

Environmental Risk Management in New Zealand – Is There Scope to Apply A More Generic Framework?

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Summary

This paper assesses whether a more generic and consistent approach is required to environmental risk management in New Zealand.

Definition of the precautionary principle

The precautionary principle has been developed as a means of avoiding danger to human health and the environment in situations where there is a high degree of uncertainty and the effects of policy decisions are possibly irreversible. The definition most widely quoted is from the 1992 Rio Declaration, which states that: “where there are threats of serious or irreversible damage, lack of full scientific evidence shall not be used as reason for postponing cost-effective measures to prevent environmental degradation”.

The precautionary principle is very controversial and may impose significant costs on society.

There has been rapid growth in the adoption of the precautionary principle in international agreements and the laws of many countries, including New Zealand (for matters such as hazardous substances and new organisms, biosecurity and fisheries). However, it remains highly controversial. Variations in how the precautionary principle is interpreted and applied can create problems, including the potential for significant costs to society through stifling economic development and technological innovation. The principle offers little guidance for regulatory policy.

A generic risk management framework and guidelines could help manage risk and uncertainty and minimise costs.

The precautionary principle needs to be considered in the context of a more generic risk management framework, with clear guidelines that provide a systematic approach to setting the best course of action under uncertainty. Such an approach could assist in determining when and how the principle should be applied to manage risk and uncertainty while minimising potential economic costs. A key benefit is that it could support activities that foster development and innovation (that may not proceed otherwise), through focusing on alternative ways of implementing the precautionary principle, while still aiming to minimise or mitigate risks. This could enable the greatest returns to be achieved with acceptable results, costs and risks.

Currently in New Zealand, the precautionary principle is not being applied in the context of an integrated risk management framework (unlike in the European Union, the United States and Canada). There is also a lack of guidelines on implementation. Clear guidelines could help ensure a more consistent and subtle approach that explores a wider range of options.

Canadian guidelines could be relevant to New Zealand.

Draft guidelines developed in Canada could be relevant to New Zealand and would be the most applicable from an operational perspective. Key benefits include: a more participatory approach and increased consistency with international commitments and across domestic legislation and regulatory regimes. Possible limitations include the potential cost of participatory processes and successful implementation being highly dependent on support from government agencies. Implementation issues would require further exploration.

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Introduction

Risk and uncertainty are pervasive in environmental policy decision-making.

Risk and uncertainty are pervasive in regulatory and policy decision-making. The purpose of this paper is to better define risk and assess whether a more generic and consistent approach to environmental risk management in New Zealand is required.

There is a range of risk management standards and procedures in place, both overseas and in New Zealand. The focus of this study is on situations where there is a high degree of uncertainty and the possibility of irreversibility. Many policy decisions involving the environment and use of natural resources have these characteristics. The precautionary principle has been developed as a means of avoiding danger to human health and the environment.

Lack of clarity around the interpretation of the precautionary principle causes problems – it could stifle economic development and innovation.

While there has been rapid growth in the adoption of the precautionary principle in international agreements and the laws of many countries, including New Zealand, it remains very controversial. The precautionary principle is open to wide interpretation as to what it actually means and when and how it should be applied. This poses a number of problems, including the potential for significant costs to society through stifling economic development and technological innovation. The likelihood of these problems arising depends on the way the principle is formulated and implemented.

A more generic framework could help manage risk and uncertainty and minimise costs.

Considering the precautionary principle in the context of a more generic risk management framework could assist in determining when the principle should be applied and, if so, how it could be implemented to manage risk and uncertainty while avoiding or minimising potential economic costs.

This paper explores:

- key concepts related to risk and uncertainty and the precautionary principle

- the need for a more generic risk management framework to assist with decision-making under uncertainty, based on appropriate information, using an integrated approach and guidelines to address uncertainties in the policy response
- the main definitions, interpretations and criticisms of the precautionary principle
- how risk and uncertainty are currently being addressed within regulatory regimes in New Zealand through the use of the precautionary principle
- how risk and uncertainty are being managed overseas in the United States, the European Union, the United Kingdom, Canada and Australia
- whether there are guidelines that could form the basis for a more generic risk management framework that could be applied across a range of specific regimes in New Zealand (ie, hazardous substances and new organisms, including genetically modified organisms and the Oceans Strategy).

Key concepts

Risk and uncertainty

Risk and uncertainty defined

Risk describes situations where there is uncertainty about which outcome will eventuate, but the range of all possible events is known and outcomes can be assigned a probabilistic value. On the other hand, uncertainty describes situations where the probabilities are unknown. There could be uncertainty about what events are possible as well as insufficient information to assign probabilities to their outcomes (Majone, OECD, 2006).

Expected utility theory is a framework for analysing choices involving uncertainty.

The framework often used by economists for the analysis of choices involving uncertainty is expected utility theory¹. Majone (OECD, 2006) defines risk as an expected loss (or negative utility), which can be calculated once we know the probability distribution of all possible events. The individual has a utility function, which measures the value to them of each course of action when each of the uncertain possibilities is assumed to be the true one. They also have a “subjective probability distribution”, which expresses quantitatively their beliefs about uncertain events.

The decision rule based on this approach is that: the individual’s optimal decision is the one that maximises expected utility (or minimises expected loss) with respect to this probability distribution.

¹ Although the expected value approach is widely used in the analysis of choices involving uncertainty, this is a special case in the expected utility model, when the utility is a linear function of wealth. Normally, under expected utility theory, the utility function is concave, characterising risk aversion (Quiggan, 2005).

Advantages associated with applying a decision rule to maximise utility

The major advantage of applying a decision rule that aims to maximise expected utility is that it encourages the risk regulator to analyse *all relevant dimensions* of the problem, including not only the nature of the risk and the benefits of minimising the risk, but also the costs, which may otherwise be overlooked². It is a holistic approach that acknowledges that most risk assessments are subjective and offers a way of consistently revising and updating such assessments in light of new information.

Expected utility theory has received some criticism. In practice, people may not choose under uncertainty to update their beliefs in the manner prescribed by the theory. The perceived importance of a risk may not be based on the likelihood of an occurrence. Instead, public perceptions may be influenced by: the severity of impact (even if the likelihood is low); whether they have control over the exposure to risk; whether the effect is immediate or delayed; whether future generations will be affected; and cultural factors such as “view of the world”.

However, faced with uncertainty, the economist can still contribute in various ways (Winpenny, OECD, 1995) by:

- making the case for investment in information
- presenting the various possible outcomes, with their probabilities, as our knowledge improves (risk assessment)
- taking into account the perceptions and preferences of the decision-maker and/or the general public (risk perception and subjective preferences)
- devising appropriate decision rules and/or principles and investment strategies (risk management).

Decision-making principles direct attention to opportunity costs and regulatory priorities.

Decision-making principles can be useful in directing attention to the importance of opportunity costs (associated with action and inaction) and regulatory priorities. This learning process can, in turn, change the practice of regulatory agencies.

Precautionary principle

Definition of the precautionary principle

There are numerous definitions and interpretations of the precautionary principle, which are discussed later in the paper. The most widely quoted was introduced at the 1992 United Nations Conference on Environment and Development (Rio Declaration, Principle 15):

“Where there are threats of serious or irreversible damage, lack of full scientific evidence shall not be used as reason for postponing cost-effective measures to prevent environmental degradation.”

² There are other decision rules, for example, minimax, which focuses on losses (ie, consequences under the worst-case scenario) but not on probabilities, while others focus on probabilities; for example, the risk classification method. The expected utility rule takes account of both losses/utility and probabilities (Majone, 2006; Quiggan, 2005).

The triggering factor is the “threat” of serious or irreversible damage, although this has not been defined, leaving governments to decide what measures to take on a case-by-case basis.

Precautionary principle focuses on uncertainty and irreversibility.

The precautionary principle comes into its own where the parties are very risk averse, or where decisions have to be taken in the face of scientific uncertainty over potentially serious environmental impacts and/or irreversible threats of harm (eg, climate change, or the inadvertent release of a genetically modified organism). This could be accompanied by the existence of a long time-lag before some potential effects become apparent and may include threshold effects that cause sudden changes in state. Values may also be an important component where people have entrenched views that are not necessarily informed by available scientific information.

Because there is a range of precautionary approaches that could be applied under conditions of risk and uncertainty³, the precautionary principle needs to be considered in the context of a broader risk management framework.

Risk management framework

The following section outlines the elements of an integrated risk management framework.

Risk management defined

Risk can never be entirely eliminated, as all decisions involve risk; even deferring a decision involves risk. Risk management involves establishing where a risk falls in terms of likelihood and impact and then developing an organisational strategy to manage the risk. It is a systematic approach to setting the best course of action under uncertainty by identifying, assessing, understanding, acting on and communicating risk issues (Treasury Board of Canada, 2001)⁴.

Risk assessment defined

Risk assessment is the process of converting uncertainty into risk (Winpenny, OECD, 1995). It entails:

- analysing the initiating events and the routes (pathways) through which the effect occurs
- specifying the size and severity of the risk
- estimating probabilities and expected values.

Risk management builds on the risk assessment and attempts to answer the questions: Does anything need to be done about it? What can be done about it? What should be done about it?

³ Winpenny (OECD, 1995) also refers to other decision-making rules. See page 141.

⁴ Examples of applied risk management frameworks: Treasury Board of Canada Secretariat (2001) "*Risk Management Framework*"; and Office of Management and Budget United States (2006) "*Proposed Bulletin on Risk Assessment*". For a particular policy area, see OGTR, Australian Government (2005) "*Risk Analysis Framework*".

Level of risk and uncertainty may vary, as well as the level of management required.

Not all public policy decisions involve risk and uncertainty to the same extent and the level of management required may vary accordingly. For example, risks with low-to-medium likelihood and minor-to-moderate impact may simply be accepted and/or monitored. But where there is high likelihood and potentially significant impact, extensive management is essential. Some situations may also involve a significant amount of uncertainty. In these circumstances, the precautionary principle comes into play, at the stage options are being developed and evaluated.

For instance, in the Canadian Model (refer Box 1), application of the precautionary principle is an option that may be considered as an integral part of the process when establishing an integrated risk management function and putting this into practice (ie, Elements 2 and 3).

Box 1: The Canadian model for integrated risk assessment

There are four key elements, which are summarised with expected results for each as follows:

Element 1: Developing the corporate risk profile

- The organisation’s risks are identified through environmental scanning including: the type of risk, source of risk, what is at risk and level of ability to control the risk.
- The current status of risk management within the organisation is assessed.
- The organisation’s risk profile is identified.

Element 2: Establishing an integrated risk management function

- Management decision on risk management is communicated, understood and applied.
- The approach to operationalise integrated risk management is implemented through existing decision-making and reporting structures.
- Capacity is built through the development of learning plans and tools.

Element 3: Practising integrated risk management

- A common risk management process is applied at all levels.
- The results of risk management practices at all levels are integrated into informed decision-making and priority setting.
- Tools and methods are applied.
- Consultation and communication with stakeholders is ongoing.

Element 4: Ensuring continuous risk management learning

- A supportive work environment is established where learning from experience is valued and lessons are shared.
- Learning plans are built into an organisation’s risk management practices.
- The results of risk management are evaluated to support innovation, learning and continuous improvement.
- Experience and best practices are shared, internally and across government.

Many of the shortcomings of the precautionary principle could be avoided or minimised through applying it in a more generic and integrated risk management framework that would enable risk and uncertainty to be addressed in a more efficient and cost-effective manner.

Mode of decision-making is important.

Simply adding the precautionary principle onto an existing framework may not be adequate to provide for comprehensive evaluation of uncertainties as they arise. The mode of decision-making is very important, including the role of science and the relative roles of experts and the public. Views need to be incorporated from many disciplinary perspectives (Harding and Fisher, 1999). There is also a need to be flexible to deal with new scientific information over time.

This indicates a need to reconsider current decision-making frameworks, including whether provisions for inviting inputs and the process used to evaluate threats are sufficiently flexible and capable of effectively responding to scientific uncertainty (Peel, 2005).

Good guidelines could help overcome some problems.

Guidelines could provide scope for more subtle management using appropriate information under conditions of uncertainty. This could help avoid or overcome some of the problems associated with implementing the precautionary principle. The guidelines would need to fit within the context of good regulatory practice and provide guidance on when and how to apply the precautionary principle.

There is also a need to consider a full range of options for implementing the precautionary principle and techniques to evaluate cost effectiveness, including cost-benefit analysis and other tools that may be applied under conditions of uncertainty.

Options for implementing the precautionary principle

Alternative policy options can be categorised to address particular problems.

There is a broad range of policy options for implementing the precautionary principle, from deferring a decision until more information is available through to banning an activity until there is evidence of safety, with a range of alternatives between. Myers (2004) uses the following categories to identify options that may be appropriate to address particular problems⁵:

- Tools for early warnings, harm, uncertainty and alternatives are:
 - Defer a decision until more information is available.
 - Research alternative, less damaging options, and/or provide funding for the development of such options.
 - Adopt a strategic or anticipatory approach – develop national and regional strategies that identify national constraints (ie, environmental standards) necessary to prevent irreversible damage, maintain opportunity sets and prevent serious environmental damage. Undertake actions to increase the capacity of social and ecological systems to recover from or adapt to changed conditions⁶.
 - Use adaptive management - identify knowledge gaps, use ongoing monitoring and research to improve the knowledge base, and incorporate flexibility and reversibility into decisions so that measures can be modified in line with advances in information.

⁵ The range of options identified have been based on Myers (2004) and the survey in Peterson (2006).

⁶ Young M D (1999).

- Use the best available technology.
- Require pre-market safety testing and approval or product registration before placing products on the market, or permits to undertake certain activities, and a process for review⁷.
- Tools for transparency are:
 - Mandatory environmental impact assessments, which increase the amount of information available to decision-makers and may identify uncertainties and potential hazards associated with the proposed activity.
 - Inclusion of “safety margins” or “uncertainty factors” in risk assessments.
 - Labelling laws.
 - Values analysis – qualitative measures taken into account as well as quantitative.
- Tools for burden-shifting are economic incentives for preventing harm, such as compensation/liability regimes, bonds and compulsory insurance and extended producer responsibility.
- Tools of restriction of use include voluntary restriction agreements, “cautions”, impositions on condition of use, priority lists of potentially harmful substances for observation, exposure or extraction limits, phase-outs or bans until there is either “reasonable certainty” or “strong evidence” of safety.

Cost-benefit analysis

Under conditions of uncertainty, cost-benefit analysis is a useful technique.

Under conditions of considerable uncertainty, cost-benefit analysis⁸ remains a useful technique for assessing and comparing options, but may need to be modified to account for additional constraints such as the acceptability of risk to the public (Treich, 2001; Hahn & Sunstein, 2005). It may be necessary to incorporate assumptions about potential hazards and expected responses to various management options (Peterson, 2006).

According to Hahn and Sunstein (2005), “cost-benefit can and should incorporate concerns about precaution. For example a problem characterised by irreversibilities can be modelled using standard techniques in cost-benefit analysis. Uncertainties about both benefits and costs can also be incorporated, perhaps by:

- specifying a range of possible outcomes;
- seeking to preserve specified options; or

⁷ In New Zealand, this process is administered by the Environmental Risk Management Authority (ERMA) under the Hazardous Substances and New Organisms Act 1996.

⁸ Winpenny (OECD, 1995) provides a practical guide to the economic appraisal of environmental projects and policies. This covers cost-benefit as well as a range of precautionary approaches and rules.

- identifying the worst-case scenario and showing a degree of risk aversion with respect to that scenario”.

According to Peterson (2006), the Swedish Board of Fisheries (FAO, 1995) proposes a similar approach. “A precautionary approach to assessment and analysis requires a realistic appraisal of the range of outcomes possible ... A precautionary assessment, would at the very least, aim to consider:

- inconsistencies in the data;
- specific alternative hypotheses about underlying biological, economic and social processes; and
- calculations of the theoretical response of the system to a range of alternative management actions”.

Tools to complement cost-benefit analysis

There are a number of tools available to complement cost-benefit analysis to help determine an appropriate course of action in a dynamic setting. Peterson (2006) lists a range of techniques that have been developed in the past decade to deal with uncertainty, including:

- formal modelling of choice under uncertainty (eg, Quiggin, 2005)
- formal modelling of policy choice with uncertainty and irreversibilities, including option values (eg, Gollier and Treich, 2003)
- environmental valuation techniques (eg, Winpenny, OECD, 1995)
- intergenerational discounting (eg, Winpenny, OECD, 1995)
- minimax choice rules (eg, Majone, 2003; Quiggin, 2005; Winpenny, OCED, 1995)
- value of information theory (eg, Macauley, 2005).

Recently, there has been a focus on option values as a useful tool where undertaking an irreversible action (eg, development that encroaches on a wilderness area, destroying its fundamental character) is less valuable if it is expected that better information will become available over time. In these circumstances, maintaining a flexible position enables advantage to be taken of information to come (Gollier and Treich, 2003).

Consequences tables are a potentially useful tool for formulating policy where there is uncertainty and for generating insights (Hirshleifer and Riley, 1992). Consequences tables enable systematic consideration of actions, states of the world and ensuing consequences. They allow analysts to break problems into manageable sections, help protect against biases and facilitate group work.

Peterson (2006) is optimistic that these “techniques (outlined above), perhaps with further development, may be useful in modifying conventional cost-benefit analyses to address uncertainties, information gaps, and large intertemporal disparities in the incidence of costs and benefits”.

However, while these techniques are useful, there could still be some limitations. Care needs to be taken to avoid simplistic approaches that do not take sufficient account of how society, industry and technology change over time. Also, the cost of obtaining information should be kept in mind and should be commensurate with the expected gains (Winpenny, OECD, 1995).

Precautionary principle: origin, definitions and interpretation

The following section outlines the origin and various definitions and interpretations of the precautionary principle.

Widespread application of the precautionary principle

Although the precautionary principle originated in Europe in the early 1970s, it was not until the 1992 United Nations Conference on Environment and Development that the principle received broad international recognition. It was positioned as an underlying element of the broader framework of sustainable development. Since then, it has spread rapidly in multilateral agreements, international laws and domestic laws and policies dealing with: climate change, biodiversity, endangered species, fisheries management, wildlife, trade, food safety, pollution controls, chemicals regulation, exposure to toxins, and other environmental and public health issues (Peterson, 2006). It is being applied in the context of a broader risk management framework in the United States, European Union, United Kingdom and Canada, although there is some variation in how it is being interpreted and applied.

Definition of the precautionary principle

While there are numerous definitions, the most widely quoted is the one in the Rio Declaration (Principle 15) as previously outlined. Under this definition, the triggering factor is the “threat” of serious or irreversible damage. Once the approach has been triggered, the wording “allows” but “does not require” action to be taken and leaves this open for governments to decide on a case-by-case basis. There are similar definitions in various international treaties including: the 1992 Convention on Climate Change, the 1992 Convention on Biological Diversity and the 2000 Protocol on Biosafety.

The principle's general formulation is both a strength and a weakness.

There is much criticism of the precautionary principle due to its lack of clarity (eg, Majone, 2002; Treich, 2001). However, the general formulation is both the strength and weakness of the precautionary principle. It is a strength because it has a high degree of generality and may be applied to all environmental protection and health safety issues, whereas excessive prescription could remove the flexibility needed to take into account the circumstances of each case (eg, Cooney, 2005; Peterson, 2006). It is also a weakness because it offers little guidance for regulatory policies (Treich, 2001).

While most definitions of the precautionary principle share common features, there are some key areas of difference (Peterson, 2006):

- What level of threat or harm is sufficient to trigger application of the principle (the threshold of harm)?

- Are the potential threats balanced against other considerations, such as costs or non-economic factors, in deciding what precautionary measures to implement?
- Does the principle impose a positive obligation to act or simply permit action?
- Where does the burden of proof rest to show the existence or absence of harm?
- Is liability for environmental harm assigned and, if so, who bears the liability?

Forms of the precautionary principle

Based on these differences, different versions of the principle can be categorised as weak, moderate or strong (Cooney, 2005; Peterson, 2006; Wiener, 2002). The particular formulation of the principle is a key factor determining the economic consequences of precautionary measures.

Weak version

The least restrictive allows, but does not require, preventive measures.

The weak version is the least restrictive and allows preventive measures to be taken in the face of uncertainty, but does not require them (eg, Rio Declaration 1992; United Nations Framework Convention of Climate Change 1992). To satisfy the threshold of harm, there must be some evidence relating to both the likelihood of occurrence and the severity of consequences.

Some, but not all, require consideration of the costs of precautionary measures. Weak formulations do not preclude weighing benefits against the costs. Factors other than scientific uncertainty, including economic considerations, may provide legitimate grounds for postponing action.

Under weak formulations, the requirement to justify the need for action (the burden of proof) generally falls on those advocating precautionary action. No mention is made of assignment of liability for environmental harm.

Moderate version

The presence of an uncertain threat is a positive basis for action.

In moderate versions of the principle, the presence of an uncertain threat is a positive basis for action, once it has been established that a sufficiently serious threat exists. For example, the United Kingdom Biodiversity Action Plan states:

"In line with the precautionary principle, where interactions are complex and where the available evidence suggests that there is a significant chance of damage to our biodiversity heritage occurring, conservation measures are appropriate, even in the absence of conclusive scientific evidence that damage will occur." (Department of the Environment (UK), 1994)

Usually, there is no requirement for proposed precautionary measures to be assessed against other factors such as economic or social costs. The trigger for action may be less rigorously defined, for example, as "potential

damage”, rather than as “serious or irreversible” damage as in the weak version. Liability is not mentioned and the burden of proof generally remains with those advocating precautionary action.

Strong version

The strong version differs from other versions in requiring action and reversing the burden of proof.

Strong versions of the principle differ from the weak and moderate versions in reversing the burden of proof. Strong versions justify or require precautionary measures and some also establish liability for environmental harm, which is effectively a strong form of “polluter pays”. For example, the Earth Charter (2000) states:

“When knowledge is limited apply a precautionary approach Place the burden of proof on those who argue that a proposed activity will not cause significant harm, and make the responsible parties liable for environmental harm.”

Reversal of proof requires those proposing an activity to prove that the product, process or technology is sufficiently “safe” before approval is granted. Requiring proof of “no environmental harm” before any action proceeds implies the public is not prepared to accept any environmental risk, no matter what economic or social benefits may arise (Peterson, 2006). At the extreme, such a requirement could involve bans and prohibitions on entire classes of potentially threatening activities or substances (Cooney, 2005).

There has been a gradual transformation to a stronger form.

Over time, there has been a gradual transformation of the precautionary principle from what appears in the Rio Declaration to a stronger form that arguably acts as restraint on development in the absence of firm evidence that it will do no harm.

There are substantial issues around how the burden of proof is applied.

There are substantial issues around how the burden of proof is applied. Through increasing costs, this can delay innovation and affect the viability of innovative industries and those that depend on their products. This may encourage them to change their activities or relocate to other jurisdictions with less stringent standards of proof, resulting in a loss in capability in the home country.

Critique of the precautionary principle

The likelihood of problems arising depends on the way the precautionary principle is formulated and implemented.

There are a number of problems associated with applying the precautionary principle. The likelihood of these problems arising depends on the way the principle is formulated and implemented. Application of the principle within an integrated risk management framework, with well designed guidelines that allow for a range of options and the costs, benefits and risks to be considered, may help avoid these problems.

Peterson (2006) summarises the most frequent criticisms of the principle:

- **Excessive discretion** - where decision-makers have a high level of discretion as to when and how to apply the precautionary principle and the regulatory framework is not applied consistently, this may lead to

unpredictable and inconsistent environmental management decisions, which create high costs for businesses and inhibit corporate planning (Harding and Fisher, 1999). Lack of clarity can provide opportunity for legal challenge through the courts, where the principle may be interpreted differently from what was intended by the policy maker. This does not provide industry with sufficient guidance or certainty.

- **Reversal of the burden of proof** – this could impose excessive costs on developers and producers, although it does not necessarily dictate who will pay the costs. According to Peterson (2006), a more important factor influencing the costs could be the “standard” of proof required to satisfy authorities.
- **Distortion of regulatory priorities** – this may occur through application of the precautionary principle (Majone, 2002) by redirecting regulatory attention from known or plausible hazards to speculative or ill-founded ones (Graham, 2004). This could increase environmental damage. It highlights the need to prioritise risks within a broader risk management framework and to assess the costs and benefits.
- **Stifling of technological innovation and paralysis of development** – this is claimed by Graham (2004) and Hahn and Sunstein (2005) and could occur under stronger versions of the principle, depending on how they are applied and the standard of proof of safety required. The counter-argument is that application of the precautionary principle may lead to some innovation in alternatives if firms know that certain avenues have been closed off. However, this is likely to be at the margin compared with the wider stifling effect that strong forms of the principle can have.
- **Costs of precautionary measures** - some highlight the costs of measures taken to avoid potential harm, but frequently overlook or discount the potential benefits, which could be substantial (eg, the experience with asbestos). If the hazard does not eventuate, expenditure on avoidance measures may be seen as wasted. However, in a cost-benefit context, this may not be the case if the expected benefits outweighed the costs, the most cost-effective and efficient alternative was chosen and the best available information was taken into account at the time.
- **Perverse consequences from precautionary measures** - may result from a failure to recognise that regulatory measures have costs, as well as benefits, and may themselves give rise to risks (Hahn and Sunstein, 2005).

- **Misuse as a protectionist barrier** - the precautionary principle is open to misuse and opportunistic manipulation by rent-seeking and commercial interests (Gollier and Treich, 2003; Graham, 2004; Majone, 2002; Treich, 2001). For example, commercial interests may oppose a competing product on the grounds that it could have unproven harmful impacts. The precautionary principle may also be used as a disguised form of protectionism and has been implicated in a number of trade disputes. An example is the European Union imposing import barriers on hormone treated beef and genetically modified food products.

Application of the precautionary principle in New Zealand

The following section outlines how the precautionary principle has been applied in New Zealand. This is considered in each area where the principle has been either explicitly or implicitly adopted.

Absence of guidelines and an integrated risk management approach

While the precautionary principle is being applied in New Zealand in a range of policy areas, this is not within the context of an integrated risk management framework (although regulatory impact statements are required, based on good practice, including standard cost-benefit analysis). Under current legislative provisions, society's risk tolerance and risk aversion is, arguably, left open to officials and other decision-makers to decide. Application of the precautionary principle is therefore open to wide interpretation, with similar risks being treated differently and cases ending up in litigation as a result.

Support for the inclusion of the precautionary principle in international agreements and domestic law

New Zealand has generally supported the Rio Declaration (principle 15) and the inclusion of the precautionary principle in international agreements and domestic law, although there has been concern that the definition is too broad. There is considerable variation in how the precautionary principle has been applied, with interpretations ranging from weak to moderate and, in some instances, strong. The Fisheries Act 1996 and the Hazardous Substances and New Organisms Act 1996 apply a precautionary approach and there is an indirect reference in the Biosecurity Act 1993. It is implicit in the application of the Resource Management Act 1991. A precautionary approach is proposed as a principle in the Sustainable Development Programme of Action, while precautionary decision-making is an underlying principle in the New Zealand Biodiversity Strategy. There are also implications for trade through the World Trade Organisation Agreement.

Legislation and regulations

Precaution implicit in the Resource Management Act

The Resource Management Act 1991 governs the use and development of land, air and water resources in New Zealand, concentrating on managing the environmental effects of human activities. Although there is no direct preference to precaution, it is implicit in the way the Act is implemented.

“First, novel scientific evidence will be accepted by the [Environment Court] if it is demonstrated after testing, to be more than mere conjecture or hypothesis. Second, the application of a general precautionary principle is within the Court’s discretion when exercising its judgement...Factors influencing the application of caution are the reliability of the scientific evidence and the gravity of the effect the scientific evidence tends to” (Birdsong, 1998).⁹

The Fisheries Act encompasses the precautionary principle.

The Fisheries Act 1996, section 10, specifies four information principles, which encompass the precautionary principle, that must be taken into account in relation to the utilisation of fisheries resources or ensuring sustainability:

- Decisions should be based on the *best available* information.
- Decision-makers should consider any *uncertainty* in the information available in any case.
- Decision-makers should be *cautious* when information is uncertain, unreliable or inadequate.
- The absence of, or any uncertainty in, any information *should not be used* as a reason for postponing or failing to take any measure to achieve the purpose of this Act.

HSNO Act is akin to precautionary approach.

The Hazardous Substances and New Organisms Act 1996, section 7, has been regarded as akin to the precautionary approach by emphasising the need for caution in managing adverse effects “where there is scientific and technical uncertainty about those effects” (Palmer, 2001).

Palmer has argued that this provision incorporated the precautionary approach into New Zealand domestic law in *Bleakley v Environmental Risk Management Authority (ERMA)*. This involved the decision by ERMA on an application for approval to field test a new organism to genetically modify cows. The Judge, in addressing the argument, said:

“I do not gain assistance from the suggested importation of the (somewhat uncertain) international concept of a “precautionary principle” whether such is expressed in terms of the Rio Declaration or otherwise.”

The Judge then indicated that the section should be construed on its own language in light of the purpose set out in section 4, part of which is to “prevent or manage” the adverse effects of new organisms. This indicated that consideration should be given to managing potentially adverse effects through field testing rather than simply banning a potentially harmful activity.

⁹ Birdsong, Bret (1998) “*Adjudicating sustainability: New Zealand’s environment court and the Resource Management Act.*” Ian Axford (New Zealand) Fellowship in Public Policy.

The Report of the Royal Commission on Genetic Modification (2002) reached the following conclusion:

“Although we heard much discussion of the precautionary principle and the precautionary approach from those who opposed release of genetically modified organisms, there was no consensus on the meaning of either term. The meaning of precaution often rests on the values of the speaker.

...We were not convinced that a single principle could be applied across the board to the issue of genetic modification in New Zealand. Decisions on the use of technology must rest on a range of factors, including the risks and acceptability to the public of the proposed use. They are factors that should inform the process of modifying genetic modification.”

This was essentially arguing for the application of a wider risk management framework involving consideration of a broader range of management options.

Royal Commission on
GMOs recommends that a
greater range of options be
considered.

The regulation of genetically modified organisms is currently based on both the weak and strong forms of the precautionary principle. When there are high risks, high irreversibility of impacts, and a high degree of uncertainty about those impacts, the strong form of the precautionary principle is applied and the application is declined. Such an application would be declined regardless of whether the available evidence showed the genetically modified organism to be safe or unsafe, as the impacts associated with getting it wrong would be considered too great. On the other hand, where there are low risks, low irreversibility and a low degree of uncertainty, minimal regulation and monitoring may be applied. Prior to the Report of the Royal Commission (2002), there were two options – field testing and open release (without controls), but nothing in between. The Commission recommended the introduction of a new category, “conditional release”, to provide a greater range of options.

Biosecurity Act allows for a
precautionary approach.

The Biosecurity Act 1993 does not refer specifically to the precautionary principle, but it allows for a precautionary approach through an import health standard to manage risks associated with the importation of “risk goods” and the management or eradication of “pests” and “unwanted organisms”. Where there is insufficient information to make a decision in the face of significant potential risks, applying a precautionary approach may mean that additional risks management measures are included in the import health standard or that an import health standard is not issued until adequate information is sought and obtained, which reduces uncertainty.

Government strategies

Biosecurity Strategy The New Zealand Biosecurity Strategy (2003) includes in its vision that:

“Decisions are founded on good information, based on quality science, taking into account the full range of values at stake with transparent tradeoffs. There is efficient use of the biosecurity budget and biosecurity risk management (from pre-border to pest management) providing an appropriate sustainable level of protection for New Zealand.”

Sustainable Development Programme of Action The Sustainable Development Programme of Action (2003) has as one of its principles: “addressing risks and uncertainty when making choices and taking a precautionary approach when making decisions that may cause serious or irreversible damage.” This is an overarching framework that could form the basis for future government strategies.

Biodiversity Strategy The New Zealand Biodiversity Strategy (2000) was a forerunner to the Sustainable Development Programme of Action and Biosecurity Strategy in its approach. Principle 12 (Precautionary Decision Making) states that:

“Management actions to conserve and sustainably use biodiversity should not be postponed because of a lack of knowledge, especially where significant or irreversible damage to ecosystems can occur or indigenous species are at risk of extinction.”

This differs from the Rio Declaration and appears to allow more scope for action to avoid harm.

International trade agreements

WTO Agreement sanctions precautionary measures. The application of Sanitary and Phytosanitary Measures in the World Trade Organisation Agreement indirectly sanctions the use of precautionary measures (Rose, 2001). The past and current approach in New Zealand has been to support approaches to improve implementation procedures for risk assessment and risk management in the Sanitary and Phytosanitary Measures Agreement. Consideration has also been given to better integration of legitimate environmental concerns with international trade agreements. However, these concerns should not be used to protect against fair competition from developing countries¹⁰. There has been much international debate on this issue, which is discussed further in the next section on international practice.

¹⁰ Clark (1999) "Speech from the Throne: 46th Opening of Parliament of New Zealand".

International practice

The following section discusses how the precautionary principle is currently being applied in the United States, the European Union, the United Kingdom and Australia. It examines:

- the extent to which the precautionary principle is being applied in the context of an integrated risk management framework based on good regulatory practice (refer Appendix One)
- whether guiding principles have been developed and, if so, how they are being applied.

An outline is also provided of the Precautionary Principle Project Guidelines based on a major international project (refer Appendix Two).

United States

Precautionary principle being implemented within a risk management framework.

Although the United States government denied the existence of the precautionary principle, the United States view is that precaution can be implemented only within a framework of risk management¹¹, otherwise significant costs and distortions would result (Graham, 2004).

According to United States guidelines, decision-making that incorporates precaution must be based on an assessment of the costs and benefits and targeted towards government objectives; ie, decisions must be:

- transparent and accountable
- based on scientific evidence
- subject to review and flexible enough to deal with new information.

US guidelines demonstrate many features of good regulatory practice.

The United States guidelines demonstrate many of the features of good regulatory practice. Although the guidelines do not mention reversal of the burden of proof, some United States regulations impose a requirement on proponents of new products, technologies or processes to prove why approval to market or use the product or technology or process should be granted. The standard of proof is generally “reasonable certainty” (Peterson, 2006).

There has been a slow but steady improvement in the conceptual foundations of risk regulation in the United States, which occurred progressively through four sequences (Majone, OECD, 2006):

- **Prohibitions** – bans presented the earliest and least sophisticated approach. For example, the initial ban on the use of saccharin led to proposals to rank additives in three risk categories: those so serious as to warrant prohibition; those so trivial as to warrant no regulatory action;

¹¹ Office of Management and Budget, United States (2003, 2006).

and those whose acceptability should depend on an assessment of benefits and the availability of alternatives.

- **Least-feasible risk** – human exposure to health risks should be reduced to the lowest possible level. This is effectively a second-best rule, given a risk-free environment is unattainable. But this fails to balance marginal costs and benefits, alternatives and probabilities. Balancing marginal costs and benefits is problematic when the issue concerns the likelihood of thresholds and step changes.
- **Significant risk doctrine** – this places a higher analytical burden on regulators than the least-feasible risk approach, or the precautionary principle. Not all potential risks are treated equally; only those activities or substances shown to pose a significant risk will be regulated, focusing limited regulatory resources on the most important risks.
- **Balancing costs and benefits** – since 1981, there has been a requirement for a full cost-benefit test administered by the Office of Budget and Management:
 - Regulatory action is not to be taken unless the potential benefits to society outweigh the potential costs.
 - Among alternative approaches to any given regulatory objective, the alternative involving the least net cost to society has to be chosen.
 - Agencies are required to set regulatory policies with the aim of maximising net benefits, taking into account the condition of the particular industries affected by regulations, the conditions of the national economy, and other regulatory measures contemplated for the future.

In addition, strong powers of ex-post determination of “liability” for harm from the release of hazardous substances were provided by the CERCLA¹² (Superfund) Act 1980. This strengthened the incentives for private precautionary action.

A unique example of policy learning

According to Majone (OECD, 2006):

“the progress from early reliance on outright bans or simple feasibility tests to the applications of key principles of decision theory not only to agency rule making but also to the enabling legislation, is an outstanding, and in many respects unique, example of policy learning. This was also linked to the development of a proper regulatory impact analysis management system.”

This has been greatly facilitated by the interaction among different partly cooperating, partly competing, institutions.

Majone claims that: “compared to these developments, risk regulation in many other OECD countries is still at rather an early stage”. This view is not necessarily shared by other countries within the OECD.

¹² The Comprehensive Environmental Response, Compensation, and Liability Act.

European Union

The EC places the precautionary principle within the existing risk management framework.

The European Commission's Communication (2000) places the precautionary principle within the existing framework of risk analysis. The aim of the Communication is to establish guidelines for applying the principle and to "avoid unwarranted recourse to the precautionary principle, as a disguised form of protectionism". Decisions must be based on scientific risk assessments and satisfy the following criteria¹³:

- **Scientific evidence of risk** – all effort should be made to evaluate the available scientific information.
- **Proportionality** – measures based on the precautionary principle must not be disproportionate to the desired level of protection and must not aim at zero risk. Decision-makers must consider less restrictive alternatives that make it possible to achieve an equivalent level of protection.
- **Non-discriminatory and consistency** – comparable situations should not be treated differently and different situations should not be treated in the same way.
- **Examination of cost and benefits** – the overall costs, including non-economic considerations, to the European Union of the action and lack of action must be compared. In weighing the costs and benefits, the protection of health takes precedence over economic considerations. An economic cost-benefit analysis should be undertaken where possible.
- **Examination of scientific developments** – precautionary measures should be maintained as long as the scientific data are inadequate, imprecise and inconclusive, and as long as the risk is considered too high to be imposed on society.
- **Assignment of responsibility for producing scientific evidence** – while there can often be a reversal of the burden of proof, where the proponent of an activity must provide "reasonable evidence" of safety, such an obligation cannot be entertained as a general principle. In some cases, there will be benefit in research funded by the public.

Member states have considerable discretion made possible by the ambiguity of the precautionary principle.

Within the European Union, Majone (OECD, 2006) claims that even while governments claim to support the Rio Declaration, interpretations may vary. A general inference from the European Court of Justice is that member states have considerable discretion in deciding to err on the side of caution. However, they must provide evidence of specific concrete risk and not merely potential risks based on a general precautionary approach. In the famous dispute about the hormones in beef, the European Union was sanctioned for introducing a public health and consumer measure that was not sufficiently supported by scientific evidence or risk analysis. There have also been other instances where the European Union's use of the precautionary principle has been viewed by its trading partners as a thinly disguised form of protectionism. This has been made possible by the ambiguity of the principle.

¹³ Peterson(2006) provides a summary based on the European Commission's Communication (2000).

Differences between the EU and the US depend on the context of the risk.

While there is still much debate as to whether the approach adopted in the European Union is more precautionary than the United States, the differences in precaution appear to depend more on the context of the risk than on broad differences in national regulatory regimes (Harding and Fisher, 1999; Wiener, 2002).

United Kingdom

UK guidelines are similar to the EC guidelines.

The United Kingdom guidelines have much in common with the European Commission's guidelines. A summary is provided by Peterson (2006):

- Action in response to the precautionary principle should accord with the principles of good regulation; that is, be proportionate, consistent, targeted, transparent and accountable.
- Costs and benefits should be compared, including: action and inaction, and social and environmental costs.
- Decision-making should be based on the standard procedure of risk assessment and management:
 - using the best scientific advice; and
 - where necessary, making assumptions about consequences and likelihoods to establish credible scenarios when accounting for uncertainties.
- Decisions must be reviewed when more information comes available.

The United Kingdom guidelines demonstrate many of the features of good regulatory practice. As a general rule, the United Kingdom approach shifts the burden of proof to the proponent of an activity, but there is flexibility in the extent to which this occurs and it is determined on a case-by-case basis. This limit on the reversal of burden of proof may reduce potential negative impacts.

ACRE Report highlights inconsistencies in regulatory assessment of environmental impact of GM and non-GM crops.

A recent report released by the Advisory Committee on Releases to the Environment (ACRE, 2006) could have a significant impact on the approach to risk assessment in the United Kingdom. The report highlights inconsistencies in the regulatory assessment of the environmental impact of GM crops in comparison with other agricultural crops and practices. While a risk assessment for GM plants is required as part of a rigorous approval process, non-GM crops and other changes to agricultural management do not require similar risk assessments. Quantitative field studies have shown that environmental impacts of changes in agricultural management can be at least as significant as those associated with GM crops.

A broader and more balanced approach is required, with implications for all new farming techniques.

The ACRE report claims that a broader and more balanced regulatory approach is required. In addition to using sustainability as a marker for introducing novel crops and practices (whether GM or non-GM), an evidence-based approach should be introduced to examine any environmental risks and benefits. The implication is that all new farming techniques in the United Kingdom should be assessed for their environmental impact before they are introduced.

Australia¹⁴

Official overarching guidelines have not been adopted, but a risk analysis framework and guidelines have been developed for GMOs.

In Australia, the precautionary approach is one of the guiding principles of ecologically sustainable development¹⁵ and is included in the Inter-Government Agreement on the Environment, which provides an overarching framework for environmental natural resource management. It is also a key component of the Environment Protection and Biodiversity Conservation Act 1999. Although the principle has been incorporated in many laws and policies, official implementation guidelines have not been adopted (Peterson, 2006). However, a risk analysis framework and some guidelines have been developed in a particular policy area for genetically modified organisms (OGTR, 2005). This could be applicable to the Hazardous Substances and New Organisms regime in New Zealand.

Precautionary Principle Project Guidelines

Precautionary Principle Project Guidelines are based on international consultation.

The Precautionary Principle Project was a major international project, which released guidelines following a process of broad consultation with a range of parties¹⁶. The guidelines are outlined in Appendix Two. They were developed for biodiversity conservation and natural resource management, although they could also be relevant to decision-making across other policy regimes (Cooney and Dickson, 2005).

Several of the project guidelines relate to the steps leading up to the invocation of the principle, starting with explicit incorporation of the principle into legislation and policy. However, the Project guidelines provide less detail than the other guidelines about the methods to be employed in assessing and comparing precautionary options.

Possible guidelines for New Zealand

Canadian guidelines could be applicable in New Zealand.

The Canadian draft discussion document (Government, Canada, 2001)¹⁷ outlines 11 guiding principles that are consistent with good regulatory practice and could be applicable in New Zealand. These principles have been developed in the context of a risk management framework and require the precautionary principle to be consistent, integrated and weighed against other relevant principles.

¹⁴ Peterson (2006) provides a detailed description of the Australian approach.

¹⁵ Refer National Strategy for Ecologically Sustainable Development (1992).

¹⁶ The project is a joint initiative of Fauna and Flora International, IUCN (the World Conservation Union), Resource Africa and the World for Wildlife Fund. They are the result of an international consultative process from 2002 to 2005 including: three regional workshops for East/Southern Africa, Latin America and South/Southeast Asia; commissioned case studies; open-access e-conference and final international review workshop.

¹⁷ This is an internal guidance document. Although consultation occurred between departments, the document was not published. Refer Proceedings of Workshop (Environment Canada 2002).

Canadian guidelines are useful from an operational perspective.

There are many areas of agreement between the draft Canadian guidelines and those surveyed (ie, the European Commission, United States, United Kingdom and Project guidelines). However, the Canadian guidelines are more useful from an operational perspective because they provide more explicit guidance on the steps leading up to invocation of the precautionary principle.

Canadian guidelines

The draft Canadian guidelines are summarised as follows:

General decision-making principles

The precautionary approach is a legitimate and distinctive decision-making tool within risk management. In addition:

- It is legitimate for decisions to be guided by society's chosen level of protection against risk – this should be established in advance.
- Sound scientific information and its evaluation must be the basis for applying the precautionary approach, particularly with regard to the decision to act or not to act (ie, to implement precautionary measures or not) and the measures taken once a decision is made.
- The scientific evidence required should be established relative to the chosen level of protection. Further, the responsibility for producing the information base (burden of proof) may be assigned. It is recognised that the scientific information base and responsibility for producing it may shift as the knowledge evolves.
- There should be mechanisms for re-evaluating the basis for decisions and for providing a transparent process for further consultation.
- A greater degree of transparency, clearer accountability and increased public involvement are appropriate.

Principles for precautionary measures

These principles apply once a decision to implement such measures has been taken:

- Precautionary measures should be subject to reconsideration, on the basis of the evolution of science, technology and society's chosen level of protection.
- Precautionary measures should be proportional to the potential severity of the risk being addressed and to society's chosen level of protection.
- Precautionary measures should be non-discriminatory and consistent with measures taken in similar circumstances.
- Precautionary measures should be cost effective, with the goal of generating an overall net benefit to society at least cost, and efficiency in the choice of measures.

- Where more than one option reasonably meets the above characteristics, then the least trade-restrictive measure should be applied.

Some key features of the guidelines

A key feature of the draft Canadian guidelines is that they emphasise the need to establish in advance society’s chosen level of protection against risk. This implies the need for estimation of the *ex ante* value of risk in different contexts. These are issues that still need to be debated in New Zealand.

The Canadian guidelines legitimise the precautionary principle as part of the risk management process but do not go as far as advocating legal status. In comparison with the other guidelines, there is more flexibility in allocating the burden of proof, with potential for review as new information comes to light.

Modified cost-benefit – an interpretation

The principle referred to as “cost effectiveness” indicates that some form of modified cost-benefit is required, which balances costs, benefits and risks. While the other guidelines discuss this in broad terms, the draft Canadian guidelines provide the following interpretation:

- The real and potential impacts of making a precautionary decision (whether to act or not to act), including social, economic and other relevant factors, should be assessed. Moreover, consideration of risk–risk tradeoffs or comparative assessments of different risks would generally be appropriate (although this may not be possible in circumstances where urgent action is needed). This can ensure that society receives net benefits from decision-making, and that the precautionary approach is not used as an unnecessary or unintentional barrier to innovation or technological change.
- Assessing the efficiency of precautionary measures generally involves comparing various policy instruments to determine which options could most efficiently address the risk at least overall cost. The outcome of this process should result in any measures taken imposing the least cost or other negative impact, while reducing risks to an acceptable level.
- As the precautionary approach is, by definition, an evolutionary process, precautionary measures should be monitored on an ongoing basis so that new scientific data that alters cost-effectiveness considerations can be incorporated (including performance monitoring results).

Implementation issues

Consideration needs to be given to implementation in the New Zealand context.

While there could be benefit in applying a more generic risk management framework and clear guidelines based on the Canadian approach, consideration needs to be given to how this could be implemented in the New Zealand context. This could require approaching and gaining support from central and local government agencies to implement guidelines at an overarching level to provide some direction and consistency for viewing different types of risk.

Establish society’s “accepted” level of risk protection.

This process could stimulate debate in New Zealand and contribute towards testing and establishing society’s “accepted” level of protection against risk in different contexts. This could help guide policy development

at a generic level (eg, the development of sector strategies and New Zealand's stance on international agreements) but below this, guidelines may need to be tailored to specific regulatory regimes¹⁸.

Variations in capability within central and local government.

There could be variations in the capability of central government agencies to apply a more generic risk management framework. Capability is also likely to be an issue within local government, especially the capacity of small jurisdictions to interpret and use the guidelines in a way appropriate to their circumstances.

Institutional features that could be required to implement a more generic risk management framework and guidelines within New Zealand include¹⁹:

- a broader, more consultative approach and the ability to synthesise a wide range of viewpoints to establish society's accepted level of risk in different situations
- lateral thinking about the range of possible options consistent with the "accepted" level of risk
- the capacity to obtain and evaluate information relating to the scientific, economic and legal implications of potential options
- a transparent process that clearly identifies and balances costs, benefits and "risks" associated with options
- flexibility to adapt as new scientific information comes to hand over time
- sharing of best practice and lessons learned across central and local government.

Benefits and limitations

Application of a more generic framework and guidelines could foster economic development and innovation.

Application of a more generic risk management framework and guidelines could provide significant benefits to society. A key benefit of the approach is that it would provide support for activities that foster economic development and innovation (that may not proceed otherwise), through focusing on alternative ways of implementing the precautionary principle, while still aiming to minimise or mitigate risks. This could enable the greatest returns to be achieved with acceptable results, costs and risks.

Improvements in the current process

There could also be significant improvements in the current risk management process:

- a wider, more participatory approach to establish "society's accepted" risk level providing more clarity around application of the precautionary principle, increasing transparency and accountability

¹⁸ Peterson (2006) refers to examples of guidelines relating to specific regulatory regimes including: genetically modified organisms (OGTR, 2005), fisheries management (FAO, 1995) and child health (WHO, 2004).

¹⁹ An example that could be useful is provided by the Council of Science and Technology Advisors (2000), Canada.

- increased consistency at both central and local government level with other relevant principles and international commitments (including the WTO Agreement) and across domestic legislation and regulatory regimes
- reduced likelihood of litigation of regulatory measures through the courts
- greater focus on opportunity costs and regulatory priorities helping to ensure a full range of risk management options are considered
- lower cost of gathering information to assess and compare options
- assignation of the burden of proof; this responsibility may change as scientific knowledge evolves
- increased flexibility to re-evaluate decisions as better information becomes available over time.

But there are some limitations.

While there are a number of benefits, the approach has some limitations. The proposed guidelines (based on the Canadian approach) have no legal standing. Successful implementation would therefore depend on support from government agencies, indicating that the benefits would need to be clearly articulated in a relevant way.

Gaining agreement on society's "accepted" level of risk is likely to be challenging.

Interpretation of the precautionary principle is likely to remain open to wide interpretation and debate. The process of obtaining agreement in advance on society's "accepted" level of risk is therefore likely to be challenging, and could potentially be time consuming and costly. However, if successful, this would be a significant step forward.

In contrast, legislating to introduce a risk management regime in the absence of wide participation runs the risk that if it is too stringent, firms may cease some activities and relocate offshore, reducing capability within New Zealand.

Documentation required – can be a slow process in the face of an imminent and irreversible threat.

While applying a more generic risk management framework is consistent with good regulatory practice, considerable effort is required to produce documentation, generally depending on what is quantifiable. This can be a slow process in the face of an imminent and irreversible threat. The precautionary principle can cut through this process, but careful consideration needs to be given to when and how the principle is applied.

While guidelines can assist, it is important that appropriate institutional arrangements are set in place. This would need to address current capability gaps within agencies.

Conclusion

The precautionary principle is very controversial and may impose significant costs on society.

The precautionary principle has been developed as a means of avoiding danger to human health and the environment in situations where there is a high degree of uncertainty and the effects of policy decisions are possibly irreversible. While there has been rapid growth in the adoption of the precautionary principle overseas and in New Zealand, it remains highly

controversial. Variations in how the precautionary principle is interpreted and applied can create problems, including the potential for significant costs to society through stifling economic development and technological innovation. The principle offers little guidance for regulatory policy.

A more generic risk management framework and guidelines could foster economic development and innovation.

Considering the precautionary principle in the context of a more generic risk management framework, with clear guidelines, could provide significant benefits to society. A key benefit of the approach is that it would provide support for activities that foster economic development and innovation (that may not proceed otherwise), through focusing on alternative ways of implementing the precautionary principle, while still aiming to minimise or mitigate risks. This could enable the greatest returns to be achieved with acceptable results, costs and risks.

Currently, in New Zealand, the precautionary principle is not being applied in the context of an integrated risk management framework (unlike in the European Union, the United States and Canada). New Zealand also lacks guidelines on implementation. Clear guidelines could help ensure a more subtle and consistent approach to managing risk and uncertainty.

Canadian guidelines could be relevant to New Zealand.

Draft guidelines developed in Canada could be relevant to New Zealand and would be worth considering from an operational perspective. They avoid the potential pitfalls in other guidelines associated with incorporating the precautionary principle into legislation. In addition, there is more flexibility in allocating the burden of proof, with potential for review as new information comes to light.

Potential for significant benefits through wider participation and greater consistency

The key benefits of applying guidelines such as the draft Canadian guidelines include a wider, participatory approach to establish society's chosen level of protection against risk in different situations. This could be challenging, but could provide greater clarity around application of the precautionary principle, increasing transparency and accountability. Another key benefit would be increased consistency with other relevant principles, international commitments (including the World Trade Organisation Agreement) and across domestic legislation and regulatory regimes. As a result, there could be reduced likelihood of litigation of regulatory measures through the courts.

Some limitations: public participatory processes could be costly and implementation issues need to be explored further.

While there are potentially significant benefits, there are also some limitations. More participatory, public processes are likely to be time consuming and costly. In addition, the guidelines would not be incorporated into New Zealand legislation and successful implementation would depend on support from central and local government. There could be variations in the capability of central and local government agencies to apply a more generic risk management framework and to interpret and use the guidelines in a way appropriate to their circumstances. While this paper has identified some of the institutional features that could be required for effective implementation, this would need to be explored further.

More specificity is required for particular regulatory regimes.

Although guidelines such as the draft Canadian guidelines could usefully be applied at a generic level in New Zealand, more specificity is likely to be required for particular regulatory regimes (eg, hazardous substances and new organisms, genetically modified organisms and the Oceans Strategy).

Modified cost-benefit analysis a useful tool.

Under conditions of uncertainty, cost-benefit analysis remains a useful tool for ensuring that a full range of options is assessed and compared. However, care needs to be taken to avoid simplistic approaches that do not take sufficient account of how society, industry and technology change over time. The literature surveyed indicates that further work may be required to modify conventional cost-benefit analyses to address uncertainties, information gaps and problems associated with large inter-temporal disparities in costs and benefits. It may also be worthwhile investigating other decision-making tools to complement cost-benefit analysis, including options values and consequences tables.

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Appendix One

Checklist for assessing regulatory practice (Ministry of Economic Development, New Zealand)

Quality regulation necessitates quality processes. Good regulatory process requires governments to apply the following six principles²⁰:

- Regulation should be based on a clear case for government action. This should include evaluating and explaining why existing measures are not sufficient to deal with the issue.
- A range of policy options, including self-regulatory and co-regulatory approaches, needs to be assessed within a cost-benefit framework.
- The option that is adopted should be the one that delivers the greatest net benefit to society.
- Effective guidance should be provided to regulators and regulated parties to ensure that the policy intent of the regulation is clear, as well as what is needed to be compliant.
- Mechanisms to monitor and review regulatory frameworks need to be built in to ensure that regulation remains relevant and effective over time.
- There needs to be effective consultation with regulated parties at the policy design and implementation stages.

²⁰ These principles are similar to those noted by the Australian Taskforce on Reducing Regulatory Burdens on Business in their report "*Rethinking Regulation*" (2006), page vi; and those embodied in the "*Generic Policy Development Process*", published by the New Zealand Ministry of Economic Development in 1997.

Appendix Two

Precautionary Principle Project Guidelines

The Precautionary Principle Project was a major international project, which released guidelines following a process of broad consultation with a wide range of parties. They were developed for biodiversity conservation and natural resource management²¹.

- Explicit incorporation of the principle into legislation and policy, and establishment of adequately resourced institutions to carry out research into risk and uncertainty in environmental decision-making.
- Recognition that the principle must be balanced against other relevant principles, such as intergenerational equity, and basic human rights.
- Development of operational measures for specific policy areas that identify concrete actions to be taken in specific contexts but permit flexibility when circumstances change.
- A transparent process of assessment, decision-making and implementation based on broad public participation and the best available information (scientific and non-scientific).
- Assessment of the threats and the environmental, economic and social uncertainties.
- Identification and assessment of options, including various courses of action and inaction and their likely consequences (including any potential risks).
- Allocation of responsibilities for providing information and evidence of threat or safety, usually, but not always, involving a reversal of the burden of proof.
- Clear communication of the precautionary measures being undertaken and their basis.
- Proportionality, taking into account economic and social costs of measures.
- Equity in the distribution of economic and social costs.
- Adaptive management, involving monitoring, research, periodic evaluation and review, and efficient and effective compliance.

²¹ Refer Cooney and Dickson (2005) "*Guidelines for applying the precautionary principle to biodiversity conservation and natural resource management.*" Appendix to Chapter 18, 299-305.