

Precautionary, Preventive Action, Priority Rectification at Source and Polluter Pays: Core Principles of Environmental Liability¹

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Abstract

This article explores the foundational principles that underpin the legal framework of environmental liability: the precautionary principle, the preventive action principle, the principle that environmental damage should be rectified at source, and the polluter pays principle. The study provides a critical analysis of their genesis in international legal instruments and examines how they have been transposed and operationalized within the legal frameworks of the European Union and Portugal, with a particular focus on Directive 2004/35/EC on environmental liability. It further examines the transposition of these principles into Portuguese law, evaluating their normative content, legal implications, and practical application. Drawing upon a systematic review of legal literature and pertinent jurisprudence from international and Portuguese courts, the article analyses the interpretative challenges and enforcement dynamics linked to these principles. It contends that the sound application of these principles is crucial not only for safeguarding the environment but also for enhancing legal certainty, economic responsibility, and intergenerational equity. The article ultimately contributes to the ongoing scholarly debate on the effectiveness and justiciability of environmental principles in contemporary legal systems.

Keywords: environmental liability, precaution, prevention, polluter pays, EU law.

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1. Introduction

This study examines the core principles underpinning environmental liability within the European Union and Portuguese legal frameworks, focusing on the precautionary principle, the prevention principle, the correction of environmental damage at source, and the polluter pays principle. While these principles have been

¹ The starting point of this article was the Chapter III of the author's doctoral thesis *Environmental liability in the European Union. From civil liability to administrative liability in Portugal*, Coimbra, Almedina, 2022.

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broadly discussed in international literature, this article contributes a detailed comparative legal analysis emphasising their integration into EU law - particularly Directive 2004/35/EC - and its transposition into Portuguese law through Decree-Law 147/2008 of 29 July.

The novelty of this work lies in its systematic approach to jurisprudence and legal doctrine, exploring not only the normative content of these principles but also their practical implications and enforcement challenges in Portugal. Methodologically, the article employs legal doctrinal research, review of case law from the Court of Justice of the European Union, other international jurisdictions and Portuguese courts, and comparative legal analysis.

It concludes that these principles, when properly interpreted and implemented, serve as essential instruments for environmental protection, legal certainty and intergenerational equity in environmental governance.

2. General Remarks

According to Articles 11 and 191(2) TFEU, the precautionary principle, the preventive action principle, the principle that environmental damage should be as a priority rectified at source, and the polluter should pay principle, are guiding principles for Union action in pursuit of the environmental protection objectives assigned to the European Union.³

Without calling into question the importance of other principles, such as the principle of integration or the principle of information and participation, which also arise in this area, we will only refer, for methodological reasons, to the principles referred to in Article 191 TFEU, specifically in paragraph 2, since they are the basis on which the current legal system of environmental liability in terms of prevention and reparation of environmental damage is built, with a special focus on the polluter pays principle, since the European legislator presents it as the basic principle of this system. In fact, in addition to the latter, both the prevention principle and the precautionary principle are essential for a better understanding of the requirement for preventive action on the part of operators and competent authorities facing an imminent threat of environmental damage, a matter in which both Directive 2004/35/EC and Portuguese Decree-Law 147/2008 are innovative compared to the traditional system of civil liability. In fact, it can be said that the three principles are so closely related that it is difficult to conceive of them being applied independently. The Spanish Supreme Court referred to those principles in a decision of 2007 as follows: "The protection of the environment can range from a reactive Law, which tackles damage that has already been produced ("polluter pays"), to a Law that tackles known risks before they are

³ Wibisana, M., «Three principles of environmental law: The polluter-pays principle, the principle of prevention, and the precautionary principle», In Faure, M., Niessen, N. (Eds), *Environmental Law in Development: Lessons from the Indonesian Experience*, Edward Elgar Publishing, 2006, pp. 24–76. Khan, M. R., «Polluter-Pays-Principle: The Cardinal Instrument for Addressing Climate Change», *Laws*, 2015; 4(3):638-653. <https://doi.org/10.3390/laws4030638>. Kamminga, M. T., «5 Principles of international environmental law», *Environmental Policy in an International Context*, Volume 1, 1995, pp. 111-131.

produced ("prevention"), to a Law that foresees and avoids threats of unknown or uncertain damage ("precaution")".⁴

3. Core Principles of Environmental Liability

3.1. The Precautionary Principle

3.1.1. Some General Considerations

"Nature is subjugated and exhausted at the end of the 20th century". With these words Beck characterises the current state of nature, after having been subjected to human intervention throughout the ages, through the most varied forms of action.⁵ In fact, humanity has exerted its dominion over nature not only to satisfy its needs, but also to try to control the dangers that come with it. To this end, it has resorted to industrial, scientific and technological development, or simply "technique", in the words of Ortega Y Gasset, for whom this is nothing more than everything that human beings develop in order to dominate nature.⁶

On the one hand, technology and development are essential for intervening in nature and eliminating its natural dangers, but on the other hand, their use results in risks for both human beings and the environment. It follows that danger has a natural origin and risk has a human origin, and that if we are not responsible for natural dangers, we are responsible for risks. In fact, while danger has its origin in nature, its strength or its limitations, risk is the result of the technique used by human beings to control nature.⁷ Basically, it is true that human beings intervene to control a natural hazard, but they quickly lose control of this process because, by innovating, they are unable to know with certainty the consequences of what is new and unknown to them.

Modern, global and over-industrialised society is based on a new economic model, in which industrial, scientific and technological development - Ortega Y Gasset's "technique" - encourages exacerbated productivity and consumption, inevitably creating, as already said, risks to human health, the environment and the planet itself. A society saturated by technology, such as modern society, is a "*risk society*", in the phrase coined by BECK.⁸

⁴ Judgment of 15 July, Section 5, rec. 3796/2007.

⁵ Beck, U., *Risikogesellschaft. Auf dem Weg in eine andere Moderne*, Suhrkamp, Frankfurt del Meno, 1986, p. 13.

⁶ Ortega Y Gasset, J., "Meditaciones de la técnica y otros ensayos sobre ciencia y filosofía", *Revista de Occidente*, 1st Edition, 8th Reprint, Madrid, Alianza Editorial, 2002, p. 28.

⁷ Esteve Pardo, J., "El Derecho del medio ambiente como derecho de regulación y gestión de riesgos", in García Ureta, A. (Coord.), *Estudios de Derecho Ambiental Europeo*, LETE, 2005, pp. 45-47; by the same author *Derecho del Medio Ambiente*, 4.^a Ed., Madrid, Marcial Pons, 2017, pp. 28-29; and, also, "El Derecho del medio ambiente como derecho de decisión y gestión de riesgos", *Revista Electrónica de Derecho - Universidad de La Rioja*, no. 4 (Derecho y Medio Ambiente: Problemas Generales), 2006, p. 8, where he reiterates that (natural) dangers are not relevant to law.

⁸ Beck, U., *op. cit.*, pp. 16 and 30, where he states that "In the society of risk, the political potential of catastrophes arises from small and large impulses (in the alarm over smog, in the toxic accident, etc.)".

It is also in this context - of a "risk society" and risks, which can be uncertain or unknown - of increasing complexity, specialisation and technicality of issues, that society's decision-making bodies must act.

The precautionary principle, which can be translated into the expression "*better safe than sorry!*", has legitimised and allowed decisions to be made about risks in relation to which there is no scientific certainty, decisions which, as a rule, take the form of preventive or anticipatory measures. This uncertainty is rooted in the lack of knowledge about the effects of a given product, activity or technology, or in the absence of certainty, information or sufficient data about those effects, or even in the lack of consensus about those effects among the scientific community. In fact, science itself, aware of its limitations, is increasingly reluctant to present as certainties what it carefully keeps at the level of probabilities.⁹ Esteve Pardo argues, however, that the assessment and evaluation of technological risks, for the purposes of adopting anticipatory measures, is the responsibility of science, and not the law, with which we tend to agree. In cases where the assessment of those risks does not offer certainty and in cases of scientific uncertainty, it should be the law that intervenes through recourse to the precautionary principle¹⁰. It is a fact that the legal order built on scientific certainties is currently faced with a context of scientific uncertainty, in which public authorities must intervene and make decisions. Decisions taken in this context inevitably have adverse consequences for the economic framework in which they are inserted and can affect security and confidence in the legal system.

Paradoxically, the risks that modern society faces are usually the result of duly authorised or licensed activities, which, as a rule, comply with legal requirements and are perfectly integrated into the industrial and economic fabric of society. It is precisely these situations that are the main problem. In this context, when there is no absolute certainty about the existence of a risk and the legal requirements have been met, it is difficult for the public authorities to take a preventive or anticipatory decision, such as preventing the commercialisation of a product, deciding to withdraw it from the market or ordering the closure of an industrial plant.

Different from uncertainty is the pure and simple ignorance of risks, when the state of technical and scientific knowledge (*state-of-the-art*) does not allow for their detection. In this case, imputing liability to the operator becomes more difficult and is often rejected by the legislator, since the operator is unaware of the risk of the activity they are carrying out.

At a time when the valuation of natural dangers and technological risks is the

⁹ Esteve Pardo, J., «Decidir y Regular en la incertidumbre, Respuestas y estrategias del Derecho Público», in Darnaculleta Gardella, M., Esteve Pardo, J. e Spiecker Gen. Döhmman, I. (Eds.), *Estrategias del Derecho ante la incertidumbre y la Globalización*, Madrid, Marcial Pons, 2015, p. 34. The author refers to Karl Popper as perhaps the first to have realised the paradigm shift in science from certainty to probability, allowing uncertainty to emerge in post-industrial society (Popper, K., *La lógica de la investigación científica*, 13th Reprint, Madrid, Tecnos, 2003). Aven, T., «A risk and safety science perspective on the precautionary principle», *Safety Science*, Vol. 165, September 2023, 106211.

¹⁰ The author explains that a warning from a laboratory or research centre is enough to trigger the precautionary principle.

order of the day, the importance of an evaluation of the real need for technological risks is unquestionable, and it is certain that they must be blamed on those who cause them, and the position of those who are exposed to them and bear them unfairly must be duly safeguarded.¹¹ It is a fact that science may not be able to control or even be unaware of the risks that result from human intervention, in order to consciously and responsibly decide which should be permitted and which should be discarded from the outset. Awareness of the existence of these risks, particularly abstract risks - those that are invisible and unpredictable to human knowledge-, requires an adaptation of the legal mechanisms necessary for effective legal protection of the environment, especially concerning liability for preventing and repairing damage. This is why the precautionary principle is so important in the environmental liability system, particularly in terms of preventing environmental damage.

3.1.2. The Content of the Precautionary Principle

The precautionary principle is a new paradigm for environmental thinking and action and is currently an unavoidable reference when it comes to risks.

In environmental law, the precautionary principle means acting upstream to prevent environmental damage from occurring, even if the risk is uncertain, hypothetical or potential. Basically, it's a new way of preventing environmental risks that will inevitably affect future generations, which leads to it being considered a guarantee of the right to the environment and the future of those generations. Morato Leite and Melissa Melo have written in this regard that the environment takes precedence over a dangerous or risky activity and polluting emissions must be reduced, even if there is no certainty of scientific proof about the causal link and its effects. Thus, not only imminent environmental risks must be considered, but also future dangers arising from human activity that could possibly jeopardise an intergenerational relationship and environmental sustainability.¹² It is, in fact, this concern with the effects that certain activities or products may have on future generations that justifies the precautionary principle and links it to the objectives of sustainable development. This new form of prevention should become mandatory in order to protect society from unknown or uncertain environmental risks, and is justified by the scientific uncertainty that exists in relation to matters such as the reduction of the ozone layer, climate change, the erosion of genetic resources, the use of genetically modified organisms, or the use of new technologies such as carbon dioxide capture and geological storage and hydraulic fracturing, as well as the irreversibility of some damage caused to the environment. However, only risks for which there is scientific uncertainty are relevant for the purposes of applying the precautionary principle. This is not the case, for example, with the risks inherent in the use of nuclear energy, since there is no uncertainty about the seriousness of the consequences of radioactivity on the

¹¹ Esteve Pardo, J., *Técnica, Riesgo y Derecho*, Barcelona, Ariel, 1999, p. 210.

¹² Morato Leite, J. R. and Melo, M. E., "As funções preventivas e precaucionais da responsabilidade civil por danos ambientais", *Seqüência Magazine*, no. 55, Dec. 2007, p. 205.

environment and human health.

This principle empowers public authorities to intervene in areas where, from the outset, the absence of absolute scientific certainty would make it impossible to adopt preventive measures. This is what makes it innovative: it grounds and legitimises the actions of public authorities in the face of unknown or uncertain risks. Scientific uncertainty as to the occurrence of environmental damage resulting from a given activity cannot serve as a basis for the public authorities not to impose or to postpone preventive measures. On the contrary, because the context is one of scientific uncertainty, these measures must be adopted as soon as possible. This is why Embid Tello argues that this is a principle of potestative action not based on science, but on the political decision to protect the population and, we would add, the environment as well.¹³ In essence, as Gomes Canotilho pointed out, the precautionary principle translates into a generic *in dubio pro natura* behaviour in the event of scientific uncertainty.¹⁴

Although the precautionary principle originated in the field of the environment, its application has spread to other areas such as public health, consumer protection or agriculture, areas in which, when damage occurs, the consequences are generally serious and affect collective interests, are not limited to national borders and sometimes have a delayed effect. This is why different sectors of new technologies, such as electromagnetism, nanotechnology, biotechnology and genetic engineering, are favoured areas for the application of the precautionary principle.

3.1.3. The Enshrinement of the Precautionary Principle

3.1.3.1. Internationally

It was in the 1970s that the precautionary principle (*vorsorgeprinzip*) first appeared in German law¹⁵, recognising the need and legitimacy of adopting preventive measures to protect the environment, particularly in the field of atmospheric pollution, without the need to verify a state of scientific certainty.

At international level, the first document to refer to it is the World Charter for Nature, approved by the United Nations on 28 October 1982. Its Principle 11(b) stipulates that activities that could pose a significant risk to nature must be preceded by the most exhaustive analysis possible and those who intend to carry them out must demonstrate that the expected benefits outweigh any damage that the exercise of such activities could cause. What's more, when the potential adverse effects are not fully known, these activities cannot be carried out. This robust version of the principle ended up fading away as it came into conflict with vested economic interests and the demands of international trade, for fear that, through arbitrary and discriminatory use, it would

¹³ Embid Tello, A. E., «El principio de precaución», in Santamaria Pastor, J. A. (Dir.), *Los principios jurídicos del derecho administrativo*, 2010, p. 1228.

¹⁴ Gomes Canotilho, J. J., *Direito Público do Ambiente*, Coimbra, Faculdade de Direito de Coimbra, 1995, pp. 40-41.

¹⁵ German Federal Emissions Protection Act (*BundesImmissionsschutzgesetz*) of 15 March 1974, §5.1.2.

become a protectionist mechanism for states.

Although often referred to in international texts, the precautionary principle was internationally recognised in the 1992 Rio Declaration.¹⁶ Principle 15 of the Declaration states that "[i]n order to protect the environment, the precautionary approach shall be widely applied by States" and that when 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". In fact, the aim of this provision was to extend the application of international laws to the defence and protection of the environment, even in a context of scientific uncertainty. It was from then on, that the presence of the precautionary principle, as an enabling principle for the adoption of preventive measures to anticipate the risk of damage in the event of scientific uncertainty as to its occurrence or extent, became generalised in international environmental law instruments.

It turns out that the status of the precautionary principle depends primarily on the jurisprudential interpretations that are made of it. Traditionally seen as a mechanism for reconciling international environmental law and international economic law, it is recognised and applied by international jurisdictions, specifically by the Appellate Body of the World Trade Organisation (WTO), the International Court of Justice and the Court of Justice of the European Union, albeit in different contexts.

Let's face it, within the framework of the WTO in the Agreement on the Application of Sanitary and Phytosanitary Measures, the approach to the precautionary principle is assertive, recognising that any of its members can adopt provisional measures of this nature when the relevant scientific evidence is deemed insufficient. Despite this, to date, the Appellate Body of the WTO dispute settlement system has refused to apply this principle directly and has ruled on its legal value.¹⁷

In a decision handed down by the International Court of Justice on 13 July 2006, in the case of the pulp mills and paper industries on the River Uruguay, Judge *ad hoc* Vinuesa preferred not to describe *precaution* as a principle, but rather as a "*precautionary approach*", relevant for the purposes of interpreting and applying rules, but without reversing the burden of proof.¹⁸ In its judgement in the *Gabcikovo-Nagymaros* case, the same court enshrined the precautionary principle as a customary principle.¹⁹

¹⁶ Fajardo Del Castillo, T., «Sobre los 25 Años de la Declaración de Río sobre el Medio ambiente y el desarrollo», *Revista Catalana de Dret Ambiental*, Vol. III, n.º 1, 2007, pp. 1-8.

¹⁷ See the cases with references WT/DS26/AB/R and WT/DS48/AB/R. Dias Varella, M., "Différences d'interprétation sur un même sujet: le principe de précaution, la CIJ, l'OMC et la CJCE", *Revue Européenne de Droit de l'Environnement*, 1/2004, 19-29.

¹⁸ Campins Eritja, M., "La regulación de la biotecnología moderna en la Unión Europea", *Revista Aragonesa de Administración Pública*, no. 53, Zaragoza, 2019, p. 280.

¹⁹ The International Court of Justice was called upon to rule on the application of the precautionary principle in the case concerning the Gabcikovo-Nagymaros Project, which pitted Slovakia against Hungary, and ruled on 25 September 1997. Hungary invoked the precautionary principle and environmental protection to withdraw from an international agreement to build a system of dams. Hungary claimed that the rules of international environmental law, including the precautionary principle, which emerged after the Gabcikovo-Nagymaros Agreement was signed, made it impossible to implement the agreement. The Court

The European Union Court of Justice's position on the precautionary principle is more precise than that of the International Court of Justice and less rigid than that of the WTO's dispute settlement body. As will be seen below, the Court of Justice has been called upon to rule, mainly by way of preliminary rulings, in the context of checking the legality of European or national measures (inclusion of substances on lists of dangerous substances, decisions to refuse or withdraw market authorisations for medicines, bans on the import or marketing of certain foodstuffs). But if the situation is indeed different at EU level, this is due to the specific characteristics of EU law. In fact, unlike international law, EU law itself defines the conditions of its primacy over the domestic law of the Member States, integrating itself directly into their legal orders, which, in turn, are obliged to respect on pain of being considered in breach.

3.1.3.2. In the European Union

In European Union law, the precautionary principle has been gradually consolidated in such a way that it now forms part of the structuring principles of the European Union's public policies. To quote GOTHE, the precautionary principle has descended from the sky of international relations to the earth of national and European rights.²⁰ While it is true that the principle was already present in international law before the 1990s, it was the Treaty on European Union that enshrined it at European level, adding it to the other principles considered to be structuring the Union's environmental policy. This occurred with its introduction in Article 191(2) TFEU (at the time, 130R of the former TEC), and with this legal enshrinement, the precautionary principle acquired constitutional force. However, we can't find any definition of it in the Treaties, just as they don't contain any definition of the environment or the other principles. The Court of Justice of the European Union has played a decisive role in shaping the concept of precaution, not only by defining its contours and conditions of application, but also by broadening its scope. This was particularly the case in 2002, when the General Court (GC), at the time the Court of First Instance, in its *Artedogan* judgement, gave a definition of the precautionary principle as a general principle of European Union law which requires the competent authorities to take appropriate measures to avoid certain potential risks to public health, safety and the environment, giving precedence to the imperatives linked to the protection of these interests over economic interests.²¹ In this

decided to analyse the issue from the perspective of civil liability, more specifically the state of necessity, taking the view that the requirements of this institute were not met, namely that the danger was not serious and imminent, and that the environmental issue had already been duly considered when the agreement was concluded. Despite recognising the precautionary principle in the text of the ruling, the same court, in the absence of concrete scientific evidence of the dangers invoked, chose to disregard its application.

²⁰ Gothe, M., "L'origine et le développement du principe de la précaution. Aspects comparatifs et internationaux", *Revue juridique d'Auvergne "Le principe de précaution"*, Vol. 00/1, p. 34.

²¹ Judgment of the General Court (then Court of First Instance (Second Chamber, Extended Composition)) of 26 November 2002 in Joined Cases T-74/00, T-76/00, T-83/00, T-84/00, T-85/00, T-132/00, T-137/00 and T-141/00, *Artedogan GmbH and Others v Commission*, paragraph 184. Cf. Naim-Gesbert, É., "De la précaution comme vrai principe environnemental", *Revue juridique de l'environnement*, Vol. 44, 2019/3, pp. 453-456 and De Sadeleer, N., «The precautionary Principle as a Device for Greater Environmental

judgement, the court also ruled that when the scientific assessment does not allow the existence of the risk to be determined with sufficient certainty, recourse to the precautionary principle will depend primarily on the level of protection sought by the public authorities in the exercise of their discretionary powers. However, it maintains that this choice must comply with the principle that the protection of public health, safety and the environment takes precedence over economic interests, and must also take into account the principles of proportionality and non-discrimination. Later, in 2010, the Court of Justice reiterated the need to respect the principle of proportionality when adopting national public health measures in a context of legal uncertainty.²² In any case, it is understood that the risk will always be considered unacceptable if it jeopardises the rights of future generations, if it entails irreversible losses, or if it affects more vulnerable social groups.

However, hundreds of acts adopted by the institutions expressly refer to precaution or precautionary strategies. And although the TFEU only refers to the precautionary principle in relation to environmental policy, by virtue of the principle of integrating environmental protection requirements into the definition and implementation of the Union's policies and activities, it now applies to all European Union policies, as the court ruled in its judgement in case C-180/96.²³

3.1.4. The Conditions for Applying the Precautionary Principle

As well as playing a fundamental role in defining and affirming the precautionary principle, the Court of Justice was decisive in establishing the conditions for its application, requiring a rigorous evaluation and management procedure to avoid irresponsibility on the part of public authorities in exercising their role of protecting people's rights.²⁴

On 2 February 2000, the European Commission also published a communication which, although non-binding, summarised its position on the precautionary principle.²⁵ It systematised the conditions and provided guidelines, based on reasonable and coherent principles, for its application and defined its position on the adoption of anticipatory measures. However, despite the Commission's efforts, given that the communication was not mandatory, the Court of Justice had to intervene to set these conditions. At the end of 2000, the Nice European Council adopted a resolution in which, while accepting the guidelines previously defined by the Commission, it extended their application to the other policies and actions of the European Union and to the actions of the Member States in the fulfilment of European policies.²⁶

Protection: Lessons from EC Courts», *Review of European Community & International Environmental Law*, Volume 18, Issue I, 2009, pp. 3-10.

²² Judgment of the CJEU of 2 January 2010 in Case C-333/08, paragraphs 90-91.

²³ Judgment of 5 May 1998, C-180/96, United Kingdom v Commission.

²⁴ As stated by Embid Tello, A. E., *op. cit.*, 2010, p. 1223.

²⁵ Communication from the Commission on the precautionary principle (COM(2000) 1 final).

²⁶ Resolution of the Nice European Council, held from 7 to 10 December 2000, on the precautionary principle.

One thing is certain: the application of the precautionary principle presupposes proof of the existence of scientific uncertainty. This can result either from not knowing the cause of the real and proven damage, or when the causal link between the real and proven damage and the hypothetical cause is not clear, or when there is no real and proven damage, but only suspicions that correspond to a minimum probability. Or, we might add, when there is no scientific consensus in any of these cases.

The Court of Justice's jurisprudential analysis shows that, for the precautionary principle to be applied, two conditions must be met. The first consists of the obligation to carry out a prior, independent, rigorous, detailed and as exhaustive as possible assessment (*Pfizer* judgement), which must result in the likelihood or plausibility of the existence of a risk (*Artedogan* judgement).²⁷ In this regard, Embid Tello emphasises the importance of the independence of the assessment, since it is at this stage that there is interference from interests that can distort the objectivity of the public authorities at the time of the decision. The diversity of technical committees and their members' publicly accessible declarations of interest are one way of guaranteeing this independence. Another guarantee is transparency that results from the full publication, with access to all, of reports, technical opinions, research protocols, results and other information that is part of the risk assessment process. Likewise, the consultation of committees of experts from various scientific fields contributes to an impartial assessment, as does the recording of dissenting minority opinions in the reports or conclusions to be presented to the public authorities.²⁸ In its Communication, the Commission also recommended that minority and negative opinions be taken into special consideration in this evaluation.²⁹ It is true that the courts do not go into considerations of a scientific nature, but they do require an overall assessment of the risk to the environment based on the most reliable scientific data available and the most recent results of research by the international scientific community (*Monsanto, Commission v. France* and *Queisser Pharma* judgements).³⁰

The second condition consists of the European institutions and the Member States determining the level of risk that is considered unacceptable and which, despite scientific uncertainty, requires the adoption of preventive measures to protect human

²⁷ Judgment of the General Court of 11 September 2002 in Case T-13/99, *Pfizer Animal Health SA v. Council*, paragraphs 43, 44, 155 and 165 and the *Artedogan* judgment cited above.

²⁸ Cf. Embid Tello, A. E., "Retos de la relación Ciencia-Derecho: La procedimentalización de la evaluación de riesgos en la Unión Europea", in Darnaculleta Gardella, M., Esteve Pardo, J. and Spiecker Gen. Döhmman, I. (Eds.), *Estrategias del Derecho ante la incertidumbre y la globalización*, Madrid, Marcial Pons, 2015a, pp. 95-97.

²⁹ Communication from the Commission on the precautionary principle (COM (2000) 1 final), Annex III. It should be noted that this recommendation turns out to be ineffective, as the Commission requires that the positions mentioned above have their credibility and reputation accredited (see point 6.2. of the Communication), which is unlikely to happen if the scientific community does not recognise this credibility. See Embid Tello, A. E., *op. cit.*, 2015a, p. 93.

³⁰ Judgment of 9 September 2003 in Case C-236/01 *Monsanto Agricultura Italia and Others*, paragraph 113. Judgment of 19 January 2017 in Case C-282/15 *Queisser Pharma*, point 56. Judgment of 28 January 2010, in Case C-333/08, *Commission v. France*, point 92, in which it was stated that the Commission had failed to fulfil its obligations.

health (*Toolex* judgement).³¹ Hence the determination of an (un)acceptable level of risk is made according to the seriousness of the damage, which must be significant in relation to the threatened legal asset, and its possible irreversibility.³² This means that, in environmental matters, legal uncertainty must always refer to a significant risk to the environment.

The Court of Justice has already gone further by ruling, in case C-127/02, on Article 6(3) of Directive 92/43/EEC of 21 May on the conservation of natural *habitats* and of wild fauna and flora, that the competent national authorities, having regard to the appropriate assessment of the effects of the plan or project on the site concerned in the light of the latter's conservation objectives, shall authorise that plan or project only if they are satisfied that it is devoid of any harmful effects on that site. This is the case when there is no reasonable doubt from a scientific point of view as to the absence of such effects³³. Lozano Cutando and Lago Candeira, in a commentary on this judgement, explain that this decision has raised the bar: it is no longer enough to lack full scientific certainty about the existence of a risk in order to be required to adopt a certain preventive measure (e.g. an appropriate environmental impact assessment), and it is mandatory to adopt it whenever the absence of a risk to the environment cannot be excluded on the basis of the scientific data available³⁴. More recently, in a ruling of 28 March 2019, the same court established that when it is impossible to determine with certainty the existence or scope of the risk, because the studies carried out are insufficient, inconclusive or imprecise, and the likelihood of real damage to the environment persists if the risk materialises, the precautionary principle always justifies the adoption of restrictive measures, provided they are objective and non-discriminatory.³⁵

It should be said that respect for the principles of proportionality and non-discrimination is another condition for applying the precautionary principle. This is because it is recognised that the measures adopted in this context will inevitably have negative effects on the economic system in which they operate, so they must be limited to what is strictly necessary to achieve the desired level of protection, thus preventing this principle from becoming an obstacle to innovation, economic initiative and free trade.

For the same reason, the application of these measures must have a time limit. In fact, only the passage of time will make it possible to confirm whether the effects are realised, or whether the data collected, and experiments carried out are conclusive, or even whether there is a scientific consensus. Therefore, the measures should be

³¹ Judgment of the CJEU of 11 July 2000 in Case C-473/98, *Toolex*, paragraph 45.

³² CAMPINS ERITJA, M., *op. cit.*, 2019, p. 279.

³³ Judgment of 7 September 2004 in Case C-127/02 *Landelijke Vereniging tot Behoud van de Waddenzee and Nederlandse Vereniging tot Bescherming van Vogels v Staatssecretaris van Landbouw, Natuurbeheer en Visserij*, paragraphs 45, 49, 61.

³⁴ Lozano Cutanda, B. and Lago Candeira, «El derecho ambiental de la Unión Europea», in Lozano Cutanda, B. (Dir.), Lago Candeira, A. e López Álvarez, L. F., *Tratado de Derecho Ambiental*, Ediciones CEF. -, 2014, pp. 75-168.

³⁵ Judgment of 28 March 2019 in Joined Cases C-487/17 to C-489/17, paragraph 57, and, to the same effect, the aforementioned judgment of 19 January 2017 in Case C-282/15 *Queisser Pharma*.

established on a provisional basis, as long as the scientific data is considered insufficient, inaccurate or inconclusive and as long as the risk is considered significant, to the point where it is not acceptable for society to assume it. This is obvious, because the passage of time is a factor in overcoming scientific uncertainty, since science is constantly evolving. For this reason, the measures adopted must always be subject to revision, in line with the evolution of knowledge about the risks in question and can and should be altered in the light of new results achieved in the meantime. And here, only science can determine the application of an exceptional measure and only science can allow it to be lifted.³⁶

Jordano Fraga, with whom we agree, systematises the requirements for applying the precautionary principle as follows: scientific uncertainty, proportionality and non-discrimination, seriousness and urgency, provisional nature, further research aimed at a more objective assessment of the risk and, finally, communication to the public.³⁷

The Court of Justice is responsible for verifying the conditions for applying the precautionary principle, but it is no longer responsible for determining which anticipatory or preventive measures should be adopted. Its purpose is not to define the measures to be adopted in each situation, but only to impose the adoption of procedures or methodologies in the decision-making process. In any case, it is more a principle of method than of action.³⁸ Therefore, in a scenario of uncertainty and serious risk to the environment, it will be up to the public authorities to adopt anticipatory, appropriate and necessary measures, which are compulsory, normally restrictive and burdensome for those affected. To this end, and in the absence of scientific knowledge to remove uncertainty or ignorance, public authorities often have recourse to the collaboration of experts, specialists and independent authorities, which can have the adverse effect of displacing their decision-making power to the private sector.

Esteve Pardo, noting that the field of choice for precautionary measures is generally authorised or licensed activities or installations, also qualifies them as measures of exception to the legal regime in force, generally negative in content, and justified by scientific assessments and opinions that warn of the existence of risks, despite compliance with legal requirements by the activities or installations that supposedly give rise to them. For this reason, the same author states that the precautionary principle places science in a sovereign position, on the cusp of power and above the law, insofar as it enables it to declare a state of exception and that it will only be necessary to invoke this principle when decisions are to be adopted that make exceptions to or put in abeyance the legal regime in force, and the concurrence of the

³⁶ Cf. Esteve Pardo, J., *op. cit.*, 1999, p. 56.

³⁷ Jordano Fraga, J., "Ciencia, tecnología, medio ambiente y responsabilidad patrimonial de la Administración: en especial, los denominados riesgos del desarrollo", *Documentación Administrativa*, n.º 265-266, January-August 2003, p. 257. Kriebel, D., J. *et al.* «The precautionary principle in environmental science», *Environmental Health Perspectives*, 109:871-76. De Smedt, K., Vos, E., "The application of the precautionary principle in the EU", *Studies in History and Philosophy of Science*, 57, 2022, pp. 163-187.

³⁸ Cf. Martin, G. J., "La responsabilité en matière d'environnement et le principe de précaution", *Revue Juridique d'Auvergne, Le principe de précaution*, Presses Universitaires de Clermont Ferrand, 2000, p. 166.

assumptions that legitimise it is therefore required.³⁹

In short, the precautionary principle can be seen as an environmental protection mechanism, the main idea of which is that public authorities should take precautions against risks that could cause serious and irreversible damage to the environment and health, even if there is no scientific certainty about their existence and scope. This obviously includes risks whose existence, at the time they are sensed, has not been scientifically established and their likelihood is neither proven nor disproven, as well as those for which, despite their proven existence, it is not possible, through logical analysis or experience, to determine the likelihood of damage occurring.

The choice of preventive measures will then fall to the institutions and states, which have numerous instruments at their disposal for this purpose, such as the environmental licence or permit, the establishment of limit values for polluting emissions, environmental impact studies, audits of companies carrying out activities likely to cause damage, satellite and terrestrial monitoring systems, environmental quality control, etc. Similarly, financial and economic incentives to change production processes in order to reduce pollution are considered appropriate instruments, as well as support for the creation and transfer of new technologies, research and study into the potential and limitations of natural resources with a view to their prudent and rational use, mandatory testing, or the procedure for notifications prior to the placing on the market of new products likely to adversely affect the environment.

In essence, the precautionary principle aims to safeguard against the occurrence of unknown risks, even if they may never materialise, or at least happen in the distant future. This is one of the reasons why it remains the subject of intense debate. Those who oppose it believe, on the one hand, that it is a vague and unnecessary principle, since the risk assessment mechanism already exists, and, on the other hand, that it undermines science and technology, paralyses scientific research and progress, penalises companies whose competitiveness is compromised by excessive regulation, and hinders innovation, all of which camouflages protectionist interests. What's more, it is expensive to implement. On the other hand, those who defend it believe that it is a rational and scientific principle based on a responsibility for the future⁴⁰, while recognising that its application may not be able to effectively prevent all types of risks. Aragão, with whom we agree on this issue, argues that the precautionary principle cannot be seen as a reason to stagnate or block scientific development, but rather simply to be cautious about potential damage if the appropriate research is not carried out. For this reason, he considers it to be a source of scientific progress, since it encourages scientific research, mitigating legal uncertainty in risk management.⁴¹ This understanding is shared by Sadeleer, who states that, in post-modern law, where the strongly hierarchical structure of norms has been replaced by a delicate interaction between law, ethics and politics, this principle is called upon to fulfil a crucial function:

³⁹ Esteve Pardo, J., *op. cit.*, 2017, pp 71-75.

⁴⁰ Jonas, H., *Le principe de la responsabilité. Une éthique pour la civilisation technologique*, Paris, Ed. Champs, Flammarion, 1999, p. 63.

⁴¹ Aragão, M. A., «Princípio da precaução: Manual de instruções», *CEDOUA*, n.º 22, 2008/2, p. 17.

to guide the judge and the Administration when weighing up the interests at stake. Far from exacerbating legal uncertainty, the precautionary principle must constitute a stable element on which shaky and chaotic regulations can rest."⁴² It is unquestionable that European Union law has actively participated in the dissemination of this principle in national law, thus calming the doctrinal controversies on the subject.

3.2. The Principle of Prevention

Whilst repairing environmental damage is important for the environment and for people's health, preventing damage is the very essence of environmental law and its primary purpose: to prevent it in order to protect.

3.2.1. General considerations

Restoring an ecosystem destroyed by environmental damage is practically impossible, and even if it were possible, the costs involved would be so high as to make the operation unfeasible. Since it is impossible to restore the existing balance between the various components of the environment, the damage that has occurred must also be considered irreversible. With each extinct species constituting an irreparable loss, we can say that we are currently living off the capital of nature, which we are slowly squandering, rather than what we can obtain from it, as Sierra Gil De La Cuesta points out.⁴³ For this reason, human beings must not only change their *modus operandi*, but also their mentality, in the sense that "prevention is better than cure", because, as La Palice said, there is no remedy for the irremediable.

Only by preventing damage can effective environmental protection be ensured, which is why it can be said that environmental law is anchored in the principle of prevention⁴⁴, or that preventive action is the cornerstone of effective and rational legal-environmental protection.

3.2.2. The Content of the Precautionary Principle

The principle of prevention consists of adopting, in advance, the necessary measures to prevent environmental damage from occurring, whenever the existence of a real risk of occurrence and the contribution of the measures to preventing it have been scientifically proven.

Repairing the damage thus loses ground to prevent its occurrence. To this end, unlike the precautionary principle, it is necessary to be aware of the damage that certain

⁴² De Sadeleer, N., "Les Avatars du Principe de la Précaution en Droit Public. Effet de mode ou révolution silencieuse?", *Revue Française de Droit Administrative*, Mai-Juin, 2001b, p. 562.

⁴³ Cfr. Sierra Gil De La Cuesta, I., «Responsabilidad Civil Medioambiental in el Derecho Comunitario», *Responsabilidad civil medioambiental*, Estudios de Derecho Judicial, n.º 80, 2005, pp. 37-55.

⁴⁴ Gomes Canotilho, J. J., "Relações Jurídicas Poligonais, Ponderação Ecológica de Bens e Controlo Judicial Preventivo", *Revista Jurídica do Urbanismo e do Ambiente*, no. 1, Coimbra, Almedina, 1994, p. 65.

activities are likely to cause to the environment, so that appropriate behaviour can be adopted to prevent environmental risks from occurring. However, knowledge of environmental risks and damage is necessarily based on a system of scientific knowledge and research and requires information to be constantly updated. Scientific knowledge and innovation play a fundamental role in identifying the best practices, developing new tools and theories, and perfecting models that allow us to anticipate future risks, thereby increasing the influence of science in the public decision-making process and in drawing up appropriate policies. The application of the precautionary principle thus presupposes the prior identification of the flora and fauna of a given geographical area, the possible sources of pollution, the existence of environmental impact assessment studies, as well as appropriate environmental and economic planning.

3.2.3. Enshrining the Principle of Prevention

It is now important to analyse when and how the principle of prevention was enshrined in international law and European Union law.

3.2.3.1. International Law

The principle we are dealing with now has been enshrined in various international conventions, as well as in international jurisprudence.

The Stockholm Declaration already referred to this *in* Principle 21, by establishing, *in fine*, for States the obligation to ensure that activities carried out within their jurisdiction or under their control do not adversely affect the environment of other States or of areas beyond their national jurisdiction. The Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention), signed on 25 February 1991 under the auspices of the United Nations Economic Commission for Europe (UNECE), recognises in its Preamble the importance of preventing, mitigating and monitoring any significant adverse impact on the environment in general and in a transboundary context. For its part, the Rio Declaration of 1992 made it incumbent on states to adopt effective legislative measures on the environment (Principle 11) and also referred to the need to carry out environmental impact assessments (Principle 17). In the same year, 1992, the Convention for the Protection of the Marine Environment of the North-East Atlantic stated that the contracting parties had taken into account the latest technical progress made and the methods devised to prevent and eliminate pollution in its entirety and that, at the same time, they were endeavouring to adopt the best available techniques and the best environmental practice (Article 206). In the same vein, the 1992 Convention on Biological Diversity stated that it was essential to anticipate and prevent the causes of the reduction and loss of biological diversity at source and, more importantly, to counteract them.

In 1997, the International Court of Justice, in its *Gabcikovo-Nagymaros* Project

judgement⁴⁵, had already emphasised the importance of vigilance and prevention in environmental protection, given the often-irreversible nature of environmental damage and the limitations and difficulties in repairing it.

3.2.3.2. European Union Law

In the European Union, the principle was already mentioned in the First *Environmental Action Programme* of 1973, which stated that the best environmental policy was to prevent all types of pollution from the outset, rather than fighting their effects later. The Third Programme also focused heavily on the idea of prevention, under the slogan "prevention is better than cure". But it was only with the Single Act that the principle acquired constitutional force. It was the Single Act that introduced the environment into the Treaty on the European Economic Community, adding, among other things, Article 130R (now 191 TFEU), which expressly based the EEC's action on the environment on the principles of preventive action, rectification with priority at source of the damage caused to the environment and the polluter pays (paragraph 2).⁴⁶ Similarly, the Court of Justice considered the principle of prevention to be a fundamental principle of environmental protection in its 2008 judgement (*Commission v France*).⁴⁷

The occurrence of disasters, such as the Fukushima case, has led to an evolution in the approach to this principle that had previously been taken. The accident at the Fukushima-Daiichi nuclear power plant in Japan in 2011 caused significant environmental, economic and social damage and raised concerns about its possible effects on the health of the affected population. Although triggered by a massive earthquake and tsunami, the investigation into the causes of the accident revealed a series of predictable factors that combined to have catastrophic consequences, namely serious and recurring technical problems and persistent institutional shortcomings, similar to those identified in the investigations into the Three Mile Island and Chernobyl nuclear accidents. While Europe had already been alerted to the need for prevention, since Chernobyl it has been mobilised in this direction.

3.2.4. The Application of the Precautionary Principle

The European Union's action in environmental matters has been dictated by the urgent need to protect the environment and has aimed to shape and condition behaviour

⁴⁵ Judgement in *Hungary v. Slovakia*, Gabcikovo-Nagymaros Project, §140.

⁴⁶ The precautionary principle was only introduced into the TFEU in 1992, with the Treaty on European Union.

⁴⁷ Judgment delivered on 9 December 2008 in case C-121/07, *Commission v. France*, point 69. France, point 69. In its judgment of 5 October 1999, the Court of Justice used the precautionary principle to interpret the concept of waste in a reference for a preliminary ruling in criminal proceedings between Italy and Paolo Lirussi (C-175/98) and Francesca Bizzaro (C-177/98), points 51, 52 and 54. At issue were Directives 75/442/EEC and 91/689/EEC (concept of temporary storage, prior to collection, at the place of production, and concept of waste management), now replaced by Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste.

to anticipate and prevent environmentally damaging practices.

In general terms, as has already been mentioned, all the mechanisms or instruments adopted in the field of environmental law have preventive effects, which makes it impossible to make an exhaustive list of the manifestations of this principle. We can, however, point to Directive 2011/65/EU, which restricts the use of certain hazardous substances in electrical and electronic equipment; Directive 2011/92/EU, on the assessment of the effects of certain public and private projects on the environment; or Directive 2010/75/EU, on industrial emissions (integrated pollution prevention and control). Also noteworthy, as they seem to be the most relevant expressions of this principle, are environmental authorisations for potentially environmentally damaging activities, environmental impact studies and assessments, plans for the prevention of foreseeable natural risks, plans for the prevention of technological risks, prior notification of activities or environmental audits. In more concrete terms, reference can be made to European Union legislation that provides for the right to obtain and the obligation to provide information on the state of the environment and any risks that may significantly affect it.⁴⁸ Similarly, the legislation that requires the assessment of impacts or risks of certain activities, products or substances. Only with knowledge of the state of the environment and the possible risks can it be effectively protected. Relevant to this are the Directives on the assessment of the effects of certain public or private projects on the environment⁴⁹, on the assessment of the effects of certain plans and programmes on the environment⁵⁰ and the EMAS Regulation⁵¹. Another expression of the application of the precautionary principle is the need for administrative authorisation, granted by the competent national authorities, to carry out certain activities or use certain products or substances. It can be said that this is a fundamental instrument of environmental law, both at European Union and Member State level.

Of the most important examples of the application of the principle of prevention, we would highlight the DRA, at European level, and the RJRA, at national level, which established the legal system of environmental liability and in which prevention occupies a prominent place. The importance given to the prevention of environmental damage in this system is a novelty compared to the previously existing system of liability for damage caused to the environment, which was purely civil in nature and presupposed that the damage had already occurred. In both the DRA and the RJRA, which transposed it, liability is assessed not only in cases where damage has occurred, but also in cases where there is an imminent threat of damage. This

⁴⁸ Examples are Council Directive 90/313/EEC of 7 June 1990 on the freedom of access to information on the environment, or Council Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment, repealed by Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011.

⁴⁹ The Council Directive 2011/92/EU of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment.

⁵⁰ Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment.

⁵¹ Regulation (EC) 1221/2009 of the European Parliament and of the Council of 25 November 2009 on the voluntary participation by organisations in a community eco-management and audit scheme, also known as the EMAS Regulation (*Eco-Management and Audit Scheme*).

preventative aspect is reflected in the imposition on the operator responsible for the obligation to adopt the necessary and appropriate preventative measures to avoid the damage materialising. Or, if the competent authority adopts these measures, the operator is obliged to bear the costs. It must be said that, under normal conditions, an operator will prefer to invest in preventive measures rather than pay for the cost of repairing environmental damage, which is usually more considerable. This is why it is said that the principle of prevention and the polluter pays principle are closely related, and so it is, insofar as the polluter pays principle will apply when, having exhausted prevention, damage occurs.⁵²

However, it must be ascertained whether the precautionary principle has any limits, i.e. whether, once the risks to the environment arising from a certain activity, product or substance have been determined, they should be banned outright. The answer to this question must be negative, in the sense that the principle of prevention is not absolute, out of respect for the principle of proportionality. It is therefore necessary to find a compromise between economic and social development and its effects on the environment, on the one hand, and the need to prevent environmental damage, on the other, which necessarily involves adopting anti-pollution standards, standards that set pollution limits and quality rules, in other words, setting values above which the level of pollution is considered unacceptable. Setting these limit values is one of the mechanisms favoured by the European Union to protect the environment and people's health, while at the same time allowing pollution to be corrected at source. However, there are those who doubt the effectiveness of this mechanism in preventing environmental damage, as it is the result of a combination of scientific knowledge, which is fallible, and the pressure exerted by *lobbies* and economic groups, and sometimes ends up reflecting the economic or technical capacity of operators rather than scientific knowledge in the field.⁵³

3.2.5. Prevention Versus Precaution

Prevention and precaution are therefore predominant concepts in European environmental policy, taking into account, given the specific nature of environmental damage, how difficult, if not often impossible, it is to repair. Both aim to protect the environment and prevent its degradation.

As already mentioned, there are no definitions of the precautionary and preventive principles in the Treaties. Krämer considers them to be synonymous, in conceptual terms, and of inseparable application⁵⁴. Close to this position, Amado

⁵² Cfr. Calster, G., Reins, L., "The ELD's Background", in Bergkamp, L. and Goldsmith, B. (Eds.), *The EU Environmental Liability Directive. A Commentary*, Oxford, Oxford University Press, 2013, pp. 27-28.

⁵³ Cf. De Sadeleer, N., *Les principes du pollueur-payeur, de prévention et de précaution: essai sur la genèse et la portée juridique de quelques principes du droit de l'environnement*, Bruxelles/Paris, Bruylant/AUF, 1999, p. 126 and "The principles of prevention and precaution in international law: two sides of the same coin?" in Fitzmaurice, M., Brus, M., Merkouris, P., *Research Handbook on International Environmental Law*, 2019, 2 Ed., Edward Elgar Publishing.

⁵⁴ Krämer, L., *EU Environmental Law*, 8th Ed., Londres, Sweet & Maxwell, 2016, p. 25.

Gomes believes that, given the characteristics of the risk society, the precautionary principle leads to an unrealistic attitude, and therefore proposes a reading of it that reduces it to a kind of qualified or reinforced version of the precautionary principle⁵⁵, arguing that, ultimately, prevention and precaution are synonyms of the same kind, in which the intensity of the risk manifests itself in different degrees.⁵⁶ Pereira Da Silva, on the other hand, downplays the importance of the distinction, considering it preferable to build a broad concept of prevention, as he believes this is the most effective and appropriate way to ensure what he calls the best available protection of environmental values.⁵⁷

Although we recognise that the use of the precautionary principle and the prevention principle are, in practice, inseparable, since they both advocate the adoption of preventive/anticipatory measures, we do not follow the position of these authors, arguing instead for the autonomy of these principles, which are distinguished both "by the conditions of application and by the nature of the *preventive* measures they promote"⁵⁸. In fact, the precautionary principle presupposes those public authorities, the European Union and the Member States, given the scientific certainty of the existence of a real and proven risk of environmental damage and the effectiveness of a given measure to prevent it, adopt the necessary anticipatory measures to prevent a foreseeable event from occurring. It is true that the precautionary principle also allows for the adoption of measures to prevent environmental damage, but in this case without any scientific certainty as to the risk of damage and the effectiveness of the measures to prevent it. In other words, the precautionary principle applies when there is no irrefutable scientific proof of the risk and consequences of the damage that a certain activity or substance may cause to the environment, while the prevention principle aims to avoid the materialisation of the risk of environmental damage that is already known and proven. In this regard, Aragão explains that traditional risk management required "conclusive scientific evidence before proceeding to regulate a product or activity involving risks. (...) On the contrary, precautionary management implies the urgent regulation of hypothetical risks, even if they have not been proven".⁵⁹ This author presents the precautionary principle as a new way of managing uncertainty, understanding that it is an evolution from preventive management, in which political actors and economic operators could use and abuse the persistent disagreement between scientists as an excuse not to act.

⁵⁵ Amado Gomes, C., *A prevenção à prova no Direito do Ambiente. Em especial, os actos autorizativos ambientais*, Coimbra, Coimbra Editora, 2000, pp. 34 ss.

⁵⁶ Amado Gomes, C., «A idade da incerteza: reflexões sobre os desafios de gerenciamento do risco ambiental», in AMADO GOMES, C., *Textos dispersos de Direito do Ambiente*, Vol. IV, Lisboa, AAFDL Editora, 2014, p. 172. As examples of the difficulty of affirming the precautionary principle as an autonomous principle, the author points to the terminological variation it suffers in the international conventions that refer to it, the reticence of the courts and the doubts of the doctrine.

⁵⁷ He justifies his position with reasons of a linguistic nature, material content and legal technique. For a more detailed analysis, see Pereira Da Silva, V., *Verde. Cor de Direito*, Coimbra, Almedina, 2002, pp. 67-71.

⁵⁸ A position already defended by Aragão, M. A., *op. cit.*, 2008, p.17.

⁵⁹ Aragão, M. A., *op. cit.*, 2008, p. 20.

In short, prevention deals with scientific certainty and precaution with scientific uncertainty, the unknown. It can therefore be concluded that the principle of prevention and the precautionary principle, although complementary, are different, with precaution corresponding to a form of prevention in a context of uncertainty. It is irrefutable that both principles are essential for protecting the environment and guaranteeing the future of humanity.

3.3. The Principle of Correcting Environmental Damage at Source as a Priority

The principle of correcting environmental damage at source as a matter of priority was included in the EEC Treaty in 1987 by the Single European Act. Gomes Canotilho, dealing with environmental policy, emphasises the adoption of preventive-anticipatory measures, rather than repressive-mediating measures, and the control of pollution at source as tasks of the state.⁶⁰ Prioritising control or correction of environmental damage at source means acting directly on the source of the pollution: because it is more effective and, for that very reason, preferable to treat pollution at its source, rather than eliminating its consequences *afterwards*. Basically, the aim is to make the source of pollution progressively cleaner, thereby correcting its production performance, which will be achieved by the economic agent at the origin of the chain using ecologically correct means.

This idea was explained by Advocate General Philippe Léger in his Opinion in Case C-277/02: "(...) the principle of preventive action recommends that the creation of pollution or damage be prevented from the outset by the adoption of preventive measures capable of eradicating a common risk. For its part, the principle of correcting, as a priority, the damage caused to the environment at source means that the intervention must focus on the very object that directly or indirectly causes the impact on the environment (...)". Also along these lines is the judgement in Case C-2/90, Commission v. Belgium, on waste management. Belgium, on waste management, had already defined that waste should be managed as close as possible to the place of production, and its transfer should be limited as much as possible.

This principle was included in Article 16 of Directive 2008/98/EC on waste and used as a basis for closing borders to the import of toxic waste from other states. By way of example, and still using the case of waste, we can say that the application of the principle of correction, prioritising at source, in absolute terms, would imply not manufacturing non-recyclable products, or, in the specific case of the car industry, producing only non-polluting vehicles; or, in the context of the circular economy, that the life cycle of products takes place as close as possible to the first stages (extraction and production), such as construction using local raw materials (stone, wood). In fact, if the extraction of raw materials, production, consumption and the reuse, recovery and recycling of products is done without long journeys, there will be less need for transport, less energy consumption and, consequently, fewer carbon dioxide emissions into the

⁶⁰ Gomes Canotilho, J. J., *op. cit.*, 1995, p. 40.

atmosphere.⁶¹ Obviously, solutions of this kind are currently utopian, difficult to realise and have serious socio-economic repercussions, particularly in terms of production, employment or investments and costs, issues for which neither producers nor states themselves are prepared. This is why public institutions, both European and national, are given a great deal of discretion in this matter, especially since the Treaty is silent on the meaning of "correction". One thing is certain: this principle must be understood as enabling the institutions to act, allowing them, but not obliging them, to adopt the measures they deem necessary and appropriate to correct, primarily at source, the damage caused to the environment.

3.4. The Polluter Pays Principle

The polluter pays principle is also one of the guiding principles of European environmental policy and it is on this principle that the environmental liability regime is based in terms of preventing and remedying environmental damage

3.4.1. The Content of the Polluter Pays Principle

Considered to be the basis of the legal system of environmental liability, the polluter pays principle, which corresponds to the expression "he who pollutes, pays", is a principle of an essentially economic nature, which arose from an interpretation of the theory of externalities, developed by British economist Arthur Cecil Pigou.⁶² According to this theory, externalities can be positive or negative, the latter including the cost to society of the pollution caused by the production of a certain product. Thus, according to Pigou, the external social costs inherent in industrial production (such as the cost of repairing the environmental damage caused by pollution) must be internalised, i.e. they must be borne by the economic agents who caused them and integrated into their production costs.⁶³ The polluter pays principle effectively intervenes in the negative

⁶¹ The circular economy, unlike the linear economy, is based on a closed circuit of extraction, production, consumption and reuse of the products and raw materials that make them up, with a view to reducing and making efficient use of natural resources and reducing waste production. Everyone must reduce the production of waste and, if they generate it, reuse or recycle it ("*reduce, reuse and recycle*"). At the same time, the aim is to strengthen environmental protection, create new business opportunities and employment models and increase European competitiveness. Cf. Wysokinska, Z., "The "New" Environmental Policy of the European Union: A Path to Development of a Circular Economy and Mitigation of the Negative Effects of Climate Change", *Comparative Economic Research*, Vol. 19, No. 2, 2016, p. 71.

⁶² Pigou studied the concept of externality introduced by Marshall (Marshall, A., *Principles of Economics*, London, Macmillan, 1890), who noted that the market price of goods might not accurately reflect the costs and benefits resulting from their production or consumption. Cf. Aragão, A., *O princípio do poluidor-pagador. Pedra Angular da Política Comunitária do Ambiente*, in Morato Leite, J. R. e Benjamin, A. H. (Coord.), *Colecção Direito Ambiental para o século XXI*, Vol. I, Coimbra, Instituto Jurídico da Faculdade de Direito da Universidade de Coimbra, 2014, p. 31.

⁶³ See Garcia, M. G., *O lugar do direito na protecção do ambiente*, Coimbra, Almedina, 2015, pp. 173-175. According to the author, in Pigou's view, the State becomes the manager of the environment, a manager of scarce, degraded, non-renewable goods, goods which, for this very reason, require special care in their preservation, not least because, as we now know, this care is the basis for the sustainability of life

externalities resulting from the economic activity of agents. This principle, as Gomes Canotilho says, on a legal and political level, mitigates the social injustice resulting from the burdens on society (secondary effects) not included in the production or consumption decisions made by polluting agents".⁶⁴ For Jordano Fraga, the same principle consists of choosing, among the various possible alternatives for distributing the costs of pollution, the one in which the costs fall on the direct polluter.⁶⁵ Thus, its purpose is to charge the polluting agent with the social costs resulting from the pollution it has caused.

However, Betancor Rodriguez presents what we consider to be the most complete reading of the polluter pays principle.⁶⁶ According to this author, the principle has three functions: the obligation of those who cause pollution to repair the damage and harm caused, in other words, a reparation function; a dissuasive objective, in that the prospect of having to assume the reparation and respective costs can be a persuasive factor for those considering adopting environmentally damaging behaviour; and, finally, a function of internalising environmental costs, in that the final cost of production or consumption must include environmental costs. It follows that the biggest problem regarding the application of the polluter pays principle lies in determining the amount to be paid by the polluter responsible, so that it can simultaneously perform the three functions that the author attributes to it: reparation, dissuasion and internalisation of costs.

3.4.2. The Enshrinement of the Polluter Pays Principle

So, let's look at when and how the precautionary principle was recognised in international law and European Union law.

3.4.2.1. International Law

The polluter pays principle was first invoked within the framework of the Organisation for Economic Cooperation and Development (OECD) in the Recommendation of 26 May 1972 on the guiding principles for the economic aspects of environmental policies.⁶⁷ According to this recommendation, the polluter should be

on Earth.

⁶⁴ Gomes Canotilho, *op. cit.*, 1995, p. 43. Aragão explains that negative environmental externalities, from a legal perspective, are considered a source of social injustice when they are borne by society and, from an economic perspective, they reflect an inefficient allocation of resources as a result of *market failure*. Cfr. Aragão, M. A., *op. cit.*, 2014, p. 36.

⁶⁵ Jordano Fraga, J., *La protección del derecho a un medio ambiente adecuado*, Barcelona, Bosch, 1995, pp. 137 ss. Ambec, S., Ehlers, L., "Regulation via the Polluter-Pays Principle", *The Economic Journal*, 126(593), 2016, 884–906.

⁶⁶ Betancor Rodriguez, A., *Responsabilidad y aseguramiento por daños ambientales. El caso Prestige*, Madrid, BOE, 2018, p. 38.

⁶⁷ Initially, the polluter pays principle was set out in Recommendation C (72) 128 of 26 May 1972, and a second Recommendation of 14 November 1974 (C (74) 223) clarified its application, providing for the possibility of introducing exceptions to the principle, particularly with regard to allowing aid to be granted

charged for the costs of measures taken by the public authorities to combat and prevent pollution in order to ensure the rational use of natural resources and avoid distortions of competition. In this way, the cost of these measures should be reflected in the cost of the goods and services whose production or consumption is a source of pollution.

Initially economic in nature, the principle has evolved into a legal principle applicable to environmental policy, conveying the idea of responsibility for compensation for damage caused to the environment and human health, which means that economic activities must respect the environment and take into account the environmental costs inherent in their exercise.

The obligation to compensate for environmental and ecological damage was already included in the 1972 Stockholm Declaration and the 1982 World Charter for Nature, but at international level, the polluter pays principle was only effectively enshrined in Principle 16 of the 1992 Rio Declaration, which stated that national authorities should endeavour to promote the internalisation of the costs of environmental protection, using the appropriate economic instruments, since it is the polluter who has to bear the cost of pollution, with respect for the public interest, and without causing distortions to international trade and investment. The principle was later invoked to justify the adoption of strict liability regimes in environmental matters, such as the Lugano Convention on Liability for Damage Resulting from Dangerous Activities to the Environment, considered to be the first proposal for common regulations on liability for environmental damage.⁶⁸

3.4.2.2. In the European Union

At European level, the polluter pays principle was recognised in the First *Environmental Action Programme* and was subsequently incorporated into the Treaty on the European Economic Community by the Single European Act. It is currently enshrined in Article 191(2) TFEU and is one of the principles of the European Union's environmental action. It is also considered by many to be the cornerstone of environmental law.

In the context of the European Union, the polluter pays principle corresponds to the idea that the costs of pollution should be charged to the "polluting agent", which, according to the Council's definition, is "any natural or legal person, whether governed by private or public law, who, directly or indirectly, causes damage to the environment or creates the conditions for such damage to occur"⁶⁹.

In the Fifth *Community Environment Programme*, it was already foreseen, with regard to waste, that the "use of economic and fiscal instruments will have to become an increasingly important part of the overall approach, with a view to setting the right

to polluters (subsidies, tax benefits), provided it is selective, limited in time and adapted to specific regional situations. KHAN, M. R., *op. cit.*, pp. 638-653.

⁶⁸ Recital 6 of the Preamble to the Lugano Convention expressly states that the strict liability regime is based on the polluter pays principle.

⁶⁹ Council Recommendation 75/436 EURATOM, ECSC and EEC of 3 March 1974 on cost allocation and public authority intervention in environmental matters.

prices and creating market-based incentives for environmentally beneficial economic behaviour". The aim of these instruments is to "internalise all external environmental costs incurred during the entire life cycle of products, from their origin to final disposal, including production, distribution and use, so that environmentally friendly products are not placed in an unfavourable competitive position on the market vis-à-vis polluting products".⁷⁰

According to this reading, it is inevitable that the obligation to bear the costs of the measures needed to eliminate pollution, or to reduce it to levels considered acceptable, should fall on the polluting agent. It was therefore intended that economic agents should adopt practices that were beneficial to the environment, to avoid, on the one hand, the environmental cost being borne by society and, on the other, polluting products having a competitive advantage over non-polluting ones.

Going a step further, the Commission's White Paper on environmental liability of 9 February 2000⁷¹ already considered environmental liability as a way of implementing the various principles of environmental policy referred to in the European Community Treaty, giving a prominent role to the polluter pays principle.

It was with the adoption of Directive 2004/35/EC on the prevention and remedying of environmental damage, which requires the adoption of preventive measures in the event of an imminent threat of environmental damage and remedial measures in the event of damage, that the current environmental liability regime was established, which now distinguishes between subjective and objective liability, applicable to economic activities considered dangerous and which, in our opinion, best represents the polluter pays principle. Reinforcing these objectives with the DRA, the polluter pays principle also now has an explicit preventive purpose. In fact, its application is now intended to guarantee that the agent responsible will repair the environmental damage and that the agent will also bear the costs of the preventive measures needed to avoid the possible occurrence of the damage. This also follows from Article 191(2) of the TFEU, which emphasises the principle of correction, prioritising at source, linking the preventive purpose to the reparation purpose.

3.4.3. The Application of the Polluter Pays Principle

The main instruments for implementing the polluter pays principle are anti-pollution regulations, environmental taxation, emissions markets and environmental liability, specifically measures to repair environmental damage.

The aim of anti-pollution standards is to impose technical standards on polluters, the costs of which they will have to bear. Examples of this are the standards that set maximum waste limits for cars, with the aim of reducing air pollution. This is a relatively simple and automatically applied mechanism, but it is not entirely satisfactory, since this type of standard has to reconcile technological development with the financial capacity of polluters, and economic interests are usually favoured over the

⁷⁰ See p. 71 of the Programme.

⁷¹ White Paper on Environmental Liability (COM(2000) 66 final).

protection of the environment and, consequently, human health. While on the one hand it is an easy-to-apply instrument, on the other it requires a monitoring system to ensure that anti-pollution standards are actually being respected. What's more, this mechanism suffers from a certain rigidity, since reviewing this type of legal act involves lengthy bureaucratic procedures that don't keep pace with faster technological and scientific development, which can be an obstacle to innovation and competitiveness.

Through environmental taxation, in the form of fees or taxes, it is possible to impose a compulsory contribution on the polluter, defined by the legislator, aimed at restoring the environment from the damage inflicted on it. If, on the one hand, this mechanism aims to integrate the cost of the environmental damage caused by the activities of economic agents into the costs they bear, on the other hand, it makes it possible to have a dissuasive effect, in the sense of getting the polluter to adopt practices in line with the polluter pays principle.

Regarding emissions markets, their origins date back to the 1992 United Nations Framework Convention on Climate Change (UNFCCC). For its part, the European Union set up a system for trading greenhouse gas emission licences through Directive 2003/87/EC, with the aim of promoting the reduction of emissions under conditions that are cost-effective and economically efficient.

Finally, and assuming that economic activity is potentially polluting and that its agents must be held responsible, the polluter pays principle requires the establishment of a liability regime for damage caused to the environment and natural resources, which obliges them to prevent and repair environmental damage. This is precisely the regime that was established by the European Union through Directive 2004/35/EC.⁷² In fact, the ELD is the first European Union act to apply the polluter pays principle, and it establishes a framework for environmental liability with a view to preventing and repairing damage to animals, plants, natural *habitats*, water and soil. Recital 2 of the DRA states that the "prevention and remedying of environmental damage should be carried out through the application of the polluter pays principle provided for in the Treaty and in line with the principle of sustainable development". The link between the polluter pays principle and the prevention principle is clear from this, i.e. the latter comes into play when prevention is no longer effective and the damage actually occurs. We can say that the fundamental principle of the DRA is to make the operator whose activity has caused environmental damage financially liable, i.e. the threat of such damage is imminent, to induce operators to take measures and develop practices that contribute to reducing those environmental risks. Recital 18 of the DRA also adds that "the operator who causes environmental damage or creates an imminent threat of such damage must, in principle, pay for the necessary preventive or restorative measures. If the competent authority acts, itself or through a third party, in place of the operator, it

⁷² This was already the direction of the Green Paper on remedying environmental damage and the White Paper on Environmental Liability. These texts abandon a purely economic interpretation of the polluter pays principle and turn it into a legal mechanism to make those who pollute pay for the damage they cause. In this sense, Ruda González, A., *El Daño Ecológico Puro. La Responsabilidad Civil por el deterioro del Medio Ambiente, con especial atención a la Ley 26/2007, de 23 de Octubre, de Responsabilidad Medioambiental*, Navarra, Thomson Aranzadi, 2008, p. 58.

must ensure that the cost in question is charged to the operator. It is also justified for operators to pay for the assessment of environmental damage or, as the case may be, for the assessment of its imminent threat."

We can therefore only recognise that the ELD is the European Union act that best reflects the essence of the polluter pays principle. In any case, Directive 2008/98/EC on waste, which enshrines the principle of extended producer responsibility, also gives voice to it, by enshrining the requirement that the costs of disposing of waste be borne by the current holder, the previous holders of the waste, or the producers of the product that gave rise to it.

The polluter pays principle is present in the Treaties and in secondary legislation, but European Union case law also refers to it. Take, for example, what the Court of Justice ruled on 24 June 2008 in relation to the ecological disaster caused by the Erika cargo ship. In effect, it established that the costs associated with disposing of the waste generated by the accidental spillage of hydrocarbons at sea should be borne by the producer of the product that generated the waste, which, due to its activity, contributed to the risk of the pollution caused by the sinking of the ship, in a clear application of the polluter pays principle.⁷³ More recently, with regard to Directive 2004/35/EC on environmental liability, the Court reaffirmed the content of the polluter pays principle by allowing the adoption of preventive and restorative measures not to be imposed on the current owners of a plot of land, who are not responsible for the pollution, but are only obliged to reimburse the costs of the interventions carried out by the competent authority up to the limit of the market value of the site, determined after those interventions have been carried out (*Fipa Group and Others* judgement).⁷⁴

3.5. The Precautionary Principle, the Principle of Prevention, the Principle of Correction, Primarily at Source, and the Polluter Pays Principle in Portuguese Law

The precautionary principle, the principle of prevention, the principle of correction, prioritising at source, and the polluter pays principle are also expressly enshrined in Portuguese law.

The most recent and most important piece of legislation that refers to them in general terms is Law no. 19/2014, of 14 April, which defines the Bases of Environmental Policy (LBPA) and repealed the previous Law no. 11/87, of 7 April, the Basic Environmental Law (LBA). Article 3 of this law contains what the Portuguese legislator considers to be the material principles of the environment to which public action in this area is subject. These include the principles of prevention and precaution, "which oblige the adoption of anticipatory measures, with the aim of obviating or minimising, primarily at source, adverse impacts on the environment, of natural or human origin, both in the face of immediate and concrete dangers and in the face of

⁷³ Judgment of 24 July 2008, in case C-188/2007, *Commune de Mesquer v. Total France SA and Total International Ltd.*

⁷⁴ Judgment of the CJEU of 4 March 2015 in Case C-534/13, *Fipa Group and Others*.

future and uncertain risks, just as they may establish, in the event of scientific uncertainty, that the burden of proof falls on the party claiming the absence of dangers or risks" (paragraph c)). The wording of this provision has effectively clarified the issue of the burden of proof, in the sense that the precautionary principle places the onus on those who introduce the risk, in the environment or on the market, to demonstrate that they have taken the necessary and appropriate measures, in accordance with the best available techniques, to avoid or minimise it, in other words, as Amado Gomes explains, the onus is on them to demonstrate that the risk is controlled at the tolerated level.⁷⁵ Despite being enshrined in law, the application of the precautionary principle has so far been dismissed by the Portuguese courts.^{76,77}

Although referred to in the same paragraph, we have already seen that the precautionary principle is distinguished from the prevention principle by the criterion of scientific (in)certainty: the former will act in the face of immediate and concrete, known and proven dangers, while the latter will be used in the context of future and uncertain, unknown or unproven risks. Although expressly referred to in the LBPA, the precautionary principle was not provided for in the old LBA, which only directly contemplated the precautionary principle as one of the specific principles which had to be complied with by the general principle that all citizens have the right to a humane and ecologically balanced environment and the duty to defend it, with the state being responsible, through its own bodies and by appealing to popular and community initiatives, for promoting the improvement of both individual and collective quality of life⁷⁸. According to the principle of prevention, "actions with immediate or long-term effects on the environment must be considered in advance, reducing or eliminating the causes, prioritising the correction of the effects of those actions or activities likely to alter the quality of the environment, with the polluter being obliged to correct or restore the environment, bearing the resulting costs, and not being allowed to continue the polluting action"⁷⁹. It was therefore clear that there was a reference, albeit indirectly, to the principle of correcting environmental damage at source, a corollary of prevention.

The same provision also refers to the polluter pays principle, as a principle that obliges the person responsible for the pollution to assume not only the costs of the polluting activity, but also those of introducing internal prevention and control measures necessary to combat threats and aggressions to the environment (paragraph d)) and which, in the new LBPA, is now entitled to autonomous treatment.

⁷⁵ Cfr. Amado Gomes, C., *Tutela Contenciosa do Ambiente. Uma amostragem da jurisprudência nacional*, Lisbon, Instituto de Ciências Jurídico-Políticas, Centro de Investigação de Direito Público, 2019, p. 15. The author adds that it is not a question of proving that the risk is zero, which would constitute a violation of the defendant's right to effective protection.

⁷⁶ The concept of precaution in environmental matters was introduced for the first time in Article 9(1) and Annex V of Decree-Law 194/2000 of 21 August on the integrated prevention and control of pollution from certain activities, repealed by Decree-Law 173/2008 of 26 August, which in turn was also repealed by Decree-Law 127/2013 of 30 August establishing the industrial emissions regime applicable to integrated pollution prevention and control.

⁷⁷ Cfr. TCAN judgement of 13.03.2020, handed down in case 00365/17.5BEBRG-A.

⁷⁸ Article 2(1) of Law 11/87 of 7 April.

⁷⁹ Article 3(a) of Law no. 11/87 of 7 April.

Article 3 of Law 58/2005 of 29 December (the Water Law) already provided for this. In addition to the general principles set out in the Basic Environmental Law in force at the time, water management had to comply with various principles, including: the precautionary principle (point f)), under which measures to avoid the negative impact of an action on the environment must be adopted, even in the absence of scientific certainty of the existence of a cause-effect relationship between them; the prevention principle (point g)), under which actions with negative effects on the environment must be considered in advance, in order to eliminate the very causes of alteration to the environment, or reduce their impacts when this is not possible; the principle of correcting the damage caused to the environment as a matter of priority at source (point h) and imposing corrective and recovery measures and the respective costs on the polluter; and the polluter pays principle (point d), which is based on the principle of the economic value of water and which recognises the current or potential scarcity of this resource and the need to guarantee its economically efficient use.

The Basic Law on Civil Protection, Law no. 27/2006 of 3 July⁸⁰, also included the principle of prevention in its article 5. In Article 5, the special principles applicable to civil protection activities include the principle of prevention (in paragraph b)), according to which the risks of a serious accident or disaster must be considered in advance, in order to eliminate the causes themselves (here, in a clear reference to correction, primarily at source, or to reduce its consequences when this is not possible), and the precautionary principle (in point c)), according to which measures must be adopted to reduce the risk of a serious accident or disaster inherent in each activity, associating the presumption of imputation of possible damage to the mere violation of that duty of care.

The Law on Nature Conservation and Biodiversity, approved by Decree-Law no. 142/2008 of 24 July⁸¹, also mentions the precautionary principle in Article 4(e), according to which measures to avoid the negative impact of an action on nature conservation and biodiversity must be adopted, even in the absence of scientific certainty of the existence of a cause-effect relationship between them.

For its part, Decree-Law no. 147/2008, of 29 July, which established the RJRA, transposing the DRA, bases the environmental liability regime, as it did, on the polluter pays principle, placing particular emphasis on a preventive aspect, which is innovative, thus combining that principle with that of prevention. The polluter pays principle is not the only one implemented by the RJRA. So too are the other principles referred to in Article 191(2) of the TFEU: the precautionary principle, which encourages the internalisation of the costs of damage and, in particular, the setting up of financial guarantees; the principle of prevention, which stems directly from Article 5 on preventive actions; and the principle of correcting the damage, as a priority, at source, which is reflected in the remedial measures, in particular the primary remedial

⁸⁰ In the version introduced by Law no. 80/2015, of 3 August. It also underwent previous changes as a result of Organic Law no. 1/2011, of 30 November; Rectification no. 46/2006, of 7 August; and Law no. 27/2006, of 3 July.

⁸¹ Rectified by Rectification no. 53-A/2008, of 22 September, and amended by Decree-Law no. 242/2015, of 15 October, and by Decree-Law no. 42-A/2016, of 12 August.

measures.⁸²

In short, all the structuring principles of European Union environmental policy, referred to in Article 191(2) of the TFEU, are echoed, directly or indirectly, in the Portuguese legal system. From analysing the legislation just mentioned, it can be concluded that the Portuguese legislator also treats the principles of prevention and precaution autonomously, distinguishing between them, the latter being irrefutably associated with scientific uncertainty.

4. Conclusion

The principles of precaution, prevention, correction at source, and polluter pays have evolved from international environmental norms into key components of EU and Portuguese environmental liability regimes. This article has demonstrated their legal enshrinement, interpretative development through jurisprudence, and relevance in contemporary environmental governance. Their integration not only strengthens the preventive and remedial capacity of environmental law but also aligns legal obligations with broader goals of sustainability and accountability. Portugal's legal framework, notably under Decree-Law 147/2008, illustrates a robust transposition of EU environmental liability principles, albeit with practical implementation challenges. Continued judicial scrutiny and policy refinement remain essential to ensuring the efficacy and legitimacy of environmental protection efforts grounded in these principles.

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