



**Lund University Master's Programme in
International Environmental Science**

**The Precautionary Principle: Relevance in International Law
and Climate Change**

By

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LIST OF ACRONYMS

AGBM	Ad Hoc Working Group on the Berlin Mandate (1995-1997)
AOSIS	Association of Small Island States
CBD	Convention on Biological Diversity
CITES	Convention on International Trade in Endangered Species
CFCs	Chlorofluorocarbons
CH ₄	Methane
CO ₂	Carbon dioxide
COP	Conference of Parties to the UNFCCC
DDT	Dichlorodiphenyltrichloroethane
<i>ENB</i>	Earth Negotiations Bulletin
EU	European Union
FCCC	Framework Convention on Climate Change
GHG	Greenhouse gas
ICJ	International Court of Justice
INC	Intergovernmental Negotiating Committee for the UNFCCC (1990-95)
IUCN	International Union for the Conservation of Nature and Natural Resources
IWC	International Whaling Commission
MEA	Multilateral Environmental Agreements
OSPAR	Oslo-Paris Convention
SWCC	Second World Climate Change Conference
UN	United Nations
UNCED	United Nations Conference on Environment and Development (Rio de Janeiro, Brazil, 1992)
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNGA	United Nations General Assembly
WCED	World Commission for Environment and Development
WCRP	World Climate Research Programme
WMO	World Meteorological Organization

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Abstract

The precautionary principle is an old concept with a new character. Threats of harm, since the early days of civilization, were confronted by taking some form of precaution. Throughout history, the concept of precaution provided humans with the moral right to avoid potential harm or damage to his health and his environment despite lack of certainty of its occurrence. Today, the precautionary principle is a common legal concept in national and international regulatory policies. In a nutshell, it means that if there is threat or risk of serious or irreversible damage to human health or the environment, precautionary actions must be taken even though there is lack of full certainty surrounding the issue. This paper looks at the concept of precaution in the framework of international law.

The precautionary principle is particularly applied in the current global effort to address climate change. Despite many uncertainties about the science and impacts of the global warming phenomenon, leaders of the global community, adopted the precautionary principle, instead of the traditional reactive wait-and-see approach, in the climate regime. Although criticized by many for its shortcomings and its marginal position in the practical sense, this paper looks at the legal validity of the precautionary principle based on its sources, rather than its merits. In other words, this thesis looks at the concept of precaution and examines it in the lens of the contemporary international legal system. The first part of this thesis endeavours to understand better the precautionary principle under international conventional law. Influenced by systems approach, this paper particularly analyzed the principle's relevance with the climate change issue. Guided by the legal positivist approach, the first part argues that the precautionary principle is a significant doctrine in international conventional law. The thesis also examines the precautionary principle in the context of international customary law.

Keywords: precautionary principle, climate change, treaties, uncertainty, customary international law

I. Introduction

The phenomenon of global warming is not new to Earth. Major atmospheric changes had happened long before civilization developed. Changes in the earth's temperature are also not new to human beings. Our ancestors have adapted and survived similar occurrences in the past.¹ In the face of just another climatic episode in earth's history, why not just 'wait-and-see' and continue with our 'business-as-usual'? Why take precaution when we have yet to put together all the pieces in this jigsaw puzzle to see the entire picture? Why waste energy and resources on matters that could turn out to be not our doing and beyond our control? These postulates and questions sum up the luring challenges posed by climate change sceptics today.

Scientists have confirmed that humans, since the Industrial Revolution, have altered the natural climate system through greenhouse gasses released to the atmosphere by our voracious consumption of fossil fuel, primarily oil. As part of the natural system, humans now play a key role in the balance of nature. And despite remaining uncertainties which are inherent in a complex system, early signs of a changing climate due to anthropogenic influence are beginning to be manifested. As much as we are a part of the natural system, uncertainty is a reality in the climatic system.

The complexity of the climate system and prediction on the impact of climate change stretches science and policy to the limit (Kelly, 2000: 2). In this regard, the Intergovernmental Panel on Climate Change, in its *Second Assessment Report* (1995) states:

¹ According to Alfsen and Skodvin (1998: 15), "there is increasing evidence that not only during cold periods with extended glaciation, but also in the previous warmer inter-glacial periods, the climate was characterised by large variability on a short (decadal) time scale."

“Climate change presents the decision maker with a set of formidable complications: a considerable number of remaining uncertainties (which are inherent in the complexity of the problem), the potential for irreversible damages or costs, a very long planning horizon, long time lags between emissions and effects, wide regional variation in causes and effects, the irreducibly global scope of the problem, and the need to consider multiple greenhouse gases and aerosols. Yet another complication arises from the fact that effective protection of the climate system requires global cooperation.” (IPCC, 1995: 45; <http://www.ipcc.ch/pub/sarsum3.htm>)

The precautionary principle² is a policy framework that addresses risks in cases involving uncertainty and ignorance, as in the case of climate change. It was originally formulated as a response to the constraints of policy and science in sufficiently addressing complex and uncertain risks and its consequences to human health and the environment (Tickner, 2003: xiii). Although the precautionary principle had a slow start, it eventually found its way in international law. Thus, notwithstanding the criticisms hurled against this principle, global leaders decided to enact numerous international agreements, in particular, the United Nations Framework Convention on Climate Change, which provides for the precautionary principle. The principle meant that if there is a probability of adverse damage, we should not wait until the risk can be scientifically confirmed before taking action to avoid it (Allaby, 1996: 48).

Hence, this paper endeavours to contribute to existing knowledge on precautionary policy under international law and its relation with climate change. Guided by Kelsen’s legal positivism, we shall examine the precautionary principle and its sources in international law. We shall also look at the relation of the Precautionary approach to global warming. We shall delve into the nature of the principle as well as the science and politics of climate change. The aim of this part of the thesis is to advance understanding of the concept of precaution. The second part of the discussion focuses on the standing of the precautionary principle in international customary law. Analysis at this point shall be aided by Article 38(1) of the Statute of the International Court of Justice.

1.1. Scope and Research Objectives

It has been argued that the precautionary principle is consistent with the paradigms of sustainable development, ecological sustainability, and intergenerational equity (Carter, 2001: 207). Although a relatively more recent concept than those enumerated, the concept of precaution has its roots deeply buried in history.³ According to one scholar, precaution provided the basis for the moral right to avoid harm even in the absence of proof thereof since the early days of civilization (Martin, 1997: 14).

The use of the precautionary principle in curbing major environmental problems today is a highly contentious issue (Morris, 2000: 7; Taylor, 1998: 25; O’Riordan, et. al., 2001: 28). Even its advocates have diverse opinions of its definition and interpretation. For this reason, an examination of the precautionary principle under international law and how it relates with the climate change issue is a relevant case study.

In view thereof, this paper has set out to answer the following questions:

- a. What is the relevance of the precautionary principle under the climate change regime?
- b. How is the precautionary principle defined under international conventional law?
- c. Has the precautionary principle emerged as a binding international custom?

² For the purpose of this thesis, the following terms are used interchangeably and are intended to refer to the Precautionary Principle: precaution, precautionary action, precautionary measures, precautionary approach.

³ Philippe Martin (1997: 276-278) suggests that the unambiguous referral to the precautionary principle is found in the Theravadan scriptures of Buddhism and the millennial oral traditions of indigenous peoples of Africa, Australia, Americas and Eurasia.

The general aim of this thesis is to better understand the concept of precaution within the international legal system. The particular objectives are to identify its legal role in global climate efforts, to examine its basic formulation as contained in international treaties and declarations, and to determine whether it has emerged as customary international law. To achieve these objectives, Chapter 2 of this paper shall look at the climate change issue and discuss its science, politics, history and development in international law. Chapter 3 shall focus on the precautionary principle by looking at its origin, elements, issues, versions, developments in international environmental law, and analysis of its formulations in international agreements. Chapter 4 is an analysis of the role of precaution within the climate change regime. The penultimate Chapter 5 shall explore the status of the precautionary principle as an international custom.

1.2. Conceptual Framework, Method and Materials

This thesis is influenced by legal positivism theory. According to Shaw (1991: 45), the positivist school declares that law as it exists ought to be analyzed empirically shorn of all ethical considerations. Elements of morality are well and good but have no part in legal science (Kelsen, 1946: 410). Contemporary legal positivism was developed by Hans Kelsen. His legal positivist approach defines law solely in terms of itself and constructs a logical unified structure based on a formal appraisal. In his own words, Kelsen (1946: 396) explains thus, “this means that legal positivism does not go beyond the [basic norm] to produce a material and absolute justification.” Law is regarded as a normative science consisting of norms which lay down patterns of behaviour. Such norms, or rules, depend for their validity on a prior norm and this process continues until one reaches what is termed the basic norm, or *grundnorm* (Ibid: 395). This basic norm is the foundation of the legal edifice, because rules which can be related back to it therefore become legal rules. According to Kelsen (1966: 402),

“With the aid of the basic norm the legal materials which have been produced as positive law must be comprehensible as a meaningful whole, that is, they must lend themselves to a rational interpretation.”

The basic norm of international law is the rule that identifies custom as the source of law, or particularly stipulates that, ‘the states ought to behave as they customarily behaved’ (Kelsen, 1946: 369). One of the primary customary rules of this is the rule of *pacta sunt servanda*, which he considers a hypothetical *grundnorm* (*ursprungsnorm*), declaring that agreements must be carried out in good faith (Ibid). Upon that rule is founded the second stage within the international legal order which consist of the network of norms created by international treaties and conventions (Ibid). It is the general international law, especially by its rule *pacta sunt servanda*, which establishes the norm which obligates the States to respect their international commitments provided in treaties signed by them. The second stage leads on to the next stage which includes those rules established by organs which have been set up by international treaties, such as decisions of the International Court of Justice (Ibid: 370).

In his 1962 publication, *Principles of International Law*, Kelsen (1966: 3) postulated that law is a social order and its function is “to bring about certain reciprocal behaviour of men, that is to induce men to refrain from certain acts to which for one reason or another are deemed detrimental to society and to perform others which for one reason or another are regarded as useful to society.” He suggested that one may induce another to adopt a certain conduct through requests, in the hope that the latter, from respect for the one making the request, will fulfil his request; enlightenment as to the appropriateness of the conduct demanded, in the expectation that the understanding thus acquired will supply the motive for corresponding action or abstention from action; example setting; promise of reward in case of obedience; and by threat of evil from an authority to be forcibly inflicted upon them should they act to the contrary (Ibid: 3-4). Kelsen (1996: 14) acknowledged that a shortcoming of a

decentralized system is that if the entity authorized by law to carry out the sanction is not more powerful than the delinquent, any sanction cannot successfully be executed. Thus, under the modern international legal framework, characterized by decentralized force and where use of sanctions, such as war, is permissible only on specific conditions, states are mostly limited to inducement by persuasion in order to achieve individual and collective interests. For this reason, “the establishment of a relatively centralized system of collective security is [important for an effective implementation] of the law”(Kelsen, 1966: 14). Kelsen (1946: 371) proposed the theory of monism which states that international law and national law form one normative system. Gyllenstierna (2003: 28) explains that there are two types of monism, *viz*,

“According to one type, international public law is conceived of as being a part of national law, and according to the second type, international public law is conceived of as being superior to all the national systems. The difference has no practical meaning..... since according to both models the legal system is conceived of as a coherent system of norms, arranged hierarchically and the difference only concerns the basis of validity of international law.”

This paper chose Hans Kelsen to represent the positivist approach to international law since it argues that his theory of legal system provides a tool to understand international law as a system. Kelsen’s positivist approach is concerned “not with the edifice of theory structured upon deductions from absolute principles,” but with viewing incidents as they occurred and discussing actual problems that had arisen (Shaw, 1991: 24). In other words, “what states actually do is the key, not what states ought to do” (Ibid). Customs and agreements acknowledged by states are the essence of international law. An obvious limitation of this approach is the lack of sufficient consideration for the *real politik* or the practical realities to which the law is just a part of.

This thesis is principally based on an examination of international legal documents and relevant decided cases and literature. Although this study tends to be basically legal, it attempts to be multi-disciplinary, employing principles from systems thinking, environmental studies and sustainability science. Personal interviews were with leading scientists and experts. They include UNEP Executive Director Klaus Töpfer, Dr. Rajendra K. Pachauri, Chairman of the Intergovernmental Panel on Climate Change, Professor. Joel Tickner, a professor at the Department of Community Health and Sustainability of the University of Massachusetts Lowell, Dr. Jeff MacNeely, Chief Scientist of the IUCN-World Conservation Union, and Rosie Cooney of the Flora and Fauna International. Literature from Lund University libraries, articles from the Lund University’s electronic database (ELIN), legal documents, law journals, and various internet sources (i.e., IPCC, UNGA, ICJ, World Resources Institute) were invaluable research sources for this study.

1.3. Limitations of the Study

This thesis presents the following limitations:

- (1) This thesis does not analyze the intricacies of international climate change negotiation leading to existing international law on the subject; statements on the matter are intended for general discussion and better understanding of the background of existing climate treaties.
- (2) This paper does not aim to come up with a definitive rule of international law, thus, analysis and conclusions of the author with regard to the status of the precautionary principle in international law should be considered mere argumentation in support of the propositions of this thesis. Certainly, it is not the intention of this paper to solve “the mystery of custom oscillating inconclusively between being a law-creating source of legal rules and mere evidence of pre-existing [international] law.”⁴

⁴ Lauterpacht, H. (1958: 379), *The Development of International Law by the International Court of Justice* (1958: 379), as quoted by Slouka (1968: 1).

(3) This paper is principally a legal research although influence by other disciplines. The author recognizes the sentiments and frustrations of other disciplines as to the current state of international environmental law and its enforcement, including the criticisms against certain treaty provisions relating to the precautionary principle and the implementation the mechanisms to address global warming. Certainly, these aspects are worth analyzing in another paper. However, this paper is limited by its focus and approach of study. Thus, lack of sufficient discussion on these topics should not be interpreted as an intention by the author to diminish the value of the arguments nor as subjectivity towards one side of the debate.

(4) As this paper's main focus is the precautionary principle under contemporary international law and only uses the climate change problem as a case study insofar as it provides for the precautionary principle in Article 3 of the Convention, this paper will only touch upon the Kyoto Protocol as may be found relevant.

1.4. Literature Review

Most published literature on the topic of the precautionary principle is supportive of it. Per Sandin (2002) of the Royal Institute of Technology in Stockholm upheld the use of the precautionary principle in tackling major environmental issues in his licentiate thesis entitled *The Precautionary Principle: from Theory to Practice*. He believes that the precautionary principle is a sound doctrine and whatever criticism hurled against it are not without defence or remedy. This sentiment is shared by the European Environmental Agency as expressed in their 2001 publication aptly titled *Late Lessons from early warnings: the precautionary principle 1896-2000*. David Freestone and Ellen Hey (1996:249) in their book *The Precautionary Principle and International Law* also expressed support for the principle and even went to the point of saying that "the precautionary principle is here to stay."

Joel Tickner's (2003) *Precaution: Environmental Science and Preventive Public Policy* is also for precautionary policies in cases involving uncertainty and complexity. The book focuses on how environmental science, in the face of uncertain and dynamic environmental risks, can assist precautionary actions (Ibid: xvi). *Reinterpreting the Precautionary Principle*, edited by Tim O'Riordan, Andrew Jordan and James Cameron (2002) provides an objective and holistic examination of the precautionary principle. It looks at the concept of precaution from the perspective of science and technology, international law and national applications.

Julian Morris' (2000) *Rethinking Risk and the Precautionary Principle* presents a critical view of the concept of precaution. It denounces the principle for its vagueness and tendency towards arbitrariness and criticized the weakness of current accepted versions in international agreements. The book then proceeds to assess specific applications of the precautionary principle. The basic argument of the book is that the precautionary principle is a counterproductive method in assessing risks. Inspired by his earlier contribution to Morris' (2000) book, Indur Goklany (2001) published *The Precautionary Principle: A Critical Appraisal of Environmental Risk Assessment*. As made clear in his title, Goklany (2001: 1) poetically likened past and present precautionary measures to "escaping goblins, only to be captured by wolves." This book presents a critical analysis of the precautionary principle through historical incidents as case studies.

On the matter of climate change, Sharon Spray and Karen McGlothlin's (2002) edited book *Global Climate Change* provides a strong argument for forward-looking measures to combat climate change. Although they acknowledged the uncertainty, Spray and McGlothlin (2002: 146) argues that "the science of climate change is strong" and we cannot afford inaction because "the stakes are high" (Ibid). Materials for the negotiations leading to the Kyoto Protocol were provided by Luterbacher and Sprinz (2001).

On the other hand, legal scholars are still in a quandary over whether the precautionary principle has reached the status of a binding international custom. On one side are the

advocates of precaution as a general principle of law. Sands (2003: 279) in particular states that:

“The legal status of the precautionary principle is evolving. There is certainly sufficient evidence of state practice to support the conclusion that the principle, as elaborated in the Rio Declaration and various international conventions, has now received sufficiently broad support to allow a strong argument to be made that it reflects a principle of customary law.”

Cameron (2002) echoed the aforementioned pronouncement of Sands and declared that the legal prerequisites of “state practice” and *opinion juris* for the formation of international customary law are present in the case of the precautionary principle (O’Riordan, et. al., 2002: 123; Freestone and Hey, 1996: 52). On the other side of the debate are legal scholars refusing to admit the precautionary principle among the roster of international customs. Birnie and Boyle (1992), for instance, denied that the precautionary principle is an international custom and noted the diverse interpretations and vagueness in its applicability (1992: 83). Susskind (1994: 79) also expressly declared that the “precautionary principle is not yet a part of customary international law.”

Concerning the theoretical literatures, the works of Hans Kelsen, particularly, *General Theory of Law and the State* (1946) and *Principles of International Law* (1966) had been invaluable sources of information. In his 1946 publication, Kelsen presents the essential elements of the ‘pure theory of law’ as a general theory of positive law. On the other hand, in *Principles of International Law*, Kelsen (1966) examined the nature and fundamental concepts of international law and analyzed its structure and the determination of its position in the contemporary world order.

II. Climate Change: The reality of a warming planet

“An increasing body of observations gives a collective picture of a warming world and other changes in the climate system.”

IPCC (2001:1)

2.1. INTRODUCTION

The signs are everywhere: rapid disappearance of glaciers in areas outside the polar region, erratic winter in some areas of the Northern Hemisphere, extreme weather occurrences in the Americas (i.e., Hurricanes Katrina, and Wilma, among others, bringing massive destruction in land areas surrounding the Gulf of Mexico), increased incidence of droughts in Asia and Africa, heat waves and skin diseases in Europe and Australasia. These are not conclusive evidence of a global climate shift but they provide warnings of a change in the climate system. Considering the major changes since the birth of civilization, directly or indirectly attributable to humans—population explosion, technological and scientific advancement in almost all fields thinkable allowing us to exploit the Earth better, massive clearance of the Earth’s forest cover, declining level of biodiversity, ecosystem destruction, air pollution— it does not take a rocket scientist to figure out that humans, being a part thereof, had already affected the natural climate system.

The progress of civilization was at the expense of the natural environment. Since the Industrial Revolution, humans have become more and more dependent on fossil fuel- starting with coal and then with oil. The resulting advancement in technology and industry generally raised the quality of life and made human propagation more efficient as well. As human population grows, the collective needs for food, clothing, shelter and other necessities shoots up exponentially as well. Trees and forests, which took the Earth millions of years to form, were rapidly cleared for human settlements, energy, industrial material, mining, and recreation. This pattern of exploitation of nature to serve human needs and wants is best characterized by Garret Hardin’s, *Tragedy of the Commons* (Hardin 1968).

2.2. The Tragedy of the Global Commons

The 1968 article by Hardin provides a monumental formulation of how human nature and economic activities led to environmental problems. He used the example of a grazing village where economic benefits are reaped by the farmer who overexploits the common pasture land better, but the long-term costs to the environment and eventually to everyone in the village are shared by all. Thus, he concluded that rational economic behaviour by one person deteriorates into collective misery of the entire community. In contemporary global setting, G. Tyler Miller (1998: 10) blames the 'exponential growth' in human population, the burning of fossil fuel, and consumption of the Earth's resources, as well as each State's quest for economic growth for damaging the foundations of Earth's capital. One effect of humans' exploitation of the Earth is the diminishing supplies of vital resources, which according to Klare (2001: 21), led to increasing global conflict.

Hardin's Tragedy of the Commons applies to the current global problem of climate change. Since the atmosphere is free for all to use and exploit, polluting it to achieve individual and collective ends of prosperity and economic growth continues to be considered by many as acceptable and tolerable. After humans discovered that there are anthropocentric benefits from common forests (i.e., coal, minerals, and raw materials), its defacement became rampant. Now, the natural system is altered, greenhouse gases (GHGs) in the atmosphere from human activities had reached a critical level and there is very little carbon sink from forest cover left. Again, as Hardin pointed out, what humans once considered rational behaviour has led to collective suffering.

The Intergovernmental Panel on Climate Change (IPCC) stated in *its 2001 Third Assessment Report* (2001: 2) that "the global average surface temperature has increased since 1861" and "over the 20th century the increase has been 0.6 ± 0.2 degrees centigrade" (*See Figure 2*). This global warming trend, as a result of climate change, is perhaps the first global environmental issue affecting everyone on the planet, and because of the longevity of greenhouse gases and the inertia of the world's climate systems, the effects could span centuries (Woodward, 2003: 127). A problem so extensive and associated with such a long timescale brings with it enormous scientific and socio-economic uncertainties, and to a large extent, policy decisions depend on how these uncertainties are handled (Elliot: 2004: 79). This phenomenon is also one of the key areas in which scientific observations and analyses could have a profound impact on how people everywhere live their lives (Dobson, 2002: 3).

2.3. The Science of Climate Change

The basic premise of the climate change issue concerns the 'greenhouse effect'. It is a natural phenomena whereby greenhouse gases [carbon dioxide (CO₂), nitrous oxide (N₂O), halocarbons and methane (CH₄), among others] raises the temperature of the Earth's lower troposphere and surface by absorbing some infrared radiation from the Earth's surface (Miller, 1998: 18). As explained by Miller, this process causes molecules of GHGs "to vibrate and transform the absorbed energy into longer-wave infrared radiation" in the troposphere (Ibid). To explain this process further, we can use the example of a typical car parked in a lot under the sun. Sunlight passes through the glass windows and ceiling of a car and strikes every object inside it. Some of the light is reflected and it goes back out through the glass. Some of the light is absorbed and this causes heating of whatever object absorbed it. The heated objects give off energy through infrared light which cannot fully penetrate the glass. Thus, infrared light, or heat, is trapped in the car, and the car heats up (Spray and McGlothlin, 2002: 6). Similarly, in the natural world, sunlight passes through the Earth's atmosphere and strikes the Earth's surface. Some of the sunlight is reflected into space while some is absorbed. The absorbed light warms up the Earth's surface and the earth gives off infrared radiation which is absorbed by the atmosphere.

The Earth's atmosphere consists of 78% nitrogen and 21% oxygen (Ibid: 7). Neither gas absorbs infrared radiation. An important component of the atmosphere for global heat balance

is carbon dioxide which makes up .5% thereof. CO₂, as well as other GHGs absorb infrared radiation. Without the natural greenhouse effect scientists estimate that the average global temperature would be about 33 degrees centigrade lower (Carter, 2001: 232). However, since the Industrial Revolution, human activities have caused greater concentrations of GHGs in the atmosphere through emissions, mostly from fossil fuel burning. Thus, the resulting changes in composition of the Earth's atmosphere due to human activities now dominate changes that occur naturally (MacDonald, 1990: 1).

2.4. Historical Development

“Considering the whole span of earthly time....in which life actually modified its surroundings has been relatively slight. Only within the moment of time represented by the present century has one species- man- acquired significant power to alter the nature of his world.”

Rachel Carson (1962: 23)

2.4.1. Consensus Building

The international legal instruments addressing the global climate change are recent but scientific and academic discussions of this phenomenon started way earlier. Climate change started to intrigue the scientific community in the early 1960s after the formulation of the Keeling curve which demonstrated the increasing concentration of GHGs in the atmosphere (Luterbacher and Sprinz, 2001: 24). The problem of environmental degradation was first addressed by the international community in 1972 at the Stockholm Conference on the Human Environment. However, global climate change was only touched upon because the world was still clueless at that time about the extent of the problem.⁵ General climate issues were addressed at a series of scientific conferences in the 1970s and early 1980s, including the UN Water Conference in 1976, the UN World Food Conference and the UN Desertification Conference in 1977.

In 1979, The World Meteorological Organization (WMO) convened the First World Climate Conference which called for an urgent action “*to foresee and to prevent potential man-made changes in climate that might be adverse to the well-being of humanity*” (UNEP, www.cs.ntu.edu.au). It was not until the 1985 International Conference on Assessment of the Role of CO₂ and other GHGs in Climate Variation and Associated Impact, sponsored by WMO and UNEP, that rising scientific apprehension began to translate into demands for political action. The 1987 Brundtland Commission Report, *Our Common Future*, published by the World Commission on Environment and Development, paid considerable attention to the risks associated with anthropogenic climate change and also highlighted the importance of the precautionary principle (WCED, 1987). Henceforth, climate change hit the limelight in the international political agenda. Paterson (1996: 60) suggests that the reasons for this are: First, the developing scientific consensus that warming was likely if current trends in global emissions of the anthropogenic GHGs continue; second, the 1980s showed an upsurge of international discussions and debates on a number of global environmental issues [i.e., depletion of the ozone layer due to chlorofluorocarbons (CFCs), transboundary air pollution and acidification, deforestation of the tropics]; and finally, there was a series of extreme weather occurrences, of which the most important politically were the US drought in 1988 and the empirical observation that the 1980s provided the six hottest years on record. These three main factors combined to make claims by scientists about climate change increasingly plausible both to the general public and their governments.

This call for political action by some sectors of the scientific community was initially answered under UN Resolution 43/53 on the Protection of Global Climate for Present and Future Generations of Mankind (1988).

⁵ See *Recommendation 70 of the Stockholm Action Plan*.

2.4.2. Consolidation of Expert Knowledge

UN Resolution 43/53 established an Intergovernmental Panel on Climate Change (IPCC). Despite the presence of existing mechanisms to monitor and oversee the state of scientific knowledge of GHG and climate science under the World Climate Research Programme (WCRP), the Congress of the WMO adopted a declaration calling for the creation of an independent, more broadly representative body to provide authoritative scientific advice to UN members (UN-NGLS, 1997: 2). Having in mind its success with the ozone depletion case but mindful of the enormous tasks involved in climate change concerning matters that go beyond science to matters of social, economic and environmental fields, the IPCC was established to “(i) assess available scientific information on climate change, (ii) assess the environmental and socio-economic impacts of climate change, and (iii) formulate response strategies” (IPCC, 1995: v). The IPCC’s 1990 First Assessment Report, a scientific assessment of global warming, which stated that given the current trend of increasing GHG emission interference with the climate system is likely, swayed decision makers to agree to an international framework convention (Bodansky, 2001: 28). Subsequently, IPCC published its Second Assessment Report in 1995, which contributed to the drafting of the Kyoto Protocol, and in 2001, it released its Third Assessment Report which contained its latest findings on the science of climate change.

2.4.3. The Road to New York

In response to the Brundtland Report, the Toronto Conference of experts, was held in 1988 which set a global carbon dioxide emissions target (Toronto Target) of 20% before 2005 (Elliot, 2001: 81). This was the first definitive proposal for emissions reduction that inspired later climate change policies. The Conference also recommended the enactment of an international convention with appropriate protocols to ensure rapid international action to protect the atmosphere and limit the rate of climate change.⁶ The 1988 Toronto Conference interestingly noted that there has been an “observed increase of globally-averaged temperature of 0.7°C in the past century” and also predicted that “climate change will continue so long as the greenhouse gasses accumulate in the atmosphere.”⁷ This was followed in 1989 at the Hague Conference where countries called for “regulatory, supportive and adjustment measures that take into account the participation and potential contribution of countries which have reached different levels of development” (Declaration of the Hague, para. 7, 1989). In 1990, the UN Economic Commission for Europe (UNECE) and the government of Norway convened the Bergen Conference on Sustainable Development. The product of the conference of 34 environment ministers and the European Commission was a Declaration that contained concrete measures to combat climate change (UN-NGLS, 1997, 2). In the same year, UNEP and WMO sponsored the Second World Climate Change Conference (SWCC) which reviewed the UNEP/WMO World Climate Programme and recommended policy actions (Ibid). More importantly, the SWCC ended with a call for a framework convention on climate change (Ibid).

2.5. Establishment of a Global Climate Regime

On 21 December 1990, the UN General Assembly, through its Resolution No. 45/122 entitled *Protection of global climate for present and future generations of mankind*,⁸ created the Intergovernmental Negotiating Committee (INC) to prepare a draft convention on climate change. The INC held five negotiating sessions between February 1991 and May 1992. On 9 May 1992, the INC negotiators adopted the Framework Convention on Climate Change (FCCC) and it was opened for signature at the United Nations Conference on Environment and Development (UNCED). Initially, the convention was signed by 154 states and the European Union (EU), demonstrating wide acceptance of the INC text (Ibid, 3). Additional

⁶ Ottawa Agreed Principles for Protection of the Atmosphere, 1989.

⁷ Toronto Conference Statement: The Changing Atmosphere—Implications for Global Security, 1988.

⁸ UNGA Res. 45/122.

signatures were had by the time the convention closed on 19 June 1993, bringing the numbers to 165 states and the EU (Ibid). The convention entered into force on 24 March 1994. Parties hence became legally bound by the terms of the treaty.

The convention's objective is to stabilize atmospheric GHG concentrations at levels that will prevent human activities from interfering dangerously with the global climate system (UNFCCC, Article 2). Although the UNFCCC does not contain any binding targets on the part of states, it provides for general commitments to stabilize atmospheric concentration of GHGs by limiting emissions, enhancing sinks and protecting reservoirs (UNFCCC, Article 3.1). Because the INC decided for a framework convention in order to achieve a broader consensus, Article 24 does not allow reservations to the convention. Therefore, all state-parties are bound by similar provisions unless they decided to withdraw at any time three years after it entered into force.

The decision to frame a protocol to the UNFCCC was reached at the first Conference of Parties (COP1) meeting held at Berlin in 1995 (UN-NGLS, 1997: 5). Other issues were discussed including: procedures for national reporting, methodology and standards for assessment, and joint implementation programs (Ibid). The inability of the first COP to resolve a number of issues led members to call for the creation of an Ad hoc Group on the Berlin Mandate (AGBM) to address issues of commitment beyond 2000 (Ibid). However, AGBM meetings were muddled with debates and politicking. Countries were divided according to their views on how to curb GHG, namely, EU group, US-led group, developing countries, oil-producing countries, and the Association of Small Island States (AOSIS). EU's proposed protocol contained specific targets while the US wanted average and cumulative emissions objectives (Hsu, 2004: 31).

IPCC's Second Assessment Report, which came out in December 1995 was endorsed at the second COP meeting (COP2) in Geneva, Switzerland. It was during COP2 that the EU and US agreed for a significant reduction in GHG emissions under a separate binding instrument (ENB, 1996: 13). Finally, on 11 December 1997, during the third COP meeting (COP3) at Kyoto, after much debate over targets, mechanisms and coverage, members adopted the Protocol to the United Nations Framework Convention on Climate Change (Bodansky, 2001: 35). This agreement covers six greenhouse gases (Kyoto Protocol, Annex A) and includes a group of options for reductions in emissions. These include energy efficiency to reduce GHG emissions from fossil fuel, sequestering GHGs by establishing or enhancing sinks, and bubble arrangements which would allow countries to meet their obligations jointly (Kyoto Protocol, Articles 2, 3, 4).

To achieve the objective set out by the convention,⁹ parties are to be guided, among others, by the precautionary principle, *viz*:

“The parties should take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects. Where there are threats of serious or irreversible damage, lack of full scientific research should not be used as a reason for postponing such measures, taking into account the policies and measures to deal with climate change should be cost-effective so as to ensure global benefits at the lowest possible cost” (UNFCCC, Article 3§3).

The nature, definition and framework of the precautionary principle are explained in the succeeding chapter.

⁹ Adopted by the Kyoto Protocol (1997) in its Preamble by reference to Article 3 of UNFCCC.

III. THE PRECAUTIONARY PRINCIPLE

3.1. INTRODUCTION

Article 3 of the UNFCCC was just one in a long list of international agreements that contained the precautionary principle, making it one of the more popular legal concepts in international environmental law today. Whereas traditional regulatory practices are reactive, precautionary measures are preventive and pre-emptive (Myhr and Traavik, 2001: 76). In its simplest form, the precautionary principle provides that if there is risk of severe damage to humans and/or the environment, absence of incontrovertible, conclusive, or definite scientific proof is not a reason for inaction. It is a better-safe-than-sorry approach, in contrast with the traditional reactive wait-and-see approach to environmental protection.

3.2. The Origin of the Precautionary Principle

In his address to the Parliamentary Earth Summit of the UN Conference on Environment and Development, the Dalai Lama of Tibet noted that “in the seventeenth century, [Tibetan leadership] began enacting decrees to protect the environment and so we may have been one of the first nations to [enforce] environmental regulations!”¹⁰ The Theravada scriptures of Buddhism provide the earliest written sources which could accommodate the concept of precaution (Martin, 1997: 276). Theravada teaches not to commit harm, the Buddha urging his followers to refrain from ‘unwholesome action’ and monks prohibited from ‘injuring plants and seeds’ (Ibid).

Undeniably, the origin of the concept of precaution may well be found in the history of civilization. In the early stage of civilization, humans had a holistic attitude towards nature which was regarded with sacred veneration. Nature was revered as the provider of life and therefore exploitation of its generosity was considered unethical. Subsequently, nature’s mystery was unravelled by the teachings of monotheistic religions and corresponding developments in science. This elevated the status of humans above the environment. The regard to human life became primordial and gave humans the right to exploit nature without ethical limitation. The struggle to survive and protect human health led to the early use of the concept of precaution.

3.3. Historical Development

Martin (1997: 264) suggests that the earliest formulation of the precautionary principle in contemporary public policy can be traced in the early 1950s under the guise of what was then called “safe minimum standard of conservation.” Major environmental issues of the 1960s--the case of DDT (dichlorodiphenyltrichloroethane) -- led environmentalists and policy makers to rethink their approach to specifically address uncertainties. This paved the way in the 1970s for the establishment of the precautionary principle as a reaction to “the limitations of public policies based on a notion of ‘assimilative capacity,’ i.e. that humans and the environment can tolerate a certain amount of contamination or disturbance, and that this amount can be calculated and controlled” (Barrett and Tickner, 2001: 1).

In the mid-1970s, West Germany’s legislature enacted a national environmental policy which provided for precautionary approach to environmental protection (Morris, 2000: 1). The German concept of "Vorsorgeprinzip" (translated as principle of foresight) prescribes society to engage in careful study and planning to avoid environmental and health damage from potentially harmful activities (Barrett and Tickner, 2001: 1). The 1970s also showed the emergence of the principle in the United States. Although the term is not used, the essence of the precautionary principle can be found in several laws such as the U.S. Federal Food, Drug and Cosmetic Act of 1958 (Section 409), which outlawed any food additive that was found to

¹⁰ Address of His Holiness the XIV Dalai Lama on 7 June 1992 to the Parliamentary Earth Summit (Global Forum) of the United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro, Brazil (Environment and Development Desk, 2004: 26).

induce cancer regardless of the magnitude of the dose, and the 1970 Clean Air Act which established the National Ambient Air Quality Standards (Goklany, 2001: 4).

The precautionary concept found its way into international law and policy as a result of proposals from environmentalists and European governments. The 1982 United Nations World Charter for Nature provided that when “potential adverse effects [of an activity] are not fully understood, [it] should not proceed” (Ibid: 4). In 1987, owing to German proposals, the precautionary principle appeared in the Second International Conference on the Protection of the North Sea (Ibid: 4; Freestone and Hey, 1996: 49).¹¹ The London accord states:

“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 inputs of such substances even before a causal link has been established by absolutely clear scientific evidence” (Second North Sea Conference, 1987).

Notably, the aforementioned provision marked the first time that the precautionary principle becomes part of an international agreement (Morris, 2000: 3). Since then, the precautionary principle has been integrated into subsequent international agreements, becoming a recognized principle of international environmental law.

From the North Sea ministerial forum, the concept of precaution was integrated into the global marine environmental regimes, into global environmental regimes, and into the negotiations for a global fisheries regime for straddling and highly migratory stocks.¹² In the Declaration of the Third International Conference on the Protection of the North Sea,¹³ the principle was adopted as a key premise for subsequent work.¹⁴ During negotiations of the Oslo and Paris (OSPAR) commissions, the precautionary concept found its way beyond the North Sea, to include the North-East Atlantic. Not only did the OSPAR commissions reiterate the principle, instruments were established for implementation of the precautionary policies,¹⁵ viz:

“the precautionary principle, by virtue of which preventive measures are to be taken when there are reasonable grounds for concern that substances or energy introduced, directly or indirectly, into marine environment may bring about hazards to human health, harm living resources and marine ecosystems, damage amenities or interfere with other legitimate uses of the sea, even when there is no conclusive evidence of the causal relationship between inputs and the effects” [Art. 2(2)(a)].

On 25 March 1985, the Convention for the Protection of the Ozone Layer (Vienna Convention) was adopted by 20 countries and the European Commission (Elliot, 2004: 74). Cameron (2001: 114) noted that the Vienna Convention is the “first [multilateral] treaty to make explicit reference to precaution”. As there was still no scientific certainty on the causes

¹¹ The participants declared that they accepted 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 inputs of such substances even before a causal link has been established by absolute clear scientific evidence*” [Paragraph VII, London Declaration, 25 November 1987].

¹² Article 6 and Annex 2 of the Draft Agreement on Straddling and Highly Migratory Fish Stocks; the Agreement incorporates both the precautionary principle and the ecosystem approach as basis for conservation and management policies [Elliot, 2004: 45].

¹³ Hague Declaration

¹⁴ The participants declared that they “*will continue to apply the precautionary principle that is to take action to avoid potentially damaging impacts of substances that are persistent, toxic and likely to bioaccumulate even where there is no scientific evidence to prove a causal link between emissions and effect.*” [Preamble, The Hague Declaration, 8 March 1990].

¹⁵ Among these are the requirement that best available technology be applied to land-based sources of pollution [PARCOM Recommendation 89/2, 22 June 1989 on the use of the Best Available Technology, The Hague declaration, 8 March 1990], and that any dumping of industrial waste during the interim period be subject to the so-called “prior justification procedure [OSCOM Decision 98/1, 14 June 1989, *Ibid*, p. 119].

and impacts of ozone depletion at the time of adoption, the Convention's later success was due largely to its precautionary nature (Ibid). In 1987, the Protocol to the Vienna Convention was adopted in Montreal. It states in part that "Parties....determined to protect the ozone layer by taking precautionary measures to control equitable total global emissions of substances that deplete it..." (Montreal Protocol, Preamble, 1987).

Also at the multilateral level, both the Governing Council of the United Nations Environmental Program and the Meeting of Contracting Parties to the Convention on the Prevention of Pollution by Dumping of Wastes and Other Matter¹⁶ applied the concept of precaution in relation to marine pollution and ocean dumping, respectively. During the Earth Summit at Rio de Janeiro, Brazil in 1992, the community of nations represented therein came up with the Agenda 21. Chapter 17 thereof refers to the precautionary concept, viz:

"A precautionary and anticipatory rather than a reactive approach is necessary to prevent the degradation of the marine environment. This requires, inter alia, the adoption of precautionary measures, environmental impact assessments, clean production techniques, recycling, wastes audits and minimization, construction and/or improvement of sewage treatment facilities, quality management criteria for handling of hazardous substances, and a comprehensive approach to damaging impact from air, land and water" (Agenda 21, Chap. 17).

This paragraph is not only a manifest endorsement of the precautionary principle, but it also clearly relates the precautionary concept to a number of specific measures which would enhance precautionary policies with respect to oceans, seas and the marine environment. In relation to the protection of marine environment, the application of the precautionary principle to the management of marine living resources in the 1982 decision of the International Whaling Commission (IWC) is most notable. IWC, in effect, implemented the precautionary principle when it imposes a *de facto* moratorium on commercial whaling.¹⁷ Henceforth, the precautionary principle was endorsed in other regional forums concerned with the protection and preservation of the marine environment as one of the principles on which to base their policies. Notable examples of regions in which the precautionary concept has been explicitly endorsed are: the North-East Atlantic,¹⁸ the Baltic Sea,¹⁹ the Black Sea,²⁰ and the Wider Caribbean Region.²¹

Significantly, the adoption of the Rio Declaration at the United Nations Conference on Environment and Development (UNCED) in 1992 signified that "the precautionary concept has become essential to international environmental policy" (Freestone, 1994: 195). Principle 15 of the Rio Declaration provides hence:

"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." (Rio Declaration, 1992)

Along with the Rio Declaration, the Convention on Biological Diversity, (CBD) which also provided for precautionary concept, was adopted in 1992 during the Earth Summit.

¹⁶ London, 13 November 1972, (1972) 11 ILM 1291.

¹⁷ The Commission amended the Schedule under Article V of the Convention so that "catch limits for the killing of commercial purposes of whales from all stocks for the 1986 coastal and 1985/6 pelagic seasons and thereafter shall be zero."

¹⁸ Article 2(2)(a), The 1992 Paris Convention for the Protection of the Marine Environment of the North-East Atlantic.

¹⁹ Article 3(2), Baltic Sea Convention.

²⁰ First Declaratory Paragraph of the Black Sea Declaration.

²¹ See *Relevance and Application of the Principle of the Precautionary Action to the Caribbean Environment Programmed*. Secretariat paper approved by the CEP Meeting of Experts and the Third Meeting of the Parties to the Cartagena Convention, November 1992, UN OCA/CAR WG.10/INF.4.

Subsequently, the Protocol to the CBD was adopted in Montreal in 2000 and its Article 1 states clearly that it must be pursued in accordance with the precautionary approach as stated in the Declaration (Elliot, 2004: 42). The Convention on International Trade in Endangered Species (CITES) came into force in 1975. The CITES Guidelines adopted in 1994 provided for a precautionary approach in determining whether species are threatened with extinction or are likely to withstand pressures of trade (Ibid: 33).

3.4. The Precautionary Principle under the Climate Change Regime

Most importantly, for this paper at least, 1992 paved the way for the convergence of the precautionary principle and the climate change issue in international law. At Rio de Janeiro, the world acknowledged the precautionary principle at the level of international law when it adopted the United Nations Framework Convention on Climate Change. Article 3 of the Climate Change Convention partly provides that:

“The parties should take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects. Where there are threats of serious or irreversible damage, lack of full scientific research should not be used as a reason for postponing such measures, taking into account the policies and measures to deal with climate change should be cost-effective so as to ensure global benefits at the lowest possible cost” (UNFCCC, 1992: Article 3 §3).

A reference to the aforementioned article was provided in the Preamble of the 1997 Kyoto Protocol and worded as follows, “Being guided by Article 3 of the Convention”. The precautionary principle is thus a norm that parties to the UNFCCC have endorsed (Brown, 2003: 142). Contested by some environmentalist and political analysts for being a weak precautionary formulation, legal positivists argue that law is law and its merits has to be interpreted without going beyond the wordings of the pertinent international agreement.

3.5. Different Formulations of Precaution

As shown in the immediately preceding section, the formulation of the precautionary principle has evolved in international law but in a less straightforward manner. This has led scholars to opine that diversity is one of the characteristics of its definitions (Martin, 1997: 266; Taylor, 1998: 25). As will be discussed later (see subchapter 3.7), these varying definitions have also caused many critics of the precautionary principle. It is therefore deemed necessary to discuss these definitions here. This chapter concludes with an attempt to find commonality among current formulations in international treaties and conventions (see subchapter 3.8).

At the scholastic and academic area, versions of the precautionary principle proposed by scholars reflect cultural origins and disciplinary backgrounds. Some scholars delve on the constraints of the physical environment, as most French definitions, while others are concerned about the economic cost of prevention measures, as is characteristic of the Anglo-Saxon formulations; others reveal a deferential relationship with nature, as some of the Scandinavian literature (Martin, 1997: 266). Definitions also vary according to disciplines, as in the context of climate change discussions, most physical scientists are concerned on irreversibility and preservation, economists, on costs, risk and optimal formulations, planners, on flexibility and protection, and lawyers on damage and indemnification (Ibid).

Definitions of the precautionary principle have also been categorized in two classes: the ‘strong’ precaution and the ‘weak’ precaution (Morris, 2000: 1). The strong version, proposed by environmentalists, suggests that precaution is mandatory, hence, activities should not be allowed if there is no proof that it will do no harm, while the weak version is justifiable, that is, lack of absolute certainty is not a justification for preventing an action that might be harmful to human health or the environment (Ibid). The wording of the precautionary

principle in most international agreements, including the UNFCCC, and declarations, such as the Rio Declaration is considered “weak” (Goklany, 2001: 5). In operational terms, a ‘strong’ precautionary principle places the burden of proof of non-harm to the technology developers, while a ‘weak’ precautionary principle places the same burden of proof to technology regulators (Ibid: 3).

A frequently quoted strong version of the precautionary principle is provided by a group of 35 scientists, advocates, and policy-makers during their conference in January 1998 at Wingspread in Racine, Wisconsin, USA (Morris, 2000: 5). The Wingspread version states:

“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 the activity, rather than the public, should bear the burden of proof.

“The process of applying the precautionary principle must be open, informed and democratic and must include potentially affected parties. It must also examine the range of alternatives, including no action” (Wingspread Statement cited from Montague, 1998; Morris, 2000: 5).

The Wingspread Statement puts the burden of proof on the shoulders of the proponent of an activity to prove that it does not pose a threat of damage to human health or the environment. It obliges proponents and governments to study alternatives to potentially harmful existing activities, and institute an open, informed, and democratic decision-making process (O’Riordan, et. al., 2001: 192-3). These provisions ensure that precaution is not only a principle to anticipate and stop potentially harmful activities but is also a principle to stimulate innovation and democratic involvement in seeking the safest alternatives to meet our needs and plan for sustainability. The construction of the first sentence has caused opponents of the principle to suggest that this version would open the door for abuse and thus stall development (Goklany, 2001: 2). In principle, the concept of precaution can be interpreted in two contrasting ways: first as ‘demanding substantial scientific proof before undertaking precautionary action’, and conversely, ‘a more cautious or risk-averse interpreter might urge even burdensome or expensive precautionary action in order to forestall dangers that were backed only by evidence amounting only to a suspicion or even a hunch’ (Weiss, 2003: 145). Further, it is argued that the Wingspread version does not provide a standard of evidence for “threats of harm” which would set the wheel of precaution to roll, but instead puts the entire burden of proof on the proponents. Thus, considering that most all of the technology developed in the last century poses some degree of damage to the environment, even a simple new technology could be questioned (Goklany, 2001: 3). These issues will be addressed further in subchapter 3.8 of this paper.

The European Commission is perhaps the staunchest supporter of the precautionary principle. The 1992 Treaty of the European Union incorporated the precautionary principle as one of the basis for “community policy on environment” (EEA, 2001: 14; EC Treaty, Art. 174.2). In an official document entitled ‘Communication from the Commission on the precautionary principle’ (European Commission, 2000), the Commission stated that it has “*the right to establish the level of protection - particularly of the environment, human, animal and plant health, - that it deems appropriate*” (Ibid, 3). The EC Communication further states:

“The precautionary principle is not defined in the Treaty, which prescribes it only once - to protect the environment. But *in practice*, its scope is much wider, and specifically where preliminary objective scientific evaluation, indicates that there are reasonable grounds for concern that the potentially dangerous effects on the *environment, human, animal or plant health* may be inconsistent with the high level of protection chosen for the Community.”

(European Commission, 2001: 3)

3.6. Criteria for Precautionary Action

As argued by Sandin (2002: 7), there are three criteria for precautionary action: (1) intentionality criterion; (2) uncertainty criterion, and; (3) reasonableness criterion. Firstly, accidental avoidance of known or unknown danger cannot be considered precautionary. There is precautionary action with respect to an activity deemed harmful only if the action is performed with the intention of preventing the specific undesirable (Ibid: 4). In the words of the EC, there has to be a ‘political decision to act or not to act as such, which is linked to the factors triggering recourse to the precautionary principle’ (European Commission, 2000: 13). Secondly, precaution only applies to circumstances involving an unknown or uncertain harm (Ibid, 6). An example of this is the use of precautionary gears when confronted with an unfamiliar substance which may or may not be toxic. Lastly, an action is precautionary if it meets the reasonableness criterion (Ibid: 7). An act, for it to be precautionary, must be based on reason and not just on the personal beliefs and convictions of the actor. Thus, as Sandin (2002: 7) summarized it,

“an action *a* is precautionary with respect to something undesirable *u*, if and only if, (1) *a* is performed with the intention of preventing *u*; (2) the agent does not believe it to be very probable that *u* will occur if *a* is not performed, and; (3) the agent has externally good reasons for believing that *u* might occur, for believing that *a* will in fact at least contribute to the prevention of *u*, and for not believing it to be certain or highly probable that *u* will occur if *a* is not performed” (Ibid: 8).

Sandin’s criteria for precautionary action supports the proposition that the measures and mechanisms contained in the UNFCCC, and subsequently elaborated in the Kyoto Protocol—basically, reduction of GHG emissions, and protection and enhancement of sinks and reservoirs—are actions in pursuance to the precautionary principle. This is so because these measures were intended by the parties to the treaties to address the potential risks and impacts of climate change, there is involved in the issue of climate change many uncertainties inherent in the complexity of the problem, which may or may not, in time, be unravelled by further scientific research and experimentation, and these measures are scientifically sound to achieve the objective of stabilizing GHG concentrations in the atmosphere.

3.7. Issues and Defences

The precautionary principle is recurrently criticized for being vague and ill-defined, absolutist, a value-judgment/ideological, or that it leads to increased risk-taking, and having the tendency to marginalize the role of science or being unscientific (Goklany, 2001; Morris, 2000). These critiques and the corresponding counter-arguments are discussed in the following part.

Vagueness issue

The objection that the precautionary principle is vague as formulated under international treaties certainly poses a problem for its proponents. Owing to the political nature of international negotiations, the adoption of a compromise version of the precautionary principle in current international agreements is expected by many. These compromise formulations leave some space for flexibility on the part of national enforcers—thus considered vague by its critics. This, according to Jordan and O’Riordan (1999: 17) is what makes the precautionary principle ‘politically potent’. Sandin (1999:891), while acknowledging the validity of the critique, argues that this is a problem that is not lacking of solutions. The precautionary principle may be given more precise formulations using the three dimensions of the precautionary principle, namely, *threat dimension*, *uncertainty dimension*,

and *action dimension*, and adding a fourth, *command dimension*,²² Sandin (1999: 891) suggested that “most formulations of the precautionary principle can be recast by inserting the formulations expressing the four dimensions into the following *if* clause: ‘If there is (1) a threat, which is (2) *uncertain*, then (3) some kind of action (4) is mandatory.’ The *De Nasjonale Forskningsetiske Komiteer* (1997: www.etikkom.no) of Norway, on the other hand, provided five crucial conditions for the principle’s application: ‘(1) There exists considerable scientific uncertainty; (2) There exists scenarios (or models) of possible harm that are scientifically reasonable; (3) Uncertainties cannot be reduced without at the same time increasing ignorance of other relevant factors; (4) The potential harm is sufficiently serious or even irreversible for present or future generations, and; (5) If one delays action, effective counteraction later will be made more difficult.’

Absolutist issue

A further accusation against the precautionary principle is that it is absolutist or overly rigid (Goklany: 2002: 7). ‘Absolutist’ here means that the precautionary principle is insensitive to scientific facts about the probabilities associated with different risks. This is in the author’s view a simple misconstruction of the precautionary principle. Using simple statutory construction principles, it may be opined that although the precautionary principle requires that actions be taken *even when there is lack of full scientific certainty*, this, however, does not include a scenario when there is no evidence at all of a potential hazard. Sandin (1999: 7) suggests that this problem can be avoided by stating a degree of evidence in qualitative terms, such as ‘strong scientific evidence’ or ‘scientifically supported strong suspicions,’ or applying some versions of the *de minimis* principle prior to application of the precautionary principle.²³

Increased Risk-taking issue

Critics of the precautionary principle say that implementation of the principle leads to more risks. It may be true that the precautionary principle may be used as a political tool by administrators to focus upon a single, conspicuous threat, while disregarding countervailing risks, but this is not such a serious reason to abandon the principle. Further, a careful examination of the aforementioned arguments will reveal an attempt to trivialize the rather scientifically-based and interdisciplinary nature of the precautionary principle. Furthermore, it goes without saying that all regulatory policies, even those involving certainty of damage, are open to abuse as some degree of interpretation in its implementation is left to regulatory bodies. But surely, this should not stop decision-makers from taking action. To avoid this, Sandin (1999: 11) suggests that measures should be in place to ensure the application of the principle in a rational manner. Particularly, according to him, the precautionary principle should be applied to the precautionary measures prescribed by the precautionary principle itself (Ibid: 11).

Value judgment issue

Critics of the precautionary principle also argue that it is value-based and not a factual judgment. Indeed, the fact that the precautionary principle requires a level of evidence below the level of absolute proof or full scientific evidence is a value judgment to be made by decision-makers (Ibid: 13), however, any degree of evidence required, including full scientific evidence, is also no less a value judgment. Thus, this critique is of no value as it is true for most, if not all, regulatory strategies.

²² The threat dimension concerns the possible threat, the uncertainty dimension concerns the limits of knowledge, the action dimension concerns the response to the threat, and the command dimension concerns the way in which the action is prescribed.

²³ A *de minimis non curat lex* is meant the legal principle that courts of law should not concern themselves with trifles.

Unscientific argument

Finally, critics say that the precautionary principle is unscientific or that it marginalizes the role of science. However, the concept of uncertainty is in itself scientifically-based, and scientific research to overcome uncertainty is an important accompanying factor to the precautionary principle. Further, most international agreements providing for the precautionary principle, directly or indirectly, call for further scientific research.²⁴

In Sandin's (1999: 14) view, there are two meanings to the word 'unscientific': (1) a statement is unscientific in the weak sense if it is *not based* on science, and (2) it may also be unscientific in the strong sense if it *contradicts* science. The precautionary principle may be unscientific in the weak sense like all decision rules including the rule that equates the evidence required for practical measures against a possible hazard with the evidence required for scientific proof that the hazard exists, but it does not contradict science (Ibid). As required for example in the UNFCCC, the precautionary approach uses the same type of scientific evidence to explore all relevant methods of sound science to understand better the dynamics of climate change while employing the precautionary approach in the meantime. This shows that the precautionary principle does not contradict science nor does it marginalize science.

3.8. Analysis of the Definition of the Precautionary Principle under International Law

Subchapter 3.5 of this paper discussed the academic debate over a strong and weak precaution. In summary, a strong formulation of precaution provides for mandatory application in cases involving uncertainty where there is risk of harm to human health or the environment. On the other hand, a weak formulation of precaution is only justifiable—that is, lack of absolute certainty is not a justification for preventing an action that might be harmful to human health or the environment. Subchapter 3.7 discussed the issues confronting the precautionary principle and the defences to each one.

It should be noted that the debate between weak and strong precautionary formulations is generally confined to academic circles and has yet to reach the level of international law. While the only example of a strong precautionary principle is provided by the Wingspread Declaration,²⁵ the highly criticized 'weak' version is contained in numerous international agreements, ministerial declarations and other official documents. Thus, however inadequate the precautionary principle, as provided by international treaties, it is inutile to argue against an official formulation. For this reason, we will limit our analysis in this subchapter to official formulations of the precautionary principle under current international treaties, MEAs and conventions.

So, what is the 'basic formulation' of the concept of Precaution in international law? At the outset, it should be noted that individual international environmental issue and their surrounding circumstances (e.g., level of scientific knowledge, impacts, and extensiveness) influenced the wordings of the precautionary provisions. Thus, to find the 'basic formulation' of the precautionary principle, a survey of international environmental agreements and multilateral declarations, beginning with the Bremen Declaration of 1984 and ending with the Ballast Water Treatment Convention of 2004, and a content analysis of its precautionary provisions was conducted to determine the common denominator in each precautionary provision. To aid this analysis, specific provisions from international agreements which mention the term 'precaution,' 'precautionary action,' 'precautionary measures,' and 'precautionary principle,' as well as articles which, although not mentioning the word, contains all its elements as discussed in subchapter 3.6, were isolated and grouped together.

²⁴ For example, the 1985 Vienna Convention on Ozone Depletion mentions "need for further scientific research and systematic observations" (Preamble); the 1987 Montreal Protocol, states that "the ultimate objective of... elimination [of ozone depleting substances is] on the basis of *development in scientific knowledge...*" (Preamble), and; The 1992 UNFCCC states that precautionary measures "should be cost-effective" and "comprehensive" (Article 3.3), which implies further research and study.

²⁵ See Chapter 3, subsection 3.5.

The individual provisions were then divided into parts according to their respective formulations. The common elements from these provisions, according to their literal and ordinary meaning, were then grouped together and tallied. As stated by Kelsen (1966: 3), a concept in law is defined by its usual, ordinary meaning. This exercise revealed three basic elements in the formulation of the precautionary principle under international environmental law. Table 1 shows the results of the analysis.²⁶

**Table 1:
Common elements among precautionary provisions**

Element	Number of times mentioned in international agreements incorporating the Precautionary Principle
<i>Risk or threat of serious damage [to human health or the environment]</i> ²⁷	15
<i>Lack of certainty</i> ²⁸	15
<i>Reasonable Action</i> ²⁹	16

Thus, it can be concluded that precautionary principle under current international law formulations provides for three fundamental elements: (a) risk or threat of serious damage to human health, and/or environment; (b) lack of complete or absolute certainty as to causes and/or impacts; (c) reasonable action to address (a). In other words, under existing MEAs, the basic formulation of the precautionary principle is, “*if there is risk (or threat) of serious (and unacceptable)*³⁰ *damage to human health or the environment, reasonable (precautionary) action should be taken despite lack of absolute certainty with regard to its causes or impacts.* Similar formulation of the precautionary principle is provided by a number of authors giving credence to this finding (Hohmann, 1994: 10; Cameron and Abouchar, 1996: 30; Christoforou, 2002: 241).

One implication of this finding, in support of the discussion in subchapter 3.6., is that any rational or scientifically-based policy, measure, or strategy employed to specifically address a potential risk of serious damage to human health and the environment despite lack of full scientific certainty, can be classified as a precautionary action. In other words, in environmental issues involving uncertainty, like the global climate change, the fact that states have decided to take concrete and scientifically sound measures aimed at addressing the problem, despite lingering doubts, is an indication of a precautionary response. Furthermore, as will be discussed further in Chapter V, this shows an emergence of a well-defined international customary norm.

²⁶ For the purpose of this study, the terms used by an international agreement in its precautionary section are dissected and grouped with provisions from other international agreements according to their meaning. Hence, each dissected part is assigned one (1) point. No distinction is made between an agreement that has already entered into force and those signed but still subject to ratification. Provisions within the treaty itself are given equal treatment. Further, treaties, conventions, and declarations are treated similarly.

²⁷ This includes the following words and phrases: *damage; unacceptable of irreversible risk; adverse effects to human health and environment; risk of damage; potentially damaging impacts; threats of serious or irreversible damage; long-term and irreversible effects.*

²⁸ This includes the following words and phrases: *no scientific evidence to prove a causal link; lack of full scientific certainty; uncertainty; scientific uncertainty; complex systems not yet fully understood; information is uncertain, unreliable or inadequate; before causal link is established by absolutely clear scientific evidence; [lack of] proof of harmful effects.*

²⁹ This includes the following words and phrases: *take appropriate measures; action; control; not be used as a reason to postpone measures (actions).*

³⁰ The term ‘unacceptable’ is employed only in Chapter 19 of Agenda 21. However, this paper argues that the term ‘unacceptable’ is comprehensive enough to cover other terms used by international agreements to describe the level of danger that requires precautionary action.

In common usage, the phrase “risk of danger” is probably redundant. If we right click our computer mouse and look at synonyms of the word “risk”, the first entry is “danger.” As enunciated by van Asselt and Vos (2004: 2), “in view of increasing incalculability and hence uncontrollability attributed to risk in societal controversies, ‘risk’ has become increasingly equated with ‘danger,’ its original and historic meaning”. But, they argued that with regard to the precautionary principle, *Risk* cannot be distinguished from *uncertainty* as they are ‘intermingled’ (Ibid). Indeed, precaution is not a necessity if there is no risk of danger involved. And if we are absolutely certain of the causes and effects of a hazardous activity, technology or occurrence, the appropriate response is usually outright prevention, banning or minimization of damage.

On the other hand, the European Environment Agency (EEA) (2001: 192) differentiates ‘uncertainty,’ ‘risk’ and ‘ignorance,’ and suggests corresponding response to each. Table 2 from EEA (Ibid) demonstrates this point.

Table 2: Risk, Uncertainty and Precaution

Situation	State and dates of knowledge	Examples of action
Risk	‘Known’ impacts; ‘known probabilities,’ e.g. asbestos causing respiratory disease, lung and mesothelioma cancer, 1965–present	Prevention: action taken to reduce known risks, e.g. eliminate exposure to asbestos dust
Uncertainty	‘Known’ impacts; ‘unknown’ probabilities, e.g. antibiotics in animal feed and associated human resistance to those antibiotics, 1969–present	Precautionary prevention: action taken to reduce potential hazards, e.g. reduce/eliminate human exposure to antibiotics in animal feed
Ignorance	‘Unknown’ impacts and therefore ‘unknown’ probabilities, e.g. the ‘surprises’ of chlorofluorocarbons (CFCs) and ozone layer damage prior to 1974; asbestos mesothelioma cancer prior to 1959	Precaution: action to anticipate, identify and reduce the impact of ‘surprises,’ e.g. use of properties of chemicals such as persistence or bioaccumulation as ‘predictors’ of potential harm; use of the broadest possible sources of information, including long-term monitoring; promotion of robust, diverse and adaptable technologies and social arrangements to meet needs, with fewer technological ‘monopolies’ such as asbestos and CFCs

Source: EEA (2001: 192)

Table 1 defines ‘risk’ as ‘known impacts,’ or what van Asselt and Vos (2004: 2) calls ‘original and historic’ connotation. However, ‘risk’ as used in most international agreements refers to ‘unknown or uncertain’ probabilities (modern meaning) (Petersen, 2002: 16). According to John Adams (1995), risks are of three types, namely: *directly perceptible* (common sense risk), *scientifically perceptible* (risk established by science), and *virtual* (unknown or uncertain risk) (Blackmore, 2004: 13). The traditional approach to risk in health policy is risk assessment, which, like the precautionary principle, is criticized for its tendency to make value-judgments of acceptable public risks, and for adhering to the doctrine ‘innocent until proven guilty.’

There is currently a forming consensus in the scientific community on the fact of global warming; however, uncertainties are still present as to its complete causes and impacts. Still, the ‘risk of serious and unacceptable danger’ continues to be ‘virtual’ except for some physical manifestations to be explained in subchapter 4.1, thus, the need for a global precautionary action.

3.9. Standard of Proof

A key issue that is equally controversial in the debates over the precautionary principle is the standard of proof attached to potential risks involving uncertainty. For instance, if a new substance is developed for a particular purpose, what is the level of proof required before the precautionary principle is set in motion? As previously mentioned, Sandin (1999: 7) proposes a degree of evidence in qualitative terms, such as ‘strong scientific evidence’, ‘scientifically supported strong suspicions’, or some versions of the *de minimis* principle prior to the application of the precautionary principle (See subchapter 3.7). On this point, the European Commission has chosen the standard ‘reasonable grounds for concern’, *to wit*:

“The Community has consistently endeavoured to achieve a high level of protection, among others in environment and human, animal or plant health. In most cases, measures making it possible to achieve this high level of protection can be determined on a satisfactory scientific basis. However, when there *are reasonable grounds for concern* that potential hazards may affect the environment or human, animal or plant health, and when at the same time the available data preclude a detailed risk evaluation, the precautionary principle has been politically accepted as a risk management strategy in several fields.” [italics supplied] (EC, 2000: 9)

The EEA (2001: 193), on the other hand, suggested that the proof requirement in specific issues should be based on a number of factors, namely: “size and nature of the potential harm, the claimed benefits, the available alternatives, and the potential costs of being wrong in both directions”.

This paper argues that existing international agreements are clear as to the standard of proof required under the precautionary principle. In this case, the intention of the negotiators can be deduced from contemporaneous circumstances at the time of adoption. Taking into account the nature of the precautionary concept, the situation and realities at the time of signing of these treaties when the world is divided into ‘developed’ and ‘developing’ countries, and considering further the public pronouncements of some significant actors (e.g., US objection to any policy which would affect economic growth), we can determine the choice of standards which can be adopted by national implementers depending on the circumstances of each case requiring precautionary response. In view of social and economic concerns of the developing countries and some in the developed world like the United States and Australia, ‘absolute proof’ could not have been intended by the treaty framers. ‘Absolute proof’ is considered dangerous as scientific research on impacts of potentially damaging substances normally takes a long time and this would confirm the fears of precautionary principle sceptics that technological progress and development would be stalled.³¹ Considering further, the realities of contemporary world politics and international relations, absolute proofs would be seen by the US and its allies and the group of developing countries as ‘unacceptable’. On the other side of the spectrum of proof is ‘no proof’ at all. A ‘no proof’ standard would defeat the purpose of taking precaution. Thus, this level of proof would not have been intended by the framers of treaties adopting the precautionary principle. Another factor that is equally important in determining the standard of proof required by precautionary principle under current international agreements is the flexibility accorded to individual parties. As earlier noted, environmentalists consider international law formulations of the precautionary principle as ‘weak’ for being a compromise version. This is true in the sense that international negotiations are, more often than not, characterized by bargaining and rarely by complete agreement. A case in point is the negotiations in the INC/FCCC which in its earlier phase was characterized by debates and position rigging rather than compromise (Bodansky, 2001: 32). Agreement was only facilitated in the final session before UNCED through the compromise

³¹ See, for example, Wiegandt (2001: 136) in Luterbacher and Sprinz (eds.), *International Relations and Global Climate Change*, Cambridge: The MIT Press .

text by the INC Chair which allowed flexibility to accommodate varying interests (Ibid). Further, flexibility is given to the parties in the sense that they are allowed to apply standards of proof depending on circumstances surrounding a particular issue. Thus, in view of the foregoing elements, the levels of proofs in applying the precautionary principle range between, but not including, the standards of ‘no proof’ and ‘absolute proof’.

Proponents of a ‘strong’ precautionary principle agree with different standards of proof depending on the circumstances. Professor Joel Tickner, a participant of the Wingspread Conference, believes that standard of proof has to be variable and offered the following factors to be considered: “magnitude of hazard”, “evidence of potential harm”, “extent of potential exposure”, “irreversibility of potential effects”, and “[availability] of safer alternatives” (Interview, 15 November 2005).

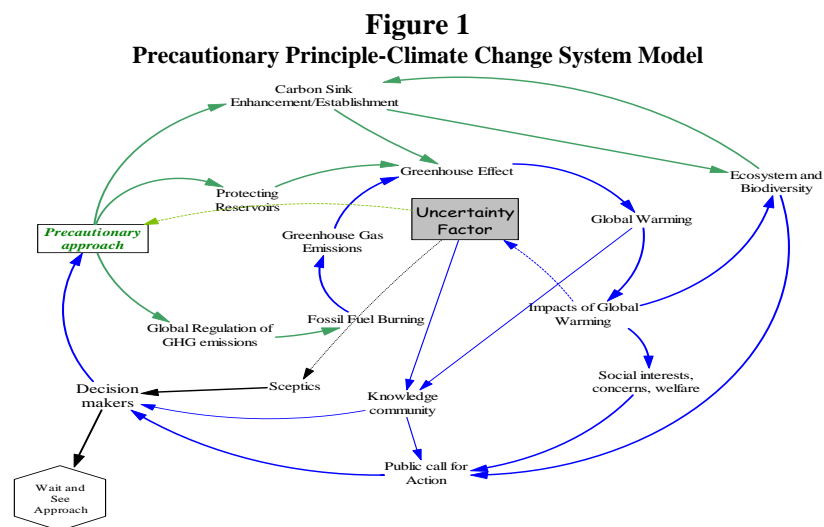
IV. The Precautionary Principle and Climate Change

“We must rethink and refeel our nature and destiny.”

White (1967: 152)

As a result of rising political demands for international action and the burgeoning scientific consensus on a warming planet due to human interference, representatives of states were confronted with policy questions which demanded a practical and instructive response. Should they give credence to climatologists who predict catastrophic natural disasters as a result of climate change and start reducing global GHG emissions? What approach and strategy would be most appropriate response to tackle issues of such magnitude as climate change? These were just some of the key questions running through the minds of national decision makers in the late 1980s. The precautionary principle has, in fact, played an important part during the conception and birth of the UNFCCC. In the face of a number of scientific, socio-political and economic uncertainties, world leaders who signed the UNFCCC opted for a ‘better safe than sorry’ approach. They established the precautionary principle as a guiding principle in the convention.³²

This section of the thesis examines the precautionary principle under the climate change issue. A basic model of the Precautionary approach under the global warming scenario is presented to show a graphic description of the system (See Figure 1). Figure 1 is influenced by the basic Causal Loop Diagram prepared by Hördur Haraldsson (2004).



³² In the words of the UNFCCC, “In their actions to achieve the objective of the Convention and to implement its provisions, the Parties shall be guided, *inter alia*, by the following (underline supplied) (Article 3, UNFCCC).”

Figure 1 above is a simple representation of the precautionary principle in relation with the climate change issue, its causes, effects and policy measures contained in pertinent international agreements. Important components of the model are explained in the succeeding sections.

4.1. *Uncertainty Factor*

As shown in Figure 1, the global climate change phenomenon is characterized by uncertainty in several dimensions. Uncertainty results from both limitations in current scientific tools and the nature of complex systems (Tickner, 2003: 5). While some uncertainties may be reduced through more information and scientific inquiry, some result from the dynamic and complex nature of natural and social systems. Thus, Bäckstrand (2001:40) argues that “[uncertainty] is a salient issue in international environmental negotiation.” This is echoed by Dr. Jeff McNeely, Chief Scientist of the IUCN, who stated in an interview for this paper that “scientific uncertainty is always going to exist, because the nature of science is constantly to make new discoveries (some of which may make our previous ideas obsolete)” (Interview, 6 November 2005).

Decision making in climate change is essentially a sequential process under general *uncertainty* (IPCC, 2001: 2). When negotiators adopted the precautionary principle under the UNFCCC in 1992, there were lingering doubts as to the veracity of claims pointing to human influences in global warming trends or whether there was indeed climate change taking place. Through the effort of the Intergovernmental Panel on Climate Change (IPCC), these doubts were drastically reduced, including the issue of anthropogenic influence on the climate system. Nevertheless, owing to the complexity of the climate system, uncertainties remain. The 1995 Second Assessment Report (SAR) of the IPCC admitted that “uncertainties remain which are relevant to judgment of what constitutes dangerous anthropogenic interference with the climate system and what needs to be done to prevent such interference (IPCC, 1995: 17). However, in the same report, the IPCC maintained that:

Uncertainty does not mean that a nation or the world community cannot position itself better to cope with the broad range of possible climate changes or protect against potentially costly future outcomes.

(IPCC, 1995: 28)

Elliot (2004: 79) states that among the uncertainties are relative contribution of gases to global warming, complex interaction of positive and negative feedbacks, impact of carbon sinks, and the threshold level for concentrations in relation with resilience of the climate system. As argued by Rosie Cooney of the Flora and Fauna International, “to the extent that the science surrounding climate change continues to exhibit a high degree of uncertainty, the precautionary principle will continue to be crucial” (Email correspondence, 18 November 2005). These uncertainties would be resolved by continued scientific research and improvement in modelling technology or eventually by natural confirmation if the projected impacts are realized. The Third Assessment Report of the IPCC (2001) provides a list of current uncertainties in climate change detection and attribution:

- Discrepancies between the vertical profile of temperature change in the troposphere seen in observations and models.
- Large uncertainties in estimates of internal climate variability from models and observations.
- Considerable uncertainty in the reconstructions of solar and volcanic forcing which are based on proxy or limited observational data for all but the last two decades.
- Large uncertainties in anthropogenic forcing are associated with the effects of aerosols (IPCC, TAR, 2001: 59, 61).

As argued by Professor Joel Tickner, these uncertainties aside, the known facts are enough to proceed with political action (Email correspondence, 6 November 2005). The causes of global warming are clear, at least in general terms. They are the escalation in demand for energy, the expansion of industry and the intensification of agriculture since the industrial revolution, all of which have led to increased atmospheric concentration of GHGs. Table 3 shows a number of significant scientific findings in the second and third assessment reports of the IPCC:

Table 3
Significant IPCC Findings (SAR-TAR)

	IPCC SAR	IPCC TAR
Finding 1	“Climate has changed over the past century. Global mean surface temperature has increased by between about 0.3 and 0.8°C since the late 19 th century, a change that is unlikely to be entirely natural” (IPCC, 1995: 5, 22)	“The global average surface temperature has increased by $0.6 \pm 0.2^{\circ}\text{C}$ since the late 19 th century. It is very likely that the 1990s was the warmest decade and 1998 the warmest year in the instrumental record since 1861” (IPCC, 2001: 26) (See Figure 3).
Finding 2	“The Balance of evidence suggests a discernible human influence on global climate. Concentration of GHGs (carbon dioxide, methane, nitrous oxide, etc.) have grown significantly since pre industrial times (about 1750 AD); anthropogenic GHGs led to positive radiative forcing of climate tending to warm the earth’s surface” (IPCC, 1995: 21)	“Over the millennium before the Industrial Era, the atmospheric concentrations of greenhouse gases remained relatively constant” (See Figure 4). Since then, however, “the concentrations of many greenhouse gases have increased directly or indirectly because of human activities” (IPCC, 2001: 38). “All simulations with greenhouse gases and sulphate aerosols that have been used in detection studies have found that a significant anthropogenic contribution is required to account for surface and tropospheric trends over at least the last 30 years” (Ibid: 57).
Finding 3	“Anthropogenic aerosols tend to produce negative radiative forcings which can lead to continental and hemispheric effects on climate patterns” (IPCC, 1995: 21).	“Changes in land use, deforestation being the major factor, appear to have produced a negative radiative forcing of $0.2 \pm 0.2 \text{ Wm}^{-2}$ ” (IPCC, 2001: 45)
Finding 4	“Climate is expected to continue to change in the future. If net global anthropogenic emissions (i.e., anthropogenic sources minus anthropogenic sinks) were maintained at current levels (about Gt/year including emissions from fossil fuel combustion, cement production, land use change), they would lead to a nearly constant rate of increase in atmospheric concentration for at least two centuries.” (IPCC, 1995: 9)	“The possibility for rapid and irreversible changes in the climate system exists, but there is a large degree of uncertainty about the mechanisms involved and hence also about the likelihood or time-scales of such transitions.” (IPCC, 2001: 53).

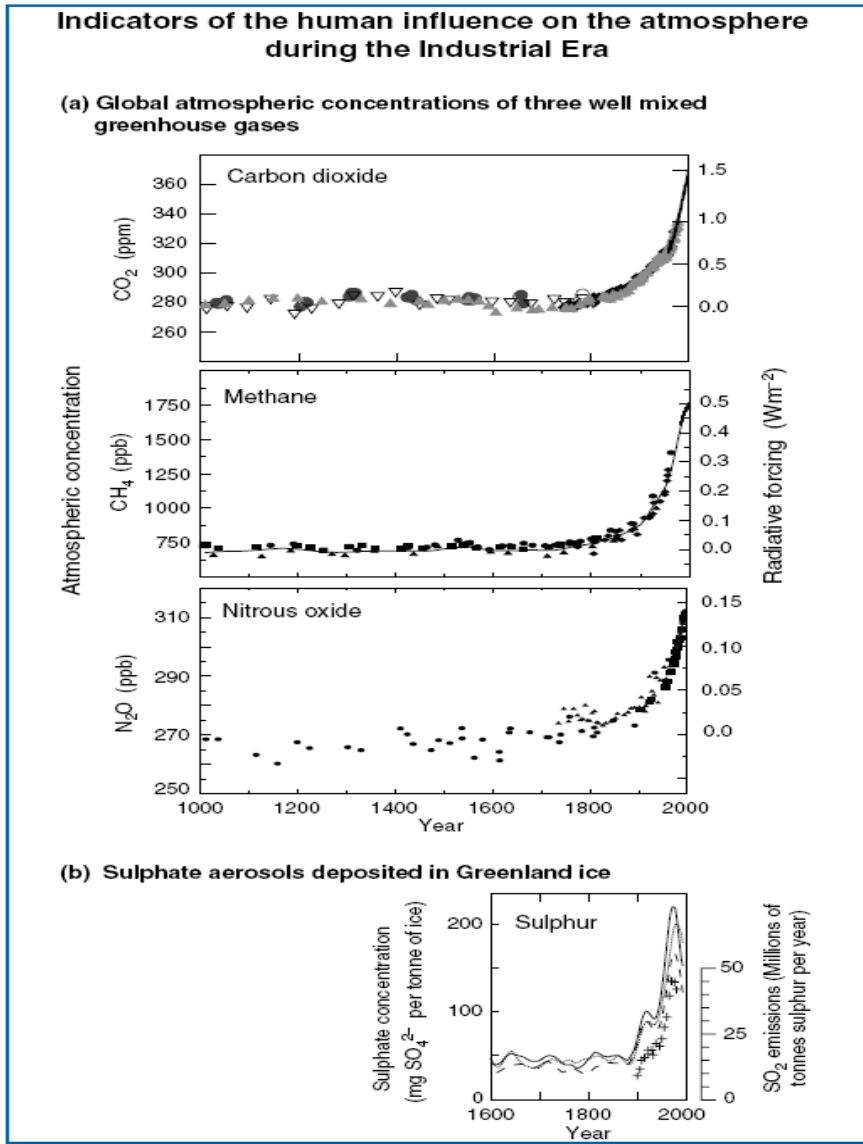
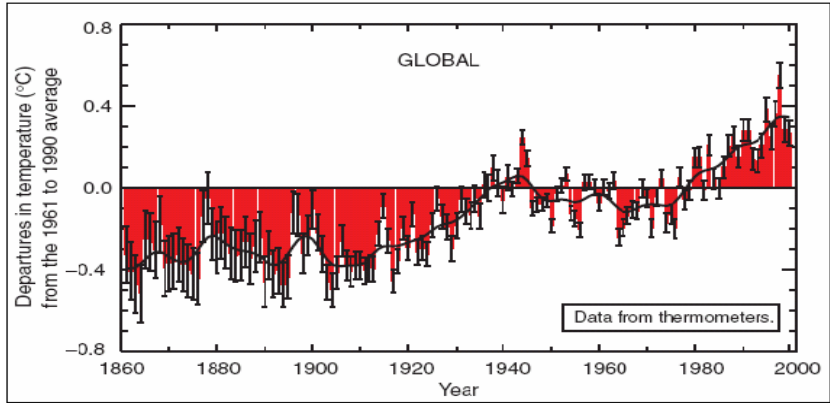


Figure 2:
Variation of
Earth's
Temperature
1860-2000
(Source: IPCC-
TAR (2001:3)

The IPCC has also confirmed pre-1992 propositions that human greenhouse gas emissions continues to alter the atmosphere in ways that are expected to affect the climate (IPCC, 2001: 5). Figure 2 showing long records of past changes in atmospheric composition provide the context for the influence of anthropogenic emissions

Figure 3 Long records of past changes in atmospheric composition provide the context for the influence of anthropogenic emissions



Source: IPCC, TAR (2001: 6)

4.2. *The Precautionary approach to global warming*

The precautionary approach is an overarching framework of decision making that governs the use of foresight in situations characterized by uncertainty and ignorance and where there are potentially large cost to both regulatory action and inaction (EEA, 2000: 192). In the words of UNEP Executive Director Klaus Töpfer, “the [UNFCCC] and its Kyoto protocol are clear manifestation of the precautionary principle... so the international community in fact has accepted the precautionary principle” (Correspondence dated 24 November 2005). Our findings in subchapter 3.8 of this paper on the ‘basic formulation’ of the precautionary principle suggests that any sound action, measure or strategy to specifically address a potential risk where there is lack of full scientific certainty could fall under the category of precautionary action. In view of this, considering the uncertainties in the climate change issue and the risks of damage to humans and the environment, the main strategies adopted in the UNFCCC—emissions reduction, establishment or enhancement of sinks and protection of reservoirs—which are scientifically found to reduce GHG concentration in the atmosphere if adequately and effectively enforced, can be considered precautionary actions.

4.3. *Wait-and-see Approach*

The alternatives to the precautionary approach in tackling the issue of climate change is referred to as Wait-and-see or Business-as-usual approach (Bode, 2004: 15; Buchner and Galeotti, 2003: 14; Hultman, 2004: 124; Holtmark and Maestad, 2000: 9). According to Kelly (2000: 129), there are two contrasting philosophies regarding the urgency with which action to combat the climate threat should be taken, the ‘wait and see’ approach’ and the ‘no regrets’ approach. Advocates of the wait-and-see approach to climate change call for delay in action until stronger evidence is available. They promote further research and prioritize expenditure that can be justified in terms of immediate and certain benefits. On the other side of the spectrum are the ‘no regrets’ advocates who react to the same scientific uncertainties through precautionary actions in view of the potential scale of the consequences of climate change (Ibid: 129). Table 4 shows these distinctions:

Table 4: Contrasting approaches to climate change

‘Wait and See’	‘No regrets’
The scientific evidence for global warming is incomplete.	Global climate change is linked to other important problems of environment and development and the combined risks are serious enough to warrant urgent and bold initiatives, even if they impose substantial cost
Hastily contrived strategies could do more harm than good: the costs could lead to a loss of human welfare and their implementation could lead to the shifting of human activity.	Human welfare, by and large, will be enhanced through strong efforts to mitigate environmental effects.
With the passage of time we will know more about the global warming problem and how best to respond to it. New solutions may emerge over time.	Time is of the essence in view of the long timescales characteristic of the problem and the time needed to alter fundamental aspects of the development process to reduce emissions and adapt to the changing climate.
Investment in research reduces the risks associated with premature and costly measures based on incomplete information	Potential costs should be factored into present-day investment calculations, offsetting the expense of early action.
We should ‘learn then act,’ so that optimal strategies can be determined on the basis of complete and accurate information.	We should ‘act then learn,’ adopting measures that favour experimentation, foresight and cost-effective preparation.

Based on Pachauri and Damodaran (1992) from Kelly (2000: 129)

As an illustration, in his study of Qatar and India’s emissions level, Sven Bode (2004: 15) observed that, since Qatar and India are included in the non-Annex 1 countries under the

UNFCCC and Kyoto Protocol, their business-as-usual approach to climate change has led to an 'increasing emissions path'. This was echoed by Bjart Holtsmark and Ottar Maestad (2000: 9-10) and concluded that inaction on the current climate change issue would result in increased demand for oil and gas and thus an increase in GHG emissions which would aggravate global warming.

4.4. Impacts of Global Warming

There are as yet many questions to be answered in relation to global warming. Nevertheless, it is possible to identify major areas of physical, social and economic impacts.³³ Some states may benefit from global warming as their climate becomes more benign. However, majority of the Earth's human population who are poor will be most vulnerable to further sufferings as they do not have the capacity to adapt (Kelly, 2000: 123). As the Earth's surface warms, the oceans will warm, seawater will expand (thermal expansion) and glaciers on land will melt, resulting in a sea level rise (IPCC, 2001: 5). The main concern will be for many of the third world countries that will not have the resources to protect themselves: such as the bay area in Manila, Ganges delta and in Bangladesh. As reported by the IPCC (1995: 6), "many human settlements will face increased risk of coastal flooding and erosion, and tens of millions of people living in deltas, in low-lying coastal areas, and on small islands will face risk of displacement." Climate change will exacerbate water shortages in many water scarce areas of the world and food production will decrease significantly in tropical and subtropical regions (Ibid: 7). Poorer nations suffering harvest failure will continue to suffer as they would be unable to buy food on the world market. Climatic zones will expand away from the equator towards the poles and ecological habitats will shift as climate patterns are changed. While some species and ecosystems will be able to adapt to changing climate, in many cases the speed of change will be too abrupt and most species and ecosystems could become extinct (Kelly, 2000: 122). The IPCC reported that 'the greater the reductions in emissions and the earlier they are introduced, the smaller and slower the projected warming and the rise in sea levels'...and... 'reductions in greenhouse gas emissions and the gases that control their concentration would be necessary to stabilize radiative forcing' (IPCC, 2001: 11).

4.5. The Role of the Public

Humankind is collectively responsible for current state of the Earth's atmosphere through their historical and continued activities that caused the unstable level of GHGs. As citizens in their respective states, the public will ultimately bear the benefits as well as costs of governmental actions, in the form of regulations of GHG emissions, or inactions. Thus, the public plays a key role in shaping the future of precautionary actions. This is very apparent today. In an interview for this study, Dr. Rajendra K. Pachauri, Chairman of the IPCC, expressed his belief that the "growing awareness among the public on the reality of climate change... has the potential of changing the political scenario significantly." In his mind, it is the people's perceptions and acceptance of the science of climate change that would determine actions to be taken (Email correspondence, Pachauri, 26 October 2005). Public pressure and lobbying can lead to a change in domestic policies as well as the states' position in international negotiations on the matter of climate change.

The advancement in media and communications has certainly helped spread the knowledge on climate change. As the potential victims of damages that could arise from global warming, each human has a stake in the problem. Professor Joel Tickner, of the Lowell Center for Sustainable Production, believes that as the people experience first-hand the impacts of climate change, their call for political action will be louder. In his words, "with more severe weather events [occurring], hopefully greater attention will be paid to climate change.... It also means that the public has to put pressure on policy makers to change [and adopt more precautionary measures]" (Email correspondence, Tickner, 5 November 2005).

³³ As it is not the focus of this paper, economic impacts are not included in the diagram in Figure 1. This should not be interpreted however as diminishing its significance in the climate issue.

V. The Precautionary Principle and International Law

5.1. Introduction

It has become a truism to observe that the international legal order, especially in the area of global environmental policies, has changed considerably since the inception of the UN Charter and the establishment of the International Court of Justice in 1946. Contributing to this change are the upsurge of international environmental agreements and the emergence of international customary law. The Stockholm Conference on Environment and Development in 1972 was primarily instrumental in this progress. It is often overlooked, however, that the body of customary international environmental law has gradually caught up with the changing needs of the global community. Despite developments in treaty law, customary international law remains the most basic source of rules to govern the activities of states (Thirlway, 1972: 2). This chapter examines the status of the precautionary principle using the internationally recognized legal procedure for determining customary international law.

5.2. Sources of International Law

The majority of international law textbooks propose that the sources of international law are contained in Article 38 (1) of the Statute of the International Court of Justice (ICJ).³⁴ Thus, according to Shaw (1991: 59), “Article 38(1)..... is widely recognized as the *most authoritative statement* as to the sources of international law” [italics supplied]. It provides thus:

“...the court, whose function is to decide in accordance with international law such disputes as are submitted to it, shall apply:
(a) international conventions, whether general or particular, establishing rules expressly recognized by the contesting states; (b) international custom, as evidence of a general practice accepted as law; (c) the general principles of law recognized by civilized nations; (d) subject to the provisions of Article 59, judicial decisions and the teachings of the most highly qualified publicists of the various nations, as subsidiary means for the determination of rules of law.”

According to Kelsen (1946: 437), the “[basic norm] of the international community is the set of rules of international law which regulate the creation of international law, or, in other terms, which determine the ‘sources’ of international law.” The two principal methods of creating international law are customs and treaties (Ibid: 438). In the words of Professor Alf Ross (1947:83) in his publication *A Textbook of International Law*, the doctrine of the sources of international law “can never in principle rest on precepts contained in one among the legal sources the existence of which the doctrine itself was meant to prove....[it is instead] in all cases actual practice and that alone.”³⁵ In other words, it could be argued that Article 38(1) is in itself a codification of existing international custom.³⁶

5.3. Customary International Law

The consent of states to be bound legally in the international arena is expressed generally in two forms: they may create legally binding obligations and rights by entering into a treaty or convention, or their consistent and general practice in an area in accordance with a sense of legal obligation may be the basis for the creation of international law. The latter form is what is commonly called Customary International Law.³⁷ In contrast with international conventions or treaties, customary law is formed by a general consensus and not by the

³⁴ To name a few: Browlie, *Principles of Public International Law* (1990: 3); Shaw, *International Law* (1991: 59); Sands, *Principles of International Environmental Law* (2003: 123).

³⁵ As quoted by Thirlway (1974: 36)

³⁶ This was in fact argued by Sir Hersch Lauterpacht in his 1947 *Memorandum of Codification: Collected Papers* as quoted by Thirlway (1974: 36).

³⁷ See e.g., the 1986 Restatement of the Law of Foreign Relations of the United States (1986, § 102.2): ‘Customary international law results from a general and consistent practice of states followed by them from a sense of legal obligation.*

convergence of wills of individual states. There are two types of customary international law in relation to coverage, namely, general—that is, rules binding *erga omnes* or on all states—and special—rules binding only to a limited number of states (Kontou, 1994: 5). For the purpose of this study, we are only concerned with customary law of general application.

Customary law, or *ius non scriptum*, is rooted from the practice of early civilization of mankind. In a primitive, pre-state, society certain rules of conduct develop overtime and these prescribe what is permissible and what is not acceptable (Shaw, 1990: 60). These rules of conduct were not written down but survive ultimately because of what Shaw called ‘aura of legitimacy’ (Ibid). In time, these set of unwritten rules came to be a reflection of what the community accepted as its common interest. International custom in contemporary legal system is an important and dynamic source of law. Accordingly, custom is a realization of the collective perceptions of states as it is based upon usages which are practiced by nations as they express their power, their hopes and fears (Shaw, 1991: 67). Customary international law was codified in the Vienna Convention on the Law of Treaties. According to Cameron and Abouchar (1997: 34-35), the significance of customary international law are: (1) it “creates binding obligations to all states unless a state has persistently objected to a practice and its legal consequences; (2) “custom can be relied upon during treaty negotiation and become codified in a binding convention,” and; (3) “customary rules are often more current and more adaptable to changing situations and moral standards.” Further, it is instructive to quote the Supreme Court of India in the 1996 *Tamil Nadu Tanneries Case* (Vellore Citizens Welfare Forum vs. Union of India, SCC 2715), which stated in paragraph 15 of its decision that:

“It is almost an accepted proposition of law that the rules of Customary International Law shall be deemed to have been incorporated in the domestic law and shall be followed by the courts of law. To support we may refer to Justice H. R. Khanna's opinion in *A.D.M v. Shivakant Shukla* [(1976) 2 SCC 521 : AIR 1976 SC 1207], *Jolly George Varghese case* [*Jolly George Varghese v. Bank of Cochin*, (1980) 2 SCC 360 : AIR 1980 SC 470] and *Gramophone Co. case* (*Gramophone Co. of India Ltd. v. Birendra Bahadur Pandey*, (1984) 2 SCC 534 : 1984 SCC (Cri) 313 : AIR 1984 SC 667].”

5.4. Definition and Elements of International Custom

Customary law is defined as an unwritten international law based on a general and consistent practice of States accepted by them as legally binding (Kontou: 1994: 2). To Kelsen (1946: 441), the “basis of customary law is the general principle that we ought to behave in the way our fellow men usually behave.” Consistent with Article 38 (1)(b) of the Statute of the ICJ, as endorsed by the ICJ itself,³⁸ there are two constitutive elements for the formation of international custom, (1) ‘state practice’ and (2) *opinio juris sive necessitatis* or the acceptance by States of the general practice of law. As the *ponente* of the International Court of Justice stated in the *Continental Shelf case*: “It is of course axiomatic that the material of customary international law is to be looked for primarily in the actual practice and *opinio juris* of States.”³⁹

State practice

It is generally agreed that state practice establishes customary international law only if it is general and consistent. The ICJ had the occasion to rule on whether a state practice establishes customary international law in the *North Sea Continental Shelf Cases*⁴⁰ decided on 20 February 1969 involving Germany and Denmark over the delimitation of the continental shelf. In this case, the *ponente* stated that state practice is ‘general’ if it is extensive and representative and includes the practice of States whose interests are specially

³⁸ See, for example, *Continental Shelf cases*, I.C.J. Reports (1969: 44).

³⁹ International Court of Justice, *Continental Shelf case* (Libyan Arab Jamahiriya v. Malta), Judgment, 3 June 1985, ICJ Reports 1985, pp. 29–30, § 27.

⁴⁰ ICJ Reports (1969).

affected (Ibid: 43). Further, general practice does not mean universal but only preponderant, thus, a few dissenters cannot prevent the creation of general customary rules. According to Shaw (1991: 66), occasional objections or claims by some states cannot overrule an international custom accepted by states “because it compromise a reasonably impartial system of international law....[thus]....it is the international context which play a vital part in the creation of custom.” Contrary practice which, at first sight, appears to undermine the uniformity of the practice concerned, does not prevent the formation of a rule of customary international law as long as this contrary practice is condemned by other States or denied by the government itself. Such condemnation or denial actually confirms the existence of the rule in question.⁴¹

The ICJ in the *North Sea Continental Shelf Cases* (ICJ Reports, 1969: 43) further ruled that state practice is ‘consistent’ if the various manifestations of a State’s conduct support one and the same rule. Although time may be necessary for a practice to gain general acceptance and for any inconsistencies to sort themselves out, it is generally accepted that ‘the passage of only a short period of time is not necessarily... a bar to the formation of a new rule of customary international law’ (Ibid). The adoption by a state of an internationally significant practice which could rapidly involve important public interests and is of a particularly noticeable nature may lead to the emergence of a legal relationship within a very short time (Slouka, 1968: 13).

Evidence of state practice can be obtained from numerous sources (Shaw, 1991: 70).⁴² Most importantly, at least for the purpose of this paper, state practice can be obtained from treaties signed by states containing the alleged customary rule as well as in pertinent national legislations. Quoting William Griffin (1959: 50), Slouka (1968: 11) states that “the number of states parties to these treaties, their spread over time and geography, and the fact that in these treaties similar problems are resolved in similar ways, make of these treaties and negotiations persuasive evidence of [customary] law creating international practice.” On the other hand, municipal or national laws may also form the basis of customary rules.⁴³

Opinio juris sive necessitatis

State practice can only establish customary international law if it is accompanied by *opinio juris*. In 1927, the Permanent Court of International Justice (PCIJ), predecessor to the present ICJ, in the *Lotus Case*⁴⁴ had the occasion to rule on whether there was a customary law to the effect that the exclusive jurisdiction of a criminal case involving an officer of a ship accused of negligence resulting in a collision belongs to the flag state of the accused simply on the basis of lack of previous prosecutions by states in similar situation. The PCIJ decided as follows:

“Even if the rarity of the judicial decisions to be found among the reported cases were sufficient to prove in point of fact the circumstance alleged by the Agent for the French Government, it would merely show that States had often, in practice, abstained from instituting criminal proceedings, and not that they recognized themselves as being obliged to do so; for only if such abstention were based on their being conscious of having a duty to abstain would it be

⁴¹ See International Court of Justice, Case concerning Military and Paramilitary Activities in and against Nicaragua (Nicaragua v. United States), Merits, Judgment, 27 June 1986, ICJ Reports 1986, p. 98, § 186.

⁴² Among others, historical records, official statements of government officials, memoirs of past leaders, official manuals on legal questions, diplomatic interchanges and the opinions of national legal advisors, comments made by governments on drafts produced by the International Law Commission, decisions of national courts (Shaw, 1991: 70). See also, Cameron and Abouchar (1996:36).

⁴³ For example, the US Supreme Court held in an 1871 case that the British Act of Parliament formed the basis of the relevant international custom (on navigational procedure) since other states had legislated in virtually identical terms (Shaw, 1991: 71); Also, see, *Nottebohm* case, ICJ Reports, 1955, 4.

⁴⁴ PCIJ, Series A, No. 10, 1927, 3 (text of the decision downloaded from http://www.worldcourts.com/pcij/eng/decisions/1927.09.07_lotus/).

possible to speak of an international custom. The alleged fact does not allow one to infer that States have been conscious of having such a duty; on the other hand, as will presently be seen, there are other circumstances calculated to show that the contrary is true.” (Ibid, 28)

Kelsen (1946: 440) posits that *opinio juris* requires that states “must believe that they apply a norm but need not believe that it is a legal norm which they apply”. In the *North Sea Continental Shelf Cases*, the ICJ stated that:

“...not only must the acts concerned amount to a settled practice, but they must also be such, or be carried out in such a way, as to be evidence of a belief that this practice is rendered obligatory by the existence of a rule of law requiring it.... The frequency, or even the habitual character of the acts is not in itself enough.” (ICJ Reports, 1969: 108)

Again, in 1986, the ICJ decided in the *Nicaragua Case*⁴⁵ (involving Nicaragua and the United States) that:

“Either the States taking [settled practice] or other States in a position to react to it, must have behaved so that their conduct is evidence of a belief that this practice is rendered obligatory by the existence of a rule of law requiring it. The need for such a belief...is implicit in the very notion of the *opinio juris sive necessitates*.” (Ibid: 14)

Explicit evidence of a sense of legal obligation, such as an official pronouncement of a legitimate state authority, is unnecessary. *Opinio juris* may be inferred from the circumstances surrounding particular acts or omissions of the community of states (Kontou, 1996: 5). *Opinio juris* can also be manifested by the readiness of states to accept a certain conduct as obligatory out of two or more courses of behaviour (Slouka, 1968: 15). The forms in which the practice and the legal conviction are expressed may well differ depending on whether the rule concerned contains a prohibition, an obligation or merely a right to behave in a certain manner. Often, the same act reflects both practice and legal conviction. The ICJ “has not in fact said in so many words that just because there are (allegedly) distinct elements in customary law the same conduct cannot manifest both...it is in fact often difficult or even impossible to disentangle the two elements.”⁴⁶ When there is sufficiently dense practice, an *opinio juris* is generally contained within that practice and, as a result, it is not usually necessary to demonstrate separately the existence of an *opinio juris*. In situations where practice is ambiguous, however, *opinio juris* plays an important role in determining whether or not that practice counts towards the formation of custom. This is supported by Brownlie (1973: 8) who stated that “the proponent [of the existence of a custom] has to establish a general practice and, having done this....the tribunal can be expected to presume the existence of an *opinion juris*.” In other words, the opponent on the issue has a burden of proving its absence (Ibid).

5.5. Analysis of the Precautionary Principle as Customary International Law

Analysis in this part of the paper is based on Article 38 of the Statute of the ICJ and relevant precedents from decisions of the ICJ and its predecessor, PCIJ. The theoretical debate on the validity of the precautionary principle in international environmental law is focused on the emergence of the norm effective *erga omnes*.⁴⁷ The fear is that this would put aside other socio-economic assessment approach in cases involving uncertainty. This part of the paper examines the customary norm creating process with regard to the precautionary principle. Hence, taking into account the basic definition of the precautionary principle in Chapter 3,

⁴⁵ ICJ Reports, 1986, 14.

⁴⁶ ILA Report, op. cit., p. 718, § 10(c).

⁴⁷ This means that it applies to all states in general.

and guided by the preceding discussions, we shall now examine whether the precautionary principle has been established by state practice and *opinio juris* to the status of customary international law. It is argued that the normative character of the precautionary principle in international law allows it to be a more politically potent international policy concept in environmental issues characterized by uncertainties as in the case of climate change.

The Nature of State Practice

The first requirement for international custom is state practice (*usus*). State practice that is general and consistent can be evidenced by numerous sources.⁴⁸ For the purpose of this study, the act of signing multilateral treaties, declarations, and statements of the Heads of State or their official representatives are deemed sufficient to prove state practice on the matter of the precautionary principle.

Article 38 of the Vienna Convention on the Law of Treaties provides that a rule set forth in a treaty can become binding upon a third state as a customary rule of international law. The ICJ, in the *Nicaragua Case* held that:

“The fact that the above-mentioned principles, recognized as such, have been codified or embodied in multilateral conventions does not mean that they cease to exist and to apply as principles of customary law, even as regards countries that are parties to such conventions.” (ICJ Reports, 1986: 36)

Despite criticisms hurled against the precautionary principle, states adopted the principle at the UNCED in 1992. The inclusion of the precautionary principle in other international agreements can be considered an act of state practice contributing to the formation of custom (Thirlway, 1972: 35). The American Law Institute Restatement (Third) on International Law §102, indicates that customary international law can arise from international agreements, “where such agreements are intended for adherence by states generally” (Cameron and Abouchar, 1996: 33). As stated by Cameron and Abouchar (1996: 34),

“it is this complex framework of treaty law and custom from which the precautionary principle draws its strength as a mechanism for environmental protection and ultimately validates its position as genuine international law.”

Thus, examining the body of international environmental law, it can be gleaned that there is general and consistent state practice to adopt a precautionary approach in multilateral treaties of general application in cases involving risk or threat of serious damage to human health or the environment and where there is uncertainty as to the causes and impacts (See discussion on Subchapter 3.8). Table 5 shows the roster of multilateral treaties adopted in the past twenty years which incorporates the precautionary principle. Although most international agreements listed in Table 5 provide for the precautionary principle in its preamble, a non-binding statement of principles, obligations contained in the agreements will be interpreted in light of such preambular statements (O’Riordan, et.al., 2002: 93).

Table 5: International Environmental Agreements which Incorporate the Precautionary Principle

Treaty	Subject	Article
Vienna Convention (1985)	Ozone depletion	Preamble
Montreal Protocol (1987)	Ozone depletion	Preamble
Climate Change Convention (1992)	Climate Change	Article 3, § 3
Biodiversity Convention (1992)	Biodiversity	Preamble
LRTAP Sulphur Protocol (1994)	Air Pollution	Preamble

⁴⁸ Sands (2003: 144) enumerates several sources of state practice from the *Yearbook of the International Law Commission* (1950-II: 368-72) as follows: ratification of treaties, participation in treaty negotiations and other international meetings, among others.

Agreement for the Conservation of Africa-Eurasian Migratory Waterbirds	Migratory Birds	Article 2
Straddling Stocks Agreement (1995)	Fish Stocks	Article 5(c); Article 6
SADC Water Protocol (1995)	Water	Preamble
Mediterranean Hazardous Waste Protocol (1996)	Pollution of Sea	Preamble; Article 8.3
Protocol to the London Convention (1996)	Marine Pollution	Article 3
ACCOBAMS	Cetaceans conservation	Article 2, § 4
Convention on the Law of Non-Navigational uses of International Watercourses (1996)	Watercourses	Preamble
Protocol to MARPOL 73/78 (1997)	Pollution from Ships	Preamble
Kyoto Protocol (1997)	Climate Change	Preamble
LRTAP POPs Protocol (1998)	Air Pollution	Preamble
LRTAP Heavy Metals Protocol (1998)	Air Pollution	Preamble; Annex VII.3
Chemicals Convention (1998)	Hazardous Chemicals and Pesticides	Article 14, §3(d); Annex 5, 1(e)
Agreement Concerning the Creation of a Marine Mammal Sanctuary in the Mediterranean (1999)	Marine Mammals	Final Declaration
Convention on the Protection of the Rhine (1999)	Rhine Protection	Article 4
Health Protocol (1999)	Water and Health	Article 5(a)
LRTAP Acidification Protocol (1999)	Air Pollution	Preamble
Biosafety Protocol (2000)	Biological Diversity	Preamble; Article 1
Galapagos Agreement (2000)	Living Marine Resources	Article 5(b)
Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (2000)	Migratory Fish Stocks	Preamble; Article 5(c); Article 6
International Convention on the Control of Harmful Anti-Fouling Systems on Ships (2001)	Pollution from Ships	Preamble
POPs Convention (2001)	Persistent Organic Pollution	Preamble; Article 1; Article 8 §9
Agreement on the Conservation of Albatrosses and Petrels (2001)	Birds Protection	Preamble; Article II § 3
North-East Pacific Convention (2002)	Marine and Coastal Protection	Article 5 § 6 (a)
International Convention for the Control and Management of Ships Ballast Water and Sediments (2004)	Pollution from Ships	Preamble

Another source of evidence for state practice is the declarations and statements of Heads of States or their official representatives. These official declarations may constitute the raw material out of which may be fashioned customary rules of international law (Shaw, 1991: 70-71). In the *Nuclear Tests Cases* decided by the ICJ on 20 December 1974, it was held that:

“It is well recognized that declarations made by way of unilateral acts.... may have the effect of creating legal obligations [under customary international law].” (ICJ Reports, 1974: 472)

Thus, for this study, a survey of international multilateral declarations by officials of States was conducted. Table 5 shows the list of official declarations since 1984 supporting or adopting the precautionary principle.

Table 6

Declaration Title	Subject
Bremen Declaration (1984)	North Sea
London Declaration (1987)	North Sea
Hague Declaration (1990)	North Sea
Rio Declaration (1992)	Environment and Development (Sustainable Development)
Rio Agenda 21 (1992)	Sustainable Development
Declaration on the Protection of the Marine Environment from Land-based Activities (1995)	Marine environment
WSSD Ministerial Declaration (2002)	Sustainable Development

The foregoing declarations suggest that States have affirmed the precautionary principle on matters involving human and environmental protection from any serious or irreversible harm although full certainty has not been obtained. In this regard, the ICJ in the *Nuclear Tests Cases* suggests that the act of official representatives of States (i.e., Presidents, Prime Ministers, Foreign Ministers) in signing these declarations constitutes a binding declaration for the countries they represent. In the words of the ICJ:

“There can be no doubt, in view of [the French President’s] functions, that his public communications, oral or written... are in international relations acts of the French States. His statements, and those of members of the French Government acting under his authority... constitute a whole. Thus in whatever form these statements were expressed, they must be held to constitute an engagement of the State, having regard to their intention and to the circumstances in which they were made.” (ICJ Reports, 1974: 474)

In view of the foregoing, it is submitted that the immensity in number and extensiveness in membership of existing international multilateral environmental agreements (MEAs), as well as declarations signed by Heads of States and Foreign Ministers, constitute sufficient evidence of state practice in relation to the precautionary principle.

Opinio Juris in relation to the Precautionary Principle

Opinio juris can be evidenced by a pattern of behaviour at the national and international level. These may include involvement in treaty formulation, enactment of national legislation, state declarations, and involvement in international conferences. As the ICJ in its Judgment on the preliminary objections in the case concerning *Temple of Preah Vihear*:

“ Where...as is generally the case in international law, which places the principal emphasis on the intention of the parties, the law prescribes no particular form..... provided their intention clearly results from it.” (ICJ Reports, 1961: 31)

As seen from the previous discussion of state practice, signing and ratification of treaties containing the precautionary principle is increasing. This, in itself, can be proof of a sense of legal obligation of states to adopt the precautionary principle (Shaw, 1991: 59; Sands, 2003: 147. As Thirlway (1972: 47) opined, as usage appears and develops through treaty making or other legal procedure, States may come to consider the practice to be required by law. Furthermore, Kontou (1994: 8) posits that it is generally accepted that ‘treaties may also be declaratory of customary law in force at the time of their conclusion.’⁴⁹ Alternatively,

⁴⁹ See also, *Fisheries Jurisdiction Case*, ICJ Reports (1973: 18).

implementation of the precautionary principle through national legislation, and national judicial decisions can also be evidence of a customary international law.

Further, in relation to protection of straddling fish stock and highly migratory fish stocks, the United Nations General Assembly, through its Resolution 56/13, “urged *All states* to apply the precautionary approach” [emphasis supplied] (<http://daccessdds.un.org>). Shaw (1991: 95) posits that UNGA resolutions are evidence of general state practice which have led to a binding rule of customary law. The resolution is addressed to “all states”, rather than to states or to members of the United Nations, and was adopted despite strong pressure from business groups. The resolution is not itself legally binding *per se*, but the fact that it was adopted by consensus, that its terms are clear, and that it has received support from a very large number of states since its adoption, all suggest that it may now reflect a rule of customary international law (Sands, 2003: 589). Notably, UNEP Executive Director Klaus Töpfer, whose agency plays a key role in global environmental programmes, argues that “the international community is, by and large, committed to the precautionary principle” (Correspondence with author dated 24 November 2005)

Examples of Precautionary concepts in the national setting

Another evidence of the emergence of a customary norm of international law, in addition to treaties and declarations, is the adoption of the norm in national policies. We shall now look at some countries which have directly or indirectly endorsed the concept of precaution.

United States

Recent US attempts to undermine the precautionary principle in international debates regarding GMOs, persistent organic pollutants and international trade, has put the US in the list of countries that object to the use of the principle. However, consistency of the US position on the principle cannot be concluded just yet.⁵⁰ According to Tickner and Raffensperger (2001: 184), the US government has explicitly endorsed the right of states to invoke the principle on several occasions: “by signing international treaties where precaution is a clear element of implementation⁵¹; through the development of national statements of sustainable development policy⁵²; through bi-national policy developments to protect the Great Lakes ecosystem⁵³, and; through executive branch pronouncements of the ability of states to undertake precautionary measures”. An example of an executive branch pronouncement which points to recognition of the principle is an official letter to the US Congress from former US Vice President Al Gore, which stated thus:

“We recognize and respect each nation’s right to set legitimate public health and environmental standards and to take appropriate precautionary action. The President and I have made it clear that the Department of Commerce and States should refrain from any actions to discourage individual countries,

⁵⁰ According to the 2001 European Environment Agency Report (EEA, 2001: 12), the United States was among the first which advocated the concept of Precautionary Prevention. The examples given are: *The Delaney Clause in the Food, Drug and Cosmetics Act, US ban on the use of scrapie-infected sheep and goat meat in the animal and human food chain in the early 1970s, ban on CFCs in aerosols in 1977.*

⁵¹ Among the international agreements signed by the US are the Rio Declaration, UNFCCC, Vienna Convention and Montreal Protocol on ozone depletion.

⁵² The President’s Council on Sustainable Development, established by President Clinton, published a report, *Sustainable America*, in 1996 which stated thus: “*We believe even in the face of scientific uncertainty, society should take reasonable actions to avert risks where the potential harm to human health or the environment is thought to be serious and irreparable*” (PCSD, 1992 as quoted by Tickner and Raffensperger, 2001: 184)

⁵³ The Science Advisory Board of the US-Canada International Joint Commission, published its 6th Biennial Report on Great Lakes Water Quality which states that: “*Such a strategy should recognize that all persistent toxic substances are dangerous to the environment, deleterious to the human condition, and can no longer be tolerated in the ecosystem, whether or not unassailable scientific proof of acute or chronic damage is universally accepted.*”

whether in the European Union or elsewhere, from implementing precautionary measures they deem appropriate...” (Gore, 1998, as quoted by Morris, 2002: 185)

Thus, even the United States, the only contemporary superpower and perceived as the foremost objector to the precautionary principle can be conceived of as formally and legally bound by a general customary international law which applies to all states. However, it should be acknowledged that in a political context, this is less significant. It cannot be argued that the United States is a ‘persistent objector’ in accordance with the ICJ decision in the *Anglo-Norwegian Fisheries Jurisdiction Case* (ICJ Reports, 1951: 139). In the said case, the ICJ held that a state may opt out of an evolving rule of general customary law by expressing its opposition to it in a “timely and consistent manner” (Ibid).

Germany

The fundamental principle of the German environmental policy is its *Vorsorgeprinzip*⁵⁴ (Cameron and Abouchar, 1996: 38). *Vorsorge* means that “early detection of dangers to health and environment by comprehensive, synchronized research, in particular about cause and effect relationship...it also means acting when conclusively ascertained understanding by science is not yet available” (Boehmer-Christiansen, 1994: 33: Ibid). *Vorsorgeprinzip* has been implemented in Germany through “the promotion of basic research and development, the establishment of liability and compensation schemes... and has come to require Best Available Technology (BAT)” (Ibid: 39).

United Kingdom

The United Kingdom’s policy on precaution is contained in its 1990 White Paper, *This Common Inheritance: Britain’s Environmental Strategy* and its 1999 White Paper, *A Better Quality of Life- A Strategy for Sustainable Development for the UK*.

The 1990 White Paper states that, “Where there are significant risks of damage to the environment, the government will be prepared to take precautionary action to limit the use of potentially dangerous materials or the spread of potentially dangerous pollutants, even where scientific knowledge is not conclusive, if the balance of likely costs and benefits justifies it” (Cameron and Abouchar, 1996: 39). The 1999 White Paper, on the other hand elaborated the State’s policy on precaution thus, “...transparency is essential: difficult decisions on precautionary action are most likely where there is reason to think there may be a significant threat, but evidence for its existence is as yet lacking or inconclusive. Decisions should be reviewed to reflect better understanding of risk as more evidence becomes available” (1990 White Paper, Chapter 4, from www.environment.defra.gov.uk).

Canada

Canada’s Integrated Risk Management Framework recognizes the “precautionary approach/principle as a means of managing risks of serious or irreversible harm in situations of scientific uncertainty” (Element 3, from www.tbs-sct.gc.ca). The principle was incorporated in the Environmental Protection Chapter of the Agreement on Internal Trade. The objective of the Agreement, which came into force in 1995, “is to reduce inter-provincial barriers to trade” and “authorize the employment of the precautionary principle as a rationale for environmental measures even if these might have a negative impact upon internal trade” (Sabapathy, from www.ucalgary.edu).

India

In the case of *Tamil Nadu Tanneries Case* (1996 SCC 2715), filed by the Vellore Citizens Welfare Forum against the government, India’s Supreme Court was confronted with a petition to stop tannery factories in the State of Tamil Nadu from releasing toxic waste substances into

⁵⁴ Translated as “principle of precaution”

the surrounding water system and agricultural and open fields. The Supreme Court held that, in its view, the precautionary principle,⁵⁵ along with the principle of sustainable development, has become a part of the customary international law. Thus, it ordered the Central Government to implement the principle and set up an agency with the authority to handle the environmental impacts of the tannery industry in Tamil Nadu (Ibid).

Thus, there is sufficient state practice to make a tenable argument that the precautionary principle is a principle of customary international law. Evidence of this is provided by numerous MEAs and declarations. The pattern of discourse at the international and national levels, as proven by the signed commitments of states and their domestic policies, point to a general acceptance of the precautionary principle as a binding norm of international law.

VI. CONCLUSIONS

A study of international law from a legal positivist perspective, has allowed us to evaluate the normative character of the precautionary principle. We have also examined the particular application of the precautionary principle in relation to the climate change issue. It should be acknowledged however that the use of this approach limits us from seeing the moral viability and practical reality of the application of international norms in the real world. On this point, Dr. Rosie Cooney of the Flora and Fauna International (and coordinator of *The Precautionary Principle Project*) argued that application and enforcement of the precautionary principle “is inherently political...[involving] economic costs to powerful interest groups (countries and corporations)” (Email correspondence, 18 November 2005). Nevertheless, this study has led us to the following conclusions:

The Role of the Precautionary Principle in Climate Change Issue

Article 3 of the UNFCCC, which provides that parties to the convention “should take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigates its adverse effects....,” represents the convergence of the precautionary principle with the global effort to address climate change. The climate change is characterized by uncertainty in several dimensions and it involves risks of severe damage to human health and the environment. The precautionary principle, which mandates that actions should be taken to avoid risks of damage despite the presence of uncertainty, is specifically intended to address this kind of problem. Thus, when INC negotiators framed the UNFCCC in 1992 despite lingering scientific uncertainties, but backed by the findings of the IPCC on its First Assessment Report, it adopted the precautionary principle under Article 3 and not the traditional wait-and-see approach. Subsequently, the Second and Third Assessment Reports of the IPCC confirmed that there is indeed a trend towards global warming, that human activities since the Industrial Revolution have influenced this phenomenon, and that there are still uncertainties in climate change detection and attribution. Using the criteria formulated by Sandin (2002), it can be said that the basic strategies adopted in the UNFCCC and the Kyoto Protocol to achieve the objective of stabilizing the level of GHGs concentration in the atmosphere—reduction of GHG emissions, protecting and enhancing sinks and reservoirs—are precautionary actions.

Intention to Abandon the Wait-and-See Approach

There appears to be a growing trend towards the abandonment of the traditional ‘wait-and-see’ or ‘business-as-usual’ approach to environmental protection, at least in the international legal context. The reality however may suggest the opposite. Delayed action is no longer seen an environmentally acceptable and sustainable strategy. Instead, the ‘no regrets’ or precautionary approach seems to be taking a stronger hold in the area of international law. As the reality of climate change continues to be manifested, it can be expected that the community of states will continue to adhere to the later approach.

⁵⁵ See, paragraph 14, *Vellore Citizens Welfare Forum vs. Union of India* (1996 SCC 2715)

Basic formulation of the Precautionary Principle under International Agreements

Since 1984, the precautionary principle has been incorporated in 29 international environmental agreements and 7 international declarations. Although each treaty and declaration contains its own version of the precautionary principle, their common elements are revealed by a simple content analysis of the same. Thus, the basic formulation of the precautionary principle under current international agreements state that: If there is risk (or threat) of serious (and unacceptable) damage to human health or the environment, reasonable precautionary action should be taken despite lack of absolute certainty with regard to its causes and impact.

Status as International Custom

States have extensively recognized the existence of the precautionary principle through their participation in the negotiations, signature and ratification of international environmental agreements incorporating the international norm. By examining international environmental agreements, national laws and policies, judicial decisions and state pronouncements, we can reasonably conclude that there is sufficient evidence to prove state practice and *opinion juris sive necessitates* as required by Article 38(1b) of the Statute of the International Court of Justice for proving the existence of an international custom. General and consistent state practice, including the signing and ratification of treaties and enforcement of the precautionary principle by national policies is evident and swiftly growing. Further, national policies incorporating the concept of precaution and the pattern of discourse by states at the international level indicate that the precautionary principle has been accepted as a binding international norm by a significant number of states. It is clear that with the increase in global awareness towards environmental concerns, people are becoming more open to adopting the precautionary principle.

REFERENCES

Books and Articles

- Alfsen, Knut, and Tora Skodvin (1998), "The Intergovernmental Panel on Climate Change (IPCC) and scientific consensus: How scientists come to say what they say about climate change," *CICERO: Policy Note 1998:3*. From website <http://www.cicero.uio.no> (Accessed 28 August 2005).
- Allaby, Michael (1996), *Basics of Environmental Science*, London: Routledge
- Barrett, Katherine, and Joel Tickner (2001), "Trans-Atlantic Consumer Dialogue (TACD) Briefing Paper on the Precautionary Principle". From website www.sustainableproduction.org/downloads/TACD%20Briefing.pdf (Accessed 27 September 2005).
- Birnie, Patricia, and Alan E. Boyle (1992), *International Law & The Environment*, Oxford: Clarendon Press.
- Blackmore, Alistair (2004), *On Measuring the Environmental Performance of the Service Sector: A Case Study of a Service Sector Organization in Cambridge, UK*, Masters Thesis, Lund University Masters in International Environmental Science (LUMES).
- Bodansky, Daniel (2001), "The History of the Global Climate Change Regime," in Urs Luterbacher and Detlef F. Sprinz, eds. (2001), *International Relations and Global Climate Change*, Cambridge: MIT Press.
- Bode, Sven (2004), "Equal emissions per capita over time – A proposal to combining responsibility and equity of rights for post 2012 GHG emission entitlement allocation," *European Environment*, Vol 14, 5, pp.300-316. From website [www.hwwa.de/Projekte/Forsch_Schwerpunkte/FS/Klimapolitik/PDFDokumente/Bode%20\(2004\)_EECT.pdf](http://www.hwwa.de/Projekte/Forsch_Schwerpunkte/FS/Klimapolitik/PDFDokumente/Bode%20(2004)_EECT.pdf) (Accessed 11 October 2005).

- Boehmer-Christiansen, Sonja (1994), "The Precautionary Principle in Germany- Enabling Government, in Tim O'Riordan and James Cameron (eds.), *Interpreting the Precautionary Principle*. London: Cameron May Ltd., as quoted by James Cameron and Juli Abouchar (1996), *The Status of the Precautionary Principle in International Law*, in Freestone, David, and Ellen Hey eds., *The Precautionary Principle and International Law: The Challenge of Implementation*, The Hague: Kluwer Law International, 29-38.
- Bratspies, Rebecca (2002), "The Illusion of Care: Regulation, Uncertainty, and Genetically Modified Food crops", *The Illusion of Care Macro*. From the website SSRN_ID353320_code021212500.pdf (Accessed 16 September 2005).
- Brownlie, Ian (1973), *Principles of Public International Law*, Oxford: Clarendon Press.
- Bäckstrand, Karin (2000), *What can Nature Withstand? Science, Politics and Discourses in Transboundary Air Pollution Diplomacy*, Doctoral Dissertation, Lund University, Department of Political Science.
- Cameron, James and Juli Abouchar (1996), *The Status of the Precautionary Principle in International Law*, in Freestone, David, and Ellen Hey eds., *The Precautionary Principle and International Law: The Challenge of Implementation*, The Hague: Kluwer Law International, 29-38.
- Carson, Rachel (1962), *Silent Spring*, New York: Penguin Books.
- Carter, Neil (2001), *The Politics of the Environment: Ideas, Activism, Policy*, Cambridge: Cambridge University Press.
- Christoforou, Theofanis (2002), "The Precautionary Principle in European Community Law and Science," in Joel Tickner (ed.), *Precaution: Environmental Science and Preventive Public Policy*, Washington DC: Island Press, 241-262.
- Dobson, David (2002), "From Ice Cores to Tree Rings", in Sharon Spray and Karen McGlothlin (eds.), *Global Climate Change*, Oxford: Rowman Littlefield Publishers.
- Elliot, Lorraine (2004), *The Global Politics of the Environment* (2nd ed), New York: Palgrave MacMillan.
- Environment and Development Desk (2004), "His Holiness the XIV Dalai Lama on Environment: Collected Statements," Department of Information and International Relations, Central Tibetan Administration. From website <http://www.tibet.net/diir/eng/enviro/2004/> (Accessed 15 October 2005).
- European Commission (2000), *Communication from the Commission on the Precautionary Principle*, Brussels: Commission of the European Union. From website europa.eu.int/comm/dgs/health_consumer/library/pub/pub07_en.pdf (Accessed 28 August 2005)
- European Environment Agency (2001), *Late Lessons from Early Warnings: The Precautionary Principle 1896-2000*, Copenhagen: European Environment Agency.
- Freestone, David, and Ellen Hey, eds. (1996), *The Precautionary Principle and International Law: The Challenge of Implementation*, The Hague: Kluwer Law International.
- Goklany, Indur (2001), *The Precautionary Principle: A Critical Appraisal of Environmental Risk Assessment*, Washington DC: Cato Institute.
- Gyllenstierna, Per (2003), *The Nikolic Case, Enquiring into the Legitimacy of Supra-National Organizations*, Graduate Thesis, Faculty of Law, University of Lund. Available at website [www.jur.lu.se/.../Examensarbeten.nsf/0/687F3628045AA2CBC1256DC5003E5903/\\$File/xsmal1.pdf?OpenElement](http://www.jur.lu.se/.../Examensarbeten.nsf/0/687F3628045AA2CBC1256DC5003E5903/$File/xsmal1.pdf?OpenElement) (Accessed 12 November 2005).
- Hardin, Garret (1968), "The Tragedy of the Commons", *Science*, in Nico Nelissen, Jan Van Der Straaten, and Leon Klinders (eds.), *Classics in Environmental Studies: An Overview of Classic Texts in Environmental Studies*, Utrecht: International Books, 101-114.
- Hohmann, Harald (1994), *Precautionary Legal Duties and Principles of Modern International Environmental Law Between Exploitation and Protection*, London: Graham and Trotman.
- Holtmark, Bjart, and Ottar Maestad (2000), "The Kyoto Protocol and the fossil fuel markets under different emission trading regimes," CICERO Working Paper 2000:10. From

- website arc.cs.odu.edu:8080/dp9/getrecord/oai_dc/544641417/oai:digbib.uio.no/7564 (Accessed 25 August 2005).
- Hsu, Lukas Hsin-Chiang (2004), *Institutional Bargaining for the Climate Regime: The Process and Its Dynamics*, Masters Thesis, Lund University Masters in International Environmental Science (LUMES).
- Haraldsson, Hördur (2004), *Introduction to System Thinking and Causal Loop Diagrams*, Department of Chemical Engineering, Lund University.
- Jones, Steven (2002), "Toward a Post-modern Communitarianism". From website www.sase.org/conf2002/papers/a003.jones.pdf (Accessed 12 October 2005).
- Kelly, P.M. (2000), "Towards a sustainable response to climate change", in Mark Huxham and David Summer (eds.) *Science and Environmental Decision Making*, Essex: Pearson Education Limited.
- Kelsen, Hans (1946), *General Theory of Law and State*, Massachusetts: Harvard University Press.
- Kelsen, Hans (1966), *Principles of International Law*, 2nd ed., New York: Holt, Rinehart and Winston, Inc.
- Klare, Michael T. (2001), *Resource Wars: The New Landscape of Global Conflict*, New York: Henry Holt and Company, LLC.
- Kontou, Nancy (1994), *The Termination and Revision of Treaties in the Light of New Customary International Law*, Oxford: Clarendon Press.
- Luterbacher, Urs and Detlef F. Sprinz, eds. (2001), *International Relations and Global Climate Change*, Cambridge: MIT Press.
- MacDonald, Gordon, and Luigi Sertorio, eds. (1990), *Global Climate and Ecosystem Change*, New York: Plenum Press.
- Martin, Philippe H. (1997), "If You Don't Know How to Fix It, Please Stop Breaking It." *Foundations of Science*, 2, 263-292.
- MsLeod, Ian (1999), *Legal Method* (3rd ed), New York: Palgrave.
- Miller, G. Tyler (1998), *Living in the Environment: Principles, Connections, and Solutions* (10th ed), Belmont: Wadsworth Publishing Company.
- Morris, Julian (2000), *Rethinking Risk and the Precautionary Principle*, Oxford: Butterworth-Heinemann.
- Myhr, Anne Ingeborg, and Terje Traavik (2001), "The Precautionary Principle: Scientific Uncertainty and Omitted Research in the Context of GMO Use and Research," *Journal of Agriculture and Environmental Ethics*, No. 15 (The Hague: Kluwer Academic Publishers, 73-86. From website www.hfac.uh.edu/English/classes/GU4322/items/shall.html (Accessed 26 August 2005).
- O'Riordan, Tim, Andrew Jordan and James Cameron, eds. (2001), *Reinterpreting the Precautionary Principle*, London: Cameron May Ltd.
- Paterson, Matthew (1996), "IR Theory: Neorealism, neoinstitutionalism and the Climate Change Convention", in John Vogler and Mark Imber (eds.), *The Environment and International Relations*, London: Routledge.
- Petersen, Arthur (2002), "The Precautionary Principle, Knowledge Uncertainty, and Environmental Assessment," Paper for NOB/NIG workshop "Knowledge Uncertainty," 30-31 October 2002, Erasmus University Rotterdam. From website www.uitgezocht.nl/VU/Docs/Precautionary_Principle.pdf (Accessed 8 August 2005).
- Sabapathy, Kanaka Nagaraj (2000), "The Precautionary Principle: Geopolitical Choices and Ethical Concerns-A case for Canada to Operationalise the Principle in its Policy of Strategic Environmental Assessment of Trade Agreements," Paper Abstracts for EVDS 683.62. From website <http://www.ucalgary.edu/evds/designresearch/projects/2001/ftaa/sabapathyabstract.html> (Accessed on 15 November 2005).
- Sandin, Per (2002), *The Precautionary Principle: From Theory to Practice*, (Licentiate Thesis), Stockholm: Kungl Tekniska Högskolan.
- Sands, Philippe (2003), *Principles of International Environmental Law*, Cambridge: Cambridge University Press.

- Shaw, Malcolm (1991), *International Law*, Cambridge: Cambridge University Press.
- Slouka, Zdenek (1968), *International Custom and the Continental Shelf: A Study in the Dynamics of Customary Rules in International Law*, The Hague: Martinus Nijhoff.
- Spray, Sharon, and Karen McGlothlin, eds. (2002), *Global Climate Change*, Maryland: Rowman and Littlefield Publishers.
- Susskind, Lawrence (1994), *Environmental Diplomacy: Negotiating More Effective Global Agreements*, Oxford: Oxford University Press.
- Tickner, Joel, ed., *Precaution: Environmental Science and Preventive Public Policy*, Washington DC: Island Press.
- Taylor, Prue (1998), *An Ecological Approach to international Law*, London: Routledge.
- United Nations Non-Government Liaison Service (Sept. 1997), "The UN Framework Convention on Climate Change", *Environment and Development File Treaty Series*, No. 9. From website www.un-ngls.org/documents/pdf/ED/climate.pdf (Accessed 4 August 2005).
- Van Asselt, Majolein, and Ellen Vos (2004), "The Precautionary Principle and the Uncertainty Paradox", submitted to the *Journal of Risk Research*. From website www.sbs.ox.ac.uk/downloads/VosAsselt-fin.pdf (Accessed 27 November 2005).
- Weiss, Charles (2002), "Scientific Uncertainty and Science-Based Precaution," *International Environmental Agreement: Politics, Law and Economics*, No. 3, The Hague: Kluwer Academic Publishers, 137-166.
- White, L. Jr. (1967), "The Historical Roots of our Ecologic Crisis", in Nico Nelissen, Jan Van Der Straaten, and Leon Klinders (eds.), *Classics in Environmental Studies: An Overview of Classic Texts in Environmental Studies*, Utrecht: International Books, 143-152.
- Wiegandt, Ellen (2001), "Climate Change, Equity, and International Negotiations," in Urs Luterbacher and Detlef F. Sprinz (eds.), *International Relations and Global Climate Change* (Cambridge: The MIT Press): 128-150.
- Woodward, Alistair (2003), "Uncertainty and Global Climate Change: The Case of Mosquitoes and Mosquito-Borne Disease", in Joel Tickner (ed.) *Precaution: Environmental Science and Preventive Public Policy*, Washington DC: Island Press, 127-139.
- World Commission on Environment and Development (1987), *Our Common Future*, Oxford: Oxford University Press.

Table of Cases

- Fisheries Case (United Kingdom v. Norway) (1951) ICJ Reports 4.
- Continental Shelf Case (Libya Arab Jamahiriya v. Malta) (1985) ICJ Reports 13.
- Fisheries Jurisdiction Case (United Kingdom v. Iceland) (1973) ICJ Reports 3.
- Military and Paramilitary Activities In and against Nicaragua (Nicaragua v. United States) (1986) ICJ Reports 14.
- North Sea Continental Shelf Cases (Federal Republic of Germany v. Denmark; federal Republic of Germany vs. Netherlands) (1969) ICJ Reports 3.
- Nottebohm Case (Liechtenstein v. Guatemala) (1955) ICJ Reports 4.
- The Case Concerning the Temple of Preah Vihear (Cambodia v. Thailand) (1961) ICJ Reports, 31.
- The *Lotus* Case (France v. Turkey), PCIJ Series A, No. 10.
- Vellore Citizens Welfare Forum v. Union of India, 1996 SCC 2715. From website <http://www.elaw.org/resources/text.asp?ID=199> (Accessed 19 November 2005).

Table of Treaties and Declarations

(Accessed 28 October 2005).

- 1984 Bremen Declaration of the International Conference on the Protection of the North Sea (Bremen), 1 November 1984, <http://odin.dep.no/md/nsc/declaration/022001-990246/dok-bn.html>.
- 1985 Convention for the Protection of the Ozone Layer (Vienna), 22 March 1985, <http://www.unep.ch/ozone/vc-text.shtml>.
- 1987 Protocol on Substances that Deplete the Ozone Layer (Montreal), 16 September 1987, <http://hq.unep.org/ozone/Montreal-Protocol/Montreal-Protocol2000.shtml>.
- 1987 London Declaration of the International Conferences on the Protection of the North Sea (London), 25 November 1987, <http://odin.dep.no/md/nsc/declaration/022001-990245/dok-bn.html>
- 1989 Ministerial Declaration of the Third International Conference on the Protection of the North Sea (The Hague) 8 March 1990, ...<http://odin.dep.no/md/nsc/declaration/022001-990244/dok-bn.html>
- 1990 Declaration of the International Conference on the Protection of the North Sea (The Hague), 8 March 1990, <http://odin.dep.no/md/nsc/declaration/022001-990244/dok-bn.html>
- 1991 Convention on the Ban of Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa (Bamako), 29 January 1991, http://www.natural-resources.org/minerals/CD/docs/int_law/Bamako_Convention.pdf
- 1992 Declaration on Environment and Development (Rio de Janeiro), 16 June 1992, <http://www.unep.org/Documents.multilingual/Default.asp?DocumentID=78&ArticleID=1163>
- 1992 Convention on Biological Diversity (Rio de Janeiro), 5 June 1992, <http://www.biodiv.org/convention/articles.asp>
- 1992 United Nations Framework Convention on Climate Change (New York), 9 May 1992, <http://unfccc.int/2860.php>
- 1992 Rio Agenda 21 (Rio de Janeiro), 16 June 1992, <http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=52&ArticleID=68&l=en>
- 1994 Protocol to the 1979 Convention on Long Range Transboundary Air Pollution on Further Reduction of Sulphur Emissions (Oslo), 14 June 1994, http://www.unece.org/env/lrtap/fsulf_h1.htm
- 1995 Agreement for the Conservation of Africa-Eurasian Migratory Waterbirds (The Hague), 16 June 1995, eelink.net/~asilwildlife/aewa.html
- 1995 Agreement for the Implementation of the 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 Stock (New York), 4 December 1995, <http://daccessdds.un.org/doc/UNDOC/GEN/N95/274/67/PDF/N9527467.pdf?OpenElement>
- 1995 Protocol on Shared Watercourse Systems in the Southern African Development Community (Johannesburg), 5 April 1995, <http://www.thewaterpage.com/SADCprotocol.PDF>
- 1995 Declaration on the Protection of the Marine Environment from Land-based Activities, 1 November 1995, <http://eelink.net/~asilwildlife/washington.html>
- 1996 Protocol for the Prevention of Pollution of the Mediterranean Sea by Transboundary Movements of Hazardous Wastes and their Disposal (Izmir), 1 October 1996, <http://www.basel.int/article11/mediterranean.doc>
- 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London), 7 November 1996, http://www.imo.org/Conventions/contents.asp?topic_id=258&doc_id=681

- 1996 Agreement on the Conservation of the Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (Monaco), 24 November 1996, <http://www.wdcs.org/dan/publishing.nsf/allweb/82F8CE9E61D79DBB802569EC004C88AE>
- 1997 Convention on the Law of Non-Navigational uses of International Watercourses (New York), 21 May 1997, <http://www.un.org/law/ilc/texts/nonnav.htm>
- 1997 Protocol of 1997 to Amend the International Convention for the Protection of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto, 6 September 1997, http://www.epa.gov/otaq/regs/nonroad/marine/ci/annex_vi.pdf
- 1997 Protocol to the United Nations Framework Convention on Climate Change (Kyoto), 11 December 1997, <http://unfccc.int/resource/docs/convkp/kpeng.html>
- 1998 Protocol to the 1979 Convention on Long Range Transboundary Air pollution on Persistent Organic Pollutants (Aarhus), 24 June 1998, <http://www.unece.org/env/lrtap/full%20text/1998.POPs.e.pdf>
- 1998 Protocol to the 1979 Convention on Long Range Transboundary Air Pollution on Heavy Metals (Aarhus), 24 June 1998, http://www.natural-resources.org/minerals/CD/docs/int_law/LRTAP_HM_en.pdf
- 1998 Convention on Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (Rotterdam), 11 September 1998, <http://www.pic.int/en/ConventionText/ONU-GB.pdf>
- 1999 Agreement Concerning the Creation of a Marine Mammal Sanctuary in the Mediterranean (Rome), 25 November 1999, http://www.tethys.org/sanctuary_text.htm
- 1999 Convention on the Protection of the Rhine (Bern), 12 April 1999, http://www.internationalwaterlaw.org/RegionalDocs/Rhine_River.htm
- 1999 Protocol on Water and Health to the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes (London), <http://www.unece.org/env/documents/2000/wat/mp.wat.2000.1.e.pdf>
- 1999 Protocol to the 1979 Long Range Transboundary Air Pollution to Abate Acidification, Eutrophication and Ground-Level Ozone (Gothenburg), 30 November 1999, <http://www.unece.org/env/lrtap/full%20text/1999%20Multi.e.pdf>
- 2000 Cartagena Protocol on Biosafety to the Convention on Biological Diversity (Montreal), 29 January 2000, <http://www.biodiv.org/biosafety/articles.asp?lg=0&a=bsp-01>
- 2000 Framework Agreement for the Conservation of the Living Marine Resources of the High Seas of the South Pacific, 14 August 2000, <http://www.oceanlaw.net/texts/summaries/galapagos.htm>
- 2000 Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 5 September 2000, <http://www.oceanlaw.net/texts/westpac.htm>
- 2001 International Convention on the Control of Harmful Anti-Fouling Systems on Ships, 5 October 2001, <http://www.deh.gov.au/coasts/pollution/antifouling/pubs/convention.pdf>
- 2001 Convention on Persistent Organic Pollutants (Stockholm), 22 May 2001, http://www.pops.int/documents/convtext/convtext_en.pdf
- 2002 Agreement on the Conservation of Albatrosses and Petrels (Canberra), 19 June 2001, www.acap.aq
- 2002 Convention for Co-operation in the Protection and Sustainable Development of the Marine and Coastal Environment of the North-East Pacific (Antigua), 18 February 2002, http://www.ethesis.net/voorzorgsprincipe/voorzorg_bijlagen.htm
- 2002 World Summit on Sustainable Development Ministerial Declaration (Johannesburg), 4 September 2002, http://www.wwf.no/pdf/Utfyllende_info_Jo-burg.pdf

- 2004 International Convention for the Control and Management of Ships Ballast Water and Sediments, 16 February 2004, www.sjofartsdir.no/upload_attachment/37Final_Act__Ballast_Water_Treatment.pdf

Other Documents

- FAO Code of Conduct for Responsible Fisheries, 31 October 1995, http://www.fao.org/documents/show_cdr.asp?url_file=/DOCREP/005/v9878e/v9878e00.htm
- Guidelines for the Application of Precautionary Reference Points in Conservation and Management of Strading Fish Stocks and Highly Migratory Fish Stocks, 4 December 1995, http://www.internationallawhelp.com/Straddling%20_Stocks_Treaty.htm
- Intergovernmental Panel on Climate Change (1995), The Science of Climate Change. Contribution of Working Group I to the Second Assessment Report of the Intergovernmental Panel on Climate Change.
- Intergovernmental Panel on Climate Change (1995), Climate Change 1995: Impacts, Adaptations and Mitigation of Climate Change: Scientific-Technical Analyses. Contribution of Working Group II to the Second Assessment Report of the Intergovernmental Panel on Climate Change.
- Intergovernmental Panel on Climate Change (1995), Climate Change 1995: Economic and Social Dimensions of Climate Change. Contribution of Working Group III to the Second Assessment Report of the Intergovernmental Panel on Climate Change.
- Intergovernmental Panel on Climate Change (2001), Climate Change 2001: The Scientific Basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change.
- Intergovernmental Panel on Climate Change (2001), Summary for Policymakers, A Report of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change.
- Government of the United Kingdom (1990), *White Paper, This Common Inheritance: Britain's Environmental Strategy*. From website www.environment.defra.gov.uk (Accessed 13 November 2005).
- Government of the United Kingdom (1999), *White Paper, A Better Quality of Life- A Strategy for Sustainable Development for the UK*. From website www.environment.defra.gov.uk (Accessed 13 November 2005).
- United Nations Environmental Program Resolution No. 15/87, 25 May 1989, http://www.ethesis.net/voorzorgsprincipe/voorzorg_bijlagen.htm
- United Nations General Assembly Resolution 43/53, 6 December 1998, <http://www.un.org/documents/ga/res/43/a43r053.htm>
- United Nations General Assembly Resolution 56/13, 13 December 2001, <http://daccessdds.un.org/doc/UNDOC/GEN/N01/475/88/PDF/N0147588.pdf?OpenElement>

Interviews/Email Correspondence:

- Cooney, Rosie, Flora and Fauna International, 18 November 2005. Email address: rosie.cooney@flora-fauna.org.
- McNeely, Jeff, International Union for the Conservation of Nature and Nature Resources, 3 November 2005. Email address: JAM@iucn.org.
- Pachauri, Rajendra K., Intergovernmental Panel on Climate Change, 26 October 2005. Email address: pachauri@teri.res.in.
- Tickner, Joel, Lowell Center for Sustainable Production, 6 November 2005 and 15 November 2005. Email address: joel_tickner@uml.edu.
- Töpfer, Klaus, United Nations Environment Programme, 24 November 2005. Email address: klaus.toepfer@unep.org.