

THE PRECAUTIONARY PRINCIPLE AND THE RISK CONCEPT

O PRINCÍPIO DA PRECAUÇÃO E O CONCEITO DE RISCO

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ABSTRACT

Objectives: This work focuses on the Precautionary Principle, starting from its current position as a principle still extra-judicial until the delineation of a procedural routine that effectively includes it in the quarrels in which the precautionary nature is evidenced. The context is the duty of care towards the environment, introduced in the main section of Article 225 of the 1988 Constitution.

Methods: descriptive, applying hermeneutic principles to analyze laws and literature; the notion of risk, associated with human affairs, is used in order to establish the basis for suggestion of a procedural routine for cases of precautionary nature. The concepts of civil liability without damage

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and of malice or negligence in face of risk exposure are discussed in parallel for their importance in sustaining the precautionary nature of a dispute. Results: the duty of care towards the environment stated in the main section of Article 225 of Constitution of 1988 makes evident that introducing a procedural routine proper to treat the cases of precautionary nature is a necessity of Brazilian Civil Processual Law. It is concluded that discussing the precautionary nature of the case the public audiences and *amicci curiae* roles is a first phase in this procedural routine. Next, the formation of Court's conviction in a context where there isn't scientific confidence about the consequences of someone's act or omission must be considered. The decision which may not be the end of the case may include the installation of an Observatory to follow and evaluate periodically the environmental consequences of the enterprise.

Keywords: Precautionary Principle; Precautionary procedure; Risk; Civil liability without damage; Malice; Negligence.

RESUMO

Objetivos: Este trabalho enfoca o Princípio da Precaução, partindo de sua posição atual como princípio ainda extrajudicial até o delineamento de uma rotina processual que efetivamente o inclua nas discussões em que se evidencia o caráter cautelar. O contexto é o dever de cuidado com o meio ambiente, introduzido no caput do artigo 225 da Constituição de 1988. Métodos: descritivo, aplicando princípios hermenêuticos para analisar leis e literatura; a noção de risco, associada aos assuntos humanos, é utilizada para fundamentar a sugestão de uma rotina processual para os casos de caráter cautelar. Os conceitos de responsabilidade civil sem dano e de dolo ou negligência frente à exposição ao risco são discutidos paralelamente por sua importância na sustentação do caráter cautelar de um litígio. Resultados: o dever de cuidado com o meio ambiente previsto no caput do artigo 225 da Constituição de 1988 evidencia que a implantação de uma rotina processual própria para tratar os casos de natureza cautelar é uma necessidade do Direito Processual Civil Brasileiro. Conclui-se que discutir o caráter cautelar do caso, as audiências públicas e os papéis dos *amicci curiae* é uma primeira fase dessa rotina processual. Em seguida, deve ser considerada a formação da condenação do Tribunal em um contexto onde não há confiança científica sobre as consequências do ato ou omissão de alguém. A decisão, que pode não ser o fim do caso, pode incluir a instalação de um Observatório para acompanhar e avaliar periodicamente as consequências ambientais do empreendimento.

Palavras-chave: Princípio de precaução; Processo de precaução; Risco; Responsabilidade civil sem danos; Malícia; Negligência.

INTRODUCTION

Among those dealing with the environmental issue, there are two clearly opposed groups: developmentalists and ecologists. From the rigorous sociological point of view, there are studies that identify several currents that approach the environmental issue based on different assumptions. Kanashiro (2010) briefly describes the basis of eight "theories" that certainly fit the vast majority of those that for some reason relate to the environmental issue. The dual denomination given above - developmentalists and ecologists - is not sociological but behavioral, reflecting attitudes that underlie the discussion of the effectiveness of the Precautionary Principle that is the focus of this study.

The central idea of precaution arose in European and American scientific and political communities in the 1970s. In Germany, the notion of *vorzogeprinzip* (GUPTA, 2015) was created for domestic use as the need to predict the consequences of human enterprises with known or only possible environmental impacts. The context in which these precautionary ideas were broached is rooted in the great coal crisis in Germany, which began in 1958, being followed by the 1973 oil crisis, all of which led to the introduction of nuclear-based development policies (CHRISTIAN HÜBNER, 2015). The world experience with nuclear power in World War II was that of a catastrophe beyond measures, which warned humanity for the need of caution. In 1978, the Christian Democratic Union of Germany (CHRISTIAN HÜBNER, 2015) inscribed in its program the following text considered visionary for the time: "... The conservation of our life support system is part of responsible freedom. Those who recklessly exploit this system today and alter environmental relationships disturb intergenerational solidarity."

In this provision, we observe the basis of civil liability in the exploitation of natural resources and concern for the well-being of future generations whose essential ideas are iterated in the Precautionary Principle, and are also present in the caput of Article 225 of the Constitution of the Federative Republic of Brazil of 1988. However, there is a great distance between this programmatic idea and the procedural framework currently being undertaken.

In the United States, as early as 1976, the case of lead reduction in gasoline reached the Supreme Court - Ethyl Corporation v. Environmental Protection Agency. Here the principle of the Christian Democratic Union of Germany loses in idealization, but gains in procedural practicality: the Supreme Court based its decision to gradually reduce the lead content of gasoline used on the United States in Section 211, item c, n. 1 (A) of the Clean Air Act authorizing the Environmental Protection Agency to regulate activities which could endanger public health and public well-being (DRECHSLER, 1977). Of course, in future cases, it was clear that the Environmental Protection Agency or any other regulatory agency could not limit economic activity on the sole assumption of harm, but rather that there was a degree of scientific certainty to these harmful consequences.

Up to this point, the constituent elements of the Precautionary Principle were already present in discussions on the topic: the risk to present and future generations, solidarity with future generations, and scientific certainty of harmful consequences in the near or far future of deployment of economic activity.

In the seventies and eighties of the twentieth century, the replacement of the base of energy development, then concentrated in oil, especially in the West, with nuclear power motivated the largest economies in the world. On March 28, 1979, there was the Three Mile Island nuclear accident in Pennsylvania, USA, which, in terms of the amount of radiation released into the environment, was not significant, but was due to the failure of a secondary pumping system, drawing attention to rigorous risk analysis when it comes to reactor safety (OLIVEIRA; BARROSO, 1980). On April 26, 1986, the great Chernobyl accident in the Soviet Union alarmed the world: the amount of radiation released into the environment causes victims to this day, according to the United Nations and Greenpeace International (PLOKHY, 2018).

The Chernobyl accident gave the real picture of the nuclear threat already experienced in the Cold War climate after World War II. During this period, discussions about the Precautionary Principle grew in the various social organizations of a political and academic character. Several international agreements have adopted it, including the Rio 92 Declaration (UNITED NATIONS DEPARTMENT OF ECONOMIC AND SOCIAL AFFAIRS, 1992), the Fourth Convention on Climate Change (FRAMEWORK CONVENTION ON CLIMATE CHANGE, 1992) and the Cartagena Protocol on Biosafety (LIM, 2007). It is relevant to mention, in view of its cultural and economic importance, that the treaty governing the European Union provides for this in its Article 174, no. 2, the use of the Precautionary Principle in the development policies adopted in the various communities (EUROPEAN COMMUNITY, 2004).

It is undeniable, however, that the Precautionary Principle, forty years after its creation in Germany, is an idea that has spread widely, but is still only a para-juridical idea and has no cogent norm status in most countries of the world. While Europe, in most frequent situations, is guided by the Precautionary Principle and has most social activist organizations pushing for its adoption, the United States is more skeptical and only adopts it when there is scientific evidence of the risks.

In the academic world, the Precautionary Principle has been labeled as paralyzing and incoherent (SUNSTEIN, 2003), vague (BODANSKY, 2004) and guilty of generating high costs for environmental solutions to the point that universal adoption is not advised (WIENER, 2009). In the legal world, it receives from the qualifiers as being arbitrary and capricious, as suggested by the cover of the book by Merchant and Mossman (2004), to the reference as the most promising idea that has ever emerged in the discussion of environmental policies worldwide (TROUWBORST, 2009). Reflecting on the reasons for this controversial trajectory of the Precautionary Principle, this article concludes, as described in this and the next sections, that there is a need for a specific process for its full use in the legal world. First, however, we focused on a naming problem: the distinction between prevention and precaution.

THE DISTINCTION BETWEEN PREVENTION AND PRECAUTION

Part of the legal doctrine is concerned with distinguishing precautionary prevention: there would be two distinct principles. The bad thing about this lies in the fact that one distinguishes the applicable conditions from one another (TROUWBORST, 2009). The distinction is made based on a misconception of risk, which is why it is not adopted in this study. Indeed, Kourilsky and Viney (2000) present the synthesis of the basis of these doctrinal positions in the following terms: “The distinction between possible risk and proven risk underlies the parallel distinction between precaution and prevention. Precaution concerns potential risks and prevention of known risks”.

It is obvious that the authors use the concept of risk as the negative consequences of a given event. In this case, if the negative effect is known and certain, it will be prevention; if the effect is only possible, this is a precaution. To illustrate this, there are two cases in which prevention and precaution would be used, respectively: contamination of a water table with high cyanide concentrations renders water unfit for consumption; transgenic seeds can be carcinogenic.

However, the concept of risk used in the various scientific fields that compete in the investigation of natural disasters is not synonymous with the negative effect, proven or not, of a

given event. Risk is a non-Newtonian physical quantity that has three dimensions (CLARET-GOUVEIA *et al.*, 2017): the scenario of a natural event, given by its description; the likelihood of this scenario occurring and the magnitude of its consequences. Therefore, the consequence, in its nature and magnitude, is only one dimension of the risk.

The concept used by Kourilsky and Viney (2000) corresponds to hazard as called in these same scientific branches. To illustrate, a mining dam, a chemical industry and a transgenic crop are themselves hazards. The breaking of a dam, an accident in a chemical industry and the cultivation and consumption of transgenic foods are hazardous scenarios that can cause damage to the environment and humans.

But more important than the semantic constraint on risk is that the doctrinal currents that share the concept of Kourilsky and Viney (2000) use a probability that measures the degree of scientific confidence in producing the negative effect rather than the probability of the risky scenario occurring. To illustrate: while it is scientifically unquestionable that contamination of a cyanide spring makes it unsuitable for consumption - it would be the application of the Prevention Principle to the case of a gold mining site near a source - the likelihood that this event will occur specifically at this location may be so small as to be acceptable - and would be the occasion of application of the Precautionary Principle. Of course, either there is no distinction as to the conditions of application between the two Principles of Prevention and Precaution or this distinction is ambiguous and could lead to serious application errors.

It follows that the distinction between prevention and precaution is innocuous. It is no different than what Cipro Neto (2009) states: "Precaution has no etymological relationship with "seeing before" or preventing; its root (Latin) is the same as caution" Trouwborst (2009) has done a long study on the distinction between prevention and precaution in international law and its conclusion was expressed as follows:

First, for all intents and purposes in international environmental law, the precautionary principle can be viewed as having absorbed the principle of prevention - or, alternatively, as its most developed form. One way or another, the result is the same. With the legal consolidation of the precautionary principle, there is no longer reason to maintain a separate prevention principle aimed at preventing "certain" harm - in any case, a principle that has never had an autonomous existence in international law. (Author's Translation).

Henceforth, the principles of prevention and precaution will be treated herein as one with the statement given by the Wingspread Declaration (THE SCIENCE AND ENVIRONMENTAL HEALTH

NETWORK, 2018): "When an activity poses threats to the environment or human health, precautionary measures should be taken even if some cause and effect relationships are not fully scientifically established."

A BREAK IN LEGAL RATIONALITY

At least on a practical level, developmentalists are those who advocate, as a principle, the possibility of growth without environmental degeneration; Ecologists are the ones who reject development as a principle, since they believe it causes environmental damage. Both positions are not necessarily true in all cases and there are more exacerbated positions. Ecologists often slip into naive positions, even advocating degrowth; Developmentalists often arm themselves with an exaggerated belief that science and technology will solve future environmental problems, even those that reach the planetary scale.

From a social and therefore legal point of view, the Precautionary Principle has the role of relieving the tensions between these two positions; the more useful they are, the further apart they are. While, on the one hand, the Precautionary Principle is a concession to scientific ignorance of the real consequences of certain human initiatives, on the other hand, it acts as a defence against the harm that is attributed *in limine* to development.

Therefore, in modern Baconian science, the rationality of the Precautionary Principle finds it difficult to sustain itself. Indeed, its field of application is described by an empty volume of scientific knowledge while filled with political and social convictions ranging from imaginative conspiracy theories to semi-religious beliefs in their fervour.

The Law, as stated in the Constitution of the Federative Republic of Brazil of 1988 in its Article 5, clause XXXV, does not exclude from the Judiciary Power an injury or threat to the law. There is the assumption that law is a coherent system, without gaps, capable of identifying itself wherever it is. In matters in which two subjects of law oppose each other, legal rationality, expressed by an argumentative discourse, can identify the norm that applies. This has been the *iuris cotidianum* for several centuries: law acts as a recomposing agent for social order.

But environmental issues are often situations in which two legal subjects differ on future actions to which one attributes results that are in accordance with the social order or contradict it. At the request of ecologists, the state has already established that it should participate in these matters with the final decision prerogative, removing the liberal bias that left them, at least until

the nineteenth century, at the height of liberalism, at the mercy of the power of capital alone. In this respect, ecologists enter the dispute as winners of the first stage. However, developmentalists have in their favor, the call for growth that attracts society and the state itself as a solution to their support through tax collection.

The law, however, is biased in this dispute: it does not have a *lato sensu* legal fact (MELLO, 2017) nor its consequences. Expressing logically, in situations such as "if *p* is, then *q* must be" where *p* is a *lato sensu* legal fact and *q* is an imputation of law aimed at the restoration of the system, where upon everything is solved directly by legal rationality. When, however, the situation is "if *q* can be, then *p* should not be," legal rationality is insufficient for a response consistent with the classic principles of law, such as freedom to act, free enterprise, and solidarity with future generations.

The Precautionary Principle has been brought into the field of law by ecologists, but of course its origin is exogenous. Precaution is a reaction to a situation where a hazard is perceived. The notion of hazard is prior and corresponds to an "external situation capable of provoking affective and structural reactions" (BARROIS, 2005). The hazard triggers psychic mechanisms and, simultaneously, actions aimed at stabilizing a certain state of social organization, avoiding a dislocation that can be traumatic.

The hazard articulates two spaces: the exterior that is endowed with its own reality, and the interior, which perceives the external reality in function of the broad historical horizon of each human being. Therefore, it is evident that the notion of danger involves, in these two articulated spaces, different temporalities as the prevailing social experiences at a given moment and the inner psychic experience, conscious or not, of their leaders. Considering that there has been damage to a social entity since the 18th century BCE Code of Hammurabi, the Law upholds the liability of the agent. In this way, hazard enters law and there requires quantification which, until today, is best done with the definition of risk.

Precaution is an expression that in law becomes the duty to care in the face of danger. It is a reflexive pause for legal rationality, not to ascertain facts and to frame them into legal types, but to collate the likelihood of unrealized facts and their consequences. When science helps with the scientific certainty of consequences - which rarely occurs outside the Newtonian physical world - law can condition the future realization of the fact to conform the probable consequences to the acceptable. It follows, therefore, that this reflexive pause runs the risk of being innocuous, so long as the legal approach is based on a Newtonian decision-making process - and here specifically the

classical civil and criminal proceedings - whatever decision is taken by the mere weight of the consequences.

It is, therefore, the point of divergence of two lines that can be synthesized in the two logical propositions cited above. The first - if p is, then q must be - follows a line backed by scientific certainty that reduces the space between present and future time. The second - if q can be, then p should not be - follows a new line backed by the notion of risk. But the concept of risk encounters permeation difficulties in law.

RISK AND SAFETY FROM THE PERSPECTIVE OF LAW

The concepts of safety commonly found in non-specialized texts contain common ideas within the population: "safety is the state, quality or condition of a person or thing that is free from dangers, uncertainties, insured from eventual harm and risk" (VILLAR; HOUAISS, 2009). This concept reflects the long tradition of "tropical paradise", an epithet that was attributed to Brazil until the late 1980s to signify a supposed immunity to natural disasters (STEVANUX *et al.*, 2009).

Analysing this popular concept, it is observed that it is an absolute security that removes all risks. There is a clear opposition between "being safe" and "being at risk". It is inconceivable in the real world: everyday experience shows that a system's security always lives with likely risk scenarios. Thus, safety and risk are no longer radical antonyms, as one might imagine from the popular concept, but they are so close in sense that they approach the class of synonyms. Among the concepts of safety and risk, there is only one opposition to their measures, since it is assumed that the higher the safety, the lower the risk (CLARET-GOUVEIA *et al.*, 2017).

The popular concept of safety found underlying many technical texts, and particularly in environmental law, is the basis for complaints against professionals on the grounds of acting with intent to produce undesirable results. To illustrate, the following excerpt from the complaint is given in a rumored recent case:

The clumsy motive of homicides was characterized by the fact that, even though absolutely aware, since the time of the venture's licensing, of all the risks involved in its construction and operation, the accused opted for a corporate policy of prioritizing economic results over safety practices for the environment and potentially affected people, assuming all risks of causing deaths.

It is relevant to emphasize that the text was elaborated to characterize one of the qualifiers for the crime of killing regardless of motive. In it, the accuser's belief is evident, showing that the opposition between security and risk is possible, and claiming the accused to be "absolutely aware."

The assumption of the total opposition between safety and risk is also observed in the definition of dam safety found in Art. 2, III, of Law No. 12,334 of September 20, 2010: "Dam safety: a condition aimed at maintaining its structural and operational integrity and preserving life, health, property and the environment".

That is, as it turns out, there is a "condition" in which no negative consequences are admitted. Article 4, III of the same law establishes by using the basis stipulated in the National Dam Safety Policy, that the "guarantee of dam safety" is the responsibility of the entrepreneur. If understood as an antonym of risk, the entrepreneur faces an impossible mission.

When considering landscapes, hazard is a geological, atmospheric or hydrological event that has the potential to cause harm to people, the environment and heritage (WAMSLER, 2007). A natural danger is not necessarily caused only by natural forces; it can also be induced by human action. Danger cannot be measured. However, it can be perceived in its own way according to one's knowledge and experience. A community may perceive a danger with feelings that range from simple fear, panic, or may even respond to it with indifference.

A dam is a source of danger just like a nuclear power plant, a highway, or an industry. In general, to identify hazards from the same source, scenarios that are literally described or translated using failure criteria are used. The hazard scenario is associated with a risk that is a distinct physical entity.

Legal texts often use risk rather than danger. Even among engineering professionals, there remains an inadequate concept of risk, whose origin is identified in the financial area. Since the early nineteenth century, from the institutionalization of state control of the private economy, expressions such as high, medium and low are used to classify investment risks. The basis of this qualitative risk assessment is the balancing of the parameters that drive the favorable performance of a system against those that make it difficult. The qualitative notion of this imbalance corresponds to the concept of safety coefficient.

Seeking to measure risk, there are assessment methods that propose the use of the product of the probability p of an unfavourable event for the magnitude of its monetary calculated

consequences, C . The risk in these cases is $R = pC$. This is broadly equivalent to identifying a natural disaster as a purely financial one. In spite of the fact that the Law has assimilated principles, such as: the polluter pays, and the conversion of damages to moral legal assets into currency are already traditional, whereby the order of magnitude of damages in the area of application of the Precautionary Principle may be such that the simple payment is a Pyrrhic victory.

The most suitable method for applications of the risk concept originates from analyses made in Nuclear Engineering in the seventies and eighties (KAPLAN; GARRICK, 1981), simultaneously with the development of the precautionary concept, but apparently without contact between them. Therefore, risk is a three-dimensional physical entity that can be expressed by a set of triple ordinates of the type $\{(S_i, p_i, C_i)\}$, $i = 1, N$ where S_i is the risk scenario; p_i , the probability of occurrence of this scenario; and C_i , the magnitude of the consequences associated with the considered scenario (HASSEL, 2010; CLARET-GOUVEIA *et al.*, 2017). N is the number of the most likely scenarios.

Concerning the interest of this work, both in Engineering and Law, danger and risk are used, but it is evident that risk is often employed to mean danger. Hazard is only one dimension of risk; The other two are the probability of a particularly hazardous event, also called a risk scenario, and the magnitude of the consequences associated with it. In Art. 225, §1, V, of the Federal Constitution of 1988 is one of the occasions where danger would have been better used instead of risk:

Article 225. Paragraph 1. *In order to ensure the effectiveness of this right, it is incumbent upon the Government:*

...

V – *to control the production, marketing and use of life-threatening techniques, methods and substances **that present a risk for life, quality of life and the environment;***

...

As noted, the danger of damage to life and the environment is inherent in the production and marketing of some goods and in the same way, in the use of techniques, methods and certain substances. This is not a risk because at least two of the three dimensions would be lacking in the likelihood of the danger (or of a scenario whose source was that danger) and the magnitude of the consequences associated with it. Along these lines and as an illustration, the following text was taken from a libel that denounced a wildlife crime resulting from the collapse of a dam:

*It is noted that the killing of fauna specimens was practiced with the use of methods and instruments capable of causing mass destruction, that is, the construction of tailings dam by the upstream elevation method, which is the least costly constructive technique, but presents **the highest amount of operational risks**.*

The purpose of the above accusation is to aggravate the penalty for the qualification of a crime committed with the "use of methods and instruments capable of causing mass destruction" provided for in Article 29, Paragraph 4, VI of Law No. 9,605/98 (BRAZIL, 1998). It should be noted that the dam construction technique by the upstream elevation method poses greater operational dangers, in the complainant's view. Dams, like all human constructions, are sources of hazards. These hazards are not risks, and as they are not risks, were not "considered" by any professional. In fact, they are inherent in dams and accepted collectively while living with them.

Also, it often happens that the same text alternates danger and risk with the same sense of danger. Take, for example, the text extracted from a complaint:

*Now, it goes without saying that the consequences **endangered the health and integrity**, not of a man, but of a community. (...) As if that were not enough, it must be considered that the Federal river (...) was, as well part of the Union, in the subtext as common use of the people, **exposed to the danger of actual death** by the excessively increased load in the demand for biological oxygen, and consequently, a harmful decrease of dissolved oxygen.*

International risk management standards (ISO, 2009; AS / NZS, 2009) are more careful in using this terminology. In English, for danger is used hazard and for risk, risk. The Risk Management process begins with a phase of hazard identification which involves seeking to know where, when, why and how natural events can have undesirable effects on a given system. This is followed by a risk analysis phase which consists in determining the risk, i.e. describing hazard scenarios, calculating the probability of each scenario and determining the magnitude of the associated consequences. A third stage, risk assessment, however, is essential to compare risks with the maximum permissible risk in order to guide decision making.

If a qualitative concept of risk is adopted, in general two scenarios are compared with the definition of safety coefficients. Although it is a qualitative assessment, unsuitable for decision-making or the attribution of criminal responsibility, the safety coefficient, because it is a subjective assessment of the relative safety of two or more systems, is widely used. But they generate an illusion of security.

When adopting a one-dimensional concept of risk, two distinct situations can be compared, using the direct risk values in each case. Here the biggest problem is the meaning of each one of them, since the consequences in each case are distinct and needed to be monetized to know the risk. Underlying this comparison is the whole issue of the valuation of legal assets such as human life, rivers, fauna and flora.

The adoption of the three-dimensional concept of risk allows an absolute risk assessment. Once the hazard scenario has been set, its likelihood and the magnitude of the consequences are independently compared. In this case, not only is the probability of the scenario not subjectively attributed, but it is based on the modelling and simulation of the physical behaviour of the systems, as the consequences can be assessed on their diversity.

Therefore, in order to assert that there is a risk taking by a professional, a company or a community, a risk analysis must be carried out and the applicable rules determine the maximum permissible risk enabling its assessment. If these conditions are not fulfilled, there is no risk taking, unless a danger is perceived that somewhat intense according to the experience of each one.

INTENT AND POSSIBLE INTENT

Two notable expressions are used in Law containing the words "danger" and "risk": "imminent danger", referring to the state or condition of a system or set of people, and "taking the risk", referring to the conduct of an agent. One analysis concludes that these expressions approximate in their semantic content "imminent risk" and "assumed danger", respectively.

By "imminent danger" is meant a certain hazard scenario whose probability of occurrence is high, much higher than that which is permissible, associated with consequences qualitatively assessed as undesirable. Thus, when this expression is used, somehow the three-dimensionality of risk is satisfied, albeit qualitatively, but is enough to require a decision. "Imminent danger," therefore, conceptually approaches "imminent risk."

When one asserts that the agent "has taken the risk", it is implied that one acts negligently in the face of dangerous scenarios whose probabilities one does not know and whose results one does not assess, although certainly undesirable. Now this is literally an assumption of danger inherent in every human endeavour. Thus "taking the risk", if it cannot be shown that the agent knew it in its three dimensions and could compare it to a maximum permissible risk, means "assuming the danger", which is generally done collectively.

The underlying conceptual issue in the use of the term "taken the risk" in law refers to the concept of deceit. In Criminal Law, four theories (GRECO, 2018) are admitted for the analysis of the conduct whose result was found to be harmful to an asset protected by law.

In synthesis, these theories are as follows. The first of these, called "*will theory*", focuses on the free and conscious will to disregard the limitation of the law, acting in the manner provided for in penal law. The second and in the majority is the "*assent theory*", whereby the agent recognizes the possibility of the injurious outcome of his action but executes it at the risk of producing it. The third is called "*theory of representation*" whereby one should not evaluate if there was risk taking, but simply whether the agent, knowing the possibility of the injurious outcome, proceeds or not in the action. The fourth is the "*probability theory*" by which the intent is confined to knowing the odds of the injurious outcome.

In the Brazilian Penal Code (BRAZIL, 1940), in Art. 18, it is read that the crime is malicious, "when the agent wanted the result or assumed the risk of producing it". In the first hypothesis, when the agent wanted the result, it is ordinary deception; in the second, when the agent took the risk of producing it, it is an eventual intent.

Consideration of these theories is relevant because accusatory libels often use more than one of them to analyse the conduct of the agent, individual or legal entity. In general, professionals and entrepreneurs are accused of intentional misconduct if an undesirable result occurs due to equipment that they were responsible for regarding design, maintenance or stability checking.

The *will theory* proves to be inadequate for environmental catastrophes simply because of the instrument. The theories of *assent* and *representation* involve the possibility of a disastrous outcome and, in this respect, are also inapplicable because in a risk society (BECK, 2013), social facilities represent dangers. The impossibility of any harmful event resulting from a human endeavour would make Earth a planet completely empty of any civilizing impulse. That is, all human endeavours are associated with probabilities of harmful outcomes. By this hermeneutic route, all environmental disasters would at least be crimes with intent.

To assert that the agent assumed the risk of producing the catastrophic outcome is to assume that the risk was known and evaluated. Knowing the risk implies determining it in its three dimensions: the scenario, S_i ; the probability of the scenario occurring, p_i ; and the magnitude of the associated consequences, C_i . Assessing risk means comparing it to a maximum permissible risk that must be defined by stakeholders or their representatives.

Eventual intent can be attributed to those disasters where there was a risk greater than the maximum permissible. The assumption of this statement is that a scientifically appropriate method for measuring risk in most significant hazard scenarios is known. The lack of this knowledge of the most appropriate risk measurement method and the lack of definition of the permissible risk lead us to use the Precautionary principle.

THE PROBLEM OF APPLYING THE PRECAUTIONARY PRINCIPLE

Apparently, the Precautionary Principle finds its moment of application when a human endeavour, as dangerous as it is, has associated it with a risk that is not known to measure, either by the probability of a consensually important scenario, or by the magnitude of its consequences.

When risk is known, that is, when it can be measured and stakeholders have defined a maximum permissible risk, the Precautionary Principle does not apply: it is just about applying legal rationality. There may be situations where risk mitigation measures apply, including by virtue of court decisions. In other cases, the maximum permissible risk may be increased by increasing stakeholder resilience, which may also require judicial initiatives.

Be the case "if q can be, then p should not be", where p is a *lato sensu* legal fact that can have the undesirable consequences q . It turns out that event p implies social and economic development. Since there is no scientific certainty about q , that is, being just a "possibility," two groups form for and against and the decision is invariably brought to justice. The Government itself may be on one of these sides, and there have been cases in which distinct parts of it have positioned themselves on opposite sides.

In lieu of the provisions of Article 225 of the Federal Constitution of 1988 (BRAZIL, 1988), the Precautionary Principle must be applied when deciding to implement p . As seen, science does not help in determining the magnitude of the consequences q . Therefore, the risk cannot be determined and compared to an admissible risk.

Issues such as the ones above have all the elements to generate actions for the constitutionality of first and second instance court decisions. At stake are constitutional principles such as free enterprise (Art. 1, IV); the guarantee of national development (Art. 3, II); of freedom (Art. 5, II); principles of the economic order (Art. 170, II-VIII) and Art. 225, caput and paragraphs. For this reason, in order to expedite the judicial provision, it would be appropriate to particularize the precautionary procedure.

AS REGARDS A PRECUATIONARY PROCESS

Before any other action, it is necessary to demonstrate the precautionary nature of the process. In fact, based on Article 319 of the Civil Procedure Code (BRAZIL, 2015), it would be necessary to file an application including the reasons why the dispute is characterized as a precautionary process.

The principal point of a precautionary nature is the scientific uncertainty about the consequences of an action or omission for which authorization from the State is sought. Of course, the action or omission falls within the domain of social interest and is governed by law. Examples are: the construction of a hydroelectric dam; the setting up of a potentially hazardous product factory in a particular urban area; licensing to deforest an area destined to mine a strategically valued ore; the diversion of a river to supply irrigation for a large plantation of transgenics; licensing to market air conditioning filters using nanotechnology chemicals; and failure to install gas scrubber towers on the grounds that emissions from a factory are non-polluting.

Of course, the parties differ on the content and quality of the consequences. Assuming the action was taken by those who defend the *lato sensu* legal impediment, it is to be expected that they claim that the consequences of such action or omission would be harmful to the environment, its quantity and its quality. The opposing party would seek evidence that this would not occur under the circumstances in which the action or omission is planned to be implemented.

Although the parties use technical advice on the magnitude and quality of the consequences in defense of their views, the precautionary nature of the dispute lies in demonstrating the lack of scientific certainty about them. Once the judging body realizes that the quarrel may be of a precautionary nature, to constitute it as such by interlocutory judgment, one or more hearings are organized in which several *amicci curiae* manifest themselves.

The rules governing the participation of *amicci curiae* are contained in the New Code of Civil Procedure (BRAZIL, 2015) of Article 138 and its paragraphs; in *verbis* the *caput*:

Art. 138. The judge or the rapporteur, considering the relevance of the matter, the specificity of the subject matter of the demand or the social repercussion of the controversy, may, by irreversible decision, of office or at the request of the parties or of those who intend to speak, request or admit the participation of a natural or legal person, body or specialized entity, with appropriate representation, within 15 (fifteen) days of their subpoena.

The three hypotheses for the admission of *amicus curiae* contemplate the case of the precautionary nature of a claim, since it will certainly be a relevant, specific and socially relevant matter. There is no need, and it would not be advisable, to apply them to the case with exclusivity of admission by irreversible decision of the judging body or the requirement that the manifestation takes place within fifteen days of the summons. As this is a matter for which there is no scientific certainty, for the sake of future generations, the precautionary process must be continuous but need not be accelerated. In addition, it may be necessary to seek scientific evidence from foreign research centers which may go beyond normal timeframes. It is true that excessive distancing from the manifestations of *amicci curiae* can make it difficult to form a judgment on the consequences of action or omission.

An issue underlying the investigation of the precautionary nature of an action or omission is the method of establishing its scientific certainty. In phenomena that are undoubtedly deterministic, scientific certainty stems from the certainty of causes. In this case, the investigation shifts to the biological and or physicochemical processes that one of the parties wishes to implement or refrain from implementing.

However, many phenomena are genuinely random, such as those that depend on climate or genetic variables and may be associated with unpredictable negative consequences. On the other hand, there are phenomena that have not been sufficiently investigated (e.g. effects of effluent nanoparticles from air conditioners on human health) or on the scale of the planned action or

omission in the project (e.g. environmental effects of a large dam in a given biome), either for lack of research interest or for lack of scientific tools.

Scientific certainty, although sought first, can be replaced by the concept of risk that addresses hazard scenarios, the likelihood of harm, and the magnitude of its consequences. Admitting risk as scientific certainty may seem counterintuitive as it is essentially probabilistic. However, scientific certainty is the reference to the rigorous, critically evaluated scientific method by which a conclusion is constructed and serves as the basis for a court decision.

When feasible and expected to be effective, the judging body may seek scientific certainty by conducting experiments performed by neutral entities such as universities and research institutes. The cost of such research could be divided between the stakeholders and the State itself accounting for future generations.

In Civil Proceedings in Homeland Law there are relevant situations in which the judging body makes use of public hearings, namely: to assist in the decision of the Repetitive Demand Incident (BRAZIL, 2015, Art. 983, §1); in the judgment of Special and Extraordinary Repetitive Appeals (BRAZIL, 2015, Art. 1038, II); Law No. 9,868: 1999, in the Admissibility and Procedure of the Direct Action of Unconstitutionality (Art. 9, §1 °) in case of "the need to clarify the matter or factual circumstances or the noticeable insufficiency of the information in the file"; *ibid.*, in Art. 20, §1º in the judgment of the Admissibility and in the Procedure of the Declaratory Action of Constitutionality.

Public hearings may also be provided to assist in judging the precautionary nature of a dispute. They have already been used, within the jurisdiction of the Federal Supreme Court, in notable situations such as judging the constitutionality of the Biosafety Law (Direct Unconstitutionality Action 3,510) and judging the Interruption of the Anencephalic Fetus Gestation (Fundamental Non-Compliance Action). 54). In all cases, the purpose of the public hearing is to hear testimonials from persons with experience and authority in the matter.

Finally, it will be up to the legislator, who if convinced of the need to regulate the precautionary process, determines whether the precautionary nature will occur in the first, second or higher instance. In the first instance, it seems appropriate that it should begin as a court case in the first instance and that the precautionary incident should be opened by one of the parties or at the request of the prosecutor or other legitimate parties as the law requires.

Starting as an acquaintance process in the first instance, if the Judge recognizes its precautionary nature, it would be the case of sending it to the Court of Appeal which, confirming it, would refer it to the court to follow the precautionary process procedure of the case. If not confirmed, the case is returned to follow up as a knowledge procurement process. Confirmation of the precautionary nature within the Court could, if deemed necessary, draw on public hearings and statements by *amicci curiae*.

The initiation of the precautionary process should rely on the prosecution as part of the process and not only as *custus legis*. Article 129 of the New Code of Civil Procedure (BRAZIL, 2015) determines the institutional functions of the Public Prosecution Service and in several of them, as per its reading, could include their participation in the precautionary process. However, from the perspective of this study, item V of that same article could include the defense of the rights and interests of future generations, since, by virtue of Article 225 of the Constitution, they appear in the Homeland Law as subjects of law.

After the probative phase of the precautionary nature of the action or omission, the judging body may decide not to authorize it. In that case, it would have considered that the level of risk of harm to human life and the environment for present and future generations is far beyond the permissible. The legislation will provide for appropriate remedies. On the other hand, such a decision should not be terminative of the process, but the terminative of a phase, since in a relatively short time, new scientific evidence may emerge as to the nature of the consequences of the intended action or omission. The interested party may be required to suspend proceedings while further evidence is awaited in one direction or the other.

Perhaps the most frequent decision will be to authorize the event by adopting stakeholder mitigation measures and policies to increase stakeholder resilience. Depending on the conviction of the judging body, the action or omission may be authorized by setting up a third-party monitoring system at the expense of the interested parties and eventually the Government.

The appointed third-party monitoring system should follow the implementation of the action or omission and its consequences until it loses its precautionary nature, either by the advent of scientific certainty as to the harmlessness of its consequences, or by the time frame that will be set. In such a case, the judging body determines the management system or delegates it to a public entity such as a university or research institute.

CONCLUSIONS

The Precautionary Principle has an exogenous origin in law, having been born from the *vorzogeprinzip* adopted in the post-World War II ideals of the Christian Democratic Union of Germany. On the other hand, the notion of liability for damages inflicted on others was already present in the 18th century BC Hamurabi Code. The obligation to repair damages leads to the notion of risk of *lato sensu* legal facts. Risk refers to the likelihood of negative outcomes in an event, while danger is the event itself.

In Law, the concepts of danger and risk are often confused. This confusion is deleterious and must be undone. An operational definition of risk associates a hazard scenario with its likelihood of occurrence and the magnitude of its consequences. This concept took hold from the 1980s, when awareness of the risk of nuclear disasters was a major concern for humanity.

Modern societies develop by producing risks. Thus, *lato sensu* legal facts entail risks and agents are civilly liable for damages caused to third parties, since this is a principle of Brazilian Civil Law.

In environmental matters, especially, legal facts that have caused harmful consequences are often seen as crimes, resulting in criminal liability. In such cases it is particularly useful for the sake of justice to subject the danger to social approval and to establish the permissible risk. Eventual intent is characterized only when the agent, knowing a measure of risk, admits it is above the normative maximum.

Situations in which the Precautionary Principle applies are characterized by the lack of knowledge of the nature of the harmful consequences that may arise from a *lato sensu* legal fact requiring authorization from the Law. This characterizes the development dilemma: entrepreneurship is necessary, because it means development, but it can have negative consequences that can affect present and future generations. When consequences are unknown, the risk is also not known, and the decision methodology based on the maximum permissible risk does not apply.

In this study, a procedural routine was outlined to include the Precautionary Principle in the decision of processes in which the risk is not known. The proposal was organized in three phases, namely: (a) the decision on the precautionary nature of the dispute; (b) the formation of the Rapporteur's conviction about the event and its consequences; and (c) the decision on the authorization of the event.

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