Chapter 4

So What Is Australia Doing?

Safety Risk

The concept of risk is all-pervading, which means that there are numerous organisations and government departments involved in evaluating risk. The Industry Commission (1995) recently produced an information paper giving the results of a survey of Commonwealth Government regulatory agencies that ascertained how they currently develop and implement regulation to reduce safety risk in Australia.

The survey consisted of responses to questions. One of these was:

> *How does your agency calculate the 'risk factor' (or the probability of an accident or other outcome occurring if the safety problem is not addressed)?*

Most of the agencies that were surveyed attempted to account for risk in developing or assessing regulatory proposals, although not necessarily by calculating a risk factor as described in the question. Several agencies were able to use historical data to determine risk factors. For some issues, data were unavailable and guesstimates had to be used.

The Australian Radiation Laboratory calculates the risks of contracting fatal cancers and selected non-fatal ailments associated with different levels of exposure to radiation. These risk factors are based on epidemiological evidence from high exposure groups, extrapolated to lower exposure levels.

Those agencies dealing with chemicals, or other substances which may cause harm to humans exposed to them, take a different approach. Rather than seeking to determine the level of risk that would result from a particular level of exposure to a particular substance, they seek to determine the level of exposure that would result in no appreciable risk. Data are gathered by exposing test animals to different levels of the substance to determine the maximum level of exposure for which there is no observable effect. This is known as the NOEL (no observable effect level) and is used to calculate allowable exposure levels for humans. This is done by applying a safety factor (typically 100) to the NOEL to determine an acceptable daily intake (ADI). The ADI is the amount of the substance, expressed on a body-weight basis, that can be ingested daily, for an entire lifetime, without appreciable risk.

The survey also dealt with the question of whether the agencies base their actions on actual or perceived risk. Only two agencies incorporated perceived risk into their work. The Federal Office of Road Safety undertakes analysis which (indirectly) incorporates consumer's risk perceptions through its 'willingness to pay' studies. Although the National Food Authority bases its risk assessment on actual risk levels, its risk management strategy also takes into account community perceptions of risk. As community perceptions sometimes do not align closely with actual risk levels, this can result in a need for regulation to overcome community concerns that are ill-founded. The case of irradiation is cited as an example, where lack of community confidence has led to a ban being imposed, even though there is a general consensus among the scientific community that food irradiation is safe.

Perceived needs

Before the establishment of the EPA in Australia Cocks (1992) wrote that

> *"Australia does not have a Federal body like the US Environment Protection Agency to set standards for chemical levels in food and in the environment. There is a clear and growing need for such a body, despite the contributions from Health and other departments...*

However, rather than setting up a version of the US Environment Protection Agency, there would appear to be value in establishing something much broader in its interests. A National Risk-management Authority could be given responsibility for studying the whole range of potential disasters (natural, chemical, socio-economic etc.) and recommending relative expenditures on reducing the impact of each."

Cocks (1992) noted that some of the advantages of considering all major risks in a common framework are that it:

(i) allows disparate risk management to be compared meaningfully (a process now called comparative risk assessment);

(ii) allows strategic analysis of the higher-order or ripple effects of risk across the economy and across the community;

(iii) allows interdependent risks to be considered jointly; and

(iv) facilitates identification of priority areas with maximum potential for reducing risk across the board — defined in this case as increasing the life expectancy of Australians.

The EPA

The public acceptance of any risk is more dependent on public confidence in the risk management process than on the results of the risk analysis process. The agency of the Federal Government with responsibility for protection of the environment is the Environment Protection Agency (EPA). It is an agency of the Federal Environment Department and has six branches:

The *Environment Assessment Branch* protects the environment by assessing proposals for development.

The *Environmental Protection Partnership Branch* protects the environment by working with industry, government and the community to adopt cleaner production strategies and to help develop and market environmental technologies.

The *Waste Management Branch* protects the environment by acting to reduce waste created at work, at home, and by industry.

The *Environment Standards Branch* protects the environment by evaluating the environmental impact of a range of chemicals and genetically modified organisms as well as helping to develop national environment protection measures for air and water.

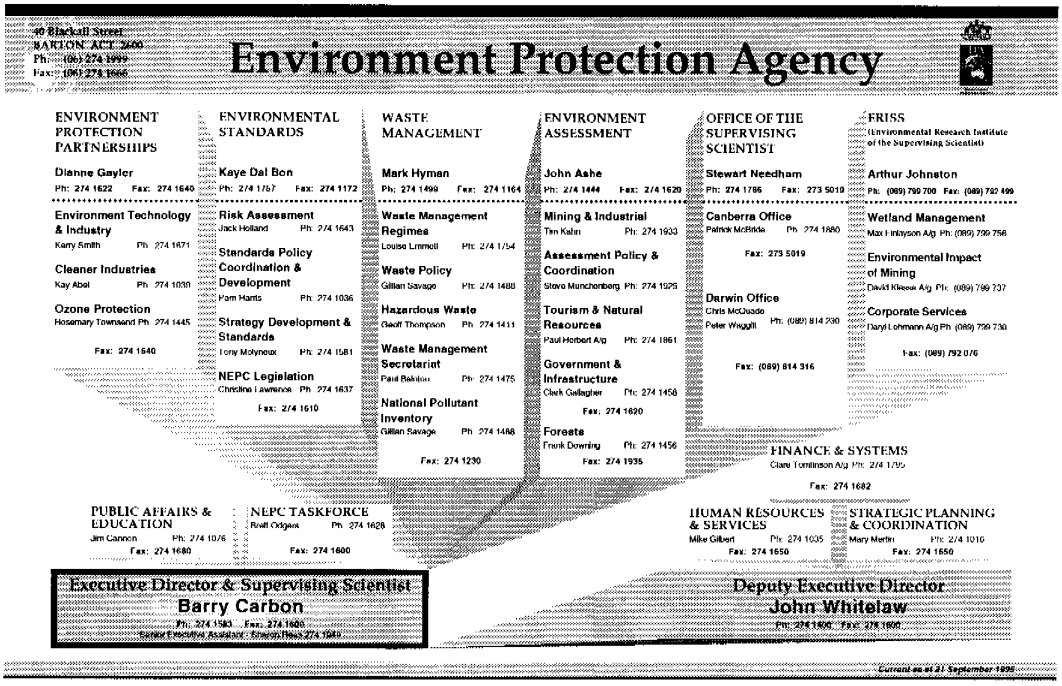
The *Office of the Supervising Scientist* protects the environment by assessing the adequacy of environmental protection relating to uranium mining in the Alligator Rivers Region, and by advising on best practice in environmental protection.

The *Environmental Research Institute of the Supervising Scientist* protects the environment by carrying out scientific research on the environmental impact of mining, particularly uranium mining, and by research on tropical freshwater and estuarine ecosystems with a view to their protection and management.

The structure of the EPA is depicted in Figure 4.1. One of the sections of the Environment Standards Branch is called the Risk Assessment section. Its role is to assess chemicals, because Australia has passed legislation to make mandatory the assessment of both industrial, and agricultural and veterinary chemicals. Holland (1991) describes the approach taken by the section, which undertakes two tasks: exposure and toxicity assessment; and hazard assessment.

The exposure and toxicity assessment varies from chemical to chemical depending on its likely usage patterns and its chemical nature in relation to persistence, accumulation, mobility and possible toxic effects on non-target organisms.

Figure 4.1 The Environment Protection Agency Structure Chart



The hazard assessment conducted by the section is based on an approach called the quotient method (Urban and Cooke, 1986). In this approach (Fig. 4.2) the estimated environmental concentration (EEC) is divided by the most sensitive toxicity concentration relevant to the particular organisms of concern. These calculations are conducted initially on a worst-case scenario where it is assumed that the area has been sprayed with the highest proposed application rate. A quotient, known as the Q value is calculated. If Q is low, then there is little risk of adverse effects. A Q-value greater than 0.1 will lead to further examination of environmental hazard including other pathways of environmental contamination.

The quotient method was originally designed for aquatic impact assessment. The reason is the assumption that chemicals eventually reach groundwater and aquifers through leaching. However, soils may also act as sinks for pollutants and should be considered in hazard assessments.

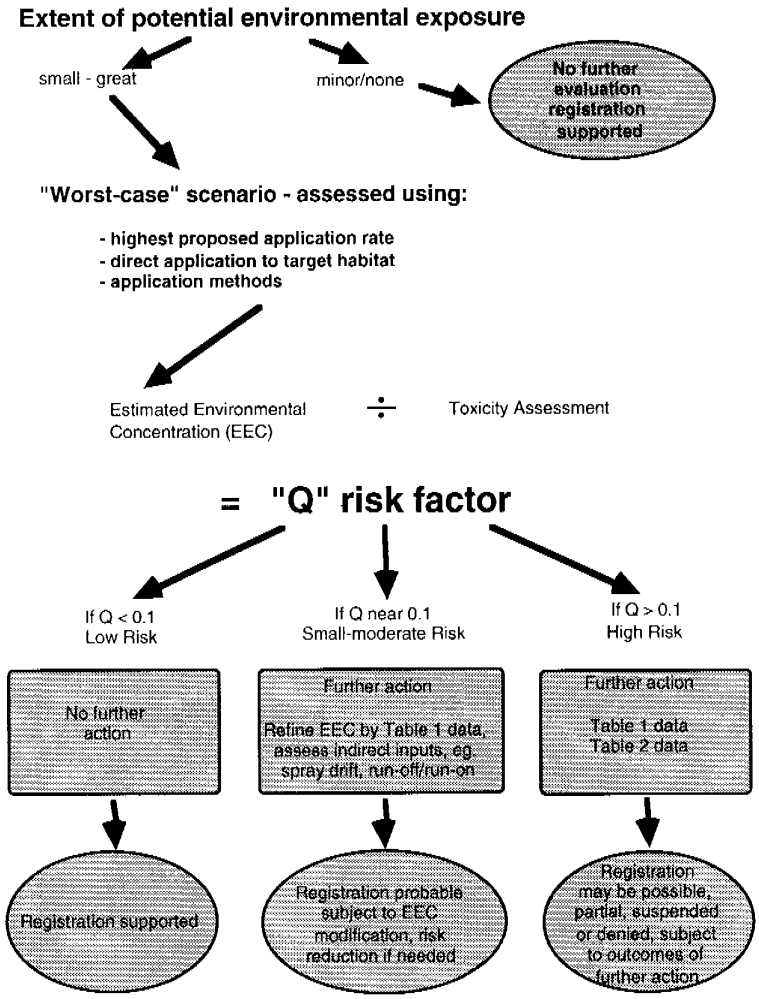
Environmental risk and due diligence

Criminal liability for the wilful flouting of environmental legislation is not confined to the actual perpetrators of the environmental offence. It stretches to include management and the directors of companies. Thus, to the legal profession in Australia the term environmental risk now means the possibility of a company or individual facing legal action for a breach of environmental legislation. The issue recently received publicity when, in March 1995, a Perth company director became the first person in Australia gaoled for an environmental offence when he was sentenced to three months prison for the illegal dumping of 22 000 litres of toxic waste.

The legal profession argues that the only way that directors could avoid conviction for illegal actions of their employees would be to show that they had complied with the process of due diligence. This means that directors and managers should show that they had an input into putting together a policy that minimises the risk of an environmental accident for their company. Company directors seeking to prove their innocence need to show that they either had no knowledge of the offence — which begs the question of whether the director was in control of their company in the first

place — or that they had in place an adequate due diligence system to minimise the risk of an environmental accident.

Figure 4.2 Hazard Assessment as currently conducted by EPA



A generic environmental risk assessment framework for Australia

The existing literature on environmental risk assessment does not, in general, attempt to pinpoint the difference between a risk analysis and a risk assessment. The United States uses the term risk assessment for the step that involves quantifying and combining the hazards and the probabilities, as shown in Figure 3.2. This terminology has also been used by the New South Wales Department of Planning, as shown in Figure 3.1. The difference between a risk analysis and a risk assessment is currently under consideration in a draft Australian and New Zealand Standard (Standards Australia & Standards New Zealand, 1994) which suggests that the steps shown in Figure 3.1 and Figure 3.2 as risk assessments should be termed risk analysis. Risk assessment consists of comparing the quantified level of risk with criteria for risk acceptability.

A second issue to consider is that the environmental impact assessment (EIA) process as undertaken in Australia (ANZECC, 1991) is itself a form of environmental risk assessment, albeit in general a qualitative rather than a quantitative risk assessment. An Australian EIA starts with a scoping study that determines the issues and concerns that will need to be addressed by consultation and further studies. The environmental

impact statement that is produced will then address the consequences arising from the identified issues.

Identifying issues and determining their consequences comprise essential parts of the risk analysis process, as shown in Fig. 3.1. A hazard analysis would then quantify these consequences. The essential extra step involved in converting a hazard analysis to a risk analysis is the introduction of the probabilistic element, by finding an answer to the question: what is the likelihood of this hazard causing an effect? The answer to such a question will involve some form of uncertainty analysis.

Figure 1 summarises the above generic framework. The left hand side lists the steps involved in undertaking the analysis or assessment shown on the right hand side. Impact analysis considers only concerns (i.e. issues) and consequences. A hazard analysis requires a further step, namely undertaking calculations to produce quantitative estimates. Risk analysis requires introducing statistical aspects through uncertainty analysis. Risk assessment then requires some determination of the acceptability, or otherwise, of the numbers produced by the risk analysis. And finally, in practice, one wishes to introduce actions to control risks, and to communicate these actions as part of risk management.

References

ANZECC (Australian and New Zealand Environment and Conservation Council) 1991, *A national approach to environmental impact assessment in Australia,* ANZECC.

Cocks, D. 1992, *Use with care: Managing Australia's natural resources in the twenty first century,* New South Wales University Press, Kensington.

Holland, J. 1991, Modelling the fate of chemicals in the environment: Commonwealth Agency Perspective, in Moore (ed.) *Modelling the Fate of Chemicals in the Environment,* Centre for Resource & Environmental Studies, ANU, Canberra.

Industry Commission, Office of Regulation Review 1995, *The analysis and regulation of safety risk,* Information Paper, Industry Commission, Canberra.

Standards Australia & Standards New Zealand 1994, Draft Australian/New Zealand Standard for Comment DR 94351, *Risk Management,* Standards Australia, Homebush, NSW.

Urban, D.J. & Cook N.J. 1986, *Standard Assessment Procedure: ecological risk assessment,* Report EPA 540/9-85-001, Hazard Evaluation Division, US EPA, Washington DC.