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# The Precautionary Principle in Biodiversity Conservation and Natural Resource Management

## An issues paper for policy-makers, researchers and practitioners

Rosie Cooney

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TRAFFIC ResourceAfrica IUCN The World Conservation Union

# The Precautionary Principle in Biodiversity Conservation and Natural Resource Management

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**The Precautionary Principle Project: Sustainable Development, Natural Resource Management and Biodiversity Conservation**

The Precautionary Principle Project is a partnership of IUCN, Fauna & Flora International, TRAFFIC and ResourceAfrica. Through a broad collaborative process of case studies, regional and international workshops, and engagement with major international policy and decision-making arenas, the project aims to increase understanding of the meaning of the precautionary principle, examine its practical impacts in terms of conservation, livelihoods and development, and develop "best-practice" guidance for its implementation in the context of sustainable development. The project runs until late 2005 and is supported by the European Union, IUCN, and the UK Department for Environment, Food and Rural Affairs.

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**Rosie Cooney**

**IUCN Policy and Global Change Series No. 2**

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# Executive summary

The precautionary principle, or precautionary approach, has emerged over recent decades as a widely and increasingly accepted general principle of environmental policy, law, and management. It is an approach to uncertainty, and provides for action to avoid serious or irreversible environmental harm in advance of scientific certainty of such harm. While an important and intuitively sensible principle, the acceptance of the precautionary principle into law and policy and its implementation in practice have been marked by controversy and confusion.

IUCN – The World Conservation Union has a mandate from its members to assess the meaning and impacts of the precautionary principle in the field of natural resource management (NRM) and biodiversity conservation, and to develop best-practice guidance for its implementation into policy and practice. In an ongoing initiative, IUCN and its partners TRAFFIC, ResourceAfrica and Fauna & Flora International are assessing the meaning, acceptance, implementation and impacts of the precautionary principle, and exploring its consequences in terms both of conservation and of development and poverty reduction.

The objectives of this paper are, first, to examine and discuss issues arising in the translation of the principle into operational measures in the specific field of biodiversity conservation and natural resource management (NRM); and second, to examine and discuss issues of sustainable development, poverty reduction and livelihoods as they relate to the precautionary principle.

The precautionary principle, or precautionary approach, is used in a variety of ways, and a wide range of formulations exists. The core concept of precaution can be viewed as a mechanism to counter a widespread regulatory presumption in favour of allowing development/economic activity to proceed when there is a lack of clear evidence about its impacts. Formulations of the precautionary principle vary from weak to strong, and from those which impose obligations to those which empower decision-makers to take precautionary action. Features common to most of these formulations include the use of language that limits the operation of the principle to circumstances in which there are threats of serious or irreversible harm, consideration of the cost-effectiveness of precautionary actions, and a shift of the burden of proof to demonstrate lack of harm to proponents of activities.

Acceptance of precaution as a governance/management tool is highly inconsistent across biodiversity-related policy sectors, and in general remains contentious. Many countries have incorporated the principle into general environmental, biodiversity or natural resource law and policy. However, at a multilateral level, it is very widely incorporated in biodiversity conservation and fisheries management instruments, but virtually absent from forestry and timber agreements and policy. It appears only a limited form of precaution is provided for under relevant international trade agreements. This poses challenges for coherent environmental policy at both international and national levels.

There are some important features of the biodiversity and natural resources sector which are different from the industrial contexts in which precaution is usually discussed. Uncertainty in NRM and biodiversity conservation is fundamental and persistent, and surrounds not only underlying natural systems but the socio-economic and political context which shapes the impact of conservation and resource decisions. Threats to biodiversity are often posed not by a new, poorly understood technology or process, but by the expansion or intensification of

well-understood activities such as harvesting of wild species or clearing forests. Threats often derive from multiple rather than singular sources, with different courses of action each raising potential risks. The costs or burdens of precautionary measures may fall on poor or subsistence natural resource users and communities, rather than industrial interests. However, there are often close linkages between biodiversity conservation and the long-term interests of those (resource users) whose actions raise threats of harm, and precaution can also support local livelihoods and communities.

Care should be taken in assuming specific management approaches are necessarily precautionary. Precaution is commonly equated with restrictive, "protectionist" conservation approaches, and assumed to be inconsistent with sustainable use. However, determining the precautionary strategy is likely to require assessment of the relative conservation threats and benefits posed by alternative strategies. Such assessments will benefit from taking into account not just scientific knowledge, but traditional and local knowledge, and incorporating understanding of the socio/economic/political contexts which will determine the impact of conservation decisions. The frequent automatic link made in legislation and policy between biological indicators of threat (such as species status) and specific management responses (such as prohibitions on use or trade), often justified on precautionary grounds, should be questioned.

Implementation of precaution involves a political and values-based balancing between the interests of biodiversity/resource conservation, and other countervailing pressures such as economic or livelihood interests. The more extreme or highly prohibitive versions of precaution (the "when in doubt, don't" approach) are problematic for reasons of both pragmatism and equity, although they may be appropriate in specific circumstances. Many versions of precaution incorporate the concept of proportionality between level of risk and measures adopted, and include some form of analysis of the various costs and benefits involved. Different decision-making instruments, arenas and contexts may demonstrate varying levels of risk-averseness, due in part to their different objectives and the varying strength of different interest groups reflected therein. Where the same issue is addressed by different policy or decision-making arenas, this can pose potential conflicts.

Precaution raises significant equity issues in biodiversity conservation and NRM. The livelihood and socio-economic impacts of the principle can be negative, particularly for those dependent on utilization of biological resources to support livelihoods. Highly restrictive or protectionist approaches raise particular problems in this respect. Attention should be paid to which groups bear the burdens of precautionary restrictions, including who bears the burden of proof, and who participates in and influences decision-making.

Precaution can be used by various groups in illegitimate ways, and can be misused to disguise objections to utilization based on, for instance, animal rights concerns.

Key issues and questions for further examination will be developed through the ongoing work of the Precautionary Principle Project.

# Acronyms

| | |
|---|---|
| AEWA | African-Eurasian Waterbird Agreement |
| CBD | Convention on Biological Diversity |
| CCAMLR | Commission for the Conservation of Antarctic Marine Living Resources |
| CITES | Convention on International Trade in Endangered Species of Wild Fauna and Flora |
| CMS | Convention on Migratory Species |
| EIA | Environmental Impact Assessment |
| EU | European Union |
| FAO | Food and Agriculture Organization |
| FSA | Agreement for the Implementation of Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks |
| FSC | Forest Stewardship Council |
| GMO | Genetically Modified Organism |
| HCV | High Conservation Value |
| IUCN | IUCN – The World Conservation Union |
| IWC | International Whaling Commission |
| LMO | Living Modified Organism |
| MAC | Marine Aquarium Council |
| MSY | Maximum Sustainable Yield |
| NASCO | North Atlantic Salmon Conservation Organization |
| NRM | Natural Resource Management |
| RMP | Revised Management Procedure |
| SPS | Sanitary and Phytosanitary Agreement |
| UN | United Nations |
| UNCLOS | United Nations Convention on the Law of the Sea |
| WTO | World Trade Organization |

# I. Introduction

The precautionary principle is variously described as *the* fundamental principle underlying all environmental policy, or as a pointless distraction from the real issues. It is seen as a fundamental tool for sustainable development, a safeguard for future generations, and countering a tendency to overlook scientific uncertainties in an unscientific manner. It is seen as anti-scientific, subject to abuse, inherently Northern, anti-innovation, and anti-sustainable use. It raises issues which are central to current international debates around environment, poverty, sustainable development and biodiversity, including the relationship between biodiversity conservation and sustainable development; conservation for biodiversity *vs* conservation for people; protectionist approaches *vs* sustainable use; and regulatory *vs* incentive-based conservation approaches.

The precautionary principle provides guidance for governance and management in responding to uncertainty. It provides for action to avert risks of serious or irreversible harm to the environment or human health *in the absence* of scientific certainty about that harm. It is now widely and increasingly accepted in sustainable development and environmental policy at multilateral and national levels. The principle represents a formalization of the intuitively attractive idea that delaying action until harm is certain will often mean delaying until it is too late or too costly to avert it. However, the potential for controversy is obvious. Applying precaution will usually involve restrictions on human actions: such restrictions (by definition) cannot be fully justified by unambiguous scientific evidence, yet may impose substantial costs. Precaution has generated an enormous body of literature over the last decade or so from the standpoint of lawyers, environmentalists, economists, and ethicists, but remains obscure, confusing, or undesirable to many.

## The context of this study

This study represents an initial examination of issues surrounding the meaning, acceptance and implementation of the precautionary principle in biodiversity conservation and natural resource management (NRM), in the context of the ongoing initiative "The Precautionary Principle Project: Sustainable Development, Biodiversity Conservation and Natural Resource Management" (www.pprinciple.net). The precautionary principle was brought to the attention of IUCN at the First World Conservation Congress in Montreal in 1996. A Resolution was adopted by the Congress calling for IUCN to examine the precautionary principle, advise on best practice for its use in an environmental context with special reference to IUCN programmes, and to disseminate these recommendations widely, bringing them particularly to the attention of secretariats of international environmental and resource use conventions and agreements.[1] In subsequent years two workshops explored implications of the precautionary principle for natural resource management. The first was convened by Africa Resources Trust (now ResourceAfrica) and the Percy FitzPatrick Institute of African Ornithology in Cape Town in March 1997. It explored these issues particularly from a southern African perspective. In 1999 a second international workshop was convened in Cambridge, UK, by ResourceAfrica,

[1] IUCN World Conservation Congress Resolution 1.45 (1996).

the IUCN Species Programme, the IUCN Environmental Law Centre, TRAFFIC International and the Lauterpacht Research Centre for International Law.

The Precautionary Principle Project is a partnership of IUCN (the Species Programme, Environmental Law Centre, and Regional Office for Southern Africa), TRAFFIC, Fauna & Flora International, and ResourceAfrica. It seeks to build on the findings of these workshops, and help fulfil the Resolution of the First World Conservation Congress, by drawing on the breadth of expertise and experience across IUCN and its partners. Through a broad collaborative process of case studies, regional and international workshops, and engagement with major international policy and decision-making arenas, the project aims to increase understanding of the meaning of the principle, examine its practical impacts in terms of conservation, livelihoods and development, and develop "best-practice" guidance for its implementation in the context of sustainable development. Funding for an inception phase was received from IUCN's Innovation Fund (known as "3I-C"), and the project is currently primarily funded by a grant from the European Union (DG-Development), with the support of the United Kingdom Department for Environment, Food and Rural Affairs.

## Background and objectives

After over a decade of analysis of the meaning, potential, and legal status of the precautionary principle, it is clear that the time has come to focus on its implementation, the translation of the principle into specific operational measures and their practical impacts (Freestone, 1999; Freestone and Hey, 1996a; von Moltke and Weill, 2004). While some analysis of the operative effect of the principle has been undertaken in various fields (eg, Renn *et al.*, 2003; Tickner, 2003a), most has focussed on industrial ("brown") environmental issues such as chemicals regulation and pollution control. The immediate relevance of the precautionary principle in the context of the "green" issues of biodiversity conservation and NRM is clear: biodiversity faces major threats with the potential for huge, but poorly understood, negative impacts. Threats include ongoing large-scale habitat destruction, forest loss and degradation, overexploitation and collapse of biological resources, spread of invasive alien species, climate change, and continued loss of biodiversity. However, very little analysis has focussed on the precautionary principle in this area.

Analysis of and debate on the precautionary principle have to date been dominated by the North and Northern concerns. They have focussed primarily on the interaction between the precautionary principle and industrial economic interests. Very little analysis has examined the principle in the context of sustainable development, and sought to examine its implications for developing countries, for poverty reduction, and for the livelihoods of the poor and marginalized. The precautionary principle is often seen as an integral principle within sustainable development. By safeguarding against serious, and particularly irreversible, harm to the natural resource base that might jeopardise future generations' capacity to provide for their own needs, it is frequently viewed as closely linked to inter-generational equity, and part of the overarching concept or policy of sustainable development, formulated by the 1987 Brundtland Commission as "development which meets the needs of the present without compromising the abilities of future generations to meet their needs"(World Commission on Environment and Development, 1987). However, by virtue of limiting the nature or extent of economic and livelihood activities, the precautionary principle can be seen as in tension with the "right to development", and has

raised various concerns among developing countries, which have been expressed in fora such as the World Trade Organization (WTO) and at the World Summit on Sustainable Development (WSSD). These issues are particularly central when addressing the precautionary principle in the context of biodiversity conservation and NRM, given that the great bulk of biodiversity lies within the developing world.

This paper, therefore, has two linked objectives:

(i) first, to examine and discuss issues arising in the translation of the principle into operational measures in the specific field of biodiversity conservation and natural resource management (NRM); and

(ii) second, to examine and discuss issues of sustainable development, poverty reduction and livelihoods as they relate to the precautionary principle in this sector.

A comprehensive review and analysis of these issues might involve technical analysis of a broad range of specialist disciplines, and assessment of a vast array of international and national legislation, policies and decisions. This is beyond the scope of this paper. This analysis seeks therefore to be illustrative rather than comprehensive, highlight major issues of broad relevance, draw preliminary conclusions where possible, and highlight areas of ambiguity for further examination.

## Structure

This paper first addresses the meaning of precaution. It discusses the core concept and its various formulations (section 2). The development of the principle in international law and policy is sketched out, and its acceptance by an array of biodiversity and resource-related governance and management instruments at international, regional and national level is analysed in more depth (section 3). The next section addresses the implementation of precaution (section 4). Specific features of biodiversity and natural resources that influence the implementation and impacts of precaution are sketched out, as are major prevailing approaches to uncertainty and their relationship to the precautionary principle. This leads to an examination of a range of issues and challenges in implementing the principle, raising questions for both biodiversity conservation and for livelihoods, poverty reduction and sustainable development. The final section (section 5) sets out preliminary conclusions and an outline of the way ahead for the development of best-practice guidance for the implementation of the precautionary principle in biodiversity conservation and natural resource management.

# 2. The meaning of the precautionary principle

## The core concept of precaution

What is the precautionary principle? Understanding the meaning of the precautionary principle requires understanding the context and rationale for its origin. In many societies, jurisdictions, and contexts, there has long been a *general presumption in favour of development*. The term "development" here is used broadly, to refer to all human economic activities modifying the environment, rather than to a more specific use such as improvement of standards of living in developing countries. Under this presumption, where there is uncertainty or ignorance regarding the impacts of an activity such as release of pollutants, fishing, building, or mining, the "default state" is that activities can go ahead. Uncertainty around environmental impact is used as a rationale for *not* banning toxic chemicals, not reducing fisheries harvest levels, or not refusing mining applications. Environmental objections against them will require clear scientific evidence that they lead to environmental harm.

However, in recent years, faced with the increasing scale of human changes and impacts on the human environment, and with growing awareness of its complexity, it has become increasingly clear that science, and human knowledge generally, cannot provide definitive evidence of all forms of harm in advance. Such evidence may be intrinsically unattainable, or come too late to prevent serious and irreversible environmental damage. How then should decision-makers act in the face of uncertainty, while seeking to balance divergent aims and objectives? Precaution has emerged as a broad principle weighing in favour of environmental protection in the case of uncertainty. The core of the principle can be understood as *countering the presumption in favour of development*. Where there is uncertainty concerning the impacts of an activity, rather than assuming human economic activities will proceed until and unless there is clear evidence that they are harmful, the precautionary principle supports action to anticipate and avert environmental harm in advance of, or without, a clear demonstration that such action is necessary. Precaution shifts the balance in decision-making toward "prudent foresight", in favour of monitoring, preventing or mitigating uncertain potential threats. This is a broad notion susceptible of supporting a very wide range of operational measures, and as discussed below, most formulations contain texts which further specify or limit its consequences.

## The content of the precautionary principle

It is important from the outset to recognise the character of a principle. The traditional concept of a legal principle is that it provides an argument in a particular direction, but does not determine a specific outcome (cf. a "rule": see Dworkin, 1976). Principles provide flexible and context-specific guidance: they may be of variable importance in different contexts, can be in conflict with other principles, and they allow discretion for decision-makers to balance them and be guided by those they find to be most important. Unless a specific formulation requires it, therefore, the precautionary principle will not determine a specific outcome or decision, and in particular will not necessitate one particular decision that would guarantee total protection

(Nollkaemper, 1996, pp.80–1). Based on this understanding the terms "precautionary principle" and "precautionary approach" are used interchangeably in this paper (see Box 1).

**Box 1. Precautionary principle or precautionary approach?**

There has been much debate over whether the terminology "precautionary principle" or "precautionary approach" should be adopted. There are two related but distinct debates. One is about the content of the legal guidance, the second is about the legal status of the guidance.

First, "the precautionary approach" has been argued as favourable terminology because "the precautionary principle" appears to mandate that risk be avoided or minimized, thereby automatically giving the environment the benefit of the doubt; while "the precautionary approach" implies that it allows flexible operational measures which are context-sensitive and allow for the balancing of various objectives, including economic ones. For instance, in fisheries, the term "precautionary principle" is often viewed as a hard-line approach requiring complete prohibitions, so "precautionary approach" has been favoured (Mace and Gabriel, 1999). What is not in question in this debate is the acceptance of the concept as guidance to be applied (in specified contexts). However, given the traditional legal understanding of a principle (see text), this distinction does not appear a useful one.

Second, some have argued against the recognition of precaution as a "principle" of environmental law, which implies a broad obligation to apply precaution in decision-making, in favour of viewing precaution as merely one particular policy/management "approach" to dealing with uncertain risks, which may be chosen over alternative approaches according to circumstance. While it is undisputed that in specific contexts there are clear legal requirements or guidance in favour of precaution, this debate relates to an extensive (unresolved) question about whether precaution has become part of customary international law (e.g., Cameron and Abouchar, 1996). Contention may also be prompted by the difficulty of some regulatory systems, such as that of the USA, in accommodating broad, generally applicable principles which allow wide discretion in decision-making (von Moltke, pers. comm.).

What is the general content of the precautionary principle? The core concept outlined above has been given expression in many different formulations of the precautionary principle in policy, legal, advocacy and analytical instruments and documents. Some are "weak" and some are "strong", some demand or exhort action while some enable or authorize, some involve a very broad scope of operation for precaution while some limit it to specified conditions. At the very minimum, the precautionary principle will require that scientific certainty of environmental harm is not required as a prerequisite for taking action to avert it. Where the principle is given its fullest effect, however, it may lead to prohibition of activities which pose any environmental threat, and require proponents of any proposed activity to demonstrate that it is safe. Much debate around the precautionary principle is confused by the fact that antagonists have very differing conceptions of the principle in mind, involving one of these extremes or any point on a continuum between them.

General formulations of the principle provide further guidance and illustrate these variations. Probably the most widely cited version of a generally applicable principle of precautionary action in the environmental context is Principle 15 of the Rio Declaration on Environment and Development (1992). This states:

> "In order to protect the environment the Precautionary Approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."

Points to note include:

- *threats:* precaution becomes relevant where there are threats of harm to the environment (or human health). There is little guidance in this formulation as to what level of evidence or suggestion or indication of a threat is required. Some formulations provide more guidance, including, for instance the introduction of criteria of "reasonableness" or "reasonable grounds for concern".[2] Sometimes science-based risk assessments are viewed as an essential first step for applying precaution (see e.g., European Commission, 2000).
- *serious or irreversible damage:* the threatened damage should be "serious or irreversible" – in this version threats of only minor or trivial damage do not raise the relevance of precaution.
- *lack of full scientific certainty not a reason for postponing:* while scientific uncertainty should not be used as a rationale for delaying protective action, under this formulation it is important to note that protective measures could be postponed for other reasons such as economic cost or poverty reduction priorities.
- *cost-effective measures:* the measures applied should be cost-effective. This implies some assessment of the costs and benefits of proposed measures, and some sort of proportionality between the costs of the measure adopted and the benefits to be gained.
- *applied by States according to their capabilities:* in this international (soft) law formulation the capabilities of States, presumably encompassing economic, governance, and technical capabilities, moderates the requirement to apply the precautionary approach.

This version of the principle of precautionary action is relatively "weak": it is limited to serious/irreversible damage, there is no call for protective measures, just a requirement that lack of scientific certainty not be used as a reason to delay them, and obligations are moderated by cost-effectiveness and the differing capabilities of States.

This can be contrasted with a relatively "strong" version, perhaps more typical of the way in which the precautionary principle is used in environmental advocacy. The Wingspread Statement on the precautionary principle was formulated in the late 1990s by a meeting in the USA of scientists, government officials, lawyers, and labour and environmental activists. While not the result of public or multilateral discussion or negotiation, it has been influential in

[2] See e.g., Convention for the Protection for the Environment of the North-East Atlantic, 1992 (OSPAR Convention), Article 2(2)(a); and Scottish Natural Heritage (2001).

the broader debate on precaution and provides a useful counterpoint. It includes the following definition:

> "When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically. In this context the proponent of an activity, rather than the public, should bear the burden of proof"(Raffensperger and Tickner, 1999).

In this version, precaution is relevant to harm in general, not limited to "serious and irreversible" harm, and a positive duty to take precautionary measures is envisaged.

Characteristic is the:

- *shift of the burden of proof:* this is one of the most important ways in which the precautionary principle is given operational effect. Proponents of potentially harmful activities may be required to demonstrate that such activities are safe or acceptable, rather than those opposing the activities being required to argue that they are harmful.

One effect of the incorporation of precaution into environmental decision-making and management is to force attention to scientific uncertainties. This makes explicit that in these circumstances, decision-making can be informed by science, but cannot be determined purely by it. Decisions will need to be based on judgements, influenced by values and perceptions, about acceptable risks, costs, and benefits. Precaution is therefore often linked to a shift towards more inclusive, participatory and democratic forms of environmental governance (see generally O'Riordan, Cameron and Jordan, 2001; Tickner, 2003b). Precaution can operate to lift decisions on environmental risk out of the purely technical realm and open the space for participation of stakeholders in deliberation and decision-making on such questions as risk identification and assessment, assessment of alternative courses of action, and choice of risk management strategy. In this respect the Wingspread Statement goes on to say "the process of applying the precautionary principle must be open, informed and democratic and must include potentially affected parties. It must also involve an examination of the full range of alternatives, including no action."

## Precaution, prevention, and polluter-pays

The precautionary principle must be distinguished from another well-established principle of environmental law, the principle of preventive action (see e.g., De Sadeleer, 2003). Risk involves negative outcomes that may or may not occur. Sometimes, usually based on a quantitative assessment of past occurrences, it is possible to reliably identify possible outcomes and assign to each a likelihood of occurrence. This is "classic" risk: the system, the possible outcomes and their likelihood are well understood, and the principle of prevention rather than the principle of precaution is relevant. This can be contrasted with the situation where there is uncertainty surrounding possible outcomes and their likelihood of occurrence. There is no clear rational basis for assigning probabilities to identified outcomes. Here precaution is the relevant principle. Prevention therefore is about preventing *known* risks, precaution is about preventing *unknown* risks.

The precautionary principle can be viewed as related to and evolving from the principle of prevention and a further well-established principle, the polluter-pays principle (see De

Sadeleer, 2003; Dzidzornu, 1998). All these principles have as their aim environmental protection, and they can be seen as reflecting a progression in the law in the time at which it addresses environmental harm: from reactive law, addressing harms that have already happened (polluter-pays); to addressing known risks before harm occurs (prevention); to anticipating and averting unknown, uncertain threats (precaution).

## Precaution and science

While precaution provides a policy approach to scientific uncertainty, science nevertheless frequently plays a very large role. Many versions or discussions of implementation of the precautionary principle emphasise the importance of initial scientific assessment of risks as a basis for decision-making (see e.g., Boisson de Chazournes, 2002; European Commission, 2000; Gehring and Segger, 2002; Scottish Natural Heritage, 2001). Many formulations of precaution or guidance for its implementation involve language that describes what level of indication of threat is required before precautionary action is justified, and this may often rely on scientific assessment.

However, the precautionary principle is often contrasted with a "sound science" based approach to risk regulation, in which environmental protection measures require clear scientific evidence of environmental risk, rather than precaution in the face of uncertain or hypothetical risks. Some argue that without clear scientific evidence of risk, regulation may reflect arbitrary or ill-informed fears or misconceptions, or illegitimate motivations such as trade protectionism. On the other hand, some argue that precautionary regulation is entirely consistent with respect for sound science. This group emphasises that scientific knowledge of the risks of many new technologies or environmental interventions is fragmentary, that the statistical power of tests for negative impacts must be borne in mind when evidence is presented that a technology or intervention does not cause harm (absence of evidence is not evidence of absence), and that the culture of scientific investigation may over-emphasise quantifiable risk factors and under-emphasise uncertainty and ignorance.

Rhetoric aside, the precautionary principle itself, as distinct from its application in any particular circumstance, should probably be viewed as neutral with respect to scientific rigour. For instance, a precautionary regime may require rigorous scientific evidence of low risk before an activity is allowed to proceed, and a non-precautionary regime may require rigorous scientific evidence of risk before prohibiting an activity. Which of these is chosen does not reflect differing valuations of science, but differing value judgements about what objectives should be favoured when science is uncertain.

# 3. Acceptance of the precautionary principle in biodiversity and natural resources law and policy

This broad general principle has had a major impact on environmental law and policy over recent decades. This section starts by providing a general background by sketching out the development of the precautionary principle in environmental law and policy. It goes on to examine the incorporation of the precautionary principle into major biodiversity and natural resource-related law and policy at international, regional and national level, with a focus on biodiversity, fisheries, forestry, invasive alien species, and trade. In some cases specific legal or policy provisions or measures are described as precautionary in the absence of any explicit inclusion or reference to precaution. In this case measures are described as precautionary if they: (a) aim to anticipate, mitigate or avert a potential threat; (b) are not clearly, uncontroversially justified by available scientific knowledge.[3]

## Development of the principle in environmental law and policy

There are several comprehensive analyses available of the "meteoric" rise of the precautionary principle in environmental law and policy (see e.g., De Sadeleer, 2003; Douma, 2003; Freestone, 1999; Freestone and Hey, 1996b; Hohmann, 1994; O'Riordan and Cameron, 1994). The precautionary principle is widely recognised as emerging from the *Vorsorgeprinzip* (directly translated as "fore-caring" or "foresight" principle) of German domestic law (von Moltke, 1988), although it has earlier antecedents in Swedish law (Sands, 2000). The principle emerged in the international arena in the late 1970s in the context of the North Sea ministerial conferences on marine pollution. At the time, the prevailing approach to marine pollution relied on scientific calibration of the assimilative capacity of the marine environment: in the absence of scientific evidence that particular emissions were causing damage, there was no recognised basis for control. The final ministerial statement from the second North Sea conference provides an early formulation of the precautionary approach in this context: "Accepting that, in order to protect the North Sea from possibly damaging effects of the most dangerous substances, a precautionary approach is necessary which may require action to control emissions of such substances even before a causal link has been established by absolutely clear scientific evidence" (Article 7).

From these beginnings, the precautionary principle, or precautionary approach, has been progressively incorporated into a very wide range of hard and soft law instruments at international, regional and national level. At the 1992 Rio de Janeiro United Nations Conference on Environment and Development (the Earth Summit) it was extended to environmental protection in general in the Rio Declaration on Environment and Development, and incorporated

[3] It is important to note that a particular regulatory or management measure cannot be identified as precautionary *prima facie*. A highly restrictive measure, such as a total ban or prohibition, will be preventive if used against a well understood threat, whereas as a milder measure such as monitoring may be precautionary if anticipating an uncertain threat.

into the Convention on Biological Diversity (CBD) and Agenda 21. It is now incorporated, at least in some instruments or contexts, in a wide range of fields including climate change, marine fisheries, food standards, transport of hazardous waste, pollution control, and chemicals regulation, although it remains contentious in many areas. The precautionary principle has been given operative effect in recent agreements, including the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (1998), the Stockholm Convention on Persistent Organic Pollutants (2001), and the Cartagena Protocol on Biosafety (2000). Much of the debate about the precautionary principle has been dominated by disputes over its use within the context of global trade liberalization and World Trade Organization (WTO) disciplines, and these disputes have a major influence over its acceptance elsewhere. While extensive analysis has focussed on whether the precautionary principle has "crystallized" into a principle of customary international law, it may conservatively be said that while it is not unequivocally accepted as having the status of customary international law (eg, Marceau, 2002), it can probably be described as customary international law in some sectors (Gehring and Cordonnier-Segger, 2002).

At national level the precautionary principle has long been accepted in many countries as a legitimate basis for medical and public health interventions, and is increasingly being adopted as a basis for environmental policy. More generally, the precautionary principle continues to provide a strong focus for advocacy in support of environmental protection, public health and sometimes human rights.

# Biodiversity and general environmental law and policy

## Global agreements

Many multilateral environmental agreements related to biodiversity, wildlife or species conservation incorporate references to the precautionary principle in some form, though few involve its elaboration into specific guidance or operational measures.

### *The Convention on Biological Diversity*

The Convention on Biological Diversity (CBD, 1992), the only global agreement for biodiversity generally, contains a version of the precautionary principle in the preambular text, which provides some guidance on how the "serious or irreversible" harm mentioned in the Rio Declaration should be interpreted in the biodiversity context. It states "where there is a threat of *significant reduction or loss* of biological diversity, lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimize such a threat" (emphasis added). The precautionary principle has subsequently been extensively included in decisions and related work on biosafety (see below), marine and coastal biodiversity (eg, Decision II/10, SBSTTA I/8), invasive alien species (see below), the ecosystem approach (Decision V/6),[4] and guidelines on sustainable use (Decision VII/12).

[4] While precaution does not appear in adopted text, the importance of adopting a precautionary approach was consistently highlighted during discussions and preliminary work. See e.g., Report: Liaison Group meeting on Ecosystem Approach, 15–17 September 2000, Paris.

### Cartagena Protocol on Biosafety

The precautionary principle was a key focus of contention in the negotiation of the Cartagena Protocol on Biosafety (2000) to the CBD on the trade of living genetically modified organisms (LMOs). The Protocol reaffirms the precautionary approach, and on this basis seeks to contribute to ensuring that development, handling, transport, use, transfer and release of living modified organisms are undertaken in a manner that prevents or reduces the risks to biological diversity or human health. Key requirements include an Advance Informed Agreement procedure for transboundary movements of LMOs, and risk assessments by importing States. It is reaffirmed in several places that lack of scientific certainty shall not prevent import States from taking action to avert potential risks.

### Invasive alien species

The precautionary principle has become increasingly important in policy efforts to address the introduction, spread and eradication of invasive alien species. The CBD has developed Guiding Principles for the Prevention, Introduction and Mitigation of Impacts of Alien Species that Threaten Ecosystems, Habitats Or Species (Annex, Decision VI/23, see also V/8), although the current status of these remains contested precisely because of controversy over the precautionary approach. The Guidelines highlight the precautionary approach as the first Guiding Principle, understood as meaning that lack of scientific certainty about the environmental, social and economic risk posed by a potentially invasive alien species or by a potential pathway should not be used as a reason for not taking preventative action against the introduction of potentially invasive alien species, and that lack of certainty about the long-term implication of an invasion should not be used as a reason for postponing eradication, containment or control measures.

Both the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention, 1982) and the African-Eurasian Waterbird Agreement (AEWA), developed under the Convention on Migratory Species (CMS, 1979), have developed guidelines on introductions of alien species that incorporate the precautionary approach (see Bern Convention: Standing Committee No 57 (1997) and No 77 (1999); CMS: MOP Resolution 2.3).

### International wildlife trade and CITES

The precautionary principle has been supported in resolutions of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, Washington, 1973), and is an important principle of decision-making and advocacy in this forum. The precautionary principle is incorporated into criteria governing the listing of species in the CITES Appendices (Res. Conf 9.24 (Rev)). Species listed in Appendix I may not be commercially traded, and trade in species included in Appendix II is regulated by a permit system. The precautionary principle has been formulated in an unusual way in this context. When Parties are deciding which species should be placed in the Appendices, in the case of scientific uncertainty it is provided that Parties should act "in the best interests of the species". Further specific "Precautionary measures" restrict the circumstances under which species can be transferred from Appendix I to Appendix II. Overall, therefore, the specific operative effect of the precautionary principle under the terms of the relevant resolution is to weigh in favour of species protection when making listing decisions, and in favour of maintaining Appendix I

species in Appendix I. However, the precautionary principle is commonly used in advocacy and debate within CITES as an argument specifically in favour of increased trade regulation and of trade bans/restrictions (Dickson, 1999). This issue is discussed further below.

CITES provides for Parties to adopt "stricter domestic measures" with respect to trade in wild species (Article XIV(1)), such as additional limitations on the import of particular taxa. Such stricter import restrictions are, for instance, relied on by the USA and the European Union, often as precautionary measures in the light of uncertainty surrounding management of harvest and trade, enforcement, and species status. The US Wild Bird Conservation Act (1992) involves a general prohibition on the import of all wild-caught birds, unless a harvest/trade programme can be demonstrated to meet a range of stringent conservation conditions, a clear example of reversal of the burden of proof. Likewise, the US Endangered Species Act (1973) involves general trade prohibitions on species listed as endangered. These unilateral trade measures tend to be controversial, as range States are not necessarily consulted in decision-making processes, and these decisions may involve substantial economic and livelihood costs.

The provisions of CITES are implemented through measures taken at the national level, including the formulation of "non-detriment" findings (see Articles III and IV) to allow trade in Appendix II and, under special circumstances, Appendix I species, the establishment of export quotas, and a choice of harvest or management strategies. These decisions are frequently made in conditions of substantial uncertainty and the precautionary principle may be given operational effect by national management authorities.

### *Other global biodiversity agreements*

Other major global biodiversity treaties include the Ramsar Convention on Wetlands (1971) and the CMS. While neither of these incorporates the precautionary principle in the text of the convention – they were negotiated before the emergence of the precautionary principle – both have recognised and accepted the notion of precaution in subsequent decisions, including the Ramsar Guidelines on Management Planning for Wetlands (Resolution VIII.14 Chapter VI) and the resolution on Allocation and Management of Water (Resolution VIII.1 Article 10.1), and the CMS resolution on Wind Turbines and Migratory Species (Resolution 7.5). A range of species-based agreements concluded under the CMS has incorporated the precautionary principle – these are discussed further below.

## Regional agreements

Most parts of the globe are covered by regional biodiversity-related agreements, and several incorporate statements of the precautionary principle. The recently amended African Convention on the Conservation of Nature and Natural Resources (2003) incorporates a strong statement of the precautionary principle as part of its fundamental obligation (Article IV). The Protocol on Environmental Protection to the Antarctic Treaty (1991) does not explicitly incorporate the precautionary principle, but does explicitly address the issue of uncertainty and contains detailed requirements to foresee, assess, minimize and monitor potential environmental harm. However, most other regional conservation framework agreements, such as those covering Southeast Asia, the Western Hemisphere, Central America, the Wider Caribbean, the

South Pacific, the Amazon, and East Africa do not incorporate the precautionary principle.[5] In general these were negotiated before the precautionary principle had emerged as a recognised environmental principle.

### *European Union*

The wide acceptance of the precautionary principle as a general environmental policy principle within the European Union (EU) has been highly influential, and driven much of the recent debate about the principle. The Maastricht Treaty of European Union (1992) states that "Community policy on the environment must aim at a high level of protection and be based on the precautionary principle, as well as on the principle that preventive action should be taken, that environmental damage should be rectified at source and that the polluter should pay." In the WTO Beef Hormone dispute with the USA (see WTO, 1998a), the EU's reliance on the precautionary principle as a basis for import restrictions to guard against uncertain health threats of hormone-treated beef gave impetus to the international debate and contention on precaution. Recently, the precautionary principle has been the focus of attention in the EU's development of a new, more precautionary, chemicals regulatory framework (REACH) (see e.g., EU, 2003), and is currently again at issue in an ongoing trade dispute over an alleged EU *de facto* moratorium on the import of genetically modified crops (see e.g., Bridges, 2004a). In 2000 the European Commission published a Communication on the Precautionary Principle, subsequently adopted by the European Parliament, which provides important guidelines for translation of the general principle into operational measures (European Commission, 2000). This Communication sets out that implementation of the precautionary principle should be guided by the principles of proportionality, non-discrimination, consistency, examination of the costs and benefits of action and inaction, and examination of scientific developments.

The 1992 EC Directive on the Conservation of Natural Habitats and of Wild Flora and Fauna (Directive 92/43, the Habitats Directive) states that in the case of a project likely to have a significant effect on a protected site "competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned…". This represents a clear reversal of the presumption in favour of development, and the burden of generating and providing the information to demonstrate that the site will not be affected will lie on the proponent.

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[5] See Asean Agreement on the Conservation of Nature and Natural Resources (Kuala Lumpur 1985); Convention on Nature Protection and Wild Life Preservation in the Western Hemisphere (Washington 1940); Convention for the Conservation of the Biodiversity and Protection of Wilderness Areas in Central America (Managua 1992); Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (the Cartagena Convention, Cartagena de Indias 1983); Convention on Conservation of Nature in the South Pacific (Apia 1976); Convention For The Protection Of The Natural Resources And Environment Of The South Pacific Region (Noumea 1986); Treaty for Amazonian Cooperation (Brasilia 1978); Protocol Concerning Protected Areas and Wild Fauna and Flora in the Eastern African Region (Nairobi 1985).

## Species and taxon-level agreements

Agreements negotiated before the 1990s generally do not incorporate the precautionary principle. These include the Agreement on the Conservation of Polar Bears (1973) and the Convention for the Conservation of Antarctic Seals (1972).

However, a number of agreements related to marine mammals incorporate or have accepted a precautionary approach. The Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS, 1991), concluded under the CMS, has incorporated precaution in relation to various issues despite a lack of explicit incorporation in the original treaty (MOP 3 Resolution 3). A later CMS agreement on Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic Area (ACCOBAMS, 1996) explicitly incorporates the precautionary principle (Article II.4), and this has been reinforced in subsequent Resolutions (Resolution 1.12). The original CMS Agreement on the Conservation of Seals in the Wadden Sea (1990) does not include the precautionary principle, however, its implementation now includes a series of subsequently established guiding principles, including precaution.[6] The Agreement on Cooperation in Research, Conservation and Management of Marine Mammals in the North Atlantic (NAMMCO, 1992) does not contain the precautionary principle. More recently, the precautionary principle has been incorporated into the Agreement on the International Dolphins Conservation Programme (1998; Article IV), negotiated to minimize dolphin deaths in the Eastern Pacific yellowfin tuna fishery. The International Convention for the Regulation of Whaling (ICRW), and its associated International Whaling Commission (IWC), were originally established as fisheries management agreements, and are discussed below under fisheries.

The precautionary principle is not widely explicitly adopted in agreements related to sea turtles, despite the fact that several of these have recently been concluded. Precaution is not explicitly incorporated into the Inter-American Convention for the Protection and Conservation of Sea Turtles (1996); the Cooperative Agreement for the Conservation of Sea Turtles of the Caribbean Coast of Costa Rica, Nicaragua and Panama (1998); or the two relevant CMS agreements on marine turtles of the Atlantic coast of Africa (1999) and of the Indian Ocean and Southeast Asia (2001).[7] Likewise the SPAW Protocol (Specially Protected Areas and Wildlife of the Wider Caribbean Region) to the Cartagena Convention, a broader agreement but with considerable relevance to turtle conservation, does not explicitly incorporate precaution. However, several of these agreements ban all consumptive use of turtles, a measure which is presumably based on the precautionary principle, given the notorious uncertainty surrounding sea turtle population dynamics.

A range of other species or taxon-specific agreements have been developed under the CMS. Of these the African-Eurasian Waterbird Agreement (1995) incorporates the precautionary principle among its fundamental principles, and precaution also appears in the Memorandum of Understanding on the Conservation and Management of the Middle-European Population of

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6 Ministerial Declaration of the 6th Trilateral Governmental Conference on the Protection of the Wadden Sea (1991).

7 Memorandum of Understanding concerning Conservation Measures for Marine Turtles of the Atlantic Coast of Africa (1999); Memorandum of Understanding on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and South-East Asia (2001).

the Great Bustard (2000), and the Agreement on the Conservation of Albatrosses and Petrels (2001).

## Incorporation at the national level

At the national level, the precautionary principle is, naturally, not evident in biodiversity and wildlife law adopted prior to the Rio Earth Summit and its incorporation into the Rio Declaration and the Convention on Biological Diversity. So, for instance, the major wildlife laws of Kenya and Brazil, enacted in the 1960s and 1970s, do not explicitly incorporate the precautionary principle,[8] although they may be viewed as incorporating precautionary elements. However, a range of both developing and developed countries has incorporated the precautionary principle into more recent legislation, and this is particularly evident where countries have recently enacted comprehensive biodiversity legislation.

### *Examples from Latin America*

Several countries in this region have recently adopted biodiversity legislation that incorporates the precautionary principle. For instance, in Ecuador it is incorporated in law on the conservation and sustainable development of the Galapagos Islands, and on invasive alien species, and in forthcoming law on biodiversity and sustainable use.[9] Relevant biodiversity law also incorporates precautionary measures, including a "reverse listing" procedure for import and export of wild species, requiring permits for all such trade.[10] In Argentina, precaution is incorporated as a principle to guide the application and interpretation of general environmental law.[11] In Peru, the recently developed National Strategy for Biological Diversity (2001) and regulations implementing the Forest and Wildlife Law (2001) include the precautionary principle as a guiding principle (Article 1(i)). In Costa Rica, the precautionary principle is incorporated into the 1998 biodiversity law (Ley de Biodiversidad, Article 11(2)) and has been relied on by the Constitutional Court in an important case concerning sea turtle conservation.[12]

### *Examples from Asia*

The Pakistan Supreme Court has recognised and upheld the precautionary principle,[13] viewing it as an integral component of sustainable development. Likewise in India, the Supreme Court has held that the precautionary principle is a norm of customary international law and of national law.[14] India's general wildlife law, the Wild Life (Protection) Act (1972), does not

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8 Brazil Lei 5.197 (1967); Kenya Wildlife (Conservation and Management) Act (1976).

9 See Legislación Ambiental Secundaria. Libro IV: Biodiversidad (2003) Art. 20, 21, 29; Ley Especial para la Provincia de Galápagos (2002); Ley Para La Conservación Y Uso Sustentable De La Biodiversidad (in Congress for approval).

10 Legislación Ambiental Secundaria Libro IV: Biodiversidad Art. 20, 29.

11 Ley General Del Ambiente Ley Nacional 25.675 Art. 4.

12 Res. 01250-99 Sala Constitucional De La Corte Suprema De Justicia, Costa Rica.

13 *Ms. Shehla Zia and others v. Wapda* Supreme Court of Pakistan (1992).

14 *Vellore Citizens Welfare Forum v. Union Of India* (1996); *M.C. Mehta v. Union of India* (1996); *Narmada Bachao Andolan v. Union of India* (1999).

incorporate the precautionary principle. However, it bans all hunting of wildlife, a measure which was presumably precautionary, given uncertainties surrounding the level and conservation impact of hunting. Southeast Asia provides several examples of the relatively recent adoption of environmental or biodiversity laws including a range of guiding principles, but, perhaps surprisingly, not the precautionary principle. Malaysia's National Biodiversity Policy (1998) makes explicit reference to the CBD and other principles, but not the precautionary principle. Lao PDR's Environmental Protection Law (1999) sets out a number of principles, but not precaution. Vietnam does not include the precautionary principle in its general Environment Protection Act (1993) or Biodiversity Action Plan (1995). Finally, Indonesia does not include text on precaution in its 1990 Act on the Conservation of Biological Resources and their Ecosystems or in the more recent Law Concerning Environmental Management (1997).

### *Examples from Africa*

A range of African countries has adopted the precautionary principle in biodiversity related legislation. The 1997 Mozambique environment legislation[15] states that environmental management activities should be undertaken so as to avoid significant or irreversible negative environmental impacts, independently of the existence of scientific certainty concerning the occurrence of these impacts (Article 4). Mozambique's 1999 law on forest and wildlife activities[16] also adopts "prevention and prudence", meaning that **"**the introduction of animal and plant species and of modern technologies into the forest and wildlife sector should be preceded by impact evaluation studies in order to guarantee sustainability." In Cameroon's general environmental law of 1996[17] the precautionary principle is incorporated as a guiding principle for management of the environment and natural resources. South Africa's National Environmental Management Act (1998) provides that sustainable development includes consideration of, *inter alia* "that a risk averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions" (Article 4(a)(vii).

### *Australia*

The precautionary principle is deeply entrenched in environmental policy in Australia. The precautionary principle, as one of the principles of "Ecologically Sustainable Development" was incorporated into the 1992 framework Inter-Governmental Agreement on the Environment, an agreement between Commonwealth and state governments. It is included in the Commonwealth Environment Protection and Biodiversity Conservation Act (1999) and in numerous state environmental statutes, particularly in New South Wales. The precautionary principle has been a key issue in a string of environmental cases in Australia,[18] which have

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[15] Lei No. 20/97.

[16] Lei No. 10/1999.

[17] Loi No. 96–12 portant loi-cadre relative à la gestion de l'environnement (1996).

[18] See *Leatch v National Parks and Wildlife Service* (1993); *Nicholls v Director-General of National Parks and Wildlife* (1994); *Greenpeace Australia Ltd v Redbank Power Co* (1995); *Northcompass v Hornsby Council* (1996); *Friends of Hinchinbrook Society Inc v Minister for Environment* (1997).

highlighted the importance of the principle, even where no specific statutory obligation is involved.

### *United States of America*

Precaution is rarely explicit in domestic US legislation, but precautionary measures are well-entrenched (see e.g., Raustiala, 2002; Wirth, 2002). In wildlife conservation, several regulatory instruments have strong precautionary elements, including the Endangered Species Act (1973), the Marine Mammal Protection Act (1972), and the Wild Bird Conservation Act (1992). In general, these involve the complete prohibition of a class of activities for defined species, or prohibition unless stringent requirements are met.

## Fisheries law and policy

### Uncertainty and "traditional" fisheries management approaches

By way of background to this section, it is important to recognise the approach to uncertainty adopted by "traditional" fisheries management. The aim of traditional fisheries management is to achieve the maximum sustainable yield (MSY). This is the maximum harvest from a stock that can be maintained indefinitely, taking into account the increase in productivity that usually results from a decrease in the stock size. Pursuit of MSY has often been associated with over-fishing, due in large part to lack of adequate recognition of or incorporation of uncertainty (see e.g., Wade, 2001). Retrospective analysis of fish stocks has demonstrated that reality often lies outside model estimates, and targeting modelled MSY can lead to overexploitation and stock collapse (Punt and Smith, 2001). This has been an important factor in the wide incorporation of the precautionary approach in fisheries.

### Multilateral agreements and policy processes

Against this background of "non-precautionary" management and widespread stock overexploitation, the recognition and incorporation of uncertainty, and attendant risks, have been major drivers of the evolution of fisheries policy and regulatory approaches. Recent decades have seen the strong emergence in international, regional and national fisheries law and policy of a "precautionary approach" to fisheries management, and it is probably within the fisheries context that the concept of precautionary resource utilization and management has received the most detailed attention and fullest elaboration to date (for comprehensive analyses see Freestone, 1999; Juda, 2002).

#### *UN Law of the Sea Convention*

The major international agreement regulating conservation and utilization of high seas marine resources is the 1982 United Nations Convention on the Law of the Sea (UNCLOS). UNCLOS contains no explicit mention of precaution and enshrines the concept of MSY, requiring the adoption of measures to "maintain or restore populations of harvested species at levels which can produce the maximum sustainable yield" (Article 119). Measures must be based on the best scientific data available. As to whether this requirement means that conservation measures

aimed at averting potential but scientifically undemonstrated risks cannot be taken, a leading commentator suggests that if adequate scientific data are not available, then the general obligations of the convention remain, and the primary applicable obligation is that of conservation (Freestone, 1999, pp. 159). This arguably provides a basis for subsequent wide acceptance of the precautionary approach.

Despite the absence of reference to precaution in UNCLOS, the precautionary approach may influence judicial decisions pursuant to it. The ruling of the International Tribunal for the Law of the Sea in the Southern Bluefin Tuna cases[19] does not rely expressly on the precautionary approach, but has been interpreted as necessarily implying acceptance of it (eg, Marr, 2000).

### *UN Fish Stocks Agreement*

The 1995 UN Fish Stocks Agreement (FSA)[20] marks a significant shift of emphasis and approach. Environmental considerations are strongly highlighted in the preambular language and given effect throughout the operative provisions. The FSA is the first global fisheries agreement requiring a precautionary approach to fisheries management. A precedent-setting and highly influential development. Article 6 requires that to preserve the marine environment as well as protect marine living resources, the precautionary approach should be applied to conservation, management and exploitation measures. It includes requirements that States apply a prescribed methodology for precautionary measures (set out in Annex II), implement improved techniques for dealing with risk and uncertainty, take into account both ecological and socio-economic uncertainties, and develop research and monitoring programmes and plans aimed at conserving non-target and dependent species (Article 6(3)). Annex II sets out guidelines for precautionary measures based on the establishment of precautionary reference points and actions to be taken where such points are approached and exceeded. Reference to MSY is retained in these Annex II guidelines, but as a "limit" point, constraining harvest, rather than as a "target" for management.

The FSA establishes obligations for signatory States that affect both management within national waters of straddling or highly migratory stocks and management of high seas stocks by international and regional fishing organizations. Its influence, in conjunction with voluntary FAO agreements, has already been clearly demonstrated by the adoption by a range of States and organizations of explicitly precautionary fisheries management methodologies.

### *FAO Code of Conduct for Responsible Fisheries and the FAO Technical Guidelines on the Precautionary Approach*

The voluntary United Nations Food and Agriculture Organization (FAO) Code of Conduct for Responsible Fisheries, also concluded in 1995, includes an exhortation to apply the precautionary approach widely in the conservation, management and utilization of living aquatic resources, directed at States, sub-regional and regional fisheries management organizations

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[19] *Southern Bluefin Tuna cases* (New Zealand v. Japan, Australia v. Japan), International Tribunal for the Law of the Sea, Order of 27 August 1999, Order on Provisional Measures of 27 August 1999.

[20] Agreement for the Implementation of Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (1995).

and arrangements (see Article 6.5 and 7.5). While the Code of Conduct is voluntary, there is evidence that it is and will continue to be highly influential in shaping fisheries management (see e.g., FAO, 2001a).

Detailed technical guidance for implementation of the precautionary approach has been developed by the FAO (FAO, 1995). These guidelines represent one of the most detailed treatments of the operational meaning of precaution in a natural resource management or conservation arena, and offer valuable lessons for other sectors. The FAO guidance first characterizes the general concept of the precautionary approach, setting out that the precautionary approach requires, *inter alia:* avoidance of irreversible changes; prior identification of undesirable outcomes; initiation of corrective measures without delay; priority given to conserving the productive capacity of the resource; harvesting and processing capacity commensurate with estimated sustainable levels of the resource; that all fishing activities have prior management authorization and are subject to periodic review; legal and institutional frameworks for fishery management, with management plans implementing the above for each fishery; and appropriate placement of the burden of proof through meeting these requirements (para. 6(a)-(h)). Detailed guidance is then developed for the implementation of the precautionary approach in relation to fisheries management, research, technology development/ transfer, and species introductions, including, e.g., management planning and design, monitoring, stock assessment methods, review and evaluation of new technologies, and cooperation and information systems on invasive species.

It is not clear that this broad and far-reaching understanding of the precautionary approach is widely reflected in legal and policy developments. Within the Fish Stocks Agreement, guidance on the precautionary approach focuses on target and limit biological reference points, rather than including the more "systemic" changes set out in the FAO guidance. It has been argued that this narrow understanding of the precautionary approach characterizes current efforts in this area, at the expense of the broader management implications (Mace and Gabriel, 1999).

The FAO continues to actively develop the precautionary approach, developing guidance across a range of fisheries (eg, Caddy and Mahon, 1995; Caddy, 1998; FAO, 2001b). More recently, the precautionary approach has been endorsed by and incorporated into ongoing work under FAO auspices on developing guidance for the ecosystem approach to fisheries (eg, FAO, 2003).

### *CCAMLR*

Of the regional fisheries organizations and arrangements, the Commission on the Conservation of Antarctic Marine Living Resources (CCAMLR, 1980) is often viewed as being among the most precautionary (Mace and Gabriel, 1999). While precaution is not explicitly adopted in the treaty, since at least the early 1990s it has been understood that in the case of uncertainty, CCAMLR Conservation Measures should be consistent with a precautionary approach (CCAMLR, 1993), although in practice this is often subject to dispute (TAP, 2001). CCAMLR adopts an ecosystem-level approach to conservation and management, widely understood as necessitating or at least being consistent with a precautionary approach.

### *NASCO*

The North Atlantic Salmon Conservation Organisation (NASCO) provides an early and leading example of the impact of the FSA in influencing precautionary fisheries management through regional agreements. In 1998 parties agreed to adopt a precautionary approach to salmon conservation and management,[21] and NASCO has developed detailed guidelines for its application.

### *International Whaling Commission*

The precautionary principle has been prominent in discussion and advocacy within the International Whaling Commission (IWC), established under the International Convention for the Regulation of Whaling (1946). A moratorium (referred to as a "pause" – indicating that it would be of short duration) on all commercial whale harvesting was instituted in 1982 (taking effect in 1985/6) pending the development of an appropriate procedure for the sustainable management of relevant stocks. In 1994, Parties agreed on the Revised Management Procedure (RMP) to govern the level of any resumed harvesting, but have not been able to accept this as a basis for removal of the moratorium. The RMP has been called a "radical framework for risk-averse management of natural resources" (Donovan and Hammond, 2004), and is often cited as a leading example of a highly robust, explicitly precautionary approach to uncertainty in the establishment of fisheries harvest limits (eg, Cook, 1999). On the other hand, however, it should be noted that the IWC has achieved precautionary management, by simply curtailing the action that it is designed to manage. Further relevant measures include the establishment of whale sanctuaries in which commercial harvesting is prohibited, for which precaution has been an explicit rationale (see e.g., Resolution 2002-1).

### *ICES*

The International Council for Exploration of the Sea (ICES), which coordinates research and advises management bodies such as the European Union with respect to North Atlantic fisheries, has since 1999 provided "precautionary" advice for fisheries managers, in line with requirements of the FSA and the Code of Conduct for Responsible Fisheries. Work to develop theoretical and practical understanding of precautionary measures is ongoing within ICES.

### *Other multilateral instruments*

A number of regional agreements that pre-date the adoption of precautionary terminology involve a clear reversal of the burden of proof. The 1952 International Convention for the High Seas Fisheries of the North Pacific Ocean reverses the burden of proof: scientific evidence was required for stocks to be released from "abstention" (fishing ban) (Freestone, 1999). The UN General Assembly Resolution of 1989 prohibiting the use of large scale driftnet fishing bans this activity in the absence of certainty as to its harm, and places the burden of proof on those wishing to lift the ban.[22]

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[21] Agreement on Adoption of a Precautionary Approach CNL (98)46. Adopted at 15th meeting of the Council of NASCO 1998.

[22] UN General Assembly Resolution on Large-scale Pelagic Driftnet Fishing and its Impact on the Living Marine Resources of the World's Oceans and Seas (1989).

More recently, in regional fisheries agreements, the precautionary approach has been adopted by the International Commission for the Conservation of Tunas (ICCAT COMSCRS/ 99/11) and the North Atlantic Fisheries Organization, the International Pacific Halibut Commission (see IPHC 1999 Catch Recommendations), and the precautionary approach forms part of the recently negotiated Convention on the Conservation and Management of Fishery Resources in the South-East Atlantic Ocean (2001). In Europe, the UNEP Mediterranean Action Plan pursuant to the Barcelona Convention on the Protection of the Marine and Coastal Environment of the Mediterranean (1995) stipulates that member States must apply the precautionary principle according to their capacity (Article 4).

### Incorporation at national level

Few States have specific fisheries legislation incorporating broad policy principles, although fisheries may be subject to general biodiversity conservation/natural resource management legislation. However, broad legislation focussing on the marine environment and incorporating the precautionary principle has been developed in various States in recent years. The "need to apply precautionary approaches" is highlighted in the South African Marine Living Resources Act (1998), covering the conservation and sustainable utilization of marine living resources. The precautionary approach is included in the Preamble to Canada's Oceans Act (1996) and in the Australian Fisheries Management Act (1991). New Zealand's Fisheries Act (1996) does not use the terminology of precaution, but adopts a set of "information principles" that set out elements amounting to the precautionary principle.

## Forest law and policy

Sovereignty over forest resources is keenly guarded by States, and there are few multilateral instruments explicitly relating to forests. While it has been argued that precaution should be accepted as a broad principle cutting across disparate sectoral forest laws, and function to "narrow the margin of sovereign discretion over issues of common concern" (Brunnee and Nollkaemper, 1996, pp. 310), reference to precaution in existing international law or policy instruments is extremely rare. Despite the prominence of the precautionary principle at the Earth Summit, it is not reflected in the Statement on forests adopted at that meeting,[23] although it was a highly controversial subject during negotiations (Humphreys, 1996). It is not reflected in the International Tropical Timber Agreement (Yokohama, 1992). Notably, the precautionary approach does not feature in the CBD programme of work on forests (see Decisions IV/7, V/4, VI/9), the Global Strategy for Plant Conservation (Decision VI/9), or the deliberations of the United Nations Forum on Forests, the International Forum on Forests or the International Panel on Forests.

### FSC and High Conservation Value forests

Perhaps the only explicit acceptance of precaution in forest policy is in relation to the designation and management of High Conservation Value (HCV) forests. The HCV concept

[23] Non-Legally Binding Authoritative Statement of Forest Principles for a Global Consensus in the Management, Conservation and Sustainable Development of All Types of Forests (1992).

derives from the "best-practice" standard for forest management of the Forest Stewardship Council (FSC). HCV forests are those exhibiting any of a number of high conservation values, which are determined by science or stakeholder consensus and include not just biodiversity considerations but also cultural and social values. FSC Principle 9 incorporates the precautionary approach with respect to decisions on and management of HCV forests, and more detailed guidance on the implementation of precaution in this context is currently under development. Elaboration of national and sub-national standards for the FSC Principles and Criteria have in some cases incorporated further guidance on the precautionary approach.[24]

### *International trade regulation*

The liberalization and expansion of world trade may pose major threats to biodiversity. Trade is particularly relevant to two potential threats: those posed by trade in genetically modified organisms, and those due to the spread and establishment of invasive alien species. The conformance with WTO disciplines of precautionary trade-restrictive measures to avert threats to biodiversity is a topic of some debate (see e.g., GBF, 2003). In general, the WTO agreements of most relevance to NRM and conservation appear to provide little explicit basis for adoption of a precautionary approach. The "environmental" exceptions to general free trade obligations provided under Article XX of the General Agreement on Tariffs and Trade (1994) do not include text related to scientific uncertainty or the precautionary principle, and it remains unclear how attempts to rely on these provisions invoking the precautionary principle would be treated in dispute resolution.

The Sanitary and Phytosanitary Agreement (SPS, 1994) governs use of trade measures to control disease, contaminants or organisms that may pose risks to human, plant or animal health, and is relevant to the control of risks of both genetically modified organisms (GMOs) and invasive alien species. While it does not incorporate the precautionary principle explicitly, this agreement provides for a circumscribed form of "provisional" action in the case of scientific uncertainty. It appears clear from a number of disputes, however, that the scope of precautionary action under this agreement will be interpreted restrictively (see WTO, 1998a,b; WTO, 1999). Furthermore, the burden of proof is placed on those seeking to defend trade-restrictive measures against potential threats. The International Plant Protection Convention (1997), which regulates measures to control pests of plants, and is relevant to the control of potentially invasive species, does not make explicit reference to precaution, and requires "technical justification" for measures to control such pests. More generally, WTO rules do not provide for assessment or monitoring of the potential negative environmental impacts of trade liberalization. This approach to uncertainty and precaution is in marked contrast to that of many major global environmental policy instruments. As a consequence, the precautionary principle is one of the key loci for potential conflict or disharmony between the WTO and the multilateral environmental regime.

[24] See e.g., Mississippi Alluvial Valley Regional standard, British Columbia Regional standard, online at www.fscoax.org.

# 4. Implementing precaution in biodiversity and natural resource management: issues and challenges

Wide and ever-expanding – if controversial and inconsistent – acceptance of the precautionary principle at the policy level forces attention to its practical implementation. For many decision-makers and practitioners the precautionary principle remains an unfamiliar concept, and attempts towards its systematic implementation are in their infancy. While it seems clear that some form of precaution must be a core element in effective approaches to biodiversity conservation and NRM, implementing the principle requires consideration of a wide range of questions and issues.

## Does acceptance of the principle in law and policy translate into implementation?

An initial question is whether the bare invocation of the precautionary principle in multilateral or domestic law and policy has any substantive impact on practical conservation interventions and outcomes. For instance, it appears that after a decade of precaution being incorporated as a broad obligation in Australian environmental law, it has had little consistent impact on practice (Fisher and Harding, 2001). The formulation and context of the principle may affect whether such obligations are created. For instance, formulations in which the precautionary principle is stated to "inspire" a policy instrument, where decisions makers "may have regard to" the precautionary principle in making a decision, or where the precautionary principle is included only in preambular texts, are likely to have less impact than where applying the precautionary approach is set out as an obligation in the operative text of an instrument. Even where an obligation is created, however, it is unlikely to mandate any specific decision/action being made, as a legal principle does not generally determine the outcome of a decision. In some cases precaution may be seen as imposing a procedural rather than a substantive requirement: it must be shown that attention was paid to the precautionary principle during the decision-making process, rather than that a "precautionary" decision was made. A forest manager, for instance, might need to demonstrate that the precautionary principle was considered during decision-making on incidental "take" of endangered species during a logging operation, rather than being required to demonstrate that the final decision was precautionary with respect to conservation of the species. Such formulations leave ample scope for precautionary considerations to be ignored or overridden. It appears likely that the precautionary principle will often have little systematic impact on practice unless formulated as an obligation, and linked to specified process or outcome standards developed on a sectoral basis, with respect to, for instance, specific species, fisheries, or protected areas.

## What sectoral features shape the implementation of precaution in biodiversity and natural resource management?

The operative measures used to implement precaution, and their impact, will necessarily vary according to environmental sector, depending on the nature and source of risks, the nature and capacities of interest groups, and prevailing management practices and approaches. To a large extent, the precautionary principle has evolved and emerged to deal with specific uncertain risks (marine pollution), against a specific prevailing management paradigm (assimilative capacity), involving a specific set of key interests (industry and the broader public/ environmental good). These features have shaped much of the debate and understanding of the principle. However, in a number of important respects the biodiversity and NRM sectors diverge from this paradigm, with significant consequences.

### The extent and nature of uncertainty

Uncertainty is a prominent feature of conservation and resource management. There are at least two types of uncertainty that can be distinguished (Walker *et al.*, 2003). One (*epistemic* uncertainty) derives from missing, inadequate or incomplete data. It might be linked to lack of investigation, sampling error, or measurement biases. The hallmark of this kind of uncertainty is that it can, at least in principle, be "solved" by more investigation or data. The second (*ontological* or *variability*) uncertainty derives from the intrinsic nature of the system being studied. The characteristics of the system: its complexity, scale, stochasticity, dynamics etc., make understanding or prediction of outcomes impossible or highly unreliable. A good example is weather: while science and technology provide ever greater tools to reduce uncertainty surrounding future weather, the scale, complexity of interacting factors and chaotic dynamics of the system preclude reliable prediction.

Uncertainty in the context of biodiversity and NRM is endemic, and is frequently of the latter type. The dynamics, behaviour, and responses to disturbance, disease, habitat destruction and hunting, extraction or fishing even of single species are usually poorly understood. Ecosystems, particularly the most biodiverse, are composed of myriad interacting species engaged in complex interactions with each other and with abiotic factors such as nutrient, temperature, and hydrological regimes. They exhibit the dynamics of complex systems, characterized by chaotic dynamics, threshold effects, state changes, and inherent stochasticity. Experimentation involving any but the simplest variables is not generally possible. While the degree of epistemic uncertainty encountered in biodiversity and natural resource management can be gauged by the fact that we do not know how many species exist to the nearest ten million (eg, Stork, 1997), this ontological or variability uncertainty is much more intractable. The history of natural resource management is characterized by "surprise" (Ashby, 2003), and ecology is unlikely ever to become a predictive science.

Even where the species or system in question is well understood, however, decision-making and management must grapple with uncertainties in the economic, political, social and cultural realms. In the scenarios within which the precautionary principle evolved the human behaviour consequent on regulation is, arguably, fairly predictable. Control of emissions generally leads to predictable reductions; a ban on toxic chemical production will usually end production.

However, most biodiversity conservation/NRM scenarios involve a close and complex interaction between natural ecosystems and human social, economic, political and psychological factors. For instance, the impact of a decision whether or not to decrease a fishery harvest quota or ban trade in a wildlife product will depend not just on the biological characteristics of the species or system in question, but on human responses to it. Fishers may exceed quotas or evade gear restriction. Trade in wildlife may not cease, but may follow different routes and become illegal and harder to regulate. Management and decision-making may therefore need to incorporate not just scientific information, but considerations of broad social, economic and political contexts.

To some extent, therefore, this suggests that the boundary between precautionary and preventive action in conservation/NRM is a blurred one. It may be that most conservation and NRM measures can be viewed as reflecting a level of precautionary action. This still leaves ample scope, however, for wide variation, dispute and negotiation over the level of precaution to be applied and the measures chosen for its implementation.

## The nature of threats to biodiversity and living natural resources

There is a substantial difference between the threats addressed by precautionary regulation and management in the biodiversity and natural resources context, as compared to its industrial applications. The precautionary principle emerged to deal with – and its current evolution is largely shaped by addressing – *new* processes or products, usually the result of *technological* development, such as industrial chemicals, hormone-treated livestock, or nanotechnology. In the context of the conservation of biodiversity and living natural resources, risks are indeed sometimes posed by new technologies or processes. This is true of the potential risks to biodiversity posed by genetically modified organisms (GMOs) or emissions, and the risks posed by introductions of alien species or of climate change can be seen as "new" in their present manifestations. But particularly when examining risks of habitat loss and over-exploitation, two of the three greatest worldwide threats to biological resources, there is no unknown new technology, process or substance concerned. Forests are cleared by chainsaw or hand, wetlands are drained or concreted, wildlife is trapped, shot, or snared. There is no particular mystery, particularly concerning causal links, comparable to a new poorly understood technology or chemical. "Harm", and particularly the serious/irreversible harm to which precaution is particularly relevant, typically does not generally result from major, poorly understood discrete activities but from the incremental and poorly understood impact of myriad small and well understood acts. The consequences of this difference are not clear. It is not clear, for instance, how the scientific risk assessment and stakeholder consultation procedures often set out for implementing precaution (see e.g., European Commission, 2000; Scottish Natural Heritage, 2001) can be generalized to these sorts of threats.

## Multiple risks

The typical conceptual paradigm of precautionary decision-making involves an activity (such as releasing a pollutant) that poses clear potential environmental risks that would not exist if the action were not undertaken. Decisions are between "risk" and "caution". However in practice, decision-makers in NRM and conservation are often confronted with a choice of strategies which *each* carry attendant environmental risks – the choice is between risk and risk. If people

are prevented from harvesting coral reef fish for trade, they may dynamite the reef for cement. If harvest of medicinal plants and wild foods from a forest is prohibited, people may resent such restrictions and oppose further conservation efforts. Management of an ecosystem for the benefit of commercially valuable species may yield economic benefits that ensure the habitat is not converted to agriculture, but may lead to alterations detrimental to other species. What does applying the precautionary principle mean in these situations? Risks may arise from different sources and over different time-scales – should the precautionary principle be understood as requiring consideration, and some sort of balancing, of all of them?

## Values and objectives in decision-making

Implementing precaution necessarily involves value judgements, and typically involves trade-offs between competing objectives. In NRM and conservation, an (arguably) particularly broad array of values and objectives poses particular challenges. There is a large diversity even *within* the constituency broadly in favour of environmental protection. Some are concerned primarily with the welfare and rights of individual animals (rarely plants): suffering or death of individuals is to be averted. Some seek to conserve biodiversity as a whole for its intrinsic and aesthetic value: any significant loss of biodiversity represents a harm. Some seek to ensure the continued provision of utilities such as ecosystem services, like freshwater supply or micro-climate regulation: maintenance of the services is crucial, rather than biodiversity *per se*. Some aim to sustain livelihoods, income, or ways of life rather than species or ecosystems: these may tolerate major reductions in stocks or simplification of ecosystems to do so. This is just within the broad "environmental" constituency. In most decision-making contexts, interest groups with no stake in environmental protection will be involved. Implementation of precaution may generally need to carefully address and stipulate the specific objectives of precautionary management and the standards to be aimed for, and find ways to address the interaction of competing interest groups with different values, priorities and objectives.

## The distributional consequences of precaution

The negative distributional consequences of precautionary management and policy in the biodiversity and NRM context may impact on the poor rather than the powerful. To date, in most disputes and most analyses concerning the precautionary principle, proponents of threat-causing activities have been powerful commercial interests standing to profit by such activities, and the precautionary principle has been used to curtail or restrict their actions to protect the public or the environment. The burdens placed by the operation of the precautionary principle – such as restrictions on import, emissions or activities – therefore fell on parties well-equipped to deal with them. In some biodiversity/NRM contexts, such as biosafety, industrial fisheries, large-scale commercial logging, or mining, the dynamics are similar. However, in many situations, adopting a precautionary approach may impose livelihood and economic costs on those with few resources, and exacerbate existing distributional inequities (Dickson, 2003). For instance, a study of a park planning process in Uganda describes the exclusion of communities from park resources on the basis of uncertainty about the impacts on biodiversity (Risby, 2002). People in all countries rely on biological resources for food, traditional medicine, fuel, building materials, ornaments, pets, livelihoods and income, for "ecosystem services" such as clean water and crop pollination, and as elements in culture and spirituality. In economic and livelihood terms, however, less developed countries rely more heavily and directly on the use

and trade of biological resources than more industrialized countries, and within less developed countries the livelihoods of the poor, particularly the rural poor, may be especially dependent (eg, DFID, 2002; Koziell and Saunders, 2001). Precautionary restrictions on access to and use of wild resources may therefore impact most seriously on poor countries and poor people within them, and equity considerations require particular attention.

### Precaution may be aligned with the long-term interests of those whose actions threaten biological resources

In the case of use and management of biological resources, the precautionary principle may not be directly antithetical or opposed to the groups whose actions raise potential threats. It has been pointed out that "[a] major difference…between fisheries and pollution (for which the Principle was created) is that the survival of capture fisheries…is directly dependant on the state of the environment…This is not the case for, say, chemical industries dumping sewage into the coastal areas" (Garcia, 1994, at 110). In areas of industrial application, the groups threatening environmental damage gain no particular benefits from minimizing environmental harm. However, under certain circumstances, those who utilize, manage and trade biological resources such as wildlife, forest products and fisheries will often be those most detrimentally affected by serious or irreversible harm, and these groups have a strong stake in sustainable management. This raises the potential for precaution to be implemented through local and community level resource and wildlife management, and to be conceived not only as an element in "top-down" regulatory strategies. It is unsurprising that traditional and indigenous natural resource management systems, where these have not been lost or eroded, may contain strong precautionary elements (see e.g., Zwane, 2004).

## Through what tools and approaches can precaution be implemented?

Against this general background, implementing precaution in biodiversity conservation and NRM will generally proceed through the use of specific management and policy tools and approaches. While these will necessarily be highly variable and context-specific, this section provides a brief survey of both some specific tools and some general approaches typically linked with precaution.

### Specific policy tools

*Reversal of evidentiary burden.* The precautionary principle is often put into practice by reversing the evidentiary burden (the "burden of proof"), by establishing a presumption that certain activities should not be allowed to proceed without a demonstration that they are not harmful, rather than operating on the presumption that certain activities should be allowed to proceed unless there is evidence that they are harmful. So, for instance, the US Wild Bird Conservation Act disallows commercial import of wild birds unless stringent conservation requirements are satisfied. "Reverse listing", where all of a class of activities or substances are prohibited or regulated unless they can be shown to be "safe" (a "white list") is one means of

implementation. Some countries take a precautionary approach to the control of alien invasive species by prohibiting the import of all species except those assessed in advance as "safe".

*Placing the evidentiary burden on proponents.* The evidentiary burden may then be placed on the proponent of an activity to demonstrate that it will not cause harm. So, for instance, national forest regulations might require an applicant for a forest concession to demonstrate that it would not negatively impact on biodiversity.

*High standard of proof.* Stronger versions of precaution may require there to be unambiguous evidence (rather than e.g., a suggestion, some indication or a reasonable inference) that an activity will not cause harm before allowing it to proceed. For instance, under the Revised Management Procedure developed under the International Whaling Commission, the risk of overexploitation is quantified and can be set at an extremely low level.

*Complete prohibition of particular activities.* Where there are threats of particularly serious or irreversible harm, certain classes of activities judged as particularly dangerous may be entirely prohibited. In many countries any intentional hunting or "take" of endangered species is entirely banned. There is a global moratorium on large-scale driftnet fishing. The South Africa Marine Living Resources Act (1988) prohibits the use of dynamite or poison to catch fish.

*Leaving "margin of error".* A common means of implementing precaution, particularly in the fisheries context, is simply leaving a margin of error when establishing harvest limits.

*Information and monitoring requirements.* One response to the recognition of potential threat or harm is to require monitoring or research to determine the likelihood and/or magnitude of threat. For instance, the Commission for the Conservation of Antarctic Marine Living Resources requires monitoring of the incidence and biological impact of marine debris in Antarctic waters[25]. Forest Stewardship Council (FSC) Principles and Criteria require monitoring to assess *inter alia* environmental impacts of forest management activities (Principle 8).

## Broad management and policy approaches

Precaution in NRM and conservation is often linked to, and/or seen as necessitating, particular broad conceptual or management approaches to conservation and NRM. Here four overlapping and interrelated general approaches are briefly introduced, and their relationship with the precautionary principle discussed. These approaches are not necessarily well-defined, operate at different levels, and may conflict or be complementary.

### *The Ecosystem Approach, or ecosystem-based management*

The species-based approaches characteristic of major national and international efforts for biodiversity conservation throughout the 1970s and 1980s have to some extent been supplanted or at least complemented by management focussing at the ecosystem level. The term "Ecosystem Approach" is used in a variety of ways, but has been defined within the CBD as "a strategy for integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way" (Decision V/6). The ecosystem approach

[25] See CCAMLR's Report to the 18th Antarctic Treaties Contracting Parties (1994).

characteristically incorporates the understanding that ecosystems are dynamic and inherently largely unpredictable, and uncertainty is therefore endemic. Adaptive management is a key management tool within the broader framework of the ecosystem approach.

Generally, it appears that the ecosystem approach will usually involve more risk-averse and precautionary management. It is frequently argued that given prevailing uncertainty regarding ecosystem structure, function, and inter-specific interactions, precaution demands an ecosystem rather than single-species approach to management (eg, Redford and Feinsinger, 2001; Thorne-Miller, 2003). In the forestry context, in fact, the ecosystem approach has been viewed as being perhaps overly reliant on the precautionary principle, as compared with "sustainable forest management" approaches (IUCN, PROFOR and World Bank, 2004). However, an ecosystem approach to management need not imply adopting a precautionary approach to biodiversity conservation threats. For instance, the ecosystem approach has been argued recently to justify culling of top marine predators such as seals and whales to promote fisheries productivity (see e.g., Pickrell, 2004).

### *Adaptive management*

Adaptive management is a management approach that expressly tackles the uncertainty and dynamism of complex systems (see e.g., Holling and Sanderson, 1996; Oglethorpe, 2002; Salafsky *et al.*, 2001; Walters, 1986). While the term is used in various and not always well-defined ways, its hallmark is an emphasis on "learning by doing." Adaptive management involves management actions that are designed as experiments to produce information about the resource being managed. It emphasises making modest, reversible management interventions, careful monitoring of impacts, and continual assessment and refinement of management practice as information increases. Management approaches to biodiversity conservation and NRM increasingly stress adaptive management. They are emphasised in, for instance, fisheries management approaches and advocacy, within the Ecosystem Approach developed within the CBD (see below), in the CBD Guidelines on Sustainable Use (Decision VII/12), and in environmental certification standards such as those of the Forest Stewardship Council (see FSC Principle 7.1, 7.2) and Marine Aquarium Council (see MAC, 2000).

The relationship between the precautionary principle and adaptive management is rather confused. Some (critics) view the precautionary principle as requiring a highly restrictive approach to conservation, involving procrastination and extensive research in the face of uncertainty, leading to delay and associated costs. These groups tend to view adaptive management as an alternative approach, which involves accepting uncertainty as a given and acting pragmatically and without unnecessary delay. This is a reasonably frequent argument in the context of wildlife management. In the commercial fisheries sphere, however, adaptive management is typically seen as consistent with and contributing to a precautionary approach (eg, Ward *et al.*, 2003). This may be because precaution is not understood to require a strongly restrictive or prohibitive approach in this sector, as maintaining a viable fisheries industry has always been accepted as a valid management objective.

### *Environmental impact assessment and risk assessment*

Some regulatory approaches place emphasis on environmental impact assessment (EIA) or risk assessment for potentially hazardous activities/substances, and basing restrictions on the

results. EIA is a well-established tool for identifying potential environmental impacts caused by specific development or policy interventions, and developing procedures for their management and mitigation. While sometimes all threats will be clearly identifiable, their nature understood and their likelihood quantifiable, more often a variety of uncertainties will need to be addressed within the EIA itself and in subsequent management responses. Risk assessment, used within EIA or elsewhere, is a broad term usually used to mean identification and analysis of the nature of risks, their magnitude and the likelihood of their occurrence. Risk assessment techniques often emphasise laboratory-based and quantitative techniques, and may be associated with specific methodologies within various contexts, such as chemicals assessment. Some risk assessment techniques, such as Ecological Risk Assessment are geared, as the name suggests, toward broad ecological risks.[26] However, the use of risk assessment techniques for some of the decisions which most affect biodiversity, such as land-use decisions, is in its early stages (see e.g., Kapustka *et al.*, 2001).

While EIA and risk assessment can inform and facilitate the application of a precautionary approach, it is not clear that they should generally be seen as fulfilling precautionary requirements or as necessarily leading to precautionary management. Conducting an EIA may itself be a precautionary measure, as it may highlight and reduce uncertainties. On the other hand, EIA techniques are not comprehensive and may tend to focus on some types of risks and not others, and may substitute informed scientific guesswork for careful delineation of uncertainties. However, precaution is most relevant after an EIA, when the decision is made as to whether potential risks posed by a development are acceptable. Here there is ample scope for a low or high level of precaution to be exercised.

### *Protectionist approaches: does "precautionary" mean "protectionist"?*

Within biodiversity conservation and natural resource management generally, it is probably true that the precautionary principle is most frequently linked to highly restrictive or "protectionist" conservation strategies. These are understood here as regulatory approaches which favour prohibitions or tight restrictions on the use and trade in wild animals or plants and strict protected areas,[27] in contrast to approaches that emphasise incentive-based conservation, sustainable use of biological resources, and community management (although few would entirely give preference to one at the expense of the other). In particular, precaution is frequently relied on as an argument against extractive use, in which individuals (or parts thereof) are permanently removed from wild populations, such as through hunting or fishing. Within the CITES arena, for instance, precaution is typically invoked to support extending trade restrictions through for e.g., "uplisting" species or limiting imports. This widespread equation of precaution with protectionist strategies in this context deserves careful attention.

There is little question that extractive use can pose a wide range of threats both to target species and to other components of the ecosystem, including overexploitation, spread of disease, social or ecological disruption due to selective harvest of particular life stages, sizes or

[26] For an introduction to Ecological Risk Assessment see e.g., links at www.esd.ornl.gov/programs/ecorisk/links.html.

[27] This is the sense in which "protectionist" is used for the rest of this paper, as distinct from "trade-protectionist".

sexes, and by-catch.[28] Overexploitation remains ranked among the major global threats to biodiversity (UNEP, 2000). However, there are potential conservation benefits, as well as risks, associated with the utilization of wild species (Hutton and Leader-Williams, 2003). Consumptive use may provide economic incentives for communities, private interests or States to conserve and maintain wild lands, outweighing the benefits of conversion to intensive revenue-producing uses such as agriculture and plantations, or it may provide incentives for management of wild species rather than allowing uncontrolled hunting or grazing. Benefits to non-target species can flow from maintenance of lands as wild, control of hunting, and reduction of grazing pressure. Revenue from wildlife utilization and trade, including from direct sales of specimens or of permits and licences, is sometimes responsible for a substantial proportion of the budgets of wildlife departments.[29] There is strong evidence of some of these effects, for example in trophy hunting of African elephants in southern Africa (Child, 1995), crocodilians and the skin trade in Africa and the USA (Hutton and Webb, 2003), habitat conservation and hunting with dogs in the UK (Oldfield *et al.*, 2003), or trophy hunting of Caprinae in Pakistan (Johnson, 1997). Likewise, "sustainable forest management" approaches seek forest conservation through sustainable utilization and trade of forest resources rather than strict protection (although doubts have been expressed about the effectiveness of this strategy for biodiversity conservation (Rice *et al.* 2001)). The Marine Aquarium Council initiative is based on the utilization and trade in marine species providing incentives for good local management and conservation. Conversion and degradation of wild habitats remain the primary threat to biodiversity worldwide, so the importance of these incentives, where they exist, should not be understated.

Restrictions on utilization and trade may undermine these conservation benefits, and have a range of further negative impacts. Trade and use restrictions, particularly when applied in the absence of a clear scientific rationale, can provoke antagonism among disenfranchised resource users toward conservation instruments (see e.g., Lombard and du Plessis, 2003) or the activities of conservation organizations (see e.g., Jepson, Brickle and Chayadin, 2001). Prohibition of use or trade in specific species may lead simply to deflection of demand to other species. Consumptive use, such as trophy hunting, will sometimes be simpler to implement than alternative conservation strategies, and avoid other environmental risks associated with them. Ecotourism, for instance, frequently viewed as a more precautionary conservation strategy than sustainable use, requires substantial institutional capacity and infrastructure development, is vulnerable to a fickle tourist market, and carries attendant environmental risks such as habitat degradation and pollution (see e.g., Roe, Leader-Williams and Clayton, 1997).

Finally, the conservation benefits of strict protectionist strategies often rely on effective State enforcement and management, often unfeasible in developing countries and problematic in the most developed. Without strict and comprehensive enforcement, prohibitions may often not solve the conservation problem, but simply drive it underground and/or make it impossible

[28] For some of the less obvious threats posed by extractive use see e.g., Festa-Bianchet M (2003) or Jachmann, Berry and Imae (1995).

[29] It is important to recognise that most of these potential benefits of utilization flow from the partial alignment between the long-term interests of resource users and conservation. Where those whose activities raise conservation threats do not have a direct stake in resource conservation (such as in the classic precautionary paradigm of industry emissions regulation), "more restrictive" is likely to equate with "more precautionary".

to monitor or manage. For instance, Kenya has a long-standing ban on the consumption and trade of wild meat, a precautionary response to concerns about overexploitation. It has been pointed out that the combination of lack of adequate resources to police such a ban, with a lack of incentives for wildlife management, plus the need of rural people for meat, has led to widespread poaching and rapidly declining wildlife populations (Barnett, 2004). Likewise, State management of protected areas may be highly ineffective where there are neither resources nor political will for effective management, and exclusion of local people may remove the group with the strongest incentive for good management (see e.g., Molnar, Scherr and Khare, 2004).

This complex set of conservation risks and benefits of utilization and trade suggests that the *automatic* equation of precaution with protectionist approaches is flawed. Highly protectionist approaches may "make the best the enemy of the good": by seeking to entirely eliminate risks of exploitation, they may preclude use of the available tools to manage utilization for sustainability. Conversely, of course, it is equally important to note that approaches based on sustainable use and community involvement should not necessarily be viewed as the most precautionary.

## Assessing conservation costs and benefits

Given the multiple risks and benefits often involved in conservation decision-making, it appears clear that determination of the risk-averse strategy will typically require some form of assessment of the potential conservation costs and benefits of alternative strategies.[30] This raises the question of how this is done, and specifically what information is taken into account.

## Traditional and indigenous knowledge, and knowledge of resource users

As discussed earlier (section 2), science often plays an important role in establishing the basis for precautionary decision-making. However, scientists and scientific institutions are not the only repositories of knowledge about ecosystems and biological resources. Traditional and indigenous people managing resources may often have different, and/or better, understanding and information than scientists about the dynamics and responses of utilized systems. There is a strong case to be made for precautionary decision-making to incorporate the understanding and knowledge of traditional, indigenous or local resource users themselves. This insight is reflected in the FAO Technical guidance on the precautionary approach, which emphasises that resource users themselves often have substantial knowledge of fisheries, and a precautionary approach should make use of their experience (FAO, 1995, pp.57).

## Incorporating the broader socio-economic and political context

Management and exploitation of wildlife and natural resources takes place as part of a complex interaction involving people and human institutions, mediated by economic, political and cultural specificities, as pointed out above. However, in practice, the conservation risks facing

[30] The language of risks and benefits, or costs and benefits, is adopted throughout this discussion, but this is not intended to imply that costs and benefits should be limited to the monetary or quantifiable.

species or populations are often defined purely in terms of biological status. Further, a direct link is often made between biological status and specific policy/management responses. Under CITES, listing in Appendix I and prohibition of commercial trade is determined by biological status characteristics, coupled with a finding that the species is in trade. The convention text does not require attention to non-biological threat factors, such as socio-economic factors or management context, or explicitly require consideration of the conservation impacts of the listing. Likewise, in the US Endangered Species Act, import restrictions follow automatically from assessment of biological status.

Such automatic links between biological scientific information and a management response may preclude comprehensive assessment and response to the broad range of conservation threats that face biodiversity. This can be highly problematic. An example is provided by Jepson, Brickle and Chayadin (2001) with respect to the listing of the Tanimbar corella *Cacatua goffini* in Appendix I of CITES. Concern about biological impacts of international trade of the corellas from Indonesia led to successful calls for banning international trade through listing in Appendix I. Listing was based on the precautionary principle, as biological information on species status was inadequate. While trade decreased, the authors highlight a range of longer term and indirect negative conservation consequences of the ban. Prohibition led to the resentment of local people, who perceived the bird as abundant and an agricultural pest, local hostility toward conservation NGOs, and consequent abandonment of plans for a protected area in the region.

Sometimes the more precautionary strategy – that which is more risk-averse in conservation terms – will be obvious. Often, however, it will require careful assessment of different options, and consideration of a wide range of social, economic, and institutional factors, most of which lie well outside the traditional borders of natural science disciplines.

## Costs, benefits, and competing objectives: the balancing act of implementing precaution

Decisions and management on precautionary grounds carry consequences not only for conservation, but for social, economic, development, food security, and livelihood interests. Implementing precaution will usually need to respond to and balance these frequently competing priorities and objectives.

### Extreme versions: “when in doubt, don’t”

First, however, why should such a balancing be made? Why should the precautionary principle not be understood to require avoidance of any risks, at any cost to other interests? In some circumstances the precautionary principle is indeed equated with its more extreme versions, calling essentially for a “zero risk” approach, in which activities should only be allowed to proceed when they are known to be safe. This approach could be characterized as “when in doubt, don’t.” There are a number of general problems with efforts to advocate or adopt this approach to precaution. First, it is logically impossible to prove a negative: there is no way to conclusively demonstrate that an action or intervention will definitely not cause harm. Second, at a practical level, in biodiversity and NRM, knowledge will always be incomplete, understanding will always be partial, and there will always be room to call for more data before

taking action. This approach can be relied on to block action indefinitely, with all the associated costs. Third, all human activities impact on the natural world – no human activity is free of risk. To call for a "zero risk" version of the precautionary principle in one context begs the question of why this should not be generally applied – an approach which would preclude, for instance, virtually all fishing, timber extraction, agriculture, and technological development, an outcome which few would view as reasonable. For these reasons such a uniformly strict interpretation of the principle will tend to render it meaningless in practice (Nollkaemper, 1991), and discredit the principle itself (Garcia, 1994, pp.118). This leaves open, however, the potential to articulate the principle in this way in specific situations where it is judged that potential damage is particularly serious or irreversible, or the environmental values to be protected particularly precious.

## Proportionality

The concept of proportionality is common to many definitions and understandings of the precautionary principle. Proportionality generally requires an appropriate relationship between the protective measures adopted and the level of security to be achieved (European Commission, 2002). A trivial, hypothetical increase in environmental security should not be pursued by highly restrictive and massively economically expensive measures; protective measures against clearly plausible (if uncertain) catastrophic and irreversible environmental harm should not be delayed due to a moderate economic cost. Proportionality involves a balancing act of threats, benefits, and uncertainties across environmental, economic and social realms. This is not necessarily a well-defined notion, as it involves a judgement which takes into account the uncertainty surrounding threats, the seriousness and possible likelihood of threats, the likely economic, social (and environmental) costs of the protective action, the environmental, economic and social benefits of the action, and the level of security that is desired. Where it is incorporated, proportionality limits the "absolutist" or extreme tendencies of the precautionary principle, limiting these to situations where proportionality requires them.

## Precaution and the objectives of management

The weight given to economic, social, livelihood and environmental factors in applying precaution will depend crucially on the context. One factor may be the stated policy objectives of the decision-making forum. Drawing from international examples, some decision-making contexts emphasise primarily conservation objectives (eg, CITES), some emphasise sustainable use and conservation of biodiversity as a whole (eg, CBD), some emphasise management and conservation of specific resources (many fisheries agreements), some emphasise sustainable development, with its environmental, social and economic aspects (eg, WSSD), some emphasise trade and/or economic growth (eg, WTO). It is not surprising that the precautionary principle, influential within all these arenas, takes on very different forms in each. In general, it appears plausible that the more "purely" conservation oriented a decision-making arena is, the "harder" a version of precaution will be adopted, the less weight competing economic or social objectives will be given, and the less environmental risk will be considered acceptable.

## Precaution and power

In a related point, precautionary decisions are necessarily political, and the relative weight placed on different threats and potential benefits in decision-making will be influenced by the strength of the different interests. Where powerful interests are at stake, the precautionary principle may be strongly resisted and be given little weight in decision-making. In commercial fisheries regulation under the EU Common Fisheries Policy, for instance, major risks to stocks are tolerated due to the political pressure to support the fishing industry (see e.g., Bridges, 2004b). While there is increasing acceptance of the precautionary principle as a component of corporate social and environmental responsibility,[31] there is an ongoing history of vehement corporate opposition to precaution. Against major economic interests, it may be that more stringent versions of precaution will only generally be applied when threats are very obviously serious and irreversible, and even then this may be delayed for decades and result in widespread harm to the environment or public health (see e.g., Harremoes *et al.*, 2002).

## Divergence between sectors

There are therefore inconsistencies in the degree to which precaution is accepted as a legitimate basis for decision-making, and inconsistencies in the level of environmental risk tolerated across different decision-making fora. A major problem is posed by the fact that the subjects and issues regulated by each of these agreements sometimes significantly overlap, meaning that different perceptions and versions of precaution, toward the same problem, are accepted within different fora. For instance, a strong precautionary approach to invasive alien species has been widely discussed and endorsed within the CBD (Decisions VI/23 and V/8). Such an approach is likely to be contentious within the WTO. The approach to sustainable use under the CBD, incorporating the precautionary approach, makes it clear that human needs and benefits are important elements in decision-making (see e.g., Decision VII/12, Annex II, Practical Principle 12). Under CITES, however, precautionary decision-making on utilization and trade in wildlife does not explicitly incorporate reference to socio-economic and livelihood needs (see e.g., CITES, 2004).

# Equity and precaution

Basic equity considerations demand that in implementing precaution, attention should be paid not only to the various costs and benefits, but also to *who* bears costs or gains benefits. For precaution to contribute to, rather than conflict with, sustainable development, the burden of the precautionary principle must be borne by those most able to afford it (Thompson and Kennedy, 1996). This is intimately tied to the question of who is involved and represented in the decision-making process.

[31] The precautionary approach is one of the ten principles of the UN Global Compact: for details see online at www.unglobalcompact.org.

## Precaution, protectionism, livelihoods and development

As discussed above, in the biodiversity context it will often be developing countries, and poor people within developing countries, who bear the costs of precautionary resource use and conservation strategies, including economic and financial loss, loss of income, land or resources, restriction of livelihood options, and opportunity costs. "Top-down", protectionist conservation approaches which prohibit access to or use of biological resources are particularly problematic in this regard (Mohammed-Katerere, 2001), as distinct from precautionary approaches that have been implemented through local level institutions and management. Subsistence and livelihood interests do not wield the same political and negotiating power in national or international decision-making as the commercial interests already mentioned, and weighed against them in conservation decision-making arenas may be Northern NGOs or governments. Where conservation measures affect only politically marginal community interests, little weight may be placed on supporting their interests and livelihoods in value judgements involving what level of risk is tolerable, and particularly stringent or restrictive versions of the precautionary principle may be applied.

## Who bears the burden of proof?

The allocation of the burden of proof carries major consequences for equity and the distribution of costs. For threats to biodiversity posed by new technologies, or large-scale change or expansion of economic activities, proponents will often be economically powerful interests which are appropriately placed to bear the burden of proof. But "proponents" of actions will often be local resource-using communities seeking to meet basic needs, with few technical resources. Should the burden of proof fall on them? A small community faced with a well-funded international NGO arguing for precautionary exclusion of traditional uses will have difficulty providing evidence to the contrary. Similarly, it will be difficult for developing countries with limited technical and scientific capacity to gather scientific evidence to counter precautionary import restrictions on wildlife products, supported by powerful States and NGOs.

In the trade context, under WTO disciplines the burden of proof rests with those attempting to demonstrate environmental harm – in the absence of adequate scientific evidence, trade-restrictive environmental measures are difficult to justify. This may impose substantial burdens on developing countries seeking to protect their biodiversity and natural resources with scarce technical and financial resources. For instance, requirements under the SPS Agreement for extensive scientific assessments to support precautionary action against threats such as invasive alien species may impose major regulatory burdens.

## Who decides?

Implementing precaution necessarily involves value judgements and subjective perceptions of risks, costs and benefits. But whose values, judgements and perceptions count?

Precaution is generally understood as weighing on the side of more participatory, democratic and transparent forms of governance, emphasising broad stakeholder engagement rather than narrow scientific/technical domination of decision-making. This is generally understood

as improving equitable and democratic decision-making, although some doubt the ability of the public or other stakeholders to reach informed judgements in highly technical areas, rather than reflecting propaganda of various advocates, ignorance, or ingrained/irrational fears or preferences.

However, precaution may be a central issue in conflicts between competing environmental priorities or approaches, and can be used by more powerful groups to impose their own agenda or viewpoints on others. In the WTO and at the World Summit on Sustainable Development, for instance, developing countries have opposed the use of the precautionary principle, because it could be used by the North to impose its own environmental agenda on developing countries, which may have both different priorities and different conservation approaches. Advocates for indigenous peoples' rights have argued that precaution is used by government agencies, donors, and NGOs in support of a Western conservation tradition of people and nature as separate, against traditional wildlife use and management (Colchester, 2003).

## Can precaution be "abused"?

A final challenge in implementing precaution is the potential for this open-ended principle to be misused or abused to disguise undeclared motivations. In the international trade context, suspicion has often been expressed that precaution can be abused to further illegitimate trade-protectionist ends (eg, Winestock, 2001). Somewhat analogous concerns may arise with respect to motivations for animal welfare and animal rights, which are not viewed in most conservation decision-making arenas, particularly the international, as legitimate bases for conservation decision-making. Widespread reliance on the precautionary principle by Northern, animal-rights oriented NGOs to oppose consumptive utilization of some animals has led some to view the precautionary principle as merely a rhetorical "tool of convenience" to disguise ideological objections to utilization *per se*, rather than sustainability concerns. This may be particularly true in relation to the "charismatic megafauna", such as elephants and whales. For these species it is not clear that any level of scientific/technical certainty would preclude such an approach. Some view an over-emphasis on possible disasters and "crises" by certain groups as geared more toward fundraising than conservation priorities (eg, Lomborg, 2001). Unfortunately, the potential for such misuses has without doubt contributed to corrosion of the legitimacy of the precautionary principle within certain constituencies.

# 5. Conclusions and current directions

The precautionary principle is now a widespread and increasingly entrenched principle within environmental law and policy. It emphasises anticipation, prevention and mitigation of *uncertain* risks, for which definitive scientific evidence is not available. It counters a widespread presumption in regulatory systems in favour of allowing development/economic activity to proceed where there is uncertainty about its impacts. Uncertainty in NRM and biodiversity conservation is fundamental, and the precautionary principle is of obvious and widespread relevance. This paper has examined questions and issues surrounding the acceptance and implementation of the precautionary principle in the context of biodiversity conservation and natural resource management. It is clear from this analysis that the precautionary principle in this area is both complex and contentious, and its effective and equitable implementation will require careful consideration of a number of issues. Some preliminary conclusions can be drawn.

First, acceptance of precaution as a governance/management tool is highly inconsistent across biodiversity-related policy sectors, and in general remains contentious. A wide range of countries has incorporated the principle into general environmental, biodiversity or natural resource law and policy. However, at multilateral level, it is very widely incorporated in biodiversity conservation and fisheries management instruments, but very rare in forestry and timber agreements and policy. In the trade context the precautionary principle is highly controversial, and it appears only a circumscribed form of precautionary action is provided for under relevant international trade agreements. This poses challenges for coherent environmental policy at both international and national levels.

Second, the bare acceptance of the precautionary principle into biodiversity and natural resource law and policy is likely to have little impact on decision-making or management practice unless it is translated into more specific obligations and operational measures.

Third, the implementation and impacts of precaution will be shaped by the specificities of the biodiversity/NRM context. There are a number of features of this sector which contrast with those industrial sectors where precaution has received most attention. Uncertainty surrounding the functioning and responses of biological systems is fundamental and persistent, and also surrounds the socio-economic and political contexts which shape the impact of conservation and resource decisions. Threats to biodiversity are often posed not by new, poorly understood technologies or processes, but by the expansion or intensification of well-understood activities such as harvesting wild species or clearing forests. Threats often derive from multiple rather than singular sources, with different courses of action each raising potential risks. The cost of precautionary measures may fall on poor or subsistence natural resource users and communities, rather than on industrial interests. However, there are often close linkages between biodiversity conservation and the long-term interests of those (resource users) whose actions raise threats of harm.

Fourth, determining which specific management approaches or tools should be considered precautionary is not straightforward. For instance, environmental impact assessment/risk assessment, ecosystem-based management approaches, and adaptive management all provide tools or approaches for addressing and managing uncertainty, and each is often discussed as

being closely linked to precaution. However, while each can be implemented in a precautionary fashion, they do not necessarily translate to precautionary management.

Fifth, the precautionary principle should not be used to automatically both support protectionist approaches to conservation and oppose sustainable use of wild species. Determining the precautionary strategy will require assessment of the relative conservation risks and benefits posed by alternative strategies.

Sixth, while examination of scientific knowledge is often viewed as an appropriate starting point for precautionary regulation or management, such assessments should also incorporate indigenous, traditional and local resource user knowledge, and examination of the broader socio-economic and political contexts which affect the impact of conservation decisions. The frequent link made in legislation and policy between biological indicators of threat (such as species status) and specific management responses (such as prohibitions on use or trade), often justified on precautionary grounds, should be questioned.

Seventh, implementation of precaution involves a political and values-based balancing between the interests of biodiversity/resource conservation, and other countervailing pressures such as economic or livelihood interests. Different decision-making instruments, arenas or contexts may demonstrate varying levels of risk-averseness, due in part to their different objectives and the varying strength of different interest groups reflected therein. Where the same issue is addressed by different policy or decision-making arenas, this can pose potential conflicts.

Eighth, the more extreme or highly restrictive versions of precaution (the "when in doubt, don't" approach) are problematic for reasons of both pragmatism and equity. Many versions incorporate the concept of proportionality between level of risk and measures adopted, and include some form of analysis of the various costs and benefits involved, including socio-economic.

Ninth, the equity implications of precaution are significant. The livelihood and socio-economic impacts of the implementation of the precautionary principle in biodiversity conservation and NRM can be negative, particularly for those dependent on the utilization of biological resources to support livelihoods. Highly restrictive or protectionist approaches raise particular problems in this respect. Attention should be paid to which groups bear the burdens of precautionary restrictions, including who bears the burden of proof, and who participates and influences decision-making.

Tenth, and finally, precaution can be misused by various groups to disguise motivations which are not generally accepted as valid conservation concerns, such as animal rights-based objections to utilization.

A number of key questions and issues require further examination. It is clear that implementation of the principle requires much greater shared understanding: how can precaution best be translated into practice? What determines the wide variation in acceptance of precaution across different decision-making contexts? How can potential conflicts between different decision-making arenas be resolved? Governance issues are crucial: how can the costs and obligations of precaution be equitably distributed? How can abuse be avoided? How should science and other expertise be best incorporated into the decision-making process?

## Towards best-practice guidance

The Precautionary Principle Project is tackling these and other questions through a broad collaborative process of research, dialogue and policy development. The major aim of this project is to develop best practice guidance for implementing the precautionary principle in biodiversity conservation and natural resource management in an effective and equitable manner. This aim is being pursued through:

(i) Regional workshops in developing country regions, drawing together practitioners, decision-makers and academics to debate and share experience on application of the precautionary principle;

(ii) Development of case studies on implementation of the precautionary principle across different sectors, regions and at different policy levels, to be published in book form in mid-2005;

(iii) Engagement with relevant conventions, including the Convention on Biological Diversity, the Convention on International Trade in Endangered Species of Wild Fauna and Flora, the UN Food and Agriculture Organization and the World Trade Organization;

(iv) A final international review and dissemination workshop.

This best-practice guidance will be of interest and practical relevance to a wide range of biodiversity and natural resource decision-makers, practitioners and policy-makers. It will be available and widely disseminated in the latter half of 2005.

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## IUCN – The World Conservation Union

Founded in 1948, The World Conservation Union brings together States, government agencies and a diverse range of non-governmental organizations in a unique world partnership: over 1000 members in all, spread across some 140 countries.

As a Union, IUCN seeks to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable.

The World Conservation Union builds on the strengths of its members, networks and partners to en-hance their capacity and to support global alliances to safeguard natural resources at local, regional and global levels.

## The Precautionary Principle Project: Sustainable Development, Natural Resource Management and Biodiversity Conservation

The Precautionary Principle Project is a partnership of IUCN, Fauna & Flora International, TRAFFIC and ResourceAfrica. Through a broad collaborative process of case studies, regional and international workshops, and engagement with major international policy and decision-making arenas, the project aims to increase understanding of the meaning of the precautionary principle, examine its practical impacts in terms of conservation, livelihoods and development, and develop "best-practice" guidance for its implementation in the context of sustainable development. The project runs until late 2005 and is supported by the European Union, IUCN, and the UK Department for Environment, Food and Rural Affairs.

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