the persistent organic pollutant dioxin, and that the project could potentially be Australia's largest known source of the pollutant[2]. A broader Greenpeace direct action and media campaign attracted significant attention to the project and amplified the concerns of the local community about the project. Within the Gladstone region the campaign garnered significant community support (Courier Mail, 2002). The campaign and continuing community complaints also increased the pressure on government regulators.

Plant commissioning trials between 7 March and 30 April 2001, were accompanied by an Environmental Protection Agency (EPA) field presence. Prior to this period the EPA had found it difficult to respond and verify complaints due to the intermittent nature of the emissions and travel time. The EPA spent 5 days in the field during the commissioning period, and maintained a 24 hour presence on these days. The EPA recorded 176 community odour complaints from 42 households during the commissioning period. These complaints were verified by EPA officers on 30 occasions, with an additional 27 odour events independently reported by EPA officers (up to 9.5kms from the plant). Odours were described to have a chemical smell similar to burnt rubber. Complainants also reported health effects including: tingling lips and tongue, dry and irritated throat, burning skin, sore and stinging eyes, runny nose, sinus problems, headache and nausea (EPA, 2001). On four separate occasions EPA officers also experienced health effects, with officers reportedly needing to withdraw from the field. The field presence concluded that: "Emissions from the Stuart Shale Oil plant during this period of plant commissioning caused an unacceptable level of odour nuisance to the community surrounding the plant" (EPA, 2001).

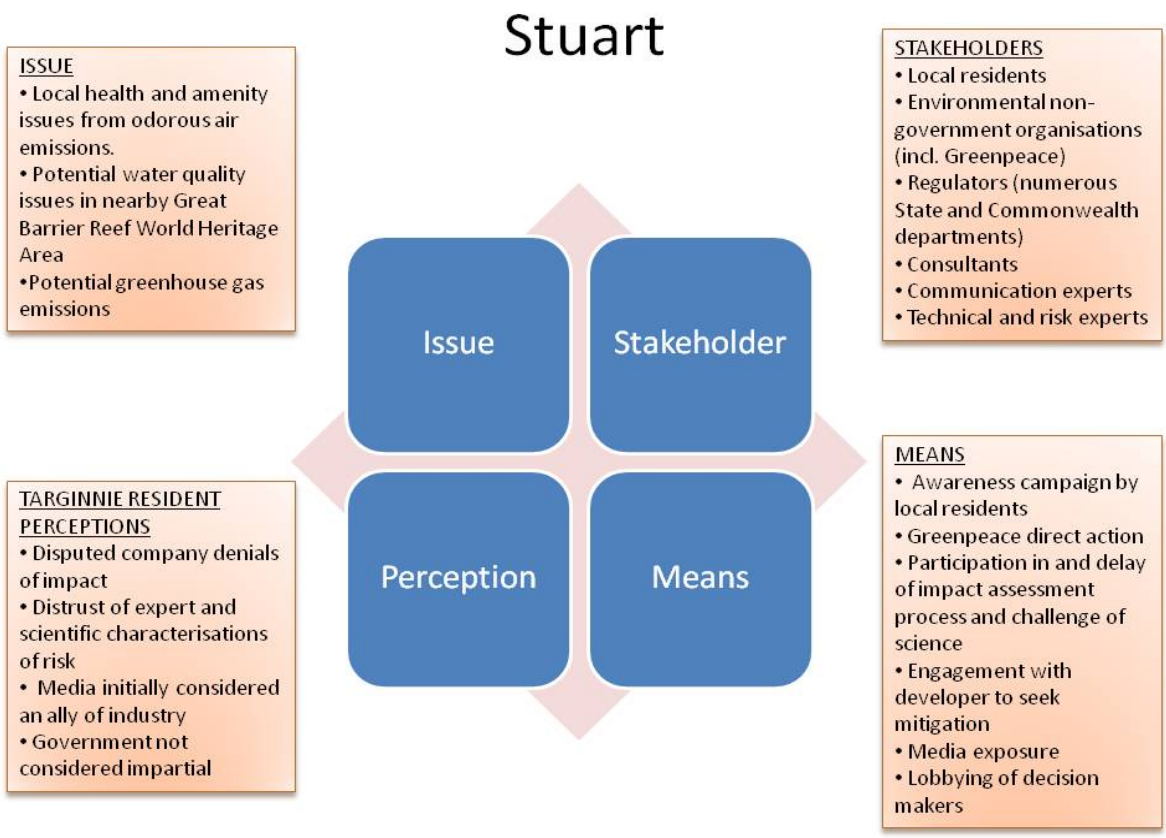
In May, 2001 an interim Queensland Health report, *Reported Health effects related to the Stuart Shale Oil Project Stage 1*, found that the emissions would not have been cause for chronic damage or enduring harm but that "the impacts arising from noise and odour emissions have been deleterious to health in a broader sense of psychological wellbeing". The report went on to argue that:

> *The effects of stress on the community have been very real. Uncertainty about the future, sleeplessness, worries about health and concern about properties becoming unsaleable, coupled with attention from media as well as both government and non-government agencies, are contributing to a high level of anxiety in residents and their families. Taking all these impacts together, there is little doubt that the operations of the plant to date have given rise to what may rightly be termed a "public health nuisance" (Queensland Health in EPA, 2001).*

The components of social risk events for the Stuart Oil Shale case study are represented in Figure 14.

[2] The Supplementary Report to the Stage 2 EIS confirmed the presence of dioxins in waste shale and air emissions, though disputed the concentrations.

Figure 14: Applying the social risk analysis framework to the Stuart Oil Shale case



Interplay between social, technical and business risk

In April of 2001, Suncor withdrew from the project citing unresolved environmental and health risks. The CEO of Suncor is reported to have said:

> *Until shale [oil] can be developed on a sustainable basis, meeting greenhouse gas emissions, meeting social commitments and meeting local environmental commitments, it just won't happen and Suncor wouldn't be part of it (Greenpeace Australia Pacific, 2001).*

The withdrawal of Suncor demonstrates the interplay between social, technical and business risk, as the social conflict magnified technical risks experienced by the project and eventually led Suncor to conclude that continued involvement in the project presented an unacceptable business risk.

The withdrawal of Suncor left SPP/CPM, a company with little operational experience, to progress the project. Despite this risk SPP/CPM decided to proceed with project commissioning and make a renewed effort to resolve the community concerns. Community relations staff continued to communicate with residents to attempt to resolve their concerns. A technological solution was also progressed. SPP/CPM invested $13 million in an

odour emissions reduction program that consisted of capital improvements and operational changes (Hill, 2002c). SPP/CPM cited independent assessments to argue that as of March 2002 the upgrades had led to an 85% reduction of odour, substantial reductions in noise, and met national and international standards (Moore, 2003, 16). Managing Director James McFarland indicated at this time that the company 'profoundly regretted' the high emissions from the plant. The lack of trust between the community and the proponent generated by the now 2 1/2 year long conflict meant that the technological solution did not lead to a resolution. Community members still experienced odour and continued to express concern and anxiety over the composition of the odour and irritants and the lack of information about them.

Figure 15. View (looking east) of the Stage 1 plant (foreground) and Mt Larcom (background). Targinnie is located between Mt Larcom and the project. Source: D Franks CSRM

Figure 16. A Targinnie property and fruit grove. View looking east toward the project site. Source: D Franks CSRM

Figure 17. A Targinnie property, now part of the State Development Area. Source: D Franks CSRM

During the Christmas period of 2002 Targinnie residents were informed by letter that the region had been declared a State Development Area by the Queensland Government and that their properties would be resumed. Community members were divided in their support of this action. The timing of the letter is a point of contention with some former residents, as is the price received by some for their properties. A community representative (at interview) contended that vulnerable community members with poor negotiation skills did not receive fair value for their properties. The representative described the approach and priority of the Queensland Government to the resolution of the crisis as: 'They didn't shut down industry, they shut down a community'. The total cost of the community buy out is reported to be more than $50 million (Bartholomew, 2009).

These events led to a partial resolution of the community opposition, albeit through controversial means, but came too late to save the project. The following year Southern Pacific Petroleum (SPP) was forced into receivership. SPP's receivers announced that they were seeking potential purchasers for the Stuart Project and other shale oil deposits. The resultant company Queensland Energy Resources (QER) announced in July 2004 that Stage 1 of the Stuart Project was to be shut down by year end. In December 2004 QER withdrew the EIS for Stage Two.

Counting the costs

The community conflict was a major factor behind the abandonment of the project, hundreds of millions of dollars in lost capital, significant reputational costs, lost opportunity costs and substantial negative impacts experienced by stakeholders. The conflict, however, has also created an ongoing legacy for the potential future development of oil shale in Queensland.

In 2007, following the abandonment of the Stuart project Queensland Energy Resources initiated pre-feasibility studies on the development of the McFarlane deposit using an alternate processing technology. The McFarlane deposit is located south of Proserpine, in the Whitsunday region of Central Queensland. The proximity of the deposit to the Goorganga wetlands, and the Great Barrier Reef World Heritage Area aroused concerns within a section of the local community over the potential impact of a repeat of the Gladstone experience on the Queensland tourism industry. Following exploratory drilling in April 2008, local environmental non-government organisations instigated a media campaign. The early opposition caught QER flatfooted as the company was not yet in a position to

engage. Information meetings had been held with individual key stakeholder groups, however, according to a company representative "at this stage [early August 2008] it's probably premature to be convening too many public meetings because there's not really much more that we can say" (ABC, 2008).

The main community consultation effort was planned to follow the company decision to proceed with the mine. This course of events, however, within the context of the legacy of the Stuart Project, again led the developers into a reactive position forced to respond to a community and environmental campaign. Community engagement in hindsight should have preceded the decision to develop the pre-feasibility study.

QER did hold a number of public meetings in Mackay and Bowen in early August 2008 and announced the formation of a community liaison committee. Local environmental groups held their own public information events in early June, with Targinnie residents invited as speakers to share their experience of the Stuart project. In June, 2008, Greenpeace again toured the region with its ship, the Esperenza, to bring attention to the local campaign.

In July, 2008, QER released the first edition of their Community Update Newsletter. The communications messages of the newsletter again presented the arguments of national benefit and energy independence and did not address the legacy of the Stuart project, the resolution of local issues, such as the impact of water or airborne emissions or how the McFarlane development might differ to the Stuart project (QER, 2008). The newsletter confirmed the company's intention to focus its resources on assessing the development of the McFarlane and Stuart deposits.

By late August the Premier of Queensland Anna Bligh placed a moratorium on the development of oil shale in Queensland[3], a move designed to provide certainty to the Whitsunday community and tourism industry. This decision cost QER the opportunity to develop a rich asset. The local Whitsunday State Member, argued that she could not stand by while the project proceeded "using unproven technology that has, at least anecdotally, been associated with environmental and health impacts when in operation in other areas" (Queensland Parliament, 2008). She went on to argue that "the Whitsunday community was totally united in its opposition to the proposal" and concerned about environmental matters and issues of community health.

[3] The Stuart deposit is exempted from the moratorium.

The Carmen de Andacollo case

The Andacollo Copper Project is operated by Carmen de Andacollo. The mine is currently owned by Canadian mining company Teck, after it acquired the operations from Aur Resources in August 2007. The mine is located in the community of Chepiquilla, around 2 km from the city of Andacollo and 55 km from La Serena, in Region IV, Chile. Chepiquilla is within the city limits of Andacollo. Work on the mine began in 1996. The project is a heap leach copper operation that processes copper oxide and supergene (weathering produced) sulphide ore. The extraction and processing consists of mining the ore material in an open cut operation and arranging this ore into a '*lixiviación*' pile where a solvent is applied to dissolve the copper minerals before collection and further processing.

The leaching piles of the Andacollo Copper Project are located just 200 m from homes in Chepiquilla. They cover an area of 520,000 m^2 and have a height of 60 m (*Juntos de Vecinos* – Chepiquilla et al., 2001). The sulphuric acid '*lixiviant*' applied to leach the ore utilised spray technology. The community representative body complained of health problems as a result of the mining operations, particularly respiratory illnesses due to the contamination by dispersion of the sulphuric acid spray. They further argued that pollution from the mine caused their trees to dry up and for the fruits to become ill and acidic (at interview, 2003). Other environmental concerns included the noise pollution from blasting so close to the community. According to a resident of Chepiquilla:

The mining company has caused pollution in the area. We are the people who have been harmed. All the trees began to die, the fruit is useless…Previously, everyone here had trees and fruit and could enjoy a healthier life. Not now. You can't plant trees or vegetables because they are all burnt by the acid from the Carmen Mining Company (in OLCA, 2001).

Another resident argued:

The heaps of rock were not here until 6 years ago. It was flat here. As soon as it arrived, the company started to pile this rock above the town. And the authorities did not worry about the harm it might do to the people…The company worries even less… And now we have enormous pollution, because the authorities didn't worry about the companies working right on top of the towns. That's why life is more unbearable in Andacollo (in OLCA, 2001).

In 1997 heavy rains caused the heap leach piles to collapse (Padilla, 2005), causing groundwater pollution in the adjacent residential areas, as confirmed by a number of studies (including one by the Coquimbo Health Service; Padilla, 2005; Corvalán and Alvear, 2003, 63; *Juntos de Vecinos* – Chepiquilla et al. 2001). The impact of the air pollution had also begun to be felt by the community. The health impacts of the spray were eventually confirmed by the Coquimbo Health Service (Corvalán and Alvear, 2003) and breaches in air quality criteria were confirmed by internal company reports witnessed by one of the authors.

The direct impact of the pollution was accompanied by a change in community identity. Before the mine community members considered Chepiquilla the 'greenhouse' of Andacollo, "We had nice fruits and trees, clean water and people from other places used to come and relax and sightsee" (at interview, 2003). The community valued their amenity even while they were located in a region with a long history of small and large scale mining and associated pollution. The loss in amenity mobilised the community members. The issues of pollution from the leaching process were brought to the attention of the company and Chilean government authorities without resolution.

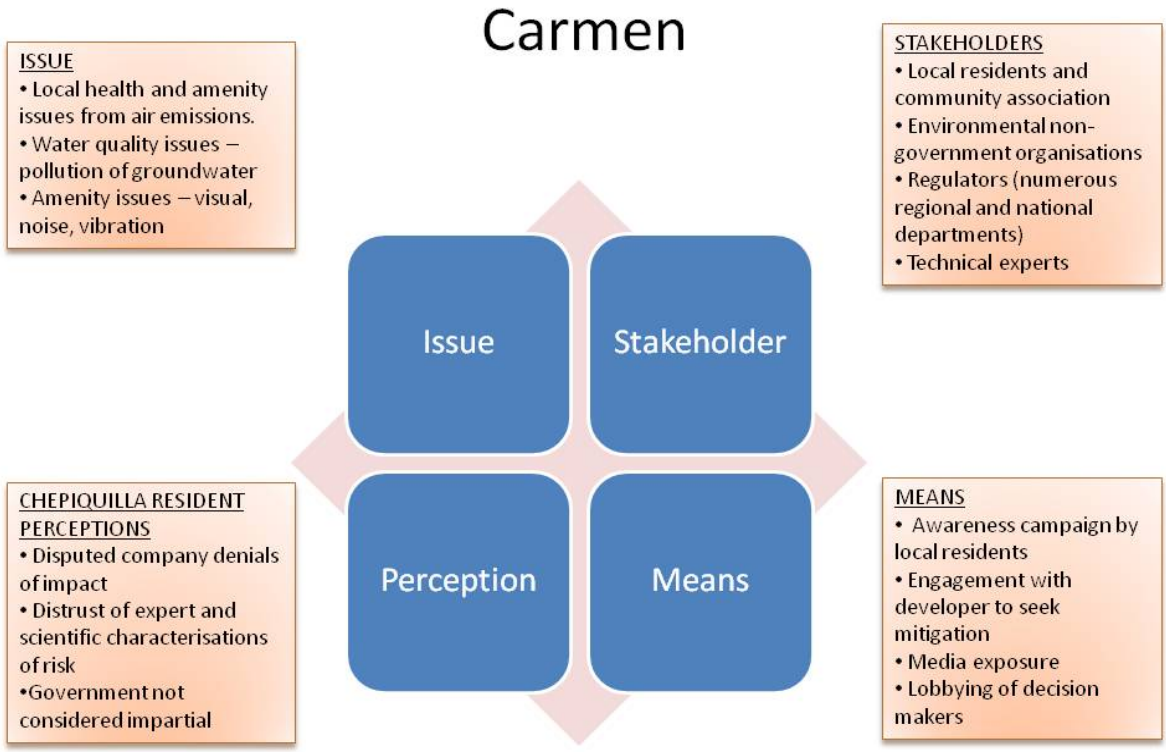
Figure 18 a, b & c. The Andacollo Copper Project. From top to bottom: photo of Andacollo showing the Andocollo copper project (top left) and adjacent Dayton gold project (top centre & right); photo of Chepequilla showing the proximity of the heap leach piles; and the heap leach piles. **Source: D Franks CSRM**

What went wrong?

Identification of social risk

Prior to the development, in 1994, a voluntary Environmental Impact Assessment (EIA) was submitted by the then owners Canada Tungsten. The project was approved under the Environmental Framework Law, however, the regulations to guide the approval process had yet to be adopted by the state when approval was granted by the authorities. A number of environmental criteria were thus not applied in this case, including public participation in the EIA process (*Juntos de Vecinos* – Chepiquilla et al. 2001; Padilla, 2005). The location of the heap leach piles was also given approval despite the fact that part of the area was within the city limits and zoned as residential. The municipal authorities were notified of this irregularity by the local community representative body. While the authorities acknowledged the illegality of the location of the mine, the city master plan was modified to administratively resolve the issue without resolving the environmental and social impacts (*Juntos de Vecinos* – Chepiquilla et al. 2001; Padilla, 2005).

Figure 19: Applying the social risk analysis framework to the Carmen de Andacollo case



Following escalation of the conflict the project operators suspended leaching in the region closest to the community and on the order of the Coquimbo Health Service adopted an alternate drip system for acid application instead of the original spray technology (OLCA, 2004). These changes significantly reduced the scale of the impacts. According to local community representatives:

Obviously, in the beginning the scale of the environmental impact was larger than nowadays, as the mining company didn't have any care to dispose its waste, they used to irrigate the

mine with very fine droplets, and the wind carried further away the pollution…As a result one day all the trees got burnt overnight and neither did they accept responsibilities nor they did anything about it….Nowadays, at least they are a little bit more controlled and the pollution is less dramatic (at interview, 2003).

Community representatives in Chepiquilla are resigned to the continuation of mining:

The ideal scenario would be for them to stop operating, but we acknowledge that they are a source of jobs for the people. So if they would comply with the Chilean environmental law, the contamination would be insignificant, but as the lixiviation [piles] are already operating it is impossible to move them somewhere else (at interview, 2003).

A process of community engagement and participation, during the design and planning phase, and efforts to profile and understand the community, and the resources they rely on, might have identified the potential for adverse socio-environmental impacts from the spray leaching and prompted the initial adoption of the alternative drip technology. Such processes are likely to have avoided the conflict and associated costs.

10. CONCLUSION AND LESSONS LEARNED

The purpose of this report has been to present a framework and tools to enable minerals industry personnel and researchers to anticipate, evaluate and manage social risks associated with the introduction of new processing technologies. The approach adopted in this report has been to focus on three key concepts. First, understanding **risk perceptions** is the key to anticipating the likely responses to new technologies. Second, ongoing **monitoring of social risks** and **risk communications** enable a more accurate assessment of social responses to new technologies. Finally, the **social risk analysis framework** introduced in the report is intended to provide managers with a tool to make better informed decisions with regard to social risk management, and to trigger an escalation of social risk analysis if appropriate.

The case studies and checklists within the report are intended to illustrate and communicate important lessons learned from the research:

- First and foremost, managing projects for social risk is not an easy task but it is an essential one if new technology projects are to gain acceptance from communities. Failure to identify social risk or to respond appropriately to community concerns is damaging to projects, businesses and communities alike.
- Compliance with legal obligations and following due process in conducting technical risk assessments are necessary prerequisites for any new technology project. However, they are not, in themselves, enough to gain community support and trust for the project. Without factoring in consideration of the social context for the project, and the identification of social issues that are important in the community, social risk situations are highly likely to arise. As can be seen in the case of the Brent Spar, no matter how competent, professional and independent the technical assessment, a project is at risk if the social issues within communities are not addressed.
- Risk management at the project level is a complex process because it involves coordinating risk assessment with risk communications activities, and ensuring that no area of project risk, including social risk, is excluded from an ongoing monitoring process.
- The risk management process needs to be responsive to potential new risks and adaptable to change. Life is complicated, risk situations ambiguous and stakeholder perceptions difficult to predict. There is no magic bullet or single approach that can overcome these obstacles to effective risk management. However, a commitment to building open community relationships based on mutual trust and respect is the most effective way of managing project risks.
- By developing a genuine, two-way dialogue with communities and stakeholders, and demonstrating transparency and openness in their risk assessment and risk communication processes, companies are developing the most effective means of minimising exposure to social risk.

11. REFERENCES

Bebbington, A. & Williams, M. 2008. Water ad mining conflicts in Peru. *Mountain Research and Development*, 28(3/4) 190-195.

Beck, U. 1992 *Risk society: Towards a new modernity.* Translated by Mark Ritter, London: Sage.

Bekefi, T., Jenkins, B. & Kytle, B. 2006. *Social Risk as Strategic Risk.* A working paper of the Corporate Social Responsibility Initiative. December: Working Paper No. 30. Cambridge, MA: John F Kennedy School of Government, Harvard University. Accessed (April 2009 at http://www.hks.harvard.edu/m-rcbg/CSRI/publications/workingpaper_30_bekefietal.pdf

Commonwealth of Australia 2004 *Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards*. Accessed 1 March 2009 at http://www.health.gov.au/internet/main/publishing.nsf/Content/ohp-ehra-2004.htm~ohp-ehra-2004-framework.htm~ohp-ehra-2004-framework-3.htm

Covello, V.T., 1983. The perception of technological risks: a literature review, *Technological Forecasting and Social Change* 23, 285–97.

Covello. V. & Sandman, P.M. 2001. Risk communication: Evolution and revolution. In Antony Wolbarst (ed.) *Solutions to an environmental peril.* Baltimore: John Hopkins University Press p. 164-178. Accessed 18 May 2009 at: http://www.psandman.com/articles/covello.htm

Dietz, T., Scott Frey, R. and Rosa, E. 1996 Risk, Technology, and Society, in: R.E. Dunlap and W. Michelson (eds.) *Handbook of Environmental Sociology*, Westport: Greenwood Press.

Engineers Against Poverty (EAP). ND. *A systematic approach to project social risk & opportunity management*. Accessed 18 May 2009 at http://www.engineersagainstpoverty.org/_db/_documents/social_risk_management_briefing_note.pdf

Environmental Defense Fund Innovation Exchange. 2008. *McDonald's: Cutting Antibiotics*. Accessed 18 May 2009 at http://innovation.edf.org/page.cfm?tagID=30703

Fischhoff, B. 1995. Risk perception and communication unplugged: twenty years of process, *Risk Analysis* 15(2), 137–45.

Fischhoff, G., Goitein, B. and Shapiro, Z. 1982. The Experienced Utility of Expected Utility Approaches, in: N.T. Feather (ed.) *Expectations and Actions: Expectancy-Value Models in Psychology*, pp. 315–40, Hillsdale: Lawrence Erlbaum.

Flynn, R. 2007. Risk and the public acceptance of new technologies. In Rob Flynn and Paul Bellaby (eds.) *Risk and the public acceptance of new technologies*. Basingstoke [England] ; New York : Palgrave Macmillan, pp 1-23.

Hattis, D. and Kennedy, D. 1990. Assessing Risks from Health Hazards: An Imperfect Science, in: T.S. Glickman and M. Gough (eds.) *Readings in Risk,* pp. 156–63, Washington, DC: Resources for the Future.

Irwin, A. & Michael. M. 2003. *Science, social theory and public knowledge.* Maidenhead: Open University Press.

Jordan, G 2001. *Shell, Greenpeace and the Brent Spar*. Houndmills, Basingstoke, Hampshire ; New York: Palgrave.

Kasperson, J & Kasperson, R. 2005 *The social contours of risk: Volume 1; Publics, risk communication and the social amplification of risk.* London, Sterling, VA: Earthscan.

Kytle, B. And Ruggie, J. 2005. *Corporate social responsibility as risk management: A model for multinationals* Working Paper No. 10 for the Corporate Social responsibility Initiative. Cambridge, MA: John F Kennedy School of Government, Harvard University . Accessed 9 April 2009 at: http://www.hks.harvard.edu/m-rcbg/CSRI/publications/workingpaper_10_kytle_ruggie.pdf

Löfstedt, R. & Renn, O. 1997 The Brent Spar controversy: An example of risk communication gone wrong, *Risk Analysis;* 12: 2, 131-136.

Lundgren, R. 1994 *Risk communication: A handbook for communicating environmental, safety and health risks.* Columbus, Ohio : Battelle Press.

Kearnes, M., Grove-Wright, R., MacNaghten, P., Wilson, J. & Wynne, B. 2006 From Bio to Nano: Learning lessons from the UK agricultural biotechnology controversy, *Science as Culture*, 15 (4) , 291-307.

Minerals Council of Australia (MCA) 2008. *Risk communication in the Australian minerals industry: principles, tool and opportunities.* Forrest, ACT: Minerals Council of Australia. Accessed 18 may 2009 at http://www.minerals.org.au/__data/assets/pdf_file/0018/26721/Risk_Comm_Bk_MARCH08_b.pdf

National Environment Protection Council. 1999. *Guideline on community consultation and risk communication. Schedule B (8).* Accessed 18 May 2009 at http://www.comlaw.gov.au/ComLaw/Legislation/LegislativeInstrument1.nsf/0/F957A3D775429729CA2574EF007AAF9C/$file/B(8)_Community+Consultation.pdf

National Research Council, 1989. *Improving risk communication.* Washington, DC: National Academy Press.

Pearce, F. 1991. *Green warriors*. Bodley Head.

Project Management Institute. 1996. *A guide to the project management body of knowledge.* Maryland, PMI Publishing.

Quiggin, J. 2007. The risk society: Social democracy in an uncertain world. Occasional paper Number 2 for the Centre for Policy development. Accessed 24 February 2009 at http://cpd.org.au/sites/cpd/files/u2/JohnQuiggin_The_Risk_Society_CPD_July07.pdf

Renn, O. 1998. Three decades of risk research: accomplishments and new challenges, *Journal of Risk Research* 1(1): 49-71.

Renn, O. 1990. Risk perception and risk management: a review, *Risk Abstracts* 7, No.1, 1–9 (Part 1) and 7, No.2, 1–9 (Part 2).

Regional Aquatics Monitoring Program, Wood Buffalo Environmental Association and the Cumulative Impact Management Association (RAMP), 2008. *Joint Community Update 2008: Reporting our environmental activities to the community*. Fort McMurray, Canada. 21p.

Sandman, P. 1993 *Responding to community outrage: Strategies for effective risk communication.* Fairfax, VA; AIHA Press . A publication of the American Industrial Hygiene Association .

Shell. No date. *Brent spar dossier*. Accessed 18 May 2009 at: http://www-static.shell.com/static/gbr/downloads/e_and_p/brent_spar_dossier.pdf

Short, J.F and Clarke, L. 1992. Social Organization and Risk, in: J.F. Short and L. Clarke, (eds.) *Organizations, Uncertainties, and Risk*, pp. 309–21, Boulder: Westview.

Slovic, P. 1987. Perception of risk, *Science* 236 (4799), 280–85.

Standards Australia/Standards New Zealand. 2004. *Risk Management: AS/NZS 4360: 2004.* Standards Australia International Ltd: Sydney and Standards New Zealand: Wellington.

Strydom, P. 2002 *Risk, environment and society.* Buckingham, Philadelphia: Open University Press.

Weinstein, N. And Sandman, P. 1993. Some criteria for evaluating risk messages. *Risk Analysis* 13(1): 103-114.
Wolfe, A. & Bjornstad, D. 2008 'It's like déjà-vu , all over again': Anticipating societal responses to nanotechnologies, in Kenneth David and Paul B. Thompson (eds) *What can nanotechnology learn from biotechnology ?: Social and ethical lessons for nanoscience from the debate over agrifood biotechnology and GMOs.* Amsterdam; Boston: Elsevier: Academic.

World Bank, 2001. *Stakeholder Analysis. A*ccessed 14 March 2009 at http://www1.worldbank.org/publicsector/anticorrupt/PoliticalEconomy/stakeholderanalysis.htm#matix

Wynne, B. 1992. Risk and Social Learning: Reification to Engagement, in: S. Krimsky and D. Golding (eds.) *Social Theories of Risk*, pp. 275–97, Westport: Praeger.

Zyglidopoulos, S. 2002 The social and environmental responsibilities of multinationals: Evidence from the Brent Spar Case *Journal of Business Ethics*, 36: 141-151

References for the Stuart Oil Shale and Carmen de Andacollo Case Studies

ABC. 2002. Residents asked if they want to stay in Yarwun-Targinnie. Australian Broadcasting Corporation (ABC) Regional News. 24 July

ABC. 2008. Mine Proponent not ready for public meetings. Australian Broadcasting Corporation Tropical North News. 11 August.

Anonymous. 2000. Odor Delays Shale-Oil Pilot Start-Up in Australia. Oil and Gas Journal, August 14, 2000.pp. 60-64.

Anonymous. 2002. Lawyers take over shale oil fight. The Observer, Gladstone. 26 July.
Ardern, L. 2001. Shale-oil firm apologises for emission. Morning Bulletin, Rockhampton, 4 October.

Australian Associated Press. 2000. Suncor Energy to put Stuart oil shale development on hold. 6 September.

Bartholomew, K. 2009. Central Qld community buyout costs Govt more than $50m.Australian Broadcasting Corporation. June 30. Online Resource:
http://www.abc.net.au/news/stories/2009/06/30/2612573.htm. Accessed: June 30, 2009.

Clow, K. 2000a. Letter to the Targinnie/Yarwun Community. Suncor Energy. Draft. 15 May.
Clow, K. 2000b. Letter to residents regarding six day plant run ending 27 May, 2000. Suncor Energy. 2p.

Clow, K. 2000c. Letter to Targinnie/Yarwun Community regarding May 2000 plant run. Suncor Energy. July 1.

Corvalán, M, and P, Alvear. 2003. Pilas de Discordia: Proyecto Andacollo Cobre. Observatorio Latinamericano de Conflictos Ambientales. Santiago, Chile. 88p.

Courier Mail. 2002. Development crisis for shale oil project. Courier Mail, editorial. 10 March. p.24.

Cunningham, L. 2002. Liz denies shale claims. Letter to the Editor. The Observer, Gladstone. 4 May.

Environsciences. 1993. The Stuart Project Environmental Impact Assessment Study. Southern Pacific Petroleum and Central Pacific Minerals. February. Volume 1 & 2.

Graham, B. 1980. The Environmental Implications of Oil Shale Development and their Relevance to Energy Research and Development Programs. Energy/Environment Interaction Papers E/EI-9. Department of Home Affairs and Environment. Commonwelath Government. Canberra. 59p.

Greenpeace Australia Pacific. 2001. Greenhouse fells first oil industry domino. Press release. 6 April.

Hill, A. 2002a. Editorial. The Observer, Gladstone. 27 April.

Hill, A. 2002b. Editorial. The Observer, Gladstone. 6 March.

Hill, A. 2002c. Shale Oil Plant Beats World Mark: SPP. The Observer, Gladstone. 6 March. pp.1.

Juntos de Vecinos – Chepiquilla, Acción Tongoy Ecologica, Centre Quebecois de Droit de L'Environment, OLCA. 2001. Petition Directed to the Canada-Chile Commission for Environmental Cooperation Pursuant to Article 14 of the Environmental Cooperation Agreement between the Government of Canada and the Government of the Republic of Chile. March 30, 2001. 18p.

Lanzon, R. 2002a. Shale tour fails to impress council. The Observer, Gladstone. 3 March.
Lanzon, R. 2002b. Beattie should help Targinnie families - Liz. The Observer, Gladstone. 14 March.
McCarthy, J. 1999. Black Gold's High Price. The Courier Mail. 16 October. p 67.

McCarthy, J. 2002a. Problems continue to plague oil-shale plant. Courier Mail, Business News, p 15.

McCarthy,J. 2002b. Getting the Good Shale Oil on SPP. Courier Mail. 18 May.

McCullough, J. 2002. Shale oil feels the squeeze. Courier Mail, 13 April.

Miller, T. 2002a. Report Casts doubt over Shale Oil Future. The Observer, Gladstone, 27 February. p1.

Miller, T. 2002b. Extension is a Slap in the Face: Williams. The Observer, Gladstone. 15 May.

Miller, T. 2002c. Community slams SPP property purchase. The Observer, Gladstone. 6 August.

Moore, M. 2003. Stuart Facilitation Working Group Independent Scientific Advisors Report. Summary and Interpretation, Health Risk Assessment. December 19.

Noonan, A. 2002. Spinning Around. Blue's Country, July/August.
Observatorio Latinamericano de Conflictos Ambientales (OLCA). 2001. Cobre Miseria de la Riqueza. Video. Santiago, Chile.

Observatorio Latinamericano de Conflictos Ambientales. 2004. Persiste Contaminación Ambiental en Chepiquilla. Santiago, April 7, 2004. Online Resource: http://www.olca.cl/oca/chile/region04/andacollo.htm. Accessed: March 10, 2007.

Observatorio Latinamericano de Conflictos Ambientales. 2005. Proyecto Minero Pascua Lama. Edición Especial Pascua Lama. 8p.

Padilla, C. 2005. Canadian Mining Exploitation in Chile: Community rights and the environment. Recommendations for Canadian Legislation. Report by Mining Watch Canada and the Observatorio Latinamericano de Conflictos Ambientales (OLCA). April 2005. Toronto, Canada.

Queensland Energy Resources (QER). 2008. Community Update Newsletter. Issue 1, July, 4p.

Queensland Environmental Protection Agency. 2001. EPA Field Response. Stuart Shale Oil Plant Odour Emissions. Final Report of Findings for Plant Runs in March and April 2001. Queensland Government. 14 August. 16p.

Queensland Environmental Protection Agency. 2003. Review of Model Validation. Stuart Oil Shale Project Independent Technical Review. A report for the Stuart Facilitation Working Group. March.

Queensland Parliament. 2008. Record of Proceedings. First Session of the Fifty-Second Parliament.28 October.pp. 3095-3170.

Sinclair Knight Merz. 1998. Stuart Oil Shale Project Stage 2 Initial Advice Statement. Southern Pacific Petroleum (Development) Pty Ltd. November 1998. 32p.

Sinclair Knight Merz. 1999. Stuart Oil Shale Project Stage 2 Executive Summary Draft Environmental Impact Statement. SPP/CPM and Suncor. September 2000. 20p.

SPP/CPM and Suncor Energy. 1998a. Oil Shale and Its Impact on Australia. 2p.

SPP/CPM and Suncor Energy. 1998b. The Stuart Oil Shale Project and the Environment. August 19, 1998.

SPP/CPM and Suncor Energy. 1998c. Stuart Oil Shale Project Stage 2. Community Consultation Newsletter No. 1. December 1998. 4p.

SPP/CPM and Suncor Energy. 1999a. Stuart Oil Shale Project Stage 2. Information about Air Quality. Information Sheet. April. 2p.

SPP/CPM and Suncor Energy. 1999b. Stuart Oil Shale Project Stage 2. The Project. Information Sheet. April. 2p.

SPP/CPM. 2002. Shale oil is here and now. The Australia. 20 March.

The Gladstone Observer. 2002a. Shale odours detected at city school. The Observer, Gladstone. 30 July.

The Gladstone Observer. 2002b. Residents question shale oil emissions. The Observer, Gladstone. 15 June.

Yarwun-Targinnie Fruit and Vegetable Growers Association. 2002. Strategic Plan. Prepared by ImpaxSIA. 43p.

12. APPENDICES

Appendix 1: A brief history of risk communication

Risk communication, the science of understanding scientific and technological risk and how it is communicated within a socio-political structure, is a relatively new scientific endeavour. The history of risk discourse can be seen as embracing four phases, beginning with narrow technical expert debates concerned with the accurate calculation of risks and evolving into broad public controversies in which large sections of the lay public now participate (Strydom, 2002).

The first phase, the *nuclear energy, safety research and the risk assessment debate* began during the 1950s with the decision of the US and Britain to invest in the development of a civil nuclear generating capability (Strydom, 2002). The forced development of the nuclear industry soon raised questions about the safety and security of civil nuclear technology and its destructive potential. At this stage, the risk assessment debate was essentially one between experts, conducted by expert risk analysts such as engineers, economists and planners in a context that was outside of public scrutiny. These were the specialists who introduced concepts such as 'risk analysis and 'risk assessment' to modern risk discourse. As far as risk communication was concerned, the risk assessment debate was confined to expert groups, whose focus was on the science, getting the numbers right and producing 'factual' information.

During the second phase of risk communications, *debate moved from the expert to the public arena*. Strydom (2002: 17) identifies 1965 as the turning point when, 'the distrust of nuclear power began to be generalised into a distrust of high technology and to be linked to threats to the natural environment'. The emergence of activist groups such as the anti-nuclear lobby and Friends of the Earth and growing consumer activism, as exemplified by Ralf Nader's automobile safety crusade, effectively drew attention to the difference between *data about risks* produced by experts and the growing public concern that *socially acceptable* levels of risk were perceived very differently by experts and the general community.

The third phase of the risk discourse was inaugurated by the general public. This change marked a turning point in the risk debate, shifting discussion and disputation from *technical issues to a conflict over values and world views*. It was during this phase, which lasted approximately for the mid 1980s to the mid 1990s, that risk researchers developed risk communication as a formal discipline, to bridge the gap between expert and lay opinions (Flynn, 2007). However, the role of risk communication continued to focus on explaining, educating and persuading the public of the veracity of technical risk assessments, rather than addressing perceptions of danger and uncertainty.

The fourth phase of risk communication– *the move to more open and transparent public communication* is only now emerging. In the UK, the first official government acknowledgement of wide public disquiet concerning new technologies prompted a review in 2001 of science communication and public communication (Flynn, 2007). This review signalled the need for a shift towards a more democratic communication process, based on building relationships and trust through open two-way dialogue. However, in spite of some limited movement towards greater transparency and the acknowledgement of scientific

uncertainty, it is difficult to tell how effective this engagement has been (Irwin & Michael, 2003 in Flynn, 2007: p. 10-11).

The problems that bedevil communication between the scientific community and the general public remain:

- The inherent imbalance in knowledge and expertise between the experts and citizens, which shapes the way people think about the world.
- The assumption by policy makers that increased awareness and knowledge of technological innovations will inevitably lead to increase public support for them.
- The framing of the public debate, whereby information given to, or sought from the public is frequently presented in the form of limited options or choices, and requires citizens to express preferences in selecting among priorities without permitting a much more fundamental questioning of wider goals and objectives and their desirability (Flynn, 2007).
- The lack of public trust in government institutions, including scientific institutions.
- The extent to which a democratic model of risk communication is practical or appropriate. While the tensions between technocratic and democratic decision making will likely never by fully resolved, the prevailing view of this debate is that broad public engagement should lead to more transparent, robust and acceptable policy decisions in the long run, although it may seem difficult or destabilising in the short term.

The importance of these issues and their relevance to the identification, analysis and communication of social risk is central to the understanding of how to manage risk at the organisational as well as the individual project level.

Approaches to risk communication

There are a number of approaches to the process of risk communication that have been developed to improve risk communications. Lundgren (1994) identifies six common communication approaches; the National Research Council's approach, Mental Models approach, Crisis Communication approach, Convergence Communication approach, Three-challenge approach and the Hazard plus Outrage approach. A summary of each of these approaches is provided in Table 3.

As can be seen by comparing each of these approaches, they are similar in many ways, with the exception of crisis communication, which can be seen as a specific subset of risk communication. The focus of each of these models is on comparing and sharing knowledge to increase the understanding of all parties. When examining the models, it is apparent that all follow a similar communication pattern, focusing on the message source; how it is most effectively transmitted and how likely it is to meet its communication endpoint or objective (Lundgren et al, 1996).

Table 3: Approaches to risk communication

Approach	Theoretical contribution	Implications
National Research Council (NRC, 1989)	Risk communication should be defined as the 'interactive process of exchange of information and opinions among individuals, groups, and institutions concerning a risk or potential risk to human health or the environment'.	Risk communications requires a two-way exchange of information
Mental Models Slovic, Fischhoff, & Morgan (Morgan et al, 1992)	Use of open-ended questions that become gradually more focused to identify how an audience saw a toxic, its exposure routes and dangers. Audience responses were used to compile a mental model of how the participants saw the risk. This was then compared with an expert model used by scientists to evaluate radon. Researchers used a follow-up questionnaire to verify differences between the two models and then designed risk communication messages to address the gaps or inconsistencies in the audience's knowledge.	Risk communication means you must understand how your stakeholders think. Risk communication messages that do not address key audience concerns or beliefs will fail.
Crisis Communication	Those who are communicating the risk should use every device to move the audience to appropriate action.	'Top down' approach to managing risk communications. The organisation knows what is best for the public.
Convergence Communication (Rogers and Kinkaid, 1981)	Communication, including risk communication is an iterative long-term process in which the values (culture, experiences, background) of the risk communication organisation and the audience affect the process of communication	The audience must be involved in the risk communication process and it must be a two-way process. Continuous feedback and interpretation are necessary for the communication to be effective
Three Challenge (Rowan, 1991)	Risk communication comprises three challenges: *Knowledge challenge* (the audience needs to be able to understand the technical information surrounding risk assessment *Process challenge* (the audience needs to feel involved in the risk management process *Communication skills challenge* (the audience and those who are communicating the risk need to be able to communicate effectively	Those communicating the risk and the audience must have excellent communication skills If audience skills are lacking, those who are communicating the risk will have to compensate with techniques designed to increase comprehensibility
Hazard plus Outrage (Sandman)	Risk = Hazard plus Outrage. The audience's view of risk reflects not just the danger of the action (hazard) but also how they feel about the action and , even more importantly, how angry they feel about it (their outrage)	Bald presentations of fact will not necessarily give the audience what they want. They may not even listen to the facts until their concerns and feelings have been addressed

Source: Derived from Lundgren, 1994)

Contribution of the social sciences to the risk debate

The technical analysis of risk has drawn much criticism from social scientists. In his review of the risk research literature, Renn (1998) identified seven areas that technical risk assessment failed to identify and that social scientists recognised as essential to effective risk analysis and risk management. These key insights were:

1. What people perceive as an undesirable effect depends on their individual values and preferences (Dietz et al, 1996).
2. The interactions between human and activities and consequences are more complex and unique than the average probabilities in technical risk analyses are able to capture (Fischhoff et al, 1982).

3. The institutional structure of controlling and managing risks is prone to organisational failures and deficits, which may increase the actual risk (Perrow, 1984; Short and Clarke, 1992).
4. Risk analysis cannot be regarded as a value-free activity (Fischhoff, 1995) and values are reflected in how risks are characterised, measured and interpreted.
5. In technical risk assessment, the numerical combination of magnitude and probability of risk assumes equal weight for both components. In fact, however, people show distinct preferences for one or the other (Slovic, 1987, Renn, 1990). Most people prefer a risk that will kill a few people at a time rather than a risk that kills many people at once.
6. Technical risk analyses provide only aggregate data over large segments of the population and long time duration. Each individual, however, may face different degrees of risk depending on the variance of the probability distribution (Hatis and Kennedy, 1990).
7. The extent to which a person is exposed to a specific risk also rests on lifestyle factors and anecdotal knowledge, both of which are mostly unknown to scientists performing risk analyses (Renn, 1998).

These insights have been developed particularly through developments in the fields of psychology and sociology. Developments in risk assessment and communication owe a considerable debt to the field of psychology for identifying the importance of *individual risk perceptions.* Critical to the debate between experts and non-experts on the likelihood and magnitude of risk is the identification of perceptual biases. These include:

Decision heuristics: Research suggests that people do not cope well when confronted with risk problems and decisions. Limitations in understanding, and the need to reduce anxiety, often lead to the denial of risk and uncertainty or to unrealistic oversimplifications of complex problems (Covello, 1983). To simplify risk problems, people use a number of inferential or judgment rules, known as heuristics. Two of the most important of these are *information availability bias* and *representativeness.* The information availability bias refers to the tendency of people to judge an event more frequent if instances of it are easy to imagine or recall (the threat of terrorism). Representativeness refers to the tendency of people to assume that roughly similar activities and events, such as nuclear power technologies and nuclear war, share the same characteristics and risk.

Overconfidence: Researchers have shown that experts and laypersons are typically overconfident about their risk estimates, which can lead to serious errors in judgment. Even more importantly, overconfidence leads people to believe they are relatively immune to common hazards, such as being involved in a traffic accident or having a heart attack. In general, people underestimate the risk of activities that they perceive to be familiar or under their personal control.

Differences in expert and non-expert estimates of risk: A consistent finding in studies of risk estimates is that risk estimates of technical experts are closely correlated with annual fatality rates, but risk estimates of non-experts are not. Risks are estimated by non-experts to be higher if the activity is perceived to be involuntary, catastrophic, not personally controllable, inequitable in the distribution of risks and benefits, and highly complex (Covello, 1983).

While psychology has contributed to our understanding of individual perceptions of risk, it is from the field of sociology that we have learned the importance of *group perspectives*.

Sociological perspectives point to the fact that *undesirable events are socially defined* – in other words, 'real' actions and consequences are always mediated through social interpretation and linked with group values and interests (Wynne, 1992). The probability of risks and the magnitude of impacts are shaped by human interventions, social organisations and technological developments. Moreover, ignoring the connections between social organisations and technological performance may seriously underestimate the likelihood of failures (Renn, 1998).

Of all the sociologists working in the areas of the 'sociology of risk', Ulrich Beck has done most to transform the way we think about risk. Instead of focusing on socially acceptable levels of safety, he turned the risk debate to the question of the conditions that constitute risk in contemporary society (Strydom, 2002). His seminal work, *The risk society* (Beck, 1992) had a transformative impact on the risk debate by raising awareness of the complex relationships between risk, science and technology, the environment and the nature of contemporary society.

Cultural analysis has also provided an important insight into the nature of risk perceptions. *We all experience risk differently* – therefore there is no approach to risk assessment that can claim universal validity and legitimacy among all groups and cultures. Because different people and cultures have different world views, attitudes towards risk will vary significantly. For example, in western culture, physical harm is the basic indicator for risk. In other cultures, however, violations of religious norms rather than personal injury may be perceived as posing the greatest risk to society.

Sociologists and cultural theorists see risk as both a system of physical occurrences independent of human observations ('the facts') and constructed meanings with respect to these events. They also recognise that abstract notions such as fairness, vulnerability and justice inform our attitudes towards risk (Kasperson & Kasperson, 1983). In similar vein are the social science studies on risk that have identified the importance of following *due process in decision making* (Renn, 1993). 'People are not only concerned about the risks that are imposed on them but also about the process by which the decision has been made. In particular, they demand that those affected by a decision will also have the opportunity to be involved in the decision-making process' (Renn, 1998: 63).

Implications for managing social risk

While social theories of risk have expanded our understanding of risk communication and social perceptions of risk, the major lesson from a review of the risk research literature is that we still lack an integrated theory to connect what has been learned from technical and social risk analyses. Technical analysis provides society with a narrow definition of undesirable effects and confines possibilities to numerical probabilities based on relative frequencies. This is both its major strength and its weakness. The numerical approach assures equal treatment from all risks under consideration. However, the limited definition of what constitutes undesirable effects is the weakness identified by social science researchers.

By way of contrast, social analyses enrich our understanding of what different people regard as risky and remind us that most people do not think solely in terms of risk minimisation. People are willing to suffer some harm if they feel it is justified in serving other goals. For example, there are many people who are prepared to donate organs to save the lives of loved ones, in spite of the risks the surgery may pose to their own health and well-being. Context shapes risk perceptions and leads to multiple interpretations of risk events. Social

analysis helps us to understand the contextual factors that shape decision making but offers no basis to enable comparable treatment of the risks under consideration.

Appendix 2: Annotated bibliography

Risk communication for new technologies: An annotated bibliography

June 2009

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

Centre for Social Responsibility in Mining
The University of Queensland, Australia
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This document covers the theme of ‘Risk communication for new technologies’ and provides materials under the headings of:

- Risk communication systems and frameworks
- Tools and resources
- Case studies
- Public perceptions of risk
- Risk communications
- Risk theory

Risk communication systems and frameworks

1b	***Title***	**Risk Assessment and Management - Leading Practice Sustainable Development Program for the Mining Industry**
	Produced by	Department of Industry, Tourism and Resources (DITR), Australian Government
	What is the resource about?	The booklet emphasises the importance of adopting a systematic approach to business risk, encompassing not only direct financial and operational exposures, but also environmental and social aspects of mining operations.
	How is this resource useful?	It provides further references to specific tools which can be used for different stages of the risk management process and contains case studies to illustrate each part of the process There is also a chapter which emphasises the importance of risk communication, of particular importance when dealing with impacts that affect local communities.
	Year	2008
	Web link	http://www.ret.gov.au/resources/Documents/LPSDP/LPSDP-RiskHandbook.pdf

	Title	**Improving risk communication**
	Author(s)	Committee on Risk Perception and Communication, Commission on Behavioral and Social Sciences and Education. Commission on Physical Sciences, Mathematics, and Resources, National Research Council.
	Produced by	Washington D. C.: National Academy Press
	What is the resource about?	The purpose of this book is to offer knowledge-based advice to governments, private and non-profit sector organisations and concerned citizens about the process of risk communication, the content of risk messages and about ways to improve risk communication in the service of public understanding and better-informed individual and social choice.
	How is this resource useful?	This book describes the NRC approach to risk management. is particularly useful in identifying the main problems in risk communication, particularly in relation to the risk communication activities of government and industry.
	Year	1989

	Title	**The Social Contours of Risk: Publics, Risk Communication and the Social Amplification of Risk, Volume I**
	Author(s)	Kasperson, J. X. & Kasperson, R. E.
	Produced by	Earthscan
	What is the resource about?	This book discusses the social dimensions of risk and risk communication. The book is divided into three sections: Communicating risk and involving publics, The social amplification of risk and Risk and ethics.
	How is this resource useful?	This volume is mainly if interest to those seeking a greater understanding of the social amplification of risk communication framework.
	Year	2005

1a	***Title***	**Responding to community outrage: Strategies for effective risk communication**
	Author (s)	Peter M. Sandman
	Produced by	AIHA Press
	What is the resource about?	This handbook sets out the basics of the 'hazard v. outrage' approach to risk communication. It explains the difference between hazard and outrage, identifies the components of outrage, and identifies the barriers in responding to perceptions of hazard in risk communications messages.
	How is this resource useful?	Provides practical guidance on how to respond to community outrage
	Year	1993

Tools and resources

2a	***Title***	**Social Risk & Opportunities Analysis for Developing Country Engineering Projects (Social Risk & Opportunities Toolkit – Draft)**
	Produced by	Engineers Against Poverty (EAP)
	What is the resource about?	This toolkit was put together by British-based NGO's with a focus on integrating social risk and opportunity thinking into the design and implementation of large engineering construction projects in developing countries. It aims to "provide practical guidance on integrating social considerations into existing project and business risk management processes, and draws on good practice in risk management, project management, community development and poverty alleviation."
	How is this resource useful?	The document stresses the significance of social risk throughout the different stages of a project lifecycle, and shows how processes such as stakeholder analysis and environmental and social impact analysis can be incorporated into a typical project risk management framework. It also includes several checklists and examples of social risks.
	Year	2006
	Web link	http://www.engineersagainstpoverty.org/docs/EAP%20Social%20Risks%20Toolkit%20-%20draft%20for%20comment.pdf

2b	*Title*	**Community Risks and Opportunities – A Site-Level Tool**
	Author	Evans R. And Brereton, D.
	Produced by	Centre for Social Responsibility in Mining (CSRM): Working paper
	What is the resource about?	The resource is designed as a workbook to support a process of identification of community risks and opportunities associated with mining projects. It identifies the main themes:
	How is this resource useful?	This paper outlines an 8-step process for monitoring community risks and opportunities and provides supporting tools to conduct the evaluation at each stage of the process.
	Year	2006
	Web link	http://www.csrm.uq.edu.au/docs/SMI%20Community%20Risks%20and%20Opportunities.pdf

2c	*Title*	**Risk Management Guidelines – Companion to AS/NZS 4360:2004**
	Produced by	Standards Australia / Standards New Zealand
	What is the resource about?	This is a guide for managing risk, which is to be used in conjunction with their Risk Management Standard. It is a very generic guide, which can be applied to many situations. It gives guidance on the steps involved in risk management, including communication and consultation, establishing context, risk identification, risk analysis, risk evaluation, risk treatment, monitoring and review, recording the process, and establishing effective risk management
	How is this resource useful?	This document is a useful companion piece for those using the Australian Standard as a reference guide for risk management practices
	Year	2004
	Web link	http://www.saiglobal.com/online/

2d	*Title*	**Risk Communication in the Australian Minerals Industry: principles, tools and opportunities**
	Produced by	Minerals Council of Australia
	What is the resource about?	This resource provides an extensive overview of risk communication, including how it fits in with risk management and public reporting, along with different frameworks and approaches.
	How is this resource useful?	The resource covers many aspects of risk communication in detail and includes an appendix of case studies and links for further information. Most useful is the framework for the social risk management process, which links risk assessment activities with risk communications activities.
	Year	2008
	Web link	http://www.minerals.org.au/__data/assets/pdf_file/0018/26721/Risk_Comm_Bk_MARCH08_b.pdf

2e	***Title***	**Risk Communication in Action: The risk communication workbook**
	Produced by	United States Environment Protection Agency
	What is the resource about?	This resource provides an extensive overview of risk communication, including ways to have successful risk communication and risk prevention. Contains a useful section on innovation and risk
	How is this resource useful?	The resource includes useful case studies and tools for public participation and risk communication.
	Year	2007
	Web link	www.epa.gov/ORD/NRMRL/pubs/625r05003/625r05003.pdf

	Title	**Guideline on Community Consultation and Risk Communication**
	Author(s)	Land and Water Quality Branch, Department of Environment and Conservation, W.A.
	Produced by	National Environment Protection Council
	What is the resource about?	This document provides a guideline for community consultation and risk communication when assessing site contamination. It gives an overview of perceptions and perspectives of risk from various parties, including stakeholder, industry and NGOs. It provides a consultation plan for communicating risk and also brief case studies of plans.
	How is this resource useful?	This provides a very brief overview of the main issues in risk communications. It is primary interest to risk assessments involving site contamination.
	Year	2006
	Web link	www.sazp.sk/public/index/open_file.php?file=CEI/EZ/CommConslutAU.pdf

3c	***Title***	**Social Risk as Strategic Risk**
	Author (s)	Bekefi T. , Jenkins B.and Kytle B.
	Produced by	Corporate Social Responsibility Initiative (Working Paper No. 30), John F. Kennedy School of Government, Harvard University
	What is the resource about?	The paper further develops the concepts explored in 1b), breaking down social risk into four components: issue, stakeholder, means and perception. It uses three case studies of American Corporations to develop this approach: Coca cola and water; problems at Freeport with community mining of tailings streams; Wal-Mart's management of social and environmental issues.
	How is this resource useful?	This resource will help practitioners understand various approaches that can be used to address social risks in a corporate setting. Practitioners will gain an overall understanding of effective social risk management tools in addressing social risks and particularly the role of proactive stakeholder engagement in mitigating such risk.
	Year	2006
	Web link	http://www.ksg.harvard.edu/m-rcbg/CSRI/publications/workingpaper_30_bekefietal.pdf

Case studies

3a	***Title***	**Shell, Greenpeace and Brent Spar**
	Author	Jordan, Grant.
	Produced by	Houndmills, Basingstoke, Hampshire ; New York: Palgrave.
	What is the resource about?	This book documents the history of Shells' attempts to dispose the Brent Spar, a redundant oil storage buoy, at sea, and the political and public controversies that resulted..
	How is this resource useful?	The book discusses the political significance of the occupation of the Brent Spar by Greenpeace protesters in 1995, and the aftermath of that event, including a change of policy by Shell.
	Year	2001

3a	***Title***	**The social and environmental responsibilities of multinationals: Evidence from the Brent Spar Case**
	Author	Zyglidopoulos, Stelios C.
	Produced by	*Journal of Business Ethics*, 36: 141-151
	What is the resource about?	This paper uses the Brent Spar example to argue that multinational corporations face levels of environmental and social responsibility higher than their national counter parts.
	How is this resource useful?	The paper provides a useful summary of the Brent Spar story and raises the important question, 'Who are the stakeholders of a multinational subsidiary?
	Year	2002
	Web link	http://www.springerlink.com/content/ljjtr0bat4xrvv2u/fulltext.pdf

3a	***Title***	**Developing realistic scenarios for the environment: lessons from the Brent Spar**
	Author	John Elkington and Alex Trisoglio
	Produced by	*Long Range Planning* 29(6): 762-769
	What is the resource about?	This paper uses the Brent Spar example to argue that multinational corporations face levels of environmental and social responsibility higher than their national counter parts.
	How is this resource useful?	The paper provides a useful summary of the Brent Spar story and raises the important question, 'Who are the stakeholders of a multinational subsidiary?
	Year	1996
	Web link	http://www.sciencedirect.com/science?_ob=MImg&_imagekey=B6V6K-3VWC3X9-1-1&_cdi=5817&_user=331728&_orig=browse&_coverDate=12%2F31%2F1996&_sk=999709993&view=c&wchp=dGLzVzz-zSkWb&md5=7196618cb7d40610871850a7c71ee3ba&ie=/sdarticle.pdf

3d	***Title***	**Misunderstood misunderstanding: Social identities and public uptake of science**
	Author(s)	Wynne, B.
	Produced by	Public Understanding of Science (1) 281-304
	What is the resource about?	This journal article discusses the role of social perceptions in how people receive scientific information. It uses a case study of Cumbrian sheep farmers and their reaction to restrictions on their sheep imposed after the Chernobyl radioactive fallout.
	How is this resource useful?	This is an excellent case study from the point of view of understanding public perceptions and how this can impact upon stakeholder relationships.
	Year	1992
	Web link	http://pus.sagepub.com/cgi/reprint/1/3/281

3b	***Title***	**Triple Bottom Line Risk Management: Enhancing Profit, Environmental Performance, and Community Benefits**
	Author (s)	Bowden A.R., Lane M.R. and Martin J.H.
	Produced by	John Wiley & Sons, Inc.
	What is the resource about?	The book is designed to demonstrate how traditional risk management approaches can be applied to environmental and social areas. It has a particular focus on semi-quantitative methods of risk analysis, i.e. going beyond the qualitative scales found in many enterprise risk systems and investigating specific issues in more detail.
	How is this resource useful?	The book includes a wide range of case studies originating from the authors' consulting activities with different industries. It includes examples from the minerals industries including tailings management strategies at Ok Tedi, and the negotiation of rehabilitation bonds at Waihi in NZ. Many of these examples have social dimensions, of particular interest is an approach to assessing community safety related to tourism activities in New Zealand, which assessed both individual and societal risk.
	Year	2001
	Web link*	http://www.ebooks.com/ebooks/book_display.asp?IID=121312# (*Can be accessed/purchased through the above link)

	Title	**Evaluating NASAs role in risk communication process surrounding space policy decisions**
	Author(s)	Joseph L. Arvai
	Produced by	Space Policy 16(2000) 61-69
	What is the resource about?	This paper outlines a five step process for evaluating the risk communications process as a means of determining the effectiveness of risk communications messages.
	How is this resource useful?	The paper is of interest because it introduces a model that illustrates the connection between risk communication and decision-making processes, as well as introducing a process for the evaluation of risk communications efforts. The process is then applied to a case study of the Cassini space mission to Saturn.
	Year	2000
	Web link	http://www.sciencedirect.com/science?_ob=MImg&_imagekey=B6V52-3YS38T7-4-1&_cdi=5774&_user=331728&_orig=browse&_coverDate=02%2F29%2F2000&_sk=999839998&view=c&wchp=dGLbVzW-zSkWA&md5=25e141b380612d877889fc479dcdf9fb&ie=/sdarticle.pdf

Public perceptions of risk

3e	***Title***	**Images of disaster: perception and acceptance of risks from nuclear power**
	Author(s)	Slovic, P., Lichtenstein, S. and Fischhoff, B.
	Produced by	G. Goodman & W. Rowe (eds.), Energy Risk Management, London: Academic Press
	What is the resource about?	This article discusses why nuclear power is yet to be fully accepted by the public, even though experts believe the risks to be fairly low. For example, the benefits of nuclear power are underappreciated, while the risks are seen to be very high. In addition, while the probability of a nuclear meltdown was seen to be fairly low, this is counteracted by the perceived disastrous effects if it were to happen.
	How is this resource useful?	The article provides a good understanding of how risks are perceived, and the decision-making processes that are used to judge their likelihood. In addition, it also offers some possibilities in changing public perception, and increasing acceptance of nuclear power.
	Year	1979

	Title	**Acceptable evidence: Science and values in risk management**
	Author(s)	Various authors. Edited by Mayo, D.G. & Hollander, R.D.
	Produced by	Oxford University Press
	What is the resource about?	This volume contains a number of articles by various authors who took part in a 1986 symposium entitled, "Ethics, Evidence, and the Management of Technological Hazards". The book helps to integrate the scientific and objective view of risk, with the view that risk is defined by values and perceptions. The first part talks about perceiving and communicating risk evidence, taking into account societal and psychological values, in addition to scientific data. The second part discusses uncertain evidence in risk management, and the part that values play in interpreting it. The final section discusses the impact of philosophy on scientific evidence in two ways – how philosophy can be used to create models of reasoning, causal inquiry and decision-making; and the role of philosophy in challenging the traditional scientific foundations of rationality and objectivity.
	How is this resource useful?	Good overview of all the key issues in relation to risk perceptions and risk management, from practitioner to philosophical viewpoints. Chapter 5 "Risk assessment and risk management: An uneasy divorce' is of particular interest for those attempting to reconcile the two functions.
	Year	1991

	Title	**Risk and the Public Acceptance of New Technologies**
	Author(s)	Various, edited by Flynn, R. & Bellaby, P.
	Produced by	Palgrave Macmillan
	What is the resource about?	This book presents a collection of chapters on risk and the public acceptance of new technologies. Most of these chapters were developed from papers presented at a seminar entitled 'Analysing Social Dimensions of Emerging Hydrogen Economies'. The book discusses a range of issues related to general risk, public acceptability and engagement. It also discusses issues pertaining to acceptance of new technologies such as GM foods, mobile telecommunications, nanotechnology and hydrogen energy technologies.
	How is this resource useful?	The opening chapter on risk and the public acceptance of new technologies is particularly useful for an overview of the issues surrounding the introduction of any new technologies. Otherwise, the book is of particular interest on the subject of hydrogen energy technologies. There are several chapters devoted to the topic.
	Year	2007

	Title	**What can nanotechnology learn from biotechnology?**
	Author(s)	Various, edited by Kenneth David and Paul B. Thompson
	Produced by	Academic Press, Elsevier
	What is the resource about?	An excellent handbook discussing the similarities and differences in the public attitudes towards the adoption of nano and bio technologies. Topics include; ethics, NGO perspectives, anticipating societal responses and socio-technical analyses.
	How is this resource useful?	Provides an excellent analysis of the context to social risk, as its focus is on socio-technical analysis of emerging technologies and their impacts on society. There is discussion of different stakeholder perceptions of risk, issues of ambiguity and uncertainty, effective communication and media.
	Year	2008

Risk Communication

3h	***Title***	**Risk Communication: Evolution and revolution**
	Author(s)	Covello, T. & Sandman, P.M.
	Produced by	John Hopkins University Press
	What is the resource about?	This article discusses the factors which inhibit effective risk communication and outlines the history and evolution of risk communication thoughts and practices. It details a number of obstacles to risk communication effectiveness, relating to the ambiguity and complexity of data, a lack of trust between parties, selective reporting by the media and various psychological and social factors relating to public risk perception. It then outlines the four stages of risk communication, from pre-risk-communication before the late 1980s, to stage four, which requires fundamental shifts in organisational values and culture, of which there has been little progress. The article closes by discussing possible reasons for such limited advancement in this latter stage.
	How is this resource useful?	Excellent summary of the key issues in risk communication.
	Year	2001
	Web link	http://www.psandman.com/articles/covello.htm

	Title	**The process of risk communication (Chapter 3), in Industry Risk Communication Manual**
	Author(s)	Hance, B. J., Chess, C. & Sandman, P. M.
	Produced by	CRC Press
	What is the resource about?	This chapter focuses on *process* and addresses 7 areas; building trust, identifying key audiences, responding in emotionally charged situations, listening skills, releasing information, developing formal and informal communication processes and developing outreach programs.
	How is this resource useful?	Each section includes useful 'how to' steps for achieving risk communication objectives.
	Year	1990
	Web link	http://books.google.com/books?id=_ez40ovBDBUC&printsec=frontcover

	Title	**Risk communication: A handbook for communicating environmental, safety, and health risks**
	Author(s)	Lundgren, Regina
	Produced by	Columbus, Ohio : Battelle Press.
	What is the resource about?	This is a handbook for practitioners that covers understanding risk communication, planning the risk communication effort, developing risk communication messages and evaluating risk communication efforts.
	How is this resource useful?	An excellent resource for planning and managing the risk communication process. Contains checklists and tables that assist in the planning and implementation of risk communications.
	Year	1994

Risk Theory

	Title	**Risk, environment and society**
	Author(s)	Strydom, Piet
	Produced by	Buckingham, Philadelphia: Open University Press.
	What is the resource about?	This book takes a theoretical approach to the relationship between technology, risk and society. Part one provides an overview of the risk debate, part 2 provides an analysis of background theories and epistemological positions and the third part discusses theoretical directions in the contemporary risk debate.
	How is this resource useful?	This book is a useful academic resource on theoretical perspectives in the risk debate..
	Year	2002

	Title	**Risk Society: Towards a new modernity**
	Author(s)	Beck, U., translated by Ritter, M.
	Produced by	Sage Publications
	What is the resource about?	This influential and historical book by Ulrich Beck includes two interrelated theses about reflexive modernisation and the problem of risk. Beck's theory of reflexive modernisation addresses the pitfalls of the 'risk society', which has come about through scientific and industrial development. He argues that society must be reflexive and critical of scientific rationalism, in order to really evolve. Beck's thesis on risk outlines the problems associated with the conceptualisation of risk based purely on scientific assertions, and the dangers of ignoring social factors like public perception.
	How is this resource useful?	The seminal work on understanding risk from a cultural perspective.
	Year	1997
	Web link	

	Title	**Three decades of risk research: accomplishments and new challenges**
	Author(s)	Renn, O.
	Produced by	Journal of Risk Research, Vol. 1(1)
	What is the resource about?	This paper gives a very detailed discussion of risk research, since the late 1960s. Firstly, it analyses the concepts of risk and risk assessments. It gives an overview of technical risk assessments, and discusses some of the criticisms and challenges of these. It then discusses other perspectives of risk: social risk, economic risk, public perceptions of risk and sociological perspectives, which takes into account different organisations or groups. Finally, it gives some guidance on how risk management can progress, by integrating the different perspectives.
	How is this resource useful?	An excellent overview of the history of risk research
	Year	1998
	Web link	http://web.ebscohost.com/bsi/pdf?vid=4&hid=9&sid=f5215e61-3b51-4f0c-8bdb-bf3905c8c030%40sessionmgr104

3h	***Title***	**The perception of technological risks: A literature review**
	Author(s)	Covello, V. T.
	Produced by	Technological Forecasting and Social Change, Vol. 23 (4)
	What is the resource about?	This article reviews the literature of human understanding of risk. The article outlines human intellectual limitations in understanding risk, judgemental errors such as overconfidence and details the differences between expert and non-expert estimates of risk. It also offers a case study of risk perception in a nuclear incident at Three Mile Island to illustrate the need to consider public understanding of risk when implementing policies.
	How is this resource useful?	A useful literature review from the perspective of the mental models approach to risk perceptions developed by Slovic and Fischoff.
	Year	1983
	Web link	http://www.sciencedirect.com/science?_ob=MImg&_imagekey=B6V71-45P0D11-13-1&_cdi=5829&_user=331728&_orig=browse&_coverDate=08%2F31%2F1983&_sk=999769995&view=c&wchp=dGLzVlz-zSkzk&md5=4202c7a5da8a44b5f3bc51f9d5f3efa4&ie=/sdarticle.pdf