INTERNATIONAL LAW AND GMOS: CAN THE PRECAUTIONARY PRINCIPLE PROTECT BIOLOGICAL DIVERSITY?

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RESUMEN: La expansión en la producción, distribución y consumo de organismos genéticamente modificados ha dado como resultado discusiones a favor y en contra de los mismos y su regulación jurídica. La autora del presente estudio nos expone los diversos escenarios en los que se desenvuelven controversias tales como las restricciones que se les han hecho a los grandes productores como Estados Unidos de América, Canadá y Argentina para comercializar sus productos por parte de la Organización Mundial de Comercio. Pero sobre todo, se trata de hacer un análisis global sobre el principio de precautoriedad que afecta diversos intereses jurídicos y económicos, de necesaria existencia por considerarse como un derecho fundamental el derecho a un medioambiente sano.

Palabras clave: biogenética, seguridad, diversidad biológica.

ABSTRACT: The expansion in the production, distribution and consumption of GOMs, has produced discussions about pros and cons concerning their legal regulation. The author of this study examines the different scenarios in which the controversies develop, referring to topics such as the restrictions of the World Trade Organization that have affected great producers of GOMs like the United States, Canada and Argentina in their capacity to commercialize their products. But mainly, the author makes a global analysis with reference to the precautionary principle that affects diverse legal and economic interests, whose existence is necessary as it is considered as a central element of the fundamental right to a healthy environment.

***Descriptors**: biogenetic, security, biological diversity.*

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SUMARIO: I. *Overview*. II. *The Precautionary Principle*. III. *Regional Level*. IV. *The Academic Debate*. V. *Conclusion*.

I. OVERVIEW

Utilization of genetically modified organisms (GMOs) in daily life has dramatically increased. According to the Directorate General for Agriculture of the European Community (EC), about 20% of the maize and 63% of soy produced in the world in 2002 were genetically modified (GM).[1] Since the advent of GMOs in the international arena, they have triggered enormous debate about their safety.[2] Biotechnology advocates affirm that GMOs have the potential to lessen some of the world's problems and to restore environmental health. GMOs, for example, can increase crop yield and alleviate world hunger;[3] they can also help reduce the dependence on chemical pesticides and herbicides.[4] In addition, GMOs have the ability to repair damaged terrain by eliminating toxins more efficiently than organic plants do.[5] On the other hand, GMOs have also been associated with health and environmental risks.[6] With regard to health, controversial studies have been conducted on the effects of transgenic pesticides in rats, resulting in a deterioration of their intestines.[7] This evidence, however, has been contested due to deficiencies in the methodology employed.[8] Additionally, genetically engineered food

[1] "World areas by crops GMOs", online: European Community *http://europa.eu.int/comm/ agriculture/agrista /2003/table_en/42312.pdf* (1 June 2006).

[2] Bridgers, Mystery, "Genetically Modified Organisms and the Precautionary Principle: How the GMO dispute before the World Trade Organization could decide the fate of International GMO Regulation" (2004) 22 *Temp. Envtl. L. & Tech. J.* at 171 (Lexis).

[3] Katz, Deborah, "The Mismatch between the Biosafety protocol and the Precautionary Principle" (2001) *Geo. Int'l Envtl. L. Rev.* at 975-976 (Lexis).

[4] *Ibidem*, at 976.

[5] *Idem*.

[6] GEO-PIE Project "Issues related to genetic engineering", online: *http://www.geopie.cornell.edu/issues/issues.html#issues* (1 June 2006).

[7] *Idem.*

[8] Ewen, Stanley W.B. y Pusztai, Arpad, "Effects of Diets Containing Genetically Modified Potatoes Expressing *Gaianthus nivalis Lectin* on Rat Small Intestine" (1999) 354 Lancet at 1353, 1354 in Katz, Deborah, "The Mismatch between the Biosafety protocol and the Precautionary Principle" (2001) *Geo. Int'l Envtl. L. Rev.*

can increase the possibility of allergic reactions when modified food is made of proteins or components of plants or products that are known to cause such detrimental medical effects.[9] Environmental damage, as well, is attributed to GMOs. Transgenic plants, for example, are believed to have the potential to transfer their traits to their organic relatives,[10] thus perhaps affecting the integrity of biological diversity.[11]

Efforts to regulate genetically modified organisms have taken place at the international and regional levels. At the international level, the Cartagena Protocol on Biosafety, based on the precautionary principle, is one of the first legally binding international agreements to govern the transboundary transfer of GMOs. The inclusion of the precautionary principle[12] in the GMO controversy has engendered even more debate, especially in the area of international trade. GMO producers such as the United States, Canada and Argentina filed a formal complaint before the World Trade Organization alleging that EC precautionary measures constitute unnecessary obstacles to trade to their transgenic products.

The precautionary principle, with arguable philosophical foundations, is widely included in international agreements ranging from fisheries to biodiversity protection.[13] This principle relies on anticipatory action in the absence of firm scientific evidence.[14] While this principle has the potential to protect the environment[15] from the un-

[9] GEO-PIE Project, *supra* note 6.

[10] *Idem.*

[11] Organization for Economic Cooperation and Development (OECD), "Gene transfer and invasiveness are the main points to consider in a risks assessment of transgenic plants", online*: http://www.oecd.org/dataoecd/46/8/1943506.pdf* (1 June 2006).

[12] There is significant debate on the terminology that should be employed. The term 'precautionary principle' for some may suggest a stronger commitment to abide by it, while for others the term 'precautionary approach' may be seen as a guideline. For the purpose of this paper, the terms precautionary principle and precautionary approach will be used interchangeably.

[13] Freestone, David y Hey, Ellen, *The Precautionary Principle and International Law: The Challenge of Implementation* (The Hague; Boston: Kluwer Law International, 1996) at 3.

[14] Fullem, Gregory D., "The Precautionary Principle: Environmental Protection in the Face of Scientific Uncertainty" (1995) 31 *Willamette L. Rev*. 497 (Heinonline).

[15] Vanderzwaag, David L. *et al*., "Canada and the Precautionary Principle/Approach in Ocean and Coastal Management: Wading and Wandering in Tricky Currents" (2002/2003) 34 *Ottawa L. Rev*. at 119 (Heinonline).

controlled spread of GMOs, it has been trapped in an endless debate over its application and compatibility with trade rules. Such debates will shape the future application and existence of this principle.

This paper will consider some of the international concerns in regulating genetically modified organisms and the possibility of minimizing their negative effects by applying the precautionary principle to the consideration of the issues at stake. The current study will be organized into four parts: part 1 deals with the precautionary principle as applied to GMOs in *1)* international environmental law, *2)* international trade law, *3)* international human rights; part 2 deals with regional regulation of GMOs in *1)* the European Community and *2)* the North American Free Trade Agreement; part 3 outlines the academic debate over the nature of the precautionary principle in terms of its normative substance and the reach of its regulatory authority over conduct, and lastly, part 4 includes concluding remarks.

II. The Precautionary Principle

This part of the paper analyzes the precautionary principle in international environmental law, international trade law, and international human rights. An analysis of the issues regarding GMOs and the Precautionary Principle is accordingly provided.

1. *International Environmental Law*

The 1984 Bremen Ministerial Declaration of the International Conference on the protection of the North Sea borrowed use of the precautionary principle from German law.[16] At that time, states fully relied on science and so, in the absence of scientific evidence, they had no basis for controlling emissions and harmful substances.[17] Article 7 of the Bremen Declaration contains the first mention of the precautionary principle at the international level; the purpose of this

[16] Sadeleer, Nicolas de, *Environmental Law Principles From Political Slogans to Legal Rules*, Oxford, Oxford University Press, 2002, at 93.

[17] Cooney, Rosie, *The Precautionary Principle in Biodiversity Conservation and Natural Resource Management*, IUCN, Policy and Global Change Series No. 2, 2004, at 6.

conference was to protect the North Sea from the 'most dangerous substances' even before a casual link could be established by 'clear scientific evidence'.[18] Later, the principle gained worldwide recognition in the Rio Declaration at the United Nations Conference on Environment and Development (UNCED) in 1992.[19] Principle 15 of the Rio Declaration states: "In order to protect the environment, the precautionary approach shall be widely applied by states according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation".[20]

In addition to the Ministerial Declarations and the UNCED, this principle has been defined in various ways in multilateral agreements,[21] some of which contain stringent and weak versions of this principle. An illustration of a strong version of this principle is the implementation of "reverse listings" for ocean dumping,[22] while the transboundary pollution regime represents an example of a weak version of this principle.[23]

The precautionary principle emerges as a rejection of the assimilative capacity model (ACM).[24] This model determines the capacity of ecological systems to withstand a particular activity.[25] The ACM fully relies on science and assumes that it can restore environmental equilibrium and health.[26] The precautionary principle marks a new era in

[18] *Ibidem*, at 7 y 8.

[19] Freestone, *supra* note 13 at 3.

[20] Rio Declaration on Environment and Development, Rio de Janeiro, Brazil, June 14,1992, (1992) 31 *ILM* 874.

[21] Freestone, *supra* note 13 at 4.

[22] Vanderzwaag, David, "The Precautionary Principle in Environmental Law and Policy: Elusive Rhetoric and First Embraces" (1999) 8 *J. Envtl. L. & Prac*. at 358.

[23] *Ibidem*, at 365.

[24] Puttagunta, Saradhi P., The Precautionary Principle in the Regulation of Genetically Modified Organisms (2000) 9 *Health Law Review* No. 2 at 12.

[25] Shipworth, D. y Keneley, R., "Fitness Landscapes and the Precautionary Principle: The Geometry of environmental Risk" (1999) 24:1 Envir. Manag. in Saradhi P. Puttagunta. See also The Precautionary Principle in the Regulation of Genetically Modified Organisms 9 *Health Law Review* No. 2 at 12.

[26] McIntyre, O. y Mosedale, T., "The Precautionary Principle as a Norm of Customary International Law" (1997) 9:2 *J. Envtl. L.* 221 at 224 in Puttagunta, Saradhi P. *supra* note 24.

environmental law and policy.[27] Rather than reacting to environmental problems, it seeks to protect human health and the environment by anticipating harm.

In spite of the numerous formulations of the principle and lack of uniformity in its application,[28] three consistent elements can be distinguished. There is first a threat of harm; second, a lack of scientific certainty or evidence; and third, necessity or duty to act.

A. *Threat of harm*

Although there is no consensus on the degree of harm that is needed to trigger precaution,[29] some enunciations state that the damage must be serious or irreversible; this requirement is used in the Rio Declaration.[30] The Cartagena Protocol, however, requires a 'potential' damage and 'adverse effects' to act as catalysts for the use of precaution.[31] Due to their complexity and uncertainty over their effects on the environment and humans, GMOs are the perfect candidate for application of the precautionary principle.[32] GMOs are highly invasive; they can easily propagate into the environment[33] and possibly affect human health if they are unintentionally consumed.[34] The potential damage these organisms can cause may be both serious and irreversible.[35]

B. *Uncertainty*

Uncertainty of evidence refers to situations where knowledge is incomplete, or scientific information is simply not available at the time

[27] Vanderzwaag, *supra* note 22 at 357.

[28] Hickey, James E. Jr. y Walker, Vern R., "Refining the Precautionary Principle in international Environmental Law" (1995) 14 *Va. Envtl. L. J.* 3 at 424 y 425.

[29] Vanderzwaag, *supra* note 22 at 359.

[30] Rio Declaration, *supra* note 20 at 15.

[31] Cartagena Protocol on Biosafety to the Convention Biological Diversity (23 February 2000), online: *http://www.biodiv.org/biosafe/biosafety-protocol.htm* (1 June 2006).

[32] Applegate, John S., "The Prometheus Principle: Using the Precautionary Principle to Harmonize the Regulation of Genetically Modified Organisms" (2001) 9 *Ind. J. Global Legal Stud.* 207 at 256 (Lexis).

[33] *Ibidem*, at 226 y 227.

[34] *Ibidem*, at 222.

[35] *Ibidem*, at 256.

the activity is being considered.[36] Due to the complexity of ecosystems, the costs and the difficulty of monitoring the effects of GMOs on human health and the environment, it may take years to demonstrate their effects,[37] leaving people and the environment unprotected in the interim. It can be said, however, that all human activities involve some uncertainty about their risks and that science can never prove the absence adverse effects.[38]

C. *Necessity and duty to act*

The precautionary principle has been criticized for lacking guidelines of its application at the international level.[39] Although there is no consensus as to which measures to apply to certain activities,[40] precautionary regulations of GMOs may require policy-makers to act by reversing the burden of proof, requiring the activity's proponent to demonstrate that GMOs will not have an adverse effect on human health or the environment. Eventually, in the strongest application of this principle, these organisms might be prohibited from entering the market.[41] Other indirect measures have been suggested to support the application of this principle, and they include super funds or monetary deposits made prior to the activity, environmental impact assessments[42] and the development of a liability regime, such as that proposed in the Cartagena Protocol.[43]

[36] McIntyre, *supra* note 26 at 222.

[37] Applegate, *supra* note 32 at 256.

[38] Wildavsky, A., *Searching for safety*, Oxford, Transaction, 1998, in Conko, Gregory, "Safety, risk and the Precautionary Principle: Rethinking Precautionary Approaches to the Regulation of Transgenic Plants", (2003) 12 *Transgenic Research* 639-647.

[39] Sunstein, Cass R., "Beyond the Precautionary Principle" (2003) 151 *U. Pa. L. Rev*. 1050 at 1011-1013.

[40] *Ibidem*, at 1003-1005.

[41] *Ibidem*, 1019-1021.

[42] Vanderzwaag, *supra* note 15 at 120-212.

[43] The Cartagena Protocol has proposed the creation of a liability regime in article 27, where it states that parties shall "adopt a process with respect to the appropriate elaboration of international rules and procedures in the field of liability and redress for damage resulting from transboundary movements of living modified organisms" See Cartagena Protocol in *supra* note 31 article 27.

D. *The Biodiversity Convention and the Cartagena Protocol*

The precautionary principle has been enunciated in both the Biodiversity Convention and the Cartagena Protocol. These agreements considered, for the first time, in the international arena, the need to protect biodiversity from the possible adverse effects of GMOs.[44] The subsequent discussion looks at them in turn.

a. The Biodiversity Convention (CBD)[45]

The United Nations Convention on Biological Diversity was signed at the 1992 United Nations Conference in Rio de Janeiro, and then ratified in December of 1993.[46] This agreement was created as a response to international concerns over the potential effects of GMOs on biodiversity and the testing of biotechnology in developing countries,[47] as illustrated for instance, in the 1986 scandal over a US research institute's testing of GM vaccines in Argentina without the proper authorization of this government.[48]

Similar to other environmental agreements, the CBD endorses a "precautionary approach".[49] The preamble states: "Where there is a threat of significant reduction or loss of biological diversity, lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimize such a threat". This version of the precautionary principle resembles statements in 'soft law' documents, such as the Rio Declaration and Agenda 21.[50]

[44] The Cartagena Protocol although dealing with GMO trade, will be analyzed under International Environmental Law because for its relation to the Biodiversity Convention.

[45] United Nations Convention on Biological Diversity (CBD), June 5, 1992, 31 *ILM* 818, 823 (1992).

[46] Adler, Jonathan, "More sorry than Safe: Assessing the Precautionary Principle and the Proposed international Biosafety Protocol" (2000) 35 *Tex. Int'l L. J.* 173. at 188.

[47] Gupta, Aarti, "Governing Trade in Genetically Modified Organisms" 42 *Environment* 4 at 24.

[48] *Ibidem*, at 24.

[49] Biodiversity Convention, *supra* note 45 see preamble.

[50] Adler, *supra* note 46 at 188.

The CBD's objectives can be summarized as comprising three factors: The preservation of biological diversity; the sustainable use of its components; and, the fair and equitable sharing of genetic resources.[51]

The Convention defines biological diversity as "the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part".[52] Biodiversity protection is left to the states, and they can "develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity".[53] Such measures may include appropriate measures to "prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species".[54] Precautionary measures in the Convention include risk assessments, which states are compelled to undertake when activities "are likely to have significant adverse effects on biological diversity with a view to avoiding or minimizing such effects".[55] In addition to states' measures to preserve biological diversity, the CBD sets the basis for a comprehensive approach to GMO regulation, specifically in article 19, which calls for the establishment of a protocol, whereby procedures such as the Advance Informed Agreement, are implemented for the "safe transfer, handling and use of any living modified organism that may have adverse effect on the conservation and sustainable use of biological diversity".[56]

The CBD sets the foundation for GMO regulation in a unique form; first, it calls for the creation of a protocol for the safe transfer of GMOs; second, it takes environmental protection further by 'freeing' the 'precautionary principle' from economical considerations[57] or the cost of precautionary measures as previously stated in

[51] *Ibidem*, at 188.
[52] Biodiversity Convention, *supra* note 45.
[53] *Ibidem*, article 2.
[54] *Ibidem*, article 8 (h).
[55] *Ibidem*, article 14 a.
[56] *Ibidem*, article 19.3.
[57] Victor, Marc, "Precaution or Protectionism? The Precautionary Principle, Genetically Modified Organisms, and Allowing Fear to Undermine Trade" (2001) 14 *Transnat'l Law*, 295 at 316. The preamble BDC states: "where there is a threat of sig-

the Rio Declaration;[58] and third, the CBD takes into account that most of the genetic resources are located in developing countries by addressing technology transfers from developed to developing countries. Lastly, it also asserts the rights of states to genetic and biodiversity resources located in their territories.

b. The Cartagena Protocol

The Cartagena Protocol on Biosafety[59] was ratified in January 2000 through article 19 of the Biodiversity Convention. The Biosafety Protocol, based on the precautionary principle, emerged as a result of international negotiations to regulate the "transboundary movement, transit, handling and use of Living Modified Organisms (LMOs)"[60] that may negatively impinge on biological diversity. Although the protocol focuses on LMOs, parties are encouraged to "take into account risks to human health".[61] LMO regulation in the protocol follows a twofold approach; those intended to be introduced in the environment and those intended for food, feed or processing.[62] Pharmaceuticals are excluded from this agreement.[63] An important feature in the protocol is the requirement of risk assessment to aid states in allowing the introduction of LMOs into their territories. Three are three core elements of the Cartagena protocol. These are the Advanced Information Agreement (AIA); risk assessment; and the precautionary principle.

Advanced Information Agreement. The idea for requiring AIA of Living Modified Organisms is that states have a right to know what is coming into their territories and that information should be provided in time to prepare for possible harm. In the worst-case scenario, a state has the right to prohibit a product from entering its borders based on

nificant reduction or loss of biological diversity, lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimize such a threat" see Biodiversity Convention, *supra* note 45.

58 *Ibidem*, at 613-317.

59 Cartagena Protocol, *supra* note 31.

60 *Ibidem*, article 1.

61 *Ibidem*, article 10 (6).

62 *Ibidem*, article 7 (2), (3) and article 11.

63 *Ibidem*, article 5.

the information available under AIA.[64] This procedure applies only to LMOs for introduction into the environment.

AIA procedures are embodied in articles 8, 9 and 10.[65] According to these procedures, the exporting party must communicate a written request to the importer prior to the transfer of LMOs intended to be introduced into the environment.[66] This request should include sufficient information regarding the organisms or products in question. The importing state has an obligation to acknowledge receipt to the exporting party within ninety days of receiving the notification and to inform the notifier whether the import may proceed under articles 9 and 10.[67] This acknowledgment should include whether or not to proceed under relevant domestic laws of the import party or under the procedures outlined in article 10.[68] Additionally, the importing party has 270 days to communicate its decision to the exporting party, whether to proceed with the transboundary movement. The Protocol points out that failure to receive a timely response from the importing party does not imply the state's consent on the transboundary movement of LMOs.[69] LMOs intended for food, feed or processing, although excluded from AIA procedures, are subject to less onerous procedures under the Biosafety Clearinghouse.[70]

Risk Assessment. Risk assessment is envisioned in the protocol as a guideline for parties in their decisions to import LMOs. An assessment of risks will enable them to anticipate and prevent environmental harm. Although this assessment is required for products to be introduced into the environment, parties are also encouraged to perform assessment for other products that fall outside this specific parameter.

[64] *Ibidem*, article 10.3 (c). In this article, a party can decide to prohibit imports in light to the information provided in the AIA procedure or in light of 'new' scientific evidence as stated in article 12 of the Protocol.

[65] *Ibidem*, article 8-10.

[66] *Idem*.

[67] *Ibidem*, article 9. See also Jacob, Thomas, "Biotechnology and International Law: The Cartagena Protocol-A First Step to a Global Biosafety Structure?" 14 *Transnat'l Law* 79.

[68] Cartagena Protocol, *supra* note 31 article 10.

[69] *Ibidem*, article 9.

[70] *Ibidem*, article 11.

Risk assessment should be performed with information available to the importing state in the AIA documentation.[71] Procedures to assess risks should be conducted in a scientifically sound manner.[72] Furthermore, the obligation to perform this assessment and the costs can both be borne by the exporter if previously requested by the importing party.[73] The Cartagena protocol encourages importing parties to take decisions under article 10, on a scientifically-based risk assessment basis.[74]

While LMOs in pharmaceuticals and food or feed are not regulated under the Protocol, a risk assessment is still required. Regarding pharmaceuticals, the agreement asserts that parties enjoy the right to perform risk assessment before any imports of LMOs are accepted.[75] This requirement also applies to LMOs for food or feed. Article 11 requires parties to comply with the information requirements set in Annex II,[76] according to which states have to provide to the information facility in the protocol, the Biosafety Clearinghouse, a "risk assessment report" according to the guidelines established in Annex III.[77]

Precautionary Principle. The precautionary 'spirit' of the Cartagena Protocol is mainly contained in the Advanced Information Agreement, and the risk assessment requirement.[78] The predominant formulation of this principle contained in this document states:

> Lack of scientific certainty due to insufficient relevant scientific information and knowledge regarding the extent of the potential adverse effects of a living modified organism on the conservation and sustainable use of biological diversity in the Party of import, taking also into account risks to human health, shall not prevent that Party from taking a decision, as appropriate, with regard to the import of the living modi-

[71] *Ibidem*, article 18.
[72] *Ibidem*, article 15.
[73] *Ibidem*, article 15 (2).
[74] *Ibidem*, article 15.2.
[75] *Ibidem*, see article 5.
[76] *Ibidem*, see Annex II.
[77] Annex III provides parties with guidelines, methodology and information to perform risk assessments. *Ibidem*, see Annex III.
[78] *Ibidem*, article 10 (6).

> fied organism in question in order to avoid or minimize such potential adverse effects.[79]

The inclusion of the precautionary principle in this agreement, to some academics, contains its strongest enunciation[80] and has been regarded by academics as its 'operationalization' in the body of an environmental treaty. The catalyst for the application of precautionary measures in this agreement is the risk assessment. If the risk assessment shows an unacceptable level of risk, then the state can oppose the import of the LMOs in question. However, if the risk assessment is inconclusive, a state may still refuse to accept LMO imports in light of the precautionary principle.[81] Additionally, states bound by the protocol are encouraged to take into account socio-economic factors that may impact biodiversity, including regard for traditional practices of the indigenous people.[82] Even if risk assessment does not predict negative impacts, states considering these "factors" can still refuse the import of LMOs.[83]

The Cartagena Protocol, seen as a modern and effective approach to the reduction of biotechnology risks, simultaneously leaves room for potential problems engendered by its application. First, it lacks guidelines for the application of the precautionary principle[84] and subordinates this principle to "scientifically based" risk assessments;[85] Second, the Protocol lacks also a scientific body to corroborate and scrutinize the results of such assessments. Third, for the repercussions on trade, dispositions of this treaty are at conflict with similar agreements in the trade area. Such conflicts may hinder its existence. Fourth, while the protocol takes into consideration developing coun-

[79] *Ibidem*, article 11 (8) of the Cartagena Protocol.

[80] Schnier, David J., "Genetically Modified Organisms & the Cartagena Protocol" (2001) 12 *Fordham Envtl. Law J.* 377 at 411.

[81] Applegate, *supra* note 32 at 243.

[82] *Ibidem*, at 243.

[83] *Ibidem*, at 243 y 244.

[84] Besides the risk assessment requirements, parties can base their decisions on "socio-economic factors" but the protocol does specifically define these factors. Cartagena Protocol, *supra* note 31.

[85] *Ibidem*, article 15.

tries,[86] it imposes substantial economic burdens on them due to the large amount of resources that must be spent to implement it, such as in technology, labelling and monitoring LMOs.[87]

In spite of the weaknesses of this agreement, it is the first step in regulating GMOs at the international level and, to some degree, provides environmental and health protection through the precautionary principle.

2. *The Precautionary Principle in the Context of Trade*

In this part of the paper, the precautionary principle is analyzed in the context of the World Trade Organization and with respect to: *a)* GATT and exceptions in Article XX, *b)* the Subsidiary Agreement on Sanitary and Phytosanitary Measures (SPS) and *c)* the Agreement on Technical Barriers to Trade (TBT).

The precautionary principle is the focus of intense debates in the fields of food safety and GMOs, particularly in the World Trade Organization.[88] Tensions over these issues grew in 1998 after an EC moratorium based on the precautionary principle was applied to GM products from the United States, Canada and Argentina.[89] In 2003, the affected exporting countries requested the establishment of a Dispute Settlement Body by the WTO.[90]

The consideration of the precautionary principle in the trade forum is highly controversial. Application of WTO rules to precautionary measures over GMOs is likely to have several repercussions: first, it will shape the area of trade related to these organisms; second, it will influence multilateral environmental agreements; and

[86] *Ibidem*, articles 20, 22 and 28.

[87] Deumie, Florence, "The Cartagena Protocol on Biosafety and the international trade of Genetically Modified Organisms: A new element if the conflict between trade and the environment", Master's thesis McGill University, 2000 [unpublished], at 35.

[88] Shaw, Sabrina y Schwartz, Risa, "The Cartagena Protocol and the WTO: Reflections on the Precautionary Principle", 10 *Swiss Review of International and European Law* at 537.

[89] Bridgers, *supra* note 2, at 181 y 182.

[90] Isaac, Grant E. y Kerr, William A., "Genetically Modified Organisms at the World Trade Organization: A Harvest of Trouble" (2003) 37 *J. World Trade* at 1083.

third, the future application and the very existence of the precautionary principle.[91]

A. *The World Trade Organization*

The World Trade Organization (WTO) emerged on April 15, 1994, predicated on the General Agreement on Tariffs and Trade (GATT) of 1947.[92] The reforms of this organization introduced 'resolutions' regarding the environment. In its preamble, it mentions the 'objective of sustainable development' and "seeking both to protect and preserve the environment".[93] In 1995, the Committee on Trade and the Environment was created to promote sustainable development and to identify a relationship between trade and the environment.[94] This Committee was created at the behest of the WTO at the end of the Uruguay Round.[95] WTO legislation since then has addressed trade issues that substantially relate to the environment.[96]

In spite of the 'greening' efforts to integrate the environment and trade, the WTO continues to pursue its objectives "by entering into reciprocal and mutually advantageous arrangement directed to the substantial reduction of tariffs and other barriers to trade and to the elimination of discriminatory treatment in international relations".[97]

WTO agreements that can potentially apply to 'GMO restrictive measures' contained in: Article XX of the General Agreement on Tariffs and Trade (GATT) of 1947,[98] The Subsidiary Agreement on Sa-

[91] *Ibidem*, at 1083-1085.

[92] Macmillan, Fiona, *WTO and the Environment*, London, Sweet & Maxwell, 2001, at 7.

[93] See preamble of Marrakech Agreement of the World Trade Organization, Annex 1A, Legal Instruments of the Uruguay Round vol.1, 33 *ILM* 1154 (1994).

[94] Macmillan, *supra* note 92 at 12.

[95] *Ibidem*, at 12 y 13.

[96] *Ibidem*, at 12-16. Among the cases the WTO has addressed are: the Tuna-Dolphin cases, The Automobiles case, The Reformulated Gasoline and the Sea Turtle Case.

[97] WTO preamble, *supra* note 93.

[98] General Agreement on Tariffs and Trade (GATT), Oct. 30, 1947, 61 Stat. A-11 TIAS 1700 *UNTS* 194, as modified by Marrakech Agreement of the World Trade Organization, Annex 1A, Legal Instruments of the Uruguay Round vol.1, 33 *ILM* 1154 (1994).

nitary and Phytosanitary Measures (SPS),[99] and the Agreement on Technical Barriers to Trade (TBT).[100]

B. *GATT and Exceptions in Article XX*

The GATT agreement imposes several obligations to member states.[101] Three of the most relevant are: the 'Most-Favoured-Nation Treatment' (MFNT), the 'National Treatment' Principle (NTP) and the prohibition from imposing quantitative restrictions on trade.[102] Substantial litigation has been brought before the WTO panels in infringement of these provisions.[103] States have justified bans or discrimination under article XX, which contains exceptions to GATT rules aimed to protect: *a)* Human health and plant life and *b)* The conservation of natural resources. The mentioned rules and exceptions are analyzed subsequently.

The Most-Favoured-Nation Treatment principle is contained in article I, according to which "any advantage, favour, privilege or immunity granted by any contracting party to any product originating in or destined for any other country shall be accorded immediately and unconditionally to the like product originating in or destined for the territories of all other contracting parties".[104]

The National Treatment Principle is contained in article III, according to which "the products of the territory of any contracting party imported into the territory of any other contracting party shall be accorded treatment no less favourable than accorded to like products of national origin in respect of all laws, regulation and requirement affecting their internal sale".[105]

[99] Agreement on the Application of Sanitary and Phytosanitary Measures (SPS) (15 April 1994), & "WTO Agreement, Annex 1A, 69" online: *http://www.wto.org/english/docs_e/legal_e/15-sps.pdf* (5 June 2006).

[100] Agreement on Technical Barriers to Trade, Apr. 15, 1994 (TBT), GATT Doc. MTN/FA II-A1A-6, online: *http://www.wto.org/english/docs_e/legal_e/final_e.htm* (5 June 2006).

[101] Macmillan, *supra* note 92 at 69.

[102] *Ibidem*, at 69 y 70.

[103] *Ibidem*, at 69-82.

[104] GATT, s*upra* note 98 article I (1).

[105] *Ibidem*, article III.

Quantitative restrictions are included in article XI, which forbids states from imposing quantitative restrictions on exports and imports. If they act contrary to this disposition, this measure would be deemed technically a 'zero quota' or a restriction and therefore *prima facie* violation of GATT.[106] Article XI contains exceptions to the prohibition of quantitative restriction, such as when states aim to "prevent or relieve critical shortages of foodstuffs",[107] when these restrictions are necessary to "the application of standards or regulations for the classification, grading or marketing of commodities in international trade", etc.[108] According to the GATT interpretation to this article, the exceptions in article XI do not seem to be related to the environment.

Although GATT members are obliged to abide by the foregoing principles previously mentioned, there are exceptions states can apply under special, specific circumstances. These are contained in article XX.[109] States can apply these when "necessary to protect human, animal or plant life or health".[110] A similar clause is contained in part (g), which refers to measures "related to the conservation of exhaustible natural resources".[111] However, the conservation of natural resources has not been invoked in litigation under the WTO yet.[112]

A concise application of GATT rules to the GMO controversy will probably not allow stringent regulation of transgenic products such as the one by the European Community and consequently, the WTO will not allow the application of the precautionary principle. Among the measures contained in the GATT agreement that may represent a problem for the application of precautionary measures is the defini-

[106] Crawford, Christine, "Conflicts Between the Convention on International Trade in Endangered Species and the GATT in Light of Actions to Halt the Rhinoceros and Tiger Trade" (1996-1998) *Geo. Intl. Envtl. L. Rev.* 555-558, in Shawn Cameron Morton, see also "The use of Trade Sanctions in Multilateral Environmental Agreements and the Interaction with GATT: Flipper Meets Gattzilla", Discussion paper online: *http:/www.web.ca/~smorton/wto-meas.html* (5 June 2006).

[107] GATT *supra* note 98 see article XI (a).

[108] *Ibidem*, see article XI (b).

[109] *Ibidem*, see article XX.

[110] *Ibidem*, see part (b).

[111] *Ibidem*, see part (g).

[112] Victor, *supra* note 57 at 309 y 310. This author reflects on the possible effects of GMOs in the environment, but it considers unlikely that this be protected under WTO law.

tion of a 'like product' and the ostensible product regulation the WTO has employed for products.[113] Article 2.6 of the Agreement of Implementation of Article VI of the GATT 1994 on Antidumping and Countervailing Measures reads as follows: "Throughout this Agreement the term 'like product' (*produit similaire*) shall be interpreted to mean a product which is identical, *i. e.* alike in all respects to the product under consideration, or in the absence of such a product, another product which, although not alike in all respects, has characteristics closely resembling those of the product under consideration".[114]

This definition could be crucial in regulating GMOs. According to this interpretation, GMOs could be technically considered similar to organic products in the GATT agreement because, in spite of genetic manipulation, their composition will remain almost identical or identical to organic products. An examination of relevant litigation suggests also that GATT looks at the end product, rather than the process itself.[115] If the WTO decides to take this approach to GMOs, it will be largely impossible to sustain bans on these products. The precautionary principle as well may not survive scrutiny from the WTO, since it would need to show sufficient scientific evidence that health effects derive from the consumption of GM products.

This interpretation was reiterated in a case before the WTO between Canada and the European Community where the appellate body stated again the relevant considerations:[116] *a)* states have freedom to choose the level of protection, *b)* scientific evidence must serve as the basis for protective measures or the 'level of protection', and *c)* the definition of likeness includes physical properties, end of use, and consumer habits.[117]

[113] Macmillan, *supra* note 92 at 22-26.

[114] Agreement on Implementation of Article VI of the GATT 1994 online: *http://www.wto.org/english/docs_e/legal_e/19-adp.pdf* (5 June 2006).

[115] Centre for International Sustainable Development Law (CISDL) Legal Brief, "Precaution in World Trade Law: The Precautionary Principle and its Implications for the World Trade Organization", online: *http://www.cisdl.org/pdf/brief_precaution_trade.pdf* (5 June 2006).

[116] European Communities Measures Affecting Asbestos and Asbestos Containing Products. WT/DS135/AB/R 12 March, 2001 at *http://docsonline.wto.org/DDFDocuments /t/WT/DS/ 135ABR.doc* (5 June 2006).

[117] CISDL Legal Brief, *supra* note 115.

C. *The Subsidiary Agreement on Sanitary and Phytosanitary Measures (SPS)*

The SPS agreement was created in 1993 by WTO parties to help reduce the incidence of non-tariff trade barriers imposed to protect, ostensibly, human, animal or plant life.[118] The WTO describes the focus of the SPS agreement: "To maintain the sovereign right it deems appropriate, but to ensure that these sovereign rights are not misused for protectionist purposes and do not result in unnecessary barriers to international trade".[119] The SPS agreement does not provide states with acceptable sanitary standards;[120] instead, it guides governments in establishing SPS rules.[121] These guidelines are aimed at helping WTO members to (1) harmonize standards and (2) to assess the appropriate level of SPS protection based on an assessment of risks. Regarding (1) harmonization, article 3 recommends that states base their sanitary measures on international standards, guidelines or recommendations, whenever they exist. (2) With respect to the level of SPS protection, article 5 encourages states to base their sanitary standards of risks on scientific evidence. The precautionary principle or at least parts of this principle can be found in various parts of the SPS agreement.[122] Precaution is specifically incorporated in (1) paragraph 6 of the preamble, which referring to the levels of protection, mentions that states can determine "the appropriate level of protection of human, animal or plant life or health".[123] (2) In article 3.3, which is precautionary in nature, the level of protection that can be implemented by states is addressed in the following manner: "members may introduce or maintain sanitary or phytosanitary measures

[118] Grosko, Brett, "Genetic Engineering and Internacional Law: Conflict or Harmony? An analysis of the Biosafety Protocol, GATT, and the WTO Sanitary and Phytosanitary Agreement" (2001) 20 *Va. Envtl. L. J.* 295 at 308.

[119] WTO, "Understanding the WTO Agreement on Sanitary and Phytosanitary (SPS) Measures", online: *http://www.wto.org/wto/goods/spsund.htm* (1 June 2006).

[120] Stewart, Terence P. y Johanson, David S., "The SPS Agreement of the World Trade Organization and the International Trade of Dairy Products" (1999) 54 *Food & Drug L. J.* 55 at 56.

[121] *Ibidem*, at 56 y 57.

[122] Shaw, *supra* note 88 at 540.

[123] SPS agreement, *supra* note 99 see preamble (1) 6.

which result in a higher level of protection than would be achieved on measures based on the international standards"[124] and (3) Article 5.7, states that states can adopt higher standards provisionally "in cases where relevant scientific evidence is insufficient".[125]

The first case to put to the test precautionary measures under the SPS was the *Beef Hormones Dispute*,[126] which was based on an embargo imposed by the European Community against US beef treated with artificial growth-enhancing hormones.[127] This case seems to indicate how the WTO applies the precautionary principle.[128]

Regarding the embargo, the appellate panel decided that the European Community had violated the SPS agreement in the absence of appropriate risk assessment[129] and consideration of international standards of protection, referring to those of the Codex food standards.[130] Regarding harmonization measures, the appellate body interpreted article 3 as meaning that if states do not base such measures on international standards,[131] they have to prove scientifically the higher standard. Regarding article 5, on the Assessment of Risks, the appellate body interpreted the article as meaning that health measures must be based on risk assessment and that there should be a rational relationship between them.[132] The hormone case can give us an idea about the standard that needs to be met to sustain stricter measures than those contained in the Codex. In this case, the European Community (1) did not look at international standards for selecting the SPS l protection level; namely, in the Codex. (2) According to article

[124] *Ibidem*, article 3.3.
[125] *Ibidem*, article 5.7.
[126] EC Measures Concerning Meat & Meat Products, Panel Reports: Case WI/DS26/R/USA, August 18, 1997 & WT/DS48/R/CAN, August 18, 1997; Appellate Body Report: WT/DS26/AB/R&WT/DS48/AB/R, January 16, 1998 in *supra* note 115.
[127] *Idem.*
[128] *Idem.*
[129] Bridgers, *supra* note 2 at 189.
[130] *Idem*. For more information see "Codex Alimentarius Commission" online: *http://www.codexalimentarius.net/web/index_en.jsp* (6 June 2006).
[131] Neugebauer, Regine, "Fine-tuning WTO jurisprudence and the SPS Agreement: Lessons from the beef hormones case" (2003) 31 *Law & Pol'y Int'l Business* 4 at 1256-2257.
[132] *Ibidem*, at 1256 y 1257.

3.3 of this agreement, the EC had a right to increase the level of protection only when the 'higher protection' was based on a risk assessment. (3) According to article 5.7, the EC could have chosen higher standards temporarily until it acquired scientific evidence to support the SPS measures. Accordingly, when countries regulate GMOs, and impose standards more stringent than those found on the international level, they will be required to demonstrate a rational relationship between the regulations and the respective risk assessment.

With respect to the precautionary principle, both the WTO panel and the appellate body refused to consider its evolution into a principle of international law.[133] However, they recognized that it was the focus of debate "among academics, law practitioners, regulators and judges".[134] The appellate body, though, found that the precautionary principle was 'reflected' in the SPS agreement, but did not override the specific obligations in that agreement.[135]

Based on the *hormones* case, the SPS agreement's version of the precautionary principle relies on a scientifically based risk assessment. This standard is not likely to afford protection in cases where scientific evidence has not yet been developed. Nevertheless, countries can impose restrictions based on 'provisional measures' to protect, at least temporarily, human health. The temporary moratorium is still more attractive than any alternative yet devised.

D. *Agreement on Technical Barriers to Trade (TBT)*

The TBT agreement was created to eliminate unfair technical regulations that may constitute or pose trade obstacles to foreign products.[136] This Agreement, however, recognizes that state parties have the right to establish their own levels of protection[137] and to enact measures to ensure that those levels are met.[138]

133 Macmillan, *supra* note 92 at 153 y 154.
134 *Ibidem*, at 153 y 154.
135 "World Trade Organization, summary on the Precautionary Principle," online: *http://www.wto.org/english/tratop_e/sps_e/sps_agreement_cbt_e/c8s2pl_e.htm* (6 June 2006).
136 Macmillan, *supra* note 92 at 153 y 154.
137 "Legal Texts: the WTO agreement," online: *http://www.wto.org/english/docs_e/legal_e/ ursum_e.htm #d Agre ement* (6 June 2006).
138 *Idem*.

The exceptions laid out in the TBT Agreement are a mixture of measures provided in GATT article XX and SPS measures. Legitimate objectives that can authorize states to impose TBT are outlined in article 2.2 and include: (1) "national security requirements," (2) "prevention of deceptive practices" and (3) "protection of human health or safety, animal or plant life or health or the environment".[139]

The TBT Agreement, although similar to the SPS Agreement, administers a very different test to determine when a measure constitutes a trade barrier.[140] While the SPS Agreement requires a scientific assessment of risks, the TBT Agreement relies on a non-discrimination test.[141] The TBT rejects a regulation that is more restrictive than necessary to achieve such objectives.[142]

An innovation in this agreement is the inclusion of the term "environment protection" as justification for imposing TBT measures by states.[143] In the application of these measures, states have to be cognizant that these restrictions shall not be more trade-restrictive than necessary to achieve a legitimate objective. At first sight, the agreement on TBT measures seems more environmentally oriented than those of article XX of GATT,[144] because of the provision referring to protection of the environment contained in article 2.2.

As suggested by Fiona Macmillan,[145] the GMO litigation before the WTO between the United States and the EC may find its way into a TBT agreement dispute, since article 1.3 of this agreement is on 'industrial and agricultural products' and since labelling measures have already been implemented by the European Community to "prevent deceptive practices".[146] Precautionary measures imposing TBT measures to prevent 'deceptive practices' in the organic market can probably be upheld as long as they are not 'more trade restricti-

139 TBT agreement, *supra* note 100 article 2.2.
140 Macmillan *supra* note 92 at 162.
141 *Ibidem*, at 163.
142 *Ibidem*, 163 y 164.
143 *Ibidem*, 163-165
144 *Ibidem*, at 166 y 167.
145 *Ibidem*, 181.
146 *Ibidem*, 182.

ve than necessary' and as long as states apply the 'Most-Favoured-Nation Treatment' and 'National Product Treatment' principles.

Although the Agreement on TBT makes no allusion to the precautionary principle, it can be narrowly construed as containing some of its elements, particularly in the exceptions included in article 2.2,[147] in which states may impose TBT measures to protect "legitimate objectives".[148] It remains to be seen the degree of restriction that WTO will impose on labelling. If the WTO panel, however, finds this measure restrictive, it will require of the EC the use of 'other measures' for GM products.

Core elements of the precautionary principle have been included in trade agreements, particularly, *a)* in the SPS agreement, *b)* in chapter XX of the GATT, and *c)* in the TBT Agreement. Although exceptions in these agreements allude to precaution, the discussion of this principle has been directly addressed under the SPS agreement; particularly, in the *Hormone Case.* The Appellate Body, in this case, said that the provisions of the SPS Agreement embraced the precautionary principle.[149] This principle, however, has been interpreted as being subordinated to clear and convincing scientific evidence to deal with uncertainties caused by lack of scientific evidence. The WTO, when deciding the case between the US and the EC over the moratorium on transgenic products,[150] is obliged by its own decisions to consider its rules not in isolation but in accordance with international law.[151] The precautionary measures by the EC have to be interpreted in accordance with multilateral environmental agreements.[152] The precautionary principle rests in the hands of the WTO; the way these institutions will interpret this principle will shape the future of protection in the international arena. If the WTO declares illegal the EC moratorium on transgenic products, countries will be reluctant to

147 TBT, *supra* note 100 article 2.
148 *Idem.*
149 Shaw, *supra* note 88 at 540.
150 Dispute Settlement Body, Panel WTO: European Communities Measures Affecting the Approval and Marketing of Biotech Products WT/DS291/27, WT/DS292/21 and WT293/21, Online: *http://www.wto.org/english/tratop_e/dispu_e/dispu_subjects_index_e.htm#gmos* (1 June 2006).
151 Appellate Body Report AB-1996-1,WT/DS2/AB/R at *supra* note 130.
152 Shaw, *supra* note 88.

apply the precautionary principle even when the application of this principle is required by a multilateral environmental agreement such as the Cartagena Protocol. An attack on the precautionary principle by the WTO can result in international conflicts between the trade and environmental regimes.

3. *The Precautionary Principle and International Human Rights*

It has been pointed out that a thorough study of the precautionary principle should include the area of human rights[153] and that this area can consequently contribute to the protection of the environment.[154] The most relevant progress in 'greening human rights' and opening the potential use of the precautionary principle has been done by means of the International Covenant on Civil and Political Rights (ICCPR),[155] essentially in the protection of minority groups and cultural rights,[156] and under the European Convention of Human Rights under the right to life.

A. *The International Covenant of Civil and Political Rights*[157]

Recently, human rights bodies have explored the possibility of placing the environment in the human rights context.[158] Environmental provisions, in particular, have been successfully invoked in cases regarding the right to life and the right of minorities to enjoy their culture and traditional practices under article 27 of ICCPR.[159] The Committee of the ICCPR, has further extended this right to encom-

[153] Vanderzwaag, David, "The Precautionary Principle and Marine Environmental Protection: Slippery Shores, Rough Seas, and Rising Normative Tides" 33 *Ocean Devel. & Int'l L.* 65 at 166.
[154] Kamminga, Menno T., "The Precautionary Approach in International Human Rights Law: How It Can Benefit the Environment", in Freestone and Hey, at 171-173.
[155] International Covenant on Civil and Political Rights (ICCPR), (1996) 999 *UNTS* 171, in force in 1976.
[156] *Ibidem*, article 27.
[157] Kamminga, *supra* note 154 at 174 y 175.
[158] *Ibidem*, at 172 y 173.
[159] *Ibidem*, at 173 y 174.

pass socio-economic activities such as hunting and fishing. In Kitok v. Sweden,[160] the United Nations Human Rights Committee considered Ivan Kitok's complaint that he had been unfairly deprived by the Sami Village, of which he was a member, of the right to herd reindeer.[161] In Kitok, the Committee viewed that traditional practices and issues could fall under the ICCPR. Under article 27, persons belonging to minority groups "shall not be denied the right, in community with the other members of their group, to enjoy their own culture, to profess and practise their own religion, or to use their own language".[162] Building upon the decision in Kitok,[163] in Ominayak v. Canada,[164] the Committee construed minority rights as extending to "economic and social activities",[165] upon which the Band of Cree natives relied as a group.[166] The Committee concluded that Canada had violated the rights of natives under article 27 of the ICCPR[167] in allowing Alberta to expropriate some of the land of the aborigines.[168] The Committee stated that culture included a particular way of life associated with the use of 'land resources', especially in the case of indigenous people and that right 'may include' such traditional activities as fishing or hunting.[169]

The ICCPR committee has envisioned the environment as an integral component in the enjoyment of some human rights by natives. Much is left to be seen, particularly when the adoption of new technologies have the potential to dramatically alter traditional practices.

160 Kitok v. Sweden, No. 197/185, Dec. of July 27, 1998, UN Doc. A/43/40.
161 *Idem.*
162 ICCPR, *supra* note 155 article 27.
163 See Anaya, James, "International Human Rights and Indigenous Peoples: The Move Toward the Multicultural State" (2004) 21 *Ariz. J. Int'l & Comp. L.* 13 at 29.
164 Ominayak, Bernard, Chief of the Lubicon Lake Band v. Canada, Report of the Human Rights Committee, UN Doc. A/45/40, vol. II, annex IX (A) (1990).
165 *Idem*.
166 *Idem*.
167 ICCPR, *supra* note 155 article 27.
168 Anaya, *supra* note 163 at 30.
169 Human Rights Committee, General Comment Adopted by the Human Rights Committee under Article 40, Paragraph 4, of the International Covenant on Civil and Political Rights: General Comment No. 23 (50) (article 27), UN Doc. CCPR/C/21/Rev.1/Add.5, P7 (1994) in *supra* note 163.

B. *The European Court of Human Rights*

Under the European model, article 8 of the European Convention of human rights has been invoked against privacy-invading environmental nuisance.[170] The case Lopez Ostra v. Spain, involved a waste and treatment station in Lorca Spain near the home of Ms. Lopez Ostra. Stinking smells and health problems triggered Ostra's complaint.[171] The European Court of Human Rights found that Spain had violated Lopez Ostra's right to enjoyment of her home and private family life.[172]

It has also been suggested that future generations may be protected under the umbrella of human rights that can benefit from the application of the precautionary principle.[173] Although the rights of future generations is a recent concept that has been embraced,[174] development in this area can potentially benefit from the application of the precautionary principle in anticipating harm and preserving the environment for future generations.[175] More generally it is suggested that human rights may dramatically benefit from the use of the precautionary principle,[176] especially regarding its potential extension to health and the environment before irreversible harm occurs.[177]

III. Regional Level

At the regional level, the precautionary principle has been embraced in different ways. In the European Community, this principle plays a fundamental role in biodiversity and health protection, particularly in the field of GMOs. In North America, this principle does not play as fundamental a role in the North American Free Trade Agreement, but has been tangentially alluded to when GMO issues

170 Kamminga *supra* note 154 at 174.
171 *Ibidem*, at 174 y 175.
172 *Ibidem*, at 174-176.
173 Kiss, Alexandre, "The Rights and Interest of Future Generations and the Precautionary Principle" in Freestone, *supra* note 13 at 28.
174 *Ibidem*, at 27 y 28.
175 *Idem*.
176 Kamminga *supra* note 154 at 174.
177 *Ibidem*, at 175.

have been raised. In this part of the paper, a regional focus of the precautionary principle is considered, particularly with relation to the European Community and the North American Free Trade Agreement.

1. *The Precautionary Principle in the European Community*

The official adoption of the precautionary principle by the EC ignited debate, mainly in the field of commerce and trade. Along with some environmental law principles such as prevention, rectification at source and the polluter pays principle, the precautionary principle was included in the Maastritch Treaty through the Single European Act.[178] According to article 174(2), EC's policy must be based on the precautionary principle.[179] In other words, this principle is applied in the context of EC law[180] along with the principles of proportionality and subsidiarity.[181] Under the European system, the EC regulates the application and strength of this principle.[182]

In February 2000, the Commission of the European Community endorsed a communication on the application of the precautionary principle.[183] This communication was aimed to guide EC policy makers in applying the principle and to prevent its application as a form of protectionism.[184] The precautionary principle is particularly essential in the management of risk. It is considered in the EC within a structured approach to the analysis of risk encompassing: risk assessment, risk management and risk communication. To apply the precautionary principle, decision makers need to start with a scientific evaluation as comprehensive as possible for the purpose of identifying

[178] Sadeleer, *supra* note 16, at 110.
[179] *Ibidem*, at 110 y 111.
[180] Rafferty, Brian P., "The Door Opens Slightly: Recent European Union Regulations on Genetically Modified Organisms" (2004) 16 *Geo. Int'l. Envtl. L. Rev*. 2. at 295-296 (Lexis).
[181] *Ibidem*, at 296.
[182] *Ibidem*, 295 y 296.
[183] Commission of the European Communities, "Communication of the application of the Precautionary Principle," (2000) 1, Online: *http://europa.eu.int/eur-lex/en/com/cnc/2000/com2000_0001en01.pdf* (6 June 2006).
[184] *Idem*.

the degree of uncertainty.[185] According to the 2000 Communication, the application of this principle in the EC should be: proportional to the chosen level of protection, non-discriminatory in its application, consistent with similar measures already taken, and based on an examination of the potential benefits and costs of action or lack of action. EC members are obliged by this communication to perform cost-benefit analysis when possible and to continually consider scientific information to update the regulations made.

The Communication on the Application of the precautionary principle in the EC is a step ahead in the crystallization of this principle as part of customary international law. Although the EC effort to standardize the application of the principle rather weakens it by subordinating its application to scientific evidence, this measure will prevent its indiscriminate application. If these guidelines are fully implemented, they may act as a model to guide policy makers around the world in the quest to implement this principle.

The European Community

Globally, product and process-oriented regulation are the two main approaches that apply to GMOs.[186] Product-oriented regulation mandates that if GMOs are not different from conventional products, they can be considered as existing under current regulation. This approach, followed by the United States, requires only that the GMO product be as safe as the organic or conventional product. Under this regulation, modified products or GMOs are those that differ in composition from traditional products.[187] In contrast, the process-oriented regulation subscribed to by the European Community is based on the assumption that if genetic modified materials are used in the production process, the final product requires separate regulation, even if it exhibits no risks different from the conventional product.[188]

GMO regulation in the EC began with the 1990 Council Directives 90/220 and 90/119. This regulation required a risk assessment to

185 *Idem*.
186 Applegate, *supra* note 32 at 228-233.
187 *Ibidem*, 228 y 229.
188 *Ibidem*, 230-233.

be performed before GMOs could be released into the environment or the market with the approval of each member state.[189] In 1998, states pressured the EC to enact legislation on labelling GMOs by vetoing all GM products.[190] Later, Directive 2001/18/EC, inspired by the precautionary principle, replaced Directive 90/220/EC, initiating a procedure for consenting experimental and commercial release of GMOs.[191] This directive established an obligatory environmental risk assessment for the authorization procedure to start. Additionally, the directive eliminated from the market GMOs that contained genes resistant to antibiotics in humans and animals, and labelled all modified products.[192] The EC, in its efforts to protect the environment, limited licences over GMOs to ten years with a possibility to renew, only if no harmful effects were attributed to the products.[193]

The year 2003 gave birth to a new era in the regulation of GMOs in the EC Parliament. Regulation 1830/2003 was created to implement GMO regulations that took effect in 2001. The newest EC regulation required producers to trace GM products throughout the production process with the purpose of clearly identifying and easily removing GM products from the market if adverse effects were detected.[194] Regulation 1830/2003 requires sellers to label products containing more than 0.9% of genetic material; these requirements apply to both GMOs for human and animal consumption.[195] Because of the inclusion of the precautionary principle as a part of EC law, and because of the directives that regulate these organisms, it would appear

[189] Dene Donat, Kim Jo, "Engineering Akerlof Lemon: Information Asymmetry, Externalities and Market intervention on Genetically Modified Market" (2003) 12 *Minn. J. Global Trade* 417 at 429 y 430.

[190] *Ibidem*, at 429.

[191] Thomas, Stephen, "Promise Peril, Precaution: The Environmental Regulation of Genetically Modified Organisms" (2001-2002) 9 *Ind. Global Legal Stud.* 187 at 192 y 193 (Heinonline).

[192] *Ibidem*, at 198 y 199.

[193] Directive 2001/18/Ec of the European Parliament and of the Council (2001) online: *http://europa.eu.int/comm/environment/biotechnology/pdf/dir2001_18.pdf* (6 June 2006).

[194] Regulation (EC) No. 1830/2003 of the European Parliament and of the Council of 22 September 2003 online: *http://www.biosafety.be/GB/Dir.Eur.GB/Del.Rel./1830_2003/1830_2003_TC.html* (6 June 2006).

[195] *Idem*.

at first glance that the EC is against the use of biotechnology.[196] The European reaction to GM products has been largely shaped by their past experience with bovine spongiform encephalopathy (BSE) in beef and food.[197] These risks have significantly shaped European attitudes toward food regulation.[198]

2. *The Precautionary Principle in the North American Free Trade Agreement*

In response to the debates over the effects of trade agreements on the environment, a parallel agreement was negotiated among NAFTA[199] parties namely, the North American Agreement on Environmental Cooperation (NAAEC).[200] The centerpiece of this agreement was the establishment of the North American Commission of Environmental Cooperation (CEC).[201] The CEC is a ministerial commission similar to a free trade commission.[202] This institution is controlled by a Council made up representatives of Mexico, Canada and the United States who have a final say in all matters relating to the environmental implications of trade.[203] Indeed, the CEC is to "address regional environmental concerns, help prevent potential trade and environmental conflicts, and to promote the effective enforcement of environmental law".[204]

Unlike in the European Community, the precautionary principle does not play a central role in the North American Free Trade

196 *Idem.*
197 Rafferty, *supra* note 180 at 292.
198 *Ibidem*, at 292 y 293.
199 North American Free Trade Agreement, Dec. 17, 1992, Can.-Mex.-U.S., 32 *ILM* 298 (entered into force Jan. 1, 1994).
200 North American Agreement on Environmental Cooperation, Sept. 14, 1993, Can.-Mex.-U.S., 32 *ILM* 1480 (entered into force Jan. 1,1994).
201 Bolinger, Christopher N., "Assessing the CEC on its record to date" (1997) 28 *Law and Pol'y in Int'l. Bus*. 4. at 1107 (Proquest).
202 Johnson, Pierre Marc y Beaulieu, Andre, *The Environment and NAFTA Understanding and Implementing the New Continental Law*, Peterborough, Ontario, Island Press, 1996, at 131.
203 *Idem.*
204 "The North American Commission for Environmental Cooperation W*ho we are*", online: *http://www. cec.org /who_we_are/index.cfm?varlan=english* (6 June 2006).

Agreement (NAFTA).[205] The principle is, nevertheless somehow embraced in this agreement through national legislation. Precaution has been considered tangentially in the NAFTA forum by the CEC.[206] The most important consideration involving this principle is the Transgenic Mexican Maize Report.[207] In this document, the CEC reflected on GMO issues and environmental protection. In the report, the CEC asserts Mexico's international obligations to take precautionary measures to protect biodiversity, including risk assessment. In this part of the paper, the transgenic maize report is analyzed with reference to *a)* The context, *b)* GMO issues in Mexico, and *c)* References to the precautionary principle.

A. *Transgenic Mexican Maize Report*

The Context

In September 2001, Mexican government officials first reported contamination of traditional maize with transgenic sequences.[208] In 2002, the Mexican government confirmed contamination of 13% of maize varieties in 11 indigenous communities.[209] Transgenic maize was also found in storage facilities of the government's food and distribution agency (DICONSA).[210] The complaint was filed on April 2002 with the CEC from various indigenous communities in the state of Oaxaca and several Non-Governmental Organization groups from the NAFTA parties.[211] Its petition included concerns over the introduction and planting of transgenic maize and requested *1)* An evaluation of the possible environmental impacts of transgenic maize;

[205] Raustiala, Kal, "Precaution in the Federal Legislation of the NAFTA parties", North America Environmental Law Policy Commission of Environmental Cooperation. Online: *http://www.cec.org/files/pdf/lawpolicy/naelp10_en.pdf* (6 June 2006).

[206] *Idem*. The Environmental effects of Free Trade (CEC), online: *http://www.cec.org/files/pdf/economy/symposium-e.pdf* (6 June 2006).

[207] "Maize and Biodiversity: The Effects of Transgenic Maize in Mexico: Key Findings and Recommendations (CEC)", online: *http://www.cec.org/maize* (6 June 2006).

[208] *Ibidem*, at 32.

[209] *Idem*.

[210] *Idem*.

[211] *Ibidem*, at 33.

2) An analysis of the gene flow in the native communities where maize was planted; *3)* The degree and source of contamination; and *4)* Recommendations to address such harm.[212] The complaint was filed under article 13 of the North American Agreement on Environmental Cooperation (NAAEC), which authorizes the CEC Secretariat to investigate and prepare reports on environmental issues within its overall program.[213]

B. *GMO issues in Mexico*

The CEC pointed at three important considerations in the maize controversy: *1)* health, *2)* environment, and *3)* socio-economic factors. *1)* Regarding health, the CEC suggested that further studies were needed to assess the effects of transgenic maize consumed in large amounts, as maize is the basis of the Mexican diet. The CEC also urged the prohibition of the production of pharmaceuticals in maize that are incompatible with food or feed.[214] *2)* With respect to the environment, the CEC pointed out that Mexico is considered one of the centers of origin of maize and that preservation of native species is an essential part in preserving this grain for humanity.[215] The CEC also mentioned that Mexico lacks the mechanisms for monitoring transgenes and that its capabilities for scientific research are different from the ones enjoyed in the other NAFTA countries.[216] *3)* With respect to the socio-economic factors, the CEC pointed that maize has cultural, spiritual and symbolic value for Mexicans and that its contamination could constitute a risk for traditional farming practices.[217]

C. *The Precautionary Principle*

The CEC posited that the advisory group that wrote the report referred to the precautionary approach when stating that Mexico was a

212 *Ibidem*, at 34.
213 *Ibidem*, at 33.
214 *Idem*.
215 *Ibidem*, at 32.
216 *Ibidem*, at 25.
217 *Idem*.

party to the Biodiversity Convention, and that under articles 8 (g)[218] and 8 (j),[219] Mexico has an obligation to respect indigenous rights and to perform risk assessments.[220] The CEC elaborated that commitment to the CBD was furthered in the Cartagena Protocol, which obliges Mexico to perform, on an individual basis, risk assessments of LMOs.[221] Lastly, the CEC discussed the guidelines in the application of the precautionary principle by the Canadian Biotechnology Advisory Committee.[222]

The precautionary principle, while endorsed in national legislation of the NAFTA parties, does not play a central role in this trade agreement. It can be said, however, that the mere creation of the CEC is a precautionary measure to prevent parties from indiscriminately exploiting the environment in the name of trade. While the CEC furthers environmental protection by promoting citizen complaints, its effectiveness is yet to be seen, particularly in the promotion and endorsement of environmental principles such as the precautionary principle.

[218] Under *in-situ* conservation, the CBD provides that states should "establish or maintain means to regulate, manage or control the risks associated with the use and release of living modified organisms resulting from biotechnology which are likely to have adverse environmental impacts that could affect the conservation and sustainable use of biological diversity, taking also into account the risks to human health". See CBD, *supra* note 45 article 8.

[219] Under part (j), parties in the CBD are encouraged to Subject to its national legislation, respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity and promote their wider application with the approval and involvement of the holders of such knowledge, innovations and practices and encourage the equitable sharing of the benefits arising from the utilization of such knowledge, innovations and practices. *Ibidem*, article 8 (j).

[220] Maize and Biodiversity *supra* note 207 at 12.

[221] *Idem*.

[222] According to these standards, the application of the precautionary principle should be *1)* Proportional to the potential severity of the risk being addressed and be effective, taking into account the benefits and costs of actions or lack of actions; *2)* Subject to reconsideration on the basis of the evolution of science, technology and society's views about the acceptable level of protection; *3)* Non-discriminatory between situations presenting similar risks and consistent with measures taken in similar circumstances; *4)* The least trade-restrictive option where more than one option exists; and *5)* Administered in a transparent and accountable way, providing for public involvement. *Idem.*

IV. The Academic Debate

Efforts to further the implementation of the precautionary principle and its consolidation as a norm of customary international law have been trapped in an endless debate[223] over the relation of this principle to science. Opponents to this principle claim that it is anti-scientific and that by preventing technology from developing, society is, in fact, being jeopardized.[224] On the other hand, advocates of this principle debate whether or not science is the appropriate mechanism for triggering this principle, especially when there is much uncertainty about how ecosystems work and function. This debate is not only a constraint to science; it extends to the philosophical and legal foundations of this principle. The following analysis of the principle dwells on its relationship to science, and discusses some of the viewpoints expressed about the nature of its ethical and legal foundations.

1. *The Precautionary Principle and Science*

The precautionary principle does not negate the need for science.[225] This principle requires scientific knowledge for the protection of the environment.[226] It is, therefore, a challenge to scientists to search for answers in light of new technologies and their effects on the environment.[227] Three factors need to be analyzed in the relationship between science and this principle: first, the different formulations of the precautionary principle; second, considerations on decision theory; and third, the environment and science.

First, the degree to which this principle clashes with science depends on the formulation of this principle.[228] Stringent versions of this principle require that the proponent of an activity shows that ac-

223 Vanderzwaag, *supra* note 22 at 361.
224 Laurence, David Mee, "Scientific Methods and the Precautionary Principle", in Freestone, *supra* note 13 at 109.
225 *Ibidem*, at 109.
226 *Idem*.
227 *Idem*.
228 Foster, Kenneth R. *et al.*, "Science and the Precautionary Principle" (2000) 288 *Science*, 979-981.

tivity to be safe and that it will not impact the environment in an adverse manner.[229] It can be affirmed, however, that all activities involve some kinds of risk, some greater than others.[230] Less stringent versions of the precautionary principle depart from zero risk, but are conditioned by economic factors. In other words, an activity will be restricted only if the measure is not cost-effective. To an extent, some of the more stringent versions can be criticized for demanding too high a degree of reliance on science.

Second, decision theory illustrates the various choices involved in decision making:[231] (1) Decisions reached with certainty are made when the outcome is clear.[232] In this case, governments can prepare a remedy for the negative outcome of an activity, because the outcome is certain; (2) decisions made that involve risk are those in which the policy maker can assign a probability of the outcome,[233] or prevent the possible outcomes of an activity; and, (3) decisions rendered out of ignorance are those where there is no certainty about the outcome.[234] As with all decisions we make in life, the correct choice is generally not the most extreme, and there are inherent risks associated with each. The precautionary principle, as well, guides policy makers in these circumstances to consider the possible outcomes and to anticipate the worst-case scenario. As David Resnik mentions, the precautionary principle is neither a scientific theory nor a hypothesis; it is a guiding principle that is aimed at providing guidance to policy makers.[235]

Third, complexity informs issues pertaining to the environment.[236] We possess no definite knowledge about the way ecosystems interact, reproduce or function. Biodiversity functions in a complex manner, and especially with a topic as far-reaching as GMOs, science cannot

229 *Ibidem*, at 979-981.
230 Sunstein, *supra* note 39 at 1016.
231 Resnik, David B., "Is the precautionary principle unscientific?" (2003) 34 *Stud. Hist. Phil. Biol. & Biomed.* 2003 at 332.
232 *Ibidem*, at 232 y 233.
233 *Ibidem*, at 332.
234 *Idem*.
235 *Ibidem*, at 342.
236 Wolfenbarger, L. L. y Phifer, R. R., "Ecological Risks and Benefits of Genetically Engineered Plants" (2000) *Science* 290 at 2088.

be held accountable for all of the answers. While scientists have been accurate in some of their predictions, they have not always been proven correct,[237] especially with regard to marine biodiversity. Long based on science, the North Sea fisheries system established a system of quotas for the exploitation of certain species. Unfortunately, the fallibility of science is exemplified only too clearly in this instance, as many species in this particular system were threatened with extinction as a result of excessive fidelity to scientific theory.[238] With complexity comes the need for the precautionary principle.[239] The validity of environmental concern is attested to by this very uncertainty, the existence of which forms the crux of the precautionary principle. The very common expression of 'better safe than sorry' serves as a colloquial reminder of the legitimacy of anxiety about environmental degradation, which can be potentially irreversible. Assuming that any form of destruction reaches this unfortunate stage, a plethora of economic resources might have to be employed to alleviate such danger.

2. *Ethical and legal considerations*

Human beings' relationship with nature poses considerable challenges for philosophers, environmentalists and lawmakers. Environmentalists believe that there must be a relation between environmental philosophy and environmental regulation.[240] Throughout history, philosophers have pointed at many factors that have perhaps accelerated the depletion of natural resources and deterioration of ecological viability. Legislation, both at the national and international levels, has not proven effective in preventing this simultaneous problem. Under these circumstances, the solution is seen in putting in place international guides to resources and environment use that encourage departure from anthropocentric and utilitarian attitudes. These guides, whether principles or rules, must be centered in the reason and com-

[237] Kaiser, Matthias, "The Precautionary Principle and its implications for science" (1997) *Foundations of Science* 2 at 202.
[238] *Ibidem*, 202 y 203.
[239] *Ibidem*, 203 y 204.
[240] Attfield, Robin, *The Ethics of Environmental Concern*, 2nd. ed., Athens and London, The University of Georgia Press, 1991, at 1-2.

mon sense and geared towards ensuring resources and environmental protection and precaution. Philosophically, the precautionary principle essentially encapsulates the balance between use and preservation that is sought.

Throughout history, environmental problems have been viewed as a practical consequence of man's cavalier dealings with nature.[241] Philosophers have attributed environmental degradation to a variety of factors, teachings supposedly arising from Christian beliefs in the dominance of man over nature.[242] Another cause pointed to is overpopulation, namely, the idea that the more there are of us, the more we consume.[243] Some others attribute environmental degradation basically to the belief in "material progress" the attitude inherited from the Enlightenment period which has since framed our policies and laws.[244]

For the foregoing reasons, among others, philosophical or theoretical ideas aimed at securing environmental protection have developed in rejection of anthropocentrism. Schools of thought of this genre have progressively become more inclusive in their consideration of what nature and environment consist of. They have included animals, living organisms, plants and ecosystem health or ecological integrity.[245] The precautionary principle as has been pointed by, among others Laura Westra, as a fundamental principle that protects ecosystems and preserves them from human-imposed-stress. Ecological integrity, it is argued, assumes that ecosystems encompass *1)* The ability to maintain operations under normal conditions; *2)* That they are able to deal with changes in environmental conditions; and *3)* That they are able to evolve.[246]

The precautionary principle, in its strong enunciations, encompasses some of the elements of this ethic. As stated in the Biodiversity

241 *Ibidem*, at 1-2.
242 *Ibidem*, at 20-22.
243 *Ibidem*, at 9.
244 *Ibidem*, at 83.
245 For more on ecological integrity, see Westra, Laura, *Living in integrity*, New York, Rowman and Littlefield, 1998.
246 Lemons, John, "Ecological integrity and national parks", in Westra, Laura y Lemons, John (eds.), *Perspectives on Ecological Integrity*, Boston, Kluwer Academic Publishers, 1995, at 177.

Convention and the Cartagena Protocol, this principle aims to restrict activities that may have an impact on "terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part." In addition, the CBD defines biological diversity as including "diversity within species, between species and of ecosystems".[247] The precautionary principle is to be applied under the Cartagena Protocol, to control the movement of LMOs and to consider their possible effects on ecosystems. In these agreements, however, GMOs can be introduced following assessment of risks and socio-economic factors.[248] This leeway would, for instance, perhaps be contrary to the notion of 'integrity' developed by Laura Westra.[249] In any case, however, even the debates over the ethics of precaution do not erode the basic point that this principle aims to protect ecosystems against adverse or destructive external influences and factors and, at the same time, ensuring also that human health is protected from polluting practices and products that may adversely impact it.

In terms of normative status there has been considerable debate over the validity of the precautionary principle, especially at the international level. Some argue that it has achieved the status of a customary norm of international law, others disagree.[250] Whatever the correct normative position, the view pursued in this paper is that the principle is worthwhile to support, especially as it relates to resources and environmental management. The general basis for its validity, it is argued by some, is that it is based on common sense.[251] This, in juridical terms, can be called a natural law viewpoint. In plain words, this viewpoint says that it does not make sense to eat chemicals in our food; and that it makes sense to preserve biodiversity and to be cautious in our use of resources and environment when we do not know precisely what to do.

247 CBD, *supra* note 45, article 2.
248 See Cartagena Protocol, *supra* note 31 articles 11, 15 y 16.
249 Westra, *supra* note 245.
250 See Trouwborst, Arie, *Evolution and Status of the Precautionary Principle in International Law*, Hague, London, Kluwer Law International, 2002.
251 Earl, R. C., "Commonsense and the Precautionary Principle-an Environmentalist's perspective" (1992) 24 *Marine Pollution Bulletin* at 184.

Natural law was the core element of international law until the 19th century, when it was replaced by positivist doctrine.[252] Still, the importance of this influence in the law remains in article 38 of the Statute of the International Court of Justice (ICJ), specifically in the fact that this court can decide cases '*ex aequo et bono*' when the parties agree.[253] It was also reflected in the ICJ statute's reference to "principles recognized by civilized nations", upon which the court could draw for its decisions.[254]

It could be argued, therefore, that though it is recognized in international environmental treaties and largely reflected in domestic legislation, such among EC states, the principle is, at the bottom, a rule of common sense, an idea of natural law. It is true, as convincingly argued by de Sageleer, that its implementation is not a straight forward matter, rather, that it necessarily calls for a series of interconnected rules and regulations to make it applicable to any particular situation. For this reason he argues, it is a directing principle because it helps to define the purpose of environmental law, nationally and internationally.[255] It is in this encompassing virtue of the precautionary principle that this paper takes its position. That position is that while it may help to pin down the normative status of the principle, its authority derives from the fact that science cannot tell us all we need to know. As such, we must use environmental facilities with caution, simply because we have a hunch that most of the uses we make of those facilities tend to degrade their quality and long term viability. This is the essence of the precautionary principle as a normative requirement for conduct.

V. Conclusion

The discussion revolving around the precautionary principle has been conducted on multiple levels in this paper; it has included international environmental law, trade, human rights, and regional exami-

[252] Hall, Stephen, "The Persistent Spectre: Natural Law, International Order and the Limits of Legal Positivism" (2001) 12 *EJIL* 2 at 270.
[253] *Ibidem*, 291 y 292.
[254] *Ibidem*, at 293.
[255] Sadeleer, *supra* note 16 at Chapters 3 and 5 at 90 and 274.

nation of the European Community and the North American Free Trade Agreement. In the areas of trade and environmental law, the GMO debate has escalated to the WTO. This organization, when considering the European moratoriums, will definitely shape the application of this principle. If the WTO finds European regulation to be inconsistent with trade agreements, countries will be less willing to apply this principle. At the regional level, while this principle has not been embraced in NAFTA, core elements are contained in national legislation. Although the precautionary principle has been considered in NAFTA by the CEC, this environmental organization is not fully independent and lacks authority to truly promote environmental values such as the precautionary principle. This paper, as well, has argued that the precautionary principle is not contrary to science; it is a principle that calls to scientists to provide answers with regard to new technologies and in this case, GMOs. With regard to the foundations of this principle, it was argued that it was based on common sense (natural law), and that some these elements are embodied in the statute of the international court of justice. The precautionary principle departs from anthropocentric attitudes and encompasses a holistic approach. The precautionary principle is not a panacea and it will not change the world overnight,[256] but it can make a difference in the protection of human health and the environment by providing guidance to policy makers when considering threats posed by GMOs.

[256] Vanderzwaag, *supra* note 22 at 374 y 375.