

International Law and GMOs: An Application of Precautionary Principle

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Abstract:

The commercial utilization of genetically modified organisms (GMOs) in daily life has dramatically increased and revealed a broad range of interests among scientists and other stakeholders like farmers, consumers, governments etc. on the possibility of regulation of GMOs. This selective modification and the resulting organisms thereof have become the controversy all over the world. There are so many benefits of GMOs for example in agriculture: increased crop production, reduced need for pesticide and herbicide, enrich nutrient composition etc. but genetically modified organisms (GMOs) have always been considered a threat to environment and human health. Within this controversy, the precautionary principle has become a contentious issue to handle lack of scientific understanding and scientific disagreement with high support from skeptical groups but resisted by GMO advocates. The growth in the production and consumption of GMOs, has produced discussions about pros and cons concerning their legal regulation. Since precautionary principle is an important issue within the frame work of sustainable development. Through this principle, sustainability can provide a normative standard, help to disclose the impact and negotiate the uncertainty of GMOs. This article describes various controversial scenarios related to issues such as World Trade Organization restrictions that have prevented major GMOs producers such as the United States, Canada, and Argentina from commercializing their products. In particular, the author makes a global analysis with reference to the precautionary principle. The Precautionary Principle is considered a central element of a fundamental right to a healthy environment and therefore affects multiple legal and economic interests in which its existence is required.

Key Words: Genetically Modified Organisms (GMOs), Environment, Human Health, The Precautionary Principle, GMO regulations, Sustainable development

Introduction

Day by day Genetically Modified Organisms (GMOs) has increased in our life. In 1994, GM crop a delayed ripening tomato was first introduced in the USA. In 1996, GM crops were planted just 1.7 million hectare and now by 2015, in 28 countries, 179.7million hectare GM crops were grown¹. Since the emergence of GMOs in different countries, they have a no. of question about their safety. Those who advocates affirm that GMOs have the potential to lessen some of the world's problems, for example, can increase crop yield and alleviate world hunger; they can also help reduce the dependence on chemical pesticides and herbicides.² On the other hand, GMOs have also been associated with health and environmental risks.³ In respect of health, a study has been conducted on the effects of transgenic pesticides in rats, resulting in a deterioration of their intestines.⁴ Another example in a laboratory experiment where a gene transferred from a peanut to a soybean showed allergenic responses to the transgenic soybean, that people with allergies of peanut.⁵ In Australia, GM peas were found cause allergic reactions in mice and also made the mice more sensitive to other food allergies.⁶ Environmental damage, as well, is attributed to GMOs. GMOs crops, for example, are believed to have the potential to transfer their traits to their organic relatives, thus perhaps affecting the integrity of biological diversity.⁷

Efforts have been made at the international and regional levels to regulate genetically modified organisms. At the international level, the Cartagena Protocol on Biosafety under the Precautionary Principle is one of the first legally binding international agreements to regulate GMO's cross-border transfer. The inclusion of the precautionary principle in the GMO controversy has engendered even more debate,

¹ <https://royalsociety.org/topics-policy/projects/gm-plants/what-gm-crops-are-currently-being-grown-and-where/>

² Katz, Deborah, "The Mismatch between the Biosafety protocol and the Precautionary Principle" (2001) *Geo. Int'l En*

³ GEO-PIE Project "Issues related to genetic engineering", online: <http://www.geopie.cornell.edu/issues/issues.html#issues> (12 April 2022)

⁴ 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

⁵ Nordlee, J. A., S. L. Taylor, J. A. Townsend, L. A. Thomas, and R. K. Bush. 1996. "Identification of a Brazil-nut Allergen in Transgenic Soybeans." *The New England Journal of Medicine* 334

⁶ V.E Prescott., Campbell P.M., Moore A., Mattes J., Rothenberg M.E., Foster P.S., Higgins T.J.V. & Hogan S.P. 2005. Transgenic expression of bean alphaamylase inhibitor in peas results in altered structure and immunogenicity. *Journal of Agricultural & Food Chemistry*

⁷ 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>(12 April 2022)

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 is philosophical foundation in international agreements to biodiversity protection. This is a principle of avoiding risk even the absence of firm scientific evidence.⁸ This principle has the potential to protect the environment from the uncontrolled spread of GMOs and is involved in endless debates about its application and compatibility with trade rules.⁹

In this article, we will consider some of the key issues that affect the relationship between precautionary measures as a legal standard and approaches to using evidence in decision making. In fact, important questions about the application of the precautionary principle that hinder widespread application remain unanswered. The Article will be organized into three parts: part 1 deals with the precautionary principle as applied to GMOs in 1) international environmental law, 2) international trade law, part 2 deals with the debate over the nature of the precautionary principle in policy making and the reach of its regulatory authority over conduct, and lastly, part 3 includes concluding remarks.

Precautionary principle

This part of the Article deals with the precautionary principle in international environmental law and international trade law. An analysis of the issues with respect to GMOs and the Precautionary Principle is accordingly dealt.

In the early 1970s, the precautionary principle originates from the German principle of “foresight” or “vorsorge”.¹⁰ In the 1980s, Bremen Ministerial Declaration of the International Conference endorsed precautionary measures, that bans the dumping of toxic substances in the North Sea.¹¹ The Precautionary Principle is worldwide

⁸ Timothy o’Riorden, James Cameron Routledge, interpreting the precautionary principle, 2013

⁹ 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

¹⁰ C. Gollier, N. Treich, in Encyclopedia of Energy, Natural Resource, and Environmental Economics, 2013

¹¹, Rosie Cooney, The Precautionary Principle in Biodiversity Conservation and Natural Resource Management, IUCN, Policy and Global Change Series No. 2, 2004, at 6.

recognition in the principle 15 of the Rio Declaration at the United Nations Conference on Environment and Development (UNCED) in 1992.

The precautionary principle appears as a rejection of the assimilative capacity model (ACM)¹² and marks a new era in environmental law and policy. This principle is not reacting to environmental problems, it looks for 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, 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

- i) threat of harm
 - ii) lack of scientific certainty
 - iii) necessity or duty to act
- i) Threat of harm**

There is no consensus on the level of harm required to provoke preparation, but some comments indicate harm must be serious or irreversible. This requirement is used in Rio Declaration¹³ and TRIPs agreement of WTO for patent protection. However, the Cartagena Protocol requires "potential" harm and "adverse effects" to act as catalysts for use Precautionary principle¹⁴. Due to the complexity and uncertainty of environmental and human impacts, GMO is a perfect example for applying the precautionary principle. GMO Highly invasive; they can easily spread to the environment and deliberate consume can affect human health. The potential harm that these organisms can cause can be serious It's irreversible.¹⁵

ii) The level of evidence for scientific uncertainty

¹² This model determines the capacity of ecological systems to withstand a particular activity. The ACM fully relies on science and assumes that it can restore environmental equilibrium and health. See, Puttagunta, Saradhi P., The Precautionary Principle in the Regulation of Genetically Modified Organisms (2000) 9 Health Law Review No. 2 at 12.

¹³ Rio Declaration on Environment and Development, Rio de Janeiro, Brazil, June 14, 1992, (1992) 31 ILM 874

¹⁴ Cartagena Protocol on Biosafety to the Convention Biological Diversity (23 February 2000), online: <http://www.biodiv.org/biosafe/biosafety-protocol.htm> (15 April 2022).

¹⁵ Juan Antonio HERRERA I, "INTERNATIONAL LAW AND GMOS: CAN THE PRECAUTIONARY PRINCIPLE PROTECT BIOLOGICAL DIVERSITY?" 2007

Uncertainty of evidence refers to situations where knowledge is incomplete or scientific information is simply unavailable at the time the activity is investigated. Due to the complexity of the ecosystem, the cost, and the difficulty of monitoring the impact of GMO. When it comes to human health and the environment, it would be taken years, before its impact becomes apparent. But it can be said that science can never do, with some uncertainty about those risks in all human activities, indicates that there is no adverse effect.

The level of evidence required for a trigger application related to the severity of a particular harm and the context of scientific understanding. Therefore, damage must be scientifically documented before applying the precautionary principle. What is considered acceptable scientific evidence of behaviour is ambiguous. For example, Article 15 (1) of the Cartagena Protocol on Biosafety states that risk assessment must be based on "available scientific evidence", while Article 10 of the Cartagena Protocol on Biosafety states that "Insufficient relevant scientific information and knowledge about the potential scope." "Adverse effects" reflect the perception that quality as well as quantity of scientific information must be considered in the assessment. The requirements for "Available Scientific Evidence" also represent the ambiguity of the wording of the Cartagena Protocol, especially when compared to those set forth in Article 10.¹⁶

iii) Burden of Proof

The precautionary principle has been criticized for lacking guidelines of its application at the international level. Although there is no consensus as to which measures to apply to certain activities, 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.

In working on the legal regulation of GMOs and GM foods, different jurisdictions apply the precautionary principle in different ways and often justify certain regulatory regimes. Canada and the United States tend to take a relatively loose approach to regulation, enabling GMO research, field testing, and commercialization in the

¹⁶ *Supra note 15*

absence of clear scientific evidence of harmful risks. Canada and the United States tend to regulate GM foods on the scientifically reasonable assumption that they are essentially equivalent to non-GM foods, while Europe tends to regulate the safety of genetically modified foods with clear scientific evidence. There is need to scientific evidence for GMOs before regulatory approval.¹⁷

With both of these approaches, the outcome of regulation often depends on where the burden of proof is initially placed. The United States and Canada tend to require scientific evidence suggesting a lack of safety, such scientific evidence that rare GMO and GM foods are generally approved for field testing and commercial use there. It proves that by requiring a proof of safety, a form of scientific proof that logically corresponds to a negative proof, Europe has ensured that GMO and GM foods are often denied regulatory approval.

1. Precautionary principle in the context of international environment law

The precautionary principle has been enunciated in both the Bio-diversity 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.

a. Biodiversity convention

The UN Convention on Biodiversity was signed at the UN Conference in Rio de Janeiro in 1992 and ratified in December 1993. The agreement was in response to international concerns about the potential impact of GMO on biodiversity and biotechnology testing in developing countries. The purpose of CBD can be summarized into three factors: Conservation of biodiversity, Sustainable use of that component, Fair and impartial sharing of genetic resources. Like other environmental agreements, the CBD advocates a "precautionary approach."¹⁸

Convention includes precautions and risk assessments that states need to perform if activities "are likely to have a significant negative impact on biodiversity in order to

¹⁷ Dr. Andrew W. Torrance, "Intellectual Property As The Third Dimension of GMO Regulation" Kansas Journal Of Law And Public Policy 16 KAN. J. L. & PUB. POL'Y 257 (2007)

¹⁸Convention on Biodiversity <https://www.cbd.int/>

avoid or minimize such effects." In addition to state actions to conserve biodiversity, CBD lays the foundation for a comprehensive approach to GMO regulation. In particular, Article 19 "calls for the establishment of protocols for implementing procedures such as prior information agreements for secure communication.", Which can adversely affect biodiversity conservation and sustainable use.

The CBD lays the foundation for GMO regulation in a distinctive form; first, it establishes for the creation of a protocol for the safe transfer of GMOs; second, it takes environmental protection; and third, CBD recognizes that most genetic resources are in developing countries by working on technology transfer from developed countries to developing countries. Finally, the state's authority over the genetic and biological resources in its territory is claimed.

b. The Cartagena Protocol

The Cartagena Protocol on Biosafety was ratified in January 2000 by Article 19 of the Convention on Biological Diversity. Biosafety protocol as a result of international negotiations to regulate "cross border movement, passage, handling and use of genetically modified organisms (LMOs)" that may adversely effect on biodiversity based on the precautionary principle Has appeared. Protocol LMO regulation follows two approaches. For the purpose of introduction into the environment such as seeds, and for the purpose of food, feed, or processing such as genetically modified vegetables. Drugs are exempt from this agreement. The Cartagena protocol has three core elements. These are Advanced Information Agreements (AIA), Risk Assessment and the precautionary principle.¹⁹

Advanced Information Agreement: The AIA of Living Modified Organisms states that information needs to be provided in a timely manner to prepare for potential harm. This procedure applies only to LMOs for environmental emissions. AIA procedures are based on Articles 8, 9, and 10. Under these procedures, the exporter must submit a written request to the importer prior to shipping the LMO intended to be released to the environment. It is noted that the Protocol does not constitute a state's consent to the LMO's cross-border movement, even if it does not receive a timely response from

¹⁹ *Supra note 14*

the importing party. LMOs intended for food, feed, or processing are subject to the less burdensome procedures under Article 11 for Biosafety Clearinghouse.²⁰

Risk Assessment: The risk assessment is provided in the protocol as a guide for the parties to the decision to import the LMO. Risk assessment can predict and prevent damage to the environment. This evaluation is required for products intended for environmental deployment, but the parties are encouraged to perform evaluations on other products that are outside the scope of this particular parameter. The risk assessment should be performed using the information available to the importing country in the AEI document. The risk assessment procedure should be science-based. The Cartagena Protocol encourages importing parties to make Article 10 decisions based on scientific risk assessments.²¹

Precautionary Principle: The preventive "spirit" of the Cartagena Protocol is primarily contained in advanced information agreements and risk assessment requirements. Sections 10.6²² and 11.8²³ regulate the application of the principles as a prerequisite for importing LMOs. As you can see, both provisions should prevent the importing party from making appropriate decisions regarding the import of such LMOs, due to the lack of scientific certainty regarding the extent of the potential adverse effects of LMOs on biodiversity.

The Cartagena Protocol is considered a modern and effective approach to reducing the risk of biotechnology, while leaving room for potential problems arising from its application. First, there is no guidance on the application of the Precautionary Principle 84, which is subordinate to a "scientifically sound" risk assessment. Second, the protocol also has no scientific institution to confirm and review the results of such assessments. Third, the provisions of this Convention on Trade Impacts are inconsistent with similar trade-related agreements. Such conflicts can hinder their

²⁰"risk assessment report" according to the guidelines established in Annex III.

²¹ *ibid*

²² "...lack of scientific certainty due to insufficient relevant scientific information or 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 the Party of import, in order to avoid or minimize such potential adverse effects, from taking a decision, as appropriate, regarding the import of the LMO in question..."

²³ "...lack of scientific certainty due to insufficient relevant information and knowledge about the extent of the potential adverse effects of a living modified organism on the conservation and sustainable use of biological diversity shall not prevent that Party, in order to avoid or minimize such potential adverse effects, from taking a decision, as appropriate, regarding the import of that living modified organism..."

existence. Fourth, the Protocol takes into account developing countries. Despite the weaknesses of this agreement, it is the first step towards GMO regulation at the international level and helps to protect the environment and human health to some extent through the precautionary principle.

c. The Nagoya-Kuala Lumpur Protocol.

The objective²⁴ of this Protocol is to contribute to the conservation and sustainable use of biological diversity, taking into account risks to human health, and providing international rules and procedures in the field of liability and redress in relation to LMOs.

The new Supplementary Protocol provides international rules and procedures in the field of liability and redress in relation to damage to biological diversity resulting from LMOs²⁵. As in the precursor agreement, the Cartagena Protocol, the adoption of this Protocol has a dual function. On the one hand, it prevents the creation of environmental damage, and, on the other hand, it provides confidence building measures for the development and application of modern biotechnology. In doing so, it prepares an environment conducive to maximizing the benefits of LMOs by providing rules for compensation or response measures in the event that damage to biodiversity occurs or is likely to occur.²⁶

2. The Precautionary Principle in the Context of Trade

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

In the World Trade Organization, the precautionary principle is the debatable issue in the fields of food safety and GMOs. In 1998, the European Union used moratorium which was based on the precautionary principle, applied to GM products from the

²⁴ Article 1 of Nagoya Protocol.

²⁵ The meeting of the Parties to the Protocol adopted 17 other decisions. Among these were the adoption of a 10-year Strategic Plan for the implementation of the Protocol, a program of work on public awareness, education and participation in relation to LMOs, and additional guidelines on risk assessment and risk management.

²⁶ <https://www.cbd.int/abs/doc/protocol/nagoya-protocol-en.pdf>

United States, Canada and Argentina. In 2003, the affected exporting countries requested the establishment of a Dispute Settlement Body by the WTO. The consideration of the precautionary principle in the trade over GMOs is highly controversial. It will shape the area of trade, influence multilateral environmental agreements.

The World Trade Organization

The General Agreement on Tariffs and Trade (GATT) of 1947 is the predecessor of the World Trade Organization (WTO), which was established on April 15, 1994. The World Trade Organization has introduced a "resolution" on environmental protection, referring to "Sustainable Development Goals". To promote sustainable development, the Trade and Environment Commission was established in 1995 to identify the relationship between trade and the environment. This committee was established as part of the Uruguay Round and deals with trade issues that are basically related to the environment.

Applicable to Article XX of the General Agreement on Tariffs and Trade (GATT) 1947, TRIPs agreement, the Supplementary Agreement on Sanitary and Phytosanitary Measures (SPS), and the "GMO Restrictions" contained in the Agreement on Technical Barriers to Trade (TBT) of WTO with respect to GMOs.

A.) GATT and Exceptions in Article XX

The GATT Agreement includes several promises to prohibit the imposition of "most favored nation treatment" (MFNT), "national treatment" principle (NTP), and quantitative trade restrictions. A serious legal dispute has been filed with the WTO Organization for violations of these provisions. The state has justified bans or discrimination under Section XX, including exceptions to the GATT Regulations aimed at protecting a) human health and flora and b) protection of natural resources.

B.)TRIPs agreement

The TRIPS Agreement allows, but does not mandate, two possible exceptions to public policy and moral patentability. Section 27.2 provides examples of patentable exceptions to protect the life or health of humans, animals and plants and avoid serious environmental damage to the members involved. The implementation of these exceptions means that they must be stipulated in order to be effective in national law

and, in some cases, if the WTO member states determine that the preferred public interest needs to be protected, the patent It means that you can refuse the grant.²⁷

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

In 1993, the SPS Agreement was created within the framework of the WTO. The SPS Agreement was created for WTO member states to reduce the creation of non-tariff barriers to trade imposed to protect the lives of people, animals, or plants. The SPS Agreement guides the government in establishing SPS rules. These rules allow WTO members to (1) harmonize the criteria under Article 3 and (2) assess the appropriate level of SPS protection based on the scientific evidence-based Article 5 risk assessment. The purpose is to support.²⁸

The precautionary principle can be found in various parts of the SPS agreement. Precaution is especially deals with paragraph 6 of the preamble²⁹, article 3.3³⁰, and Article 5.7³¹.³² the Beef Hormones Dispute case³³ was the first case to put to the test of precautionary measures under the SPS which was ban imposed by the European Union against US beef treated with artificial growth-enhancing hormones. This case seems to indicate how the WTO applies the precautionary principle.

Regarding the ban, the appellate panel of WTO decided that the European union had violated the SPS agreement in the absence of appropriate risk assessment. With respect to harmonization measures, the appellate body interpreted article 3 as if states do not have on international standards they have to prove scientifically at the higher standard. With respect to article 5, on the Assessment of Risks, the appellate body

²⁷ Resource Book on TRIPs and Development, Part II: Substantive Obligations 2.5 Patents

²⁸ WTO, "Understanding the WTO Agreement on Sanitary and Phytosanitary (SPS) Measures", online: <http://www.wto.org/wto/goods/spsund.htm>

²⁹ 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".

³⁰ 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 which result in a higher level of protection than would be achieved on measures based on the international standards"

³¹ states can adopt higher standards provisionally "in cases where relevant scientific evidence is insufficient".

³² *Supra* note 26

³³ 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

interpreted the article as health measures must be based on risk assessment and a rational relationship between them. In this case, the European Union did not look at international standards for selecting the SPS protection level.

The EU had the right to raise the level of protection under Section 3 (3) of the SPS Agreement only if "higher protection" was based on a risk assessment. Even under Article 5.7 of the SPS Agreement, the EU could have temporarily chosen higher criteria until it received scientific evidence to support the risk assessment. Therefore, countries that regulate GMOs and impose stricter standards than at the international level must show a reasonable link between regulation and their respective risk assessments.³⁴

Therefore, 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)

Under the WTO, the TBT Agreement was developed to prohibit unfair technical restrictions that could create trade barriers for foreign products. The Agreement states that States parties have the right to set their own level of protection and take steps to ensure that this level is achieved. Article 2.2 of the TBT serves the following purposes: (1) "National Security Requirements", (2) "Prevention of Deceptive Practices", (3) "Human Health or Safety, Animal and Plant Life or Health, or Environmental Protection".

The SPS Agreement and the TBT Agreement have a no. of similarities however the primary variations While the SPS Agreement calls for a systematic evaluation of risks, the TBT Agreement is predicated on a non-discrimination test. The TBT rejects a law this is greater restrictive than vital to gain such objectives.

3. The policy making debate

³⁴ 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

Efforts to further the implementation of the precautionary principle have been trapped in an endless debate over the relation of this principle to science, Opponents claim that it is anti-scientific which is preventing technology from developing society, while advocates claim, whether or not science is the appropriate mechanism, especially, when there is much uncertainty about work and function of environment. This debate is not only about to science but also extends to the philosophical and legal foundations of this principle.

a. The Precautionary Principle and Science

The precautionary principle does not nullify the need for science, which requires scientific knowledge for challenge to scientists to search for answers in light of new technologies and their effects on the environment for the protection of the environment. Three factors need to be analysed in the relationship between science and this principle³⁵: first, the different conceptualisation of the precautionary principle; second, the environment and science.

First, the degree to which this principle clashes with science depends on the conceptualisation of this principle. Strong versions of this principle require that the activity of proponent shows that to be safe and would not impact the environment in an adverse manner. Weak versions of the precautionary principle depart from zero risk, but are conditioned by economic factors. To an extent, some of the stronger versions can be criticized for demanding too high a degree of support on science.

Second, complexity informs issues pertaining to the environment 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 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, especially with regard to GMOs. Long based on science GMOs in which gene manipulation, after release of GMOs in the environment react differently with biotic and abiotic factor raises uncertainty. With complexity and uncertainty comes the need for the precautionary principle. The very common phrase "safer than sorry" serves as a colloquial reminder of the legitimacy of the fear of environmental degradation. This

³⁵ *Supra note 15*

may be irreversible. Assuming some form of destruction has reached this unfortunate stage, it may be necessary to deploy abundant economic resources to mitigate such threats.

b. Ethical and legal considerations

Human beings, biotechnology especially GMOs relationship with nature raises challenges for philosophers, environmentalists and lawmakers. Environmentalists believe that there must be a connection between environmental philosophy and environmental regulation. Throughout history, philosophers have pointed out many factors that may have accelerated the depletion of natural resources and the decline in ecological viability. Laws at both national and international levels have not proven effective in preventing this simultaneous problem. In these situations, the solution is found in the development of international resource and environmental use guidelines that facilitate the transition from an anthropocentric and utilitarian attitude. These guides, whether principles or rules, need to be reasonably brave and directed towards resource and environmental protection and prevention. In philosophical terms, the precautionary principle essentially summarizes the desired balance between use and preservation³⁶.

The Precautionary Principle can affect "land, ocean, and other aquatic ecosystems and the ecosystem complexes they contain" in the strong statements of the Convention on Biological Diversity and the Cartagena Protocol. The CBD defines biodiversity as "intra-species, inter-species, and ecosystem diversity." The Precautionary Principle, applied under the Cartagena Protocol, controls the movement of LMOs and takes into account potential impacts on ecosystems. However, these agreements allow GMOs to be introduced after assessing risks and socio-economic factors. In any case, even in the debate surrounding preventive ethics, this principle aims to protect ecosystems from harmful or destructive external influences and factors, while at the same time from environmentally harmful practices and products that adversely affect them. It does not undermine the basic premise that it is aimed at protecting human health.

³⁶ *Supra note 17*

Conclusion

The discussion of the precautionary principle in this article has been done at several levels. It includes international environmental law as well as trade law. In the field of trade and environmental law, GMO discussions are escalating to the WTO. This organization will certainly shape the application of this principle, taking into account the Moratorium. If the WTO determines that European regulations are incompatible with trade agreements, countries will be less motivated to apply this principle. The precautionary principle is not in conflict with science. This is a principle that encourages scientists to provide answers related to new technologies, in this case GMO. The Precautionary Principle is not a panacea and will not change the world overnight, but it will make a difference in protecting human health and the environment by guiding policy makers in dealing with the threat posed by GMO.

Biodiversity conservation should not be seen as an activity separate from other activities of state or international organizations. In fact, biodiversity conservation and sustainable use have many aspects and interactions with other disciplines. Currently, there is a general move towards greater acceptance and practice of the precautionary principle. This has evolved from a simple and novel approach to environmental protection to a guiding principle in international and domestic regulation, as confirmed by the UN agreement in Rio de Janeiro Declaration on Environment and Development.

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