

## **Precautionary Civil Liability for Ammonium Nitrate in Algerian Legislation**

**Belmerdaci Rafika<sup>1</sup>**

<sup>1</sup>University of Baji Mokhtar Annaba, Research Laboratory for Maghreb Legal Studies (Algeria).

**The E-mail Author:** [rafi23@hotmail.fr](mailto:rafi23@hotmail.fr)

**Received: 02/2023**

**Published: 07/2024**

---

### **Abstract:**

The explosion of **Ammonium Nitrate** in the city of Beirut, Lebanon, on August 4, 2020, resulted in hundreds of deaths and thousands of injuries. Approximately 2,750 tons of this chemical agricultural fertilizer, stored in a warehouse at the Beirut port for six years, detonated. This fertilizer was intended to increase soil yield and fertility but, at the same time, posed a significant threat as a potential explosive. Agricultural chemical fertilizers, including ammonium nitrate, have become essential for intensive agriculture since the early 20th century to ensure food security. However, their specific nature of harm and non-disappearing characteristics have prompted a reconsideration of the classical concept of liability. This has led jurisprudence to revisit the notion of fault and develop principles of precautionary civil liability that align with the nature of damages resulting from their use.

**Keywords:** ammonium nitrate, precautionary principle, precautionary fault, potential harm, scientific uncertainty.

---

### **Introduction:**

The use of ammonium nitrate is considered among the effective means to rebalance soil nutrients and prevent nutrient depletion, thus increasing soil fertility and productivity. However, recent scientific research has demonstrated the serious damages arising from its use, which cannot be rectified. This has necessitated a reevaluation of how to deal with it through preventive measures to avoid environmental problems resulting from its manufacture, storage, or use before they occur. Hence, the concept of precautionary civil liability has emerged.

This underscores the practical importance of our research topic due to the emerging role of civil responsibility, internationally and domestically, making a shift from repairing damage after it occurs to preventing it due to its irreparable nature and its dual impact, both direct and indirect, on both humans and the environment.

Both jurisprudence and judiciary have shown significant interest in the topic of precautionary civil liability and its close connection to environmental damages and its role in protecting the environment from them. Hence, it is crucial to shed light on this aspect by focusing on the innovations introduced by jurisprudence and judiciary in this regard, attempting to explore the problematic issue revolving around:

**The role of renewing the concept of civil liability in preventing the damages of ammonium nitrate, considering it is one of the most common chemical fertilizers on one hand and a ticking time bomb on the other?**

We have endeavored to guide the research process using both descriptive and analytical methods, aiming to determine the legal framework for dealing with ammonium nitrate at both national and international levels, as well as the concept of precautionary civil liability. This is in hopes of elucidating its intricacies and details and its link to minimizing the negative impacts and damages resulting from ammonium nitrate, by shedding light on the substance from a legal perspective in the first section and concluding with the renewal of the pillars of civil liability in the second section.

**First Section: Legal Framework for Dealing with Ammonium Nitrate**

**First Query: Definition of Ammonium Nitrate**

Ammonium nitrate is a chemical substance with multiple uses, commonly employed as a fertilizer<sup>1</sup> and an explosive or oxidizing agent. It is characterized by its easy solubility in water and is used in the manufacture of fertilizers, explosives, and antibiotics. It is classified into different grades based on its intended use.

**Second Query: Legal Framework**

Standards for classifying ammonium nitrate vary from one country to another, given its dual nature as a fertilizer and an explosive. Careful classification according to specific standards is necessary to minimize potential risks.

**Subsection 1: Terminological Definition of Ammonium Nitrate**

Ammonium nitrate is a chemical substance with multiple uses in fertilizer and explosive industries<sup>2</sup>. It possesses distinctive physical and chemical properties and is classified into various grades based on its intended use and nitrogen content.

Ammonium nitrate is a chemical fertilizer that consists of white crystals containing 65% oxygen and 15% nitrogen. It is easily prepared from its raw materials, namely, ammonia and nitric acid. It is a salt that readily dissolves in water, and when treated with ammonia gas, it forms a colorless ammoniacal solution, which serves as a beneficial fertilizer, especially when used with ammonium superphosphate. Ammonium nitrate is an important fertilizer with an NPK ratio of 34% (0-0-34), which is lower than that of urea (0-0-46), resulting in slight deficiencies in transportation. However, it distinguishes itself from urea in that it is more stable and does not rapidly lose nitrogen to the atmosphere<sup>3</sup>. Ammonia and nitric acid are the two main raw materials for the production of ammonium nitrate. The processes involved in its preparation include neutralizing nitric acid with ammonia gas and evaporating the solution to concentrate it for obtaining ammonium nitrate crystals, which are then dried and packaged<sup>4</sup>.

Ammonium nitrate belongs to the class of nitrogen fertilizers and is one of the most commonly used. It partially assimilates into soil colloids<sup>5</sup>, and the rate of ammonium absorption is lower than that of nitrate under field conditions. Therefore, most crops do not respond to fertilizers containing ammonium as they do to added nitrates. However, at the same time, it is considered an explosive salt. Because of this, its use as a fertilizer has been prohibited in some countries, and the production of liquid fertilizers is often prohibited due to the significant fire hazards they pose.<sup>6</sup>

However, it is important to distinguish between sensitive ammonium nitrate, which includes pure ammonium nitrate at 100%, and ammonium nitrate emulsions and mixtures, which contain 45% ammonium nitrate, except for solutions and explosives in the first category, which include hazardous materials defined by the United Nations<sup>7</sup>.

Ammonium nitrate is a chemical substance with multiple uses in the fields of fertilizer and explosives manufacturing, as well as a nutrient in antibiotics<sup>8</sup> and yeast growth<sup>9</sup>. It is an ammonium nitrate salt with the function of being a fertilizer, oxidizing agent, and explosive<sup>10</sup>.

### **Secondly : the classification of ammonium nitrate:**

Ammonium nitrate is generally classified into different grades based on the nitrogen content as follows:

- Sensitive ammonium nitrate.
- Technical grade ammonium nitrate for use in the manufacture of civilian explosives and blasting agents.
- Fertilizer grade ammonium nitrate for use in fertilizer production.

The grade of ammonium nitrate affects the physical explosive properties of the substance. However, it can be mixed with contaminants from any grade, turning it into a highly explosive material in this case.

It is necessary to note that countries differ in the classification criteria for ammonium nitrate products. For example, Australia classifies all ammonium nitrate products containing more than 45% nitrogen content as sensitive ammonium nitrate.<sup>11</sup>

### **Subsection 2: Specificity of Ammonium Nitrate**

The Algerian legislator has classified ammonium nitrate and considered it a toxic substance based on Annex II of Executive Decree 07-145, which specifies the scope, content, and procedures for approving an environmental impact assessment study. Therefore, it is legally manufactured in classified<sup>12</sup> facilities<sup>13</sup>.

Ammonium nitrate is a chemical substance with dual use as a fertilizer (firstly) and as an explosive or oxidizer (secondly).

#### **Firstly: The specificity of ammonium nitrate as a fertilizer.**

The Food and Agriculture Organization (FAO) defines fertilizers as "substances used to provide nutrients to plants, usually through application to soil, foliage, or water in the production of rice, hydroponics, or aquatic organism farming." This definition aligns with the one provided by the International Fertilizer Association<sup>14</sup>. Fertilizers, in general, are classified as toxic substances, capable of causing death or acute and chronic hazards through inhalation, ingestion, or skin contact.<sup>15</sup> Ammonium nitrate is considered one of the single chemical fertilizers and belongs to the group of nitrogen fertilizers. It is a substance added to agricultural soil to increase the level of absorbable nutrients to compensate for their deficiency and enhance the productivity of crops. It is symbolized by "NH<sub>4</sub>NO<sub>3</sub>" and is widely used as a fertilizer due to its effectiveness in increasing production.<sup>16</sup>

This type of fertilizer is produced in Algeria by ASMIDAL, an industrial complex established on September 1, 1984, following the restructuring of the national oil company "SONATRACH"<sup>17</sup> to include the nitrogen fertilizer

complex in Arzew and the phosphate fertilizer complex in Annaba. Most studies recommend the need to expand fertilizer production by increasing the number of factories, especially since the raw materials required for production are available. Additionally, optimizing the consumption of nitrogen fertilizers is advised to reduce the fertilizer gap between production and consumption and gradually decrease imports from abroad in preparation for achieving self-sufficiency in the required agricultural fertilizers while adhering to fertilizer regulations to produce healthy and safe food.<sup>18</sup> Ammonium nitrate is characterized by its rapid absorption, making it one of the most consumed nitrogen fertilizers nationally and internationally. However, it is considered a toxic substance with severe long-term effects.

**Secondly: the dimensions of the specificity of ammonium nitrate as an explosive.**

According to the report of the Expert Committee on the Transport of Dangerous Goods and the Globally Harmonized System of Classification and Labelling of Chemicals<sup>19</sup>, ammonium nitrate is classified as a toxic substance with explosive properties. The report includes a testing guide and standards to assess the suitability of materials for transport, including ammonium nitrate in tanks. It also comprises a long list of tests, including tests to determine the thermal stability and shock sensitivity of the substance. Each type of test is subject to specific conditions and specifications to achieve a particular goal and ensure the material's transportability<sup>20</sup>.

The substance is likely to explode due to the presence of combustible or incompatible contaminants, if subjected to pressure or exposed to high temperatures (exceeding 160 degrees Celsius), or if subjected to severe shock. Ammonium nitrate stored improperly can clump together when contaminated with water or when stored under pressure, forming a solid mass. Increased pressure enhances the likelihood of an explosion if ammonium nitrate is exposed to heat or shock.<sup>21</sup>

Armed groups often exploit fertilizers rich in ammonium nitrate in conflict zones. For example, the Taliban in Afghanistan historically used various types of fertilizers, including potassium chlorate and ammonium nitrate, to manufacture improvised explosive devices (IEDs). To address this issue, the Global Skeild Programme was launched in 2010. This program aims to monitor governments' control over 13 of the most common chemical precursors and other materials that can be used in IED manufacturing to combat their illicit trafficking and leakage.

Observers of international affairs can also note that armed groups, when not subject to international regulations, can legitimately obtain ammonium nitrate. This is indicated in a report by the Conflict Armament Research organization, which addresses the supply of explosive device components in Iraq and Syria. However, the Islamic State organization almost exclusively uses locally-made explosives manufactured from fertilizers, especially ammonium nitrate and urea, mixed with other chemical precursors. Additionally, this organization seems to have easily acquired ammonium nitrate and detonation devices and other raw materials through legitimate means, such as trade with retail companies and regional distribution.<sup>22</sup>

### **Second Issue: Ammonium Nitrate from a National and International Legal Perspective:**

The specificity of ammonium nitrate as a fertilizer or explosive, as outlined above, has prompted Algeria to address its regulation (first branch) and adopt a set of international standards and rules in line with the guidance of the international system governing toxic chemicals (second branch).

#### **First Branch: nationale Legal Rules for Regulating Ammonium Nitrate Handling**

Many countries have legislation governing the handling of ammonium nitrate. Guidelines may be published by various government departments addressing the topic from different perspectives such as public health, environmental protection, civil defense, transportation, storage, manufacturing, importation, exportation, security, disposal, mining, and quarrying<sup>23</sup>. Those involved in handling ammonium nitrate bear the responsibility to comply with these regulations.

#### **Firstly : the content of the environmental impact study and summary:**

Based on Executive Decree 07-145 dated May 19, 2007, which specifies the scope, content, and procedures for approving an environmental impact study and summary<sup>24</sup>, the manufacturing of ammonium nitrate as fertilizer can only proceed after following legal procedures, with one of the most important being the environmental impact study or summary. This study aims to assess the project's compatibility with its environment, identify and classify the project's direct or indirect effects, and ensure compliance with environmental protection regulations within the framework of the project<sup>25</sup>. Manufacturing can only occur within classified facilities according to the provisions of Executive Decree No. 06-198 dated May 31, 2006, which regulates the organization applied to classified establishments for environmental protection<sup>26</sup>. This summary is prepared by accredited consulting firms appointed by the Minister responsible

for the environment and at the expense of the project owner<sup>27</sup>. This is done in accordance with the examination procedures for impact studies and summaries specified in Chapter Three of the aforementioned Decree 07-145, according to Articles 7 to 19 thereof. It is legally required that the content of the study or summary be based on the project's scale and its environmental impacts, particularly including:

1. Project Owner's Introduction: His title or company headquarters, as well as, if necessary, his company and potential experience in the field of the proposed project completion.
2. Introduction of the Consulting Firm.
3. Analysis of Potential Alternatives for Various Project Options, explaining and establishing options based on economic, technological, and environmental levels.
4. Identification of the Study Area.
5. Detailed Description of the Original Site Condition and its Environment, including its natural resources and biological diversity, as well as the potential impact on terrestrial, marine, or aquatic habitats by the project.
6. Detailed Description of Various Project Stages, especially the construction, operation, and post-operation phases (decommissioning of facilities and restoration of the site to its previous state).
- 7 .Estimation of the types and quantities of residues, emissions, and damages that may occur during various stages of the project's implementation and operation (especially waste, heat, noise, radiation, vibrations, odors, smoke, etc.).
- 8- Division of the expected direct and indirect impacts, short-term, medium-term, and long-term, of the project on the environment (air, water, soil, biodiversity, health).
- 9-Cumulative effects that may occur during various stages of the project.
- 10-Description of the measures planned by the project owner to eliminate or reduce the damages resulting from the various stages of the project's implementation and operation, and/or compensate for them.
- 11- Environmental management plan, which constitutes a program for monitoring the mitigation and/or compensation measures implemented by the project owner.

- 12- Financial provisions allocated for implementing the recommended measures.
- 13- Any other work, information, document, or study presented by consulting firms to support or establish the content of the relevant impact study or summary.<sup>28</sup>

### **Second Issue: Procedures for Reviewing Impact Study Summaries:**

The project owner must deposit the Environmental Impact Study or Summary with the competent regional governor in ten copies<sup>29</sup>. The environmental authorities responsible at the regional level then examine the content of the impact study or summary, upon the governor's request, and may require the project owner to provide any necessary additional information or studies. The project owner is given a one-month deadline to submit them.<sup>30</sup>

Subsequently, the governor issues a decision to initiate a public inquiry after the initial examination and acceptance of the impact study or summary. This serves as an invitation to interested parties, whether natural or legal persons, to express their opinions on the proposed project and its expected environmental impacts. The public inquiry is subject to the provisions of Articles 10 to 15 of Executive Decree 07-145, followed by approval of the impact study and summary, which is then subject to Articles 16 to 19 of the same decree.<sup>31</sup> After the project is completed, the environmental authorities responsible at the regional level monitor and follow up on projects that were the subject of an impact study or summary.<sup>32</sup>

### **Second Branch: International Legal Rules for Dealing with Ammonium Nitrate**

Hazardous materials are subject to an internationally recognized system for safe transportation. Recommendations by the United Nations concerning the transport of dangerous goods, or model regulations known as "The Orange Book," govern the safe transportation of hazardous materials.

The orange Book " provides guidance on how to transport it safely, including ammonium nitrate, and the importance of using a risk classification system during storage. This system determines the composition of ammonium nitrate, its purpose, and its concentration in any product based on it. According to this, ammonium nitrate can be classified into two hazard categories: the first category is explosives, and the fifth category is oxidizing substances and organic peroxides.<sup>33</sup>

The classification of a product containing ammonium nitrate is determined through a series of detailed tests outlined in the United Nations testing and standards guide. The manufacturer must conduct these tests to apply the appropriate hazard category to its products, and this information will be included in the product's safety data sheet and placed on its packaging.

It is important to note that this classification applies only to products that are in good condition, uncontaminated, and inside approved packaging. If ammonium nitrate from hazard category 5.1 (for example, with organic materials) becomes contaminated or clumps, it may become susceptible to explosion and the associated hazardous effects of hazard category 1.

Guidance document number 01.50, issued by the United Nations, also provides information on the UN system for classifying risks of explosives and their symbols<sup>34</sup>.

The United Nations has also issued what is known as the Globally Harmonized System of Classification and Labelling of Chemicals (GHS), which includes coordinated standards for classifying substances and mixtures according to their health, environmental, and physical hazards, as well as coordinated elements for hazard communication, including labeling requirements, safety data sheets, etc<sup>35</sup>. This international system specifically addresses all provisions related to explosives in detail in Chapter 2, including explosive substances, referring to products containing ammonium nitrate.<sup>36</sup>

## **Second Section: Precautionary Civil Liability**

Similar to classical civil liability, precautionary civil liability is based on three pillars, the error in which it renews its content (the first requirement), and the potential damage associated with it is flexible in the rules of proving causality (the second requirement).

### **The first requirement: Precautionary Error**

The concept of precautionary error will not be clarified until we specify the intended meaning of renewing the concept of error (the first branch), and differentiate between prevention and precaution (the second branch).

### **Branch One: Renewing the Concept of Error:**

Despite the contradictions inherent in the principle of caution, which constitute an objection to applying tort liability based on the uncertainty of harm, many legal scholars consider the principle of caution to be a factor renewing the concept of error. This is evident in the statement of Madame Rémond Guillard, who stated: "If the commitment to risk assurance is an

indicator of a certain system that establishes a place for caution, where everyone finds themselves obliged to double the necessary precautions in the face of the unknown, this leads to the innovation and renewal of the concept of error that may permeate one's obligations here. Therefore, the content of the commitment to caution lies in not respecting this commitment, which leads to the occurrence of error."<sup>37</sup>

It is therefore necessary to find a solution to the problem of preventing significant ecological damage, especially that resulting from chemical agricultural fertilizers, including ammonium nitrate. Thus, it is worthwhile to search for solutions that contribute to establishing legal responsibility for not observing the precautionary principle.

By renewing the concept of error, it means overcoming difficulties for the affected parties through various legal means and procedural methods, including expanding the concept of error resulting from assuming the product defect, which inevitably imposes new obligations on professionals beyond the known boundaries of civil liability under civil law. Given the difficulty of proving error on the professional side, French jurisprudence has attempted to assume this by the motive of safeguarding people's lives from the danger of defective products or hazardous characteristics, as is the case with ammonium nitrate, where a new judicial innovation has emerged in the sphere of liability for negligence, facilitating the burden of proof for others. It will only require proving that the damage is due to a defect in the product to assume error on the side of the product.<sup>38</sup>

Classical civil liability rules for limiting ecological damage do not cover the protection of pure ecological damage due to the connection of civil liability rules to protecting rights and interests falling within ownership. They do not solve the problem of protecting natural elements not owned by anyone because the philosophy of compensation still addresses intervention methods and mechanisms after the damage has occurred. Therefore, it does not achieve the desired preventive policy of environmental rules. Therefore, it is necessary to think of an alternative and different formulation for the function of civil liability in preserving the environment through the development of precautionary methods and the avoidance of hazards rather than focusing on the interventionist nature. The goal should shift from attempting to restore the situation to what it was before to taking all preventive measures to maintain the situation as it is.<sup>39</sup>

The principle of precaution has become a suitable principle for expanding and renewing the concept of civil liability based on fault, as it represents the real and new factor of error within the concept of commitment to precaution and caution. Non-compliance with the commitment establishes error, which diverges

from the ordinary course of affairs. The principle of precaution is far from the commitment to exercising due care, which imposes this precaution in the face of known risks, and is associated with situations of uncertainty and probability<sup>40</sup>. Hence, the concept of error has evolved from being a proven fault to becoming a probable fault. This responsibility constitutes a new generation of preventive civil liability with a fundamental function in preventing significant and harmful environmental hazards.<sup>41</sup>

Liability based on precaution entails new ethics of responsibility. It does not address mistakes committed against the environment but rather includes what should be done within the realm of possibility to protect it<sup>42</sup>.

Although the principle of precaution as a basis for civil liability has not been immune to criticism, it has been proven to be adopted towards the principles of civil liability and environmental legislation, marking an important shift towards risk prevention. In this regard, it enhances the preventive impact of civil liability, allowing for the recognition of damage. In the case of our study on ammonium nitrate, acknowledging the precautionary principle requires the activity owner (classified facility) to implement safety measures when conducting their activities to avoid potential environmental deterioration and combat the causes of deterioration. This includes continuous assessment of the environmental impacts of polluting activities to prevent risks and take all preventive measures to maintain the status quo rather than repair it after damage has occurred, which may not always be possible.<sup>43</sup>

Furthermore, it appears that the French judiciary has adopted the opinion of Professor Philippe MALINVAUD, which is the concept of virtual fault (*faute virtuelle*), and considered it sufficient to trigger product liability to protect victims from defective products. This concept aligns with the theory of *res ipsa loquitur*, known in the Anglo-Saxon system, which holds that the mere occurrence of an accident is evidence of the manufacturer's negligence, and they cannot escape this assumption unless they prove the existence of an external cause.<sup>44</sup>

## **Second Branch: Prevention and Precaution**

We must distinguish between two cases of prevention: the case of classic prevention '*la prévention classique*' to avoid future damages that we already know, such as explosions, fires associated with the use of flammable materials, or the discharge of waste into water and the disposal of toxic materials<sup>45</sup>. In the context of the dispute between Argentina and Uruguay before the International Court of Justice in The Hague concerning pulp mills on the Uruguay River, the Court refused to take provisional measures through the order issued on July 13,

2006, and considered that we are not in the field of applying the precautionary principle since the effects of waste from pulp mills are well known and widely understood. "The prevention associated with the precautionary principle (prévention – précaution) aims to avoid damages that we do not know due to scientific uncertainty. Examples include long-term effects of chemical waste in the oceans, the impact of pesticides, and chemical fertilizers, which are subjects of our study."<sup>46</sup>

Based on the above, we will mention, in chronological order, a series of disasters resulting from the manufacturing process of ammonium nitrate fertilizer in various countries around the world, including:

1. The explosion of ammonium nitrate fertilizer on the outskirts of Texas City in the United States in 1947, resulting in immediate death of 600 people, injuring 4000 others, and destroying 90% of the city's buildings. Fires continued to burn for 6 consecutive days after the explosion, and it was not known at that time that ammonium nitrate could explode.<sup>47</sup>
2. The largest disaster in Kuwait occurred in 1966 in an area near an industrial suburb where petroleum refining and fertilizer manufacturing plants are located. The emissions of carbon dioxide gas from these plants increased significantly, resulting in dozens of people suffering from eye inflammations and difficulty breathing.<sup>48</sup>
3. On July 10, 1976, an explosion occurred at a chemical factory in the Italian Seveso area, releasing dioxin, a toxic substance. This incident was the legal beginning of the concept of major technological risk, defined by Europeans as "an incident resulting, for example, from the release of substances, or fire, or explosion on a large scale, associated with the development of an uncontrolled industrial activity that leads to immediate or delayed serious risk to humans inside or outside the facility and/or to the environment, involving one or more substances."<sup>49</sup>
4. On February 26, 1993, the basement of the World Trade Center in New York was destroyed using a 544 kg ammonium nitrate bomb, waking everyone to a horrific nightmare, resulting in the deaths of 1050 people, despite the target being to kill a quarter million.

These disasters underline the urgent need to adopt preventive measures and precautions to avoid potential catastrophic events associated with the use and manufacturing of ammonium nitrate.

5. The bombing of the Alfred P. Murrah Federal Building in Oklahoma City on April 19, 1995, using ammonium nitrate mixed with diesel fuel to produce a bomb that destroyed the entire building and killed 168 people.<sup>50</sup>
6. The burning of cooling towers at nitrogen fertilizer plants in Texas, United States, in 1997 had a devastating impact on vast areas.
7. An explosion at a nitrate storage warehouse in a small production facility in the industrial city of Toulouse, southern France (200 tons of nitrates), on April 21, 2001, resulted in the death of 31 people inside the factory and injured 2442 others. It also destroyed 500 homes and 85 schools and colleges, collapsed entrances to other factories, disrupted telephone communications within a radius of 100 km, shattered building windows in a 3 km radius, and created a crater with a diameter of 50 meters and a depth of 10 meters. Utilizing modern industrial security technology protected 6000 tons of ammonium nitrates and 30 thousand tons of other fertilizers from the explosion.<sup>51</sup>
8. It is also noteworthy to mention the catastrophic explosion of chemical fertilizers in Beirut, Lebanon, on August 4, 2020, resulting in the deaths of hundreds and injuring thousands, where Prime Minister Saad Hariri announced the explosion of about 2750 tons of ammonium nitrate stored in a warehouse at the Beirut port for six years.<sup>52</sup>

The Toulouse incident had a significant impact on the European level, as it resurfaces every year, raising strong questions about the dangerous behaviors of institutions. Among the various ways to deal with risks is prevention, which is rules imposed under the European directives called "Seveso," named after the major disaster mentioned above. This led to the issuance of European legislation, Seveso I in June 24, 1982, and Seveso II in December 1996. The first legislation requires industrialists to assess and reduce risks through technical and organizational measures, while the second strengthens preventive measures. Alongside the principle of prevention, a new principle called the precautionary principle emerged, according to the legal scholar Denis MAZEAUD. According to Professor JORDAIN, the precautionary principle can strengthen the role of preventive civil liability.<sup>53</sup>

### **Second Issue: Linking Potential Damage with Flexibility in Causation Rules**

Renewing the concept of fault shed light on the remaining pillars. The Algerian legislator adopted the concept of potential damage (first branch) and also softened the strictness of causation rules (second branch).

### **First Branch: Potential Damage**

The concept of precaution considered within the framework of traditional liability differs from the new concept of the precautionary principle, which awaits its embodiment through the uncertainty surrounding the results or effects that may arise from an activity or product, or the severity and comprehensiveness of the damages and dangers. The difference between them lies in that the damage based on the precautionary principle is potential and uncertain, i.e., not scientifically proven, while the damage in traditional liability is based on a known and confirmed risk even if it did not lead to actual damages. Moreover, Professor Christophe RADE added that considering compensation for risk as compensable damage represents a radical transformation that undoubtedly enhances the preventive impact of civil liability, paving the way for recognizing damage associated with non-compliance with the precautionary principle.<sup>54</sup>

The resort to the precautionary principle aims to eliminate the uncontrolled effects of technological innovations and industrial activities on health and the environment, heralding the emergence of a new paradigm for writing the law. This means that they are damages that are expected to include all fears, threats, and dangers that may be real or assumed, as unexpected dangers emerge from the appearance of new types of technology. Therefore, uncertain risks necessitate more intensive precautionary measures than required by probability. Precautionary measures are also necessary to confront completely unexpected risks, and the principle of precaution applies to both confirmed and secondary risks, which are risks where the causal relationship between the incident and the resulting damage is established by scientific evidence. These are risks that can be estimated, and preventive measures are applied to them.<sup>55</sup>

The stringent security measures are imperative, especially considering the potential risks in the agricultural chemical fertilizer sector. This field is fertile ground for applying the precautionary principle, both in the manufacturing stage at the classified facility level due to the toxicity of these substances, and during usage by farmers and field users, given their significant impact on the environmental and human health domains.

### **Second Branch: Flexibility in Causation Rules**

Legal causation involves establishing a link between the substance causing harm and the activity or operation of the facility from which the substance emanated. Scientifically, in the environmental domain, increased leakage of a substance into the environment leads to harm. This is usually determined based on scientific statistics that establish cases of harm resulting from increased environmental pollution with harmful substances. Therefore, it is focused on

proving the causation relationship between the harm and the substance causing it.<sup>56</sup>

In France, jurisprudence has attempted to overcome difficulties faced by victims in several ways to obtain compensation for uncertain risks. The precautionary principle, by supporting civil liability rules, aims to achieve a preventive responsibility for damages not yet occurred. The French judiciary has adopted the concept of presumed fault<sup>57</sup>, applying it to uncertain risks that cannot be scientifically proven with conclusive evidence. For instance, it can be applied to health risks resulting from the use of ammonium nitrate as fertilizer, even if the causal relationship between the action and its effects is not clearly established.<sup>58</sup> This is particularly relevant as environmental damage often does not manifest immediately but may occur in the future, making it challenging to prove causation due to the potential interference of other factors with the original cause.<sup>59</sup>

Considering that most environmental pollution cases require scientific evidence to prove the occurring damage, the evidence depends on the specifics of each case. For instance, in air pollution cases, it is necessary to prove that emissions have exceeded the specified air quality standards. Similarly, in cases of water pollution, the claimant needs to prove that the presence of pollutants is the sole cause of pollution. Moreover, judges are not technological experts in purely scientific pollution methods, and thus must ensure objectivity.<sup>60</sup>

The widespread nature of environmental damage and its extension over long distances due to air and water currents makes environmental harm difficult to determine, requiring specialized scientific expertise<sup>61</sup>. The difficulty lies in the time gap between the occurrence of environmental pollution and the manifestation of environmental harm, which may lead to the absence of a causation relationship.<sup>62</sup> Therefore, new rules for proving causation, such as the presumption of causation based on the maximum scientific evidence available, have been created. This approach, known as scientific causation<sup>63</sup>, allows for the judge's decision to rely on the possibility of a causation relationship rather than absolute confirmation of its existence. For example, Japanese law established a specialized agency to identify toxic substances and associated diseases, conduct site assessments near polluted areas, analyze pollutant toxicity, and investigate the activities of responsible parties.<sup>64</sup>

## **Conclusion:**

In conclusion, the use of ammonium nitrate necessitates the consideration of significant long-term environmental and health damages, leading to the development of classical civil liability rules and the adoption of the

precautionary principle. This has resulted in a renewal of its concept to align with the nature of the damages caused, creating an alternative and different formula for the function of civil liability.

Here is a rephrased summary of the conclusions drawn from this research paper :

1. **Algerian Legislation and Ammonium Nitrate:** The Algerian legislature has not specifically addressed ammonium nitrate, leaving the matter to specialists in the field. However, it has classified it as a toxic substance, aligning with the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, which Algeria ratified with reservations in 1998.
2. **Characteristics of Ammonium Nitrate:** Ammonium nitrate is characterized by its versatility as both a fertilizer and an explosive substance, making it highly specific and potentially hazardous.
3. **Regulations Governing Ammonium Nitrate:** Ammonium nitrate is subject to strict regulations adopted at both the national and international levels, reflecting a cautious approach to dealing with this explosive substance.
4. **Precautionary Principle in Algerian Law:** The principle of precaution has been transferred from international conventions to domestic legal systems, with Algerian legislators not hesitating to adopt it and define it in several legal texts.
5. **Scientific Uncertainty and Technological Advancements:** The lack of available technologies should not delay the implementation of appropriate measures to prevent serious environmental damage at a reasonable economic cost, as this constitutes a case of scientific uncertainty.
6. **Precautionary Principle and Civil Liability:** The precautionary principle enhances the preventive effect of civil liability, compelling classified facility owners to implement safety measures to avoid potential environmental degradation rather than focusing on remediation after damage occurs.
7. **Renewed Concept of Fault:** The precautionary principle introduces a new dimension to the concept of fault, emphasizing alternative methods of civil liability focused on precautionary measures and risk avoidance rather than interventionist approaches.

8. **Ethics of Precautionary Liability:** Precautionary liability entails new ethical standards, focusing not on past environmental transgressions but on what should be done within the realm of possibility to protect the environment.
9. **Precautionary Civil Liability and Potential Damage:** Precautionary civil liability is based on the idea of potential damage, encompassing all foreseeable harm. It obligates owners of facilities involved in ammonium nitrate production to take precautionary measures.
10. **Application of Precautionary Principle in Agricultural Chemical Fertilizers:** The field of chemical fertilizers, particularly ammonium nitrate, is conducive to applying the precautionary principle, both in manufacturing and usage stages, due to the substance's toxicity.
11. **Scientific Causation and Liability:** The probabilistic evidence is sufficient to establish liability, as the inherent danger of the activity confirms the inevitability of harm, especially in activities leading to environmental disasters, known as scientific causation.

Based on the above, we can propose the following recommendations:

1. The specificity of ammonium nitrate and its multiple safe and unsafe uses necessitates the establishment of a special legal framework for chemical agricultural fertilizers.
2. Expanding the concept of fault to include errors arising from materials with hazardous properties.
3. Implementing legal provisions that clearly enshrine the precautionary principle based on potential harm.
4. Adopting legal texts that incorporate the latest developments in jurisprudence and judiciary to facilitate compensation for victims of uncertain risks, thus reinforcing precautionary civil liability.

---

<sup>1</sup> www.marefa.org, accessed: 27/01/2023 at 10:29.

<sup>2</sup> Mahmoud Shakir Abdul Hussein, Chemical Industries, Dar Al-Yazouri for Publishing and Distribution, Jordan, 2007, p. 201.

<sup>3</sup> "Mahmoud Shakir Abdul Hussein, Chemical Industries, Dar Al-Yazouri for Publishing and Distribution, Jordan, 2007, p. 201."

<sup>4</sup> Same Reference, p202.

<sup>5</sup> Soil colloids are among the most important active components in soil, and they can be described in two groups: organic and inorganic. Generally, colloidal state refers to the dispersion of a substance or a group of substances into extremely small particles in a liquid. See: Soil colloids, lecture available on the website: iku.atu.edu.iq, Accessed on: 05/05/2023, at: 12:30.

<sup>6</sup> "Muzaffar Ahmed Dawood Al-Mosuli, Plant Nutrition, Dar Al-Kutub Al-Ilmiyah, Cairo, Egypt, 2019, p. 126."

<sup>7</sup> MARENDET, François, GOELLER, Jérôme, PASKAL, Michel, Gestion des risques liée à la présence d'ammonitrates dans les portes des maritimes et fluviaux, conseil générale de l'environnement et du développement durable, France, mai 2021, p81.

<sup>8</sup> "Regulating Ammonium Nitrate, Gazette for Primary Producers, p. 4, available on the website: agriculture.gov.au, Accessed on: 24/11/2022, at: 20:01."

<sup>9</sup> The diverse uses of solid ammonium nitrate include the following: manufacturing explosives, manufacturing fertilizers, manufacturing antibiotics, and manufacturing yeast. For more details, see: "What is Ammonium Nitrate: Learn about the substance that exploded in the Beirut port," available at: [www.gichad.org](http://www.gichad.org), Accessed on: 05/05/2023, at: 12:25, and also: Uomustansiriyah.ed.iq, Accessed on: 05/05/2023, at: 14:00.

<sup>10</sup> Amer Ahmed Ghazi Mona, Industrial Environment and Protection Methods, Dar Dijlah, Iraq, 2010, p. 73. And see also: gosttem.com, Accessed on: 24/11/2022, at: 12:18."

<sup>11</sup> Akram Thabet Al-Rawi, Nadiya Hanoun Salman, Aswan Hamadullah Aboud Al-Biyar, "Production of Yeast Extract," Journal of Biotechnological Research Center, Volume 5, Issue 2, 2011, p. 36 (32-43). Available at: [www.iasi.net](http://www.iasi.net). Accessed on: 05/05/2023, at: 12:52.

<sup>12</sup> Executive Decree No. 07-145 dated 2 Jumada al-Awwal 1428 corresponding to May 19, 2007, specifies the scope of application, content, and procedures for approving an environmental impact assessment study and summary. This decree was published in Official Gazette No. 34.

Similarly, Executive Decree No. 07-144 dated 2 Jumada al-Awwal 1428 corresponding to May 19, 2007, specifies the list of classified establishments. This decree was also published in Official Gazette No. 34.

<sup>13</sup> Executive Decree No. 06-198 dated May 31, 2006, regulates the organization applied to classified establishments for environmental protection. This decree was published in Official Gazette No. 37.

<sup>14</sup> International Code of Conduct on the Use and Management of Fertilizers for Sustainable Agricultural Production, Food and Agriculture Organization of the United Nations, Forty-First Session, Rome, 22-29 June 2019, p. 12. Available on the website: FAO.org. Accessed on: 27/01/2023, at: 12:47. See also: MORDERIntellegence.com, consulted on: 05/05/2023.

<sup>15</sup> Mohammed Alaa El-Din Othman, Mohammed El-Sayed Hussein, Mukhtar Abdel-Hafez, "Current Situation of Production and Consumption of Nitrogen Fertilizers Used in Egyptian Agriculture," Egyptian Journal of Agricultural Economics, Volume 27, Issue 1, March 2018, p. 124.

<sup>16</sup> The annex related to Executive Decree No. 07-144 mentioned earlier.

<sup>17</sup> In 1996, ASMIDAL transitioned to self-sufficiency to become a public economic company with shares, including subsidiary companies under its control, namely SOMIAS and KIMIAL in 1999, ASFRTRADE in 2000, and the companies Fertil and Alzofair in Arzew in 2001, with the separation of the pesticide company's activity, which was independently practiced at that time by MOBYDAL. Following economic reforms, ASMIDAL was established as a holding company after capitalizing some of its subsidiary companies.

In 2012, it was restructured into a fertilizer and phytosanitary products industrial complex after absorbing MOBYDAL through integration by ALPNYT, the latter being part of ASMIDAL. See: Asmidal.dz.com, consulted on: 27/01/2023 at 15:08.

<sup>18</sup> Hassan Hathim Al-Yasiri, "The Impact of Chemical Control on Soil Pollution in the Western Area of Akla City," *Journal of the University of Babylon for Humanities*, Volume 24, Issue 26, p. 1148.

<sup>19</sup> The report was issued on December 11-12, 2002, in Geneva. It is available on the website: [www.gichd.org](http://www.gichd.org). Accessed on January 27, 2023, at 15:16.

<sup>20</sup> The aforementioned report, page 16.

<sup>21</sup> "Reducing the Risks Associated with Ammonium Nitrate," UN SaferGuard, GICHD, AMAT Insights, Issue 01, September 2020, p. 8. Available at [gichd.org](http://gichd.org). Accessed on March 22, 2023, at 12:30.

<sup>22</sup> - Amat insights opcit ,P1017.

<sup>23</sup> Despite its negative effects and the danger it poses as an explosive material, many countries still stockpile shipments of ammonium nitrate, including Yemen, Iraq, India, Australia, and the United Kingdom. Additionally, pollutants such as chromium, copper, cobalt, and nickel can make ammonium nitrate less stable and more prone to explosion. See also: Amat Insights, opcit, p.10. For more information, visit the link: [www.worldsafe.qld.gov.au](http://www.worldsafe.qld.gov.au).

<sup>24</sup>amat insights,opcit ,p20.21

<sup>25</sup> amat insights,opcit,p20-21

<sup>26</sup> Official Gazette," issue number 34.

<sup>27</sup> Article 2 of Decree 07-145 mentioned above.

<sup>28</sup>Official Gazette, issue number 37.

<sup>29</sup>Refer to Article 4 of the aforementioned Decree 07-145.

<sup>30</sup> Refer to Article 6 of the aforementioned Decree 07-145.

<sup>31</sup> Refer to Article 7 of the aforementioned Decree 07-145.

<sup>32</sup> Refer to Article 21 of Decree 07-145 mentioned above.

<sup>33</sup>[unece.org](http://unece.org), accessed on: 03/28/2023 at 14:45.

<sup>34</sup> Globally Harmonized System, section: 1-1-3, p. 13 available on the website [unece.org](http://unece.org), accessed on 03/28/2023 at 14:45.

<sup>35</sup> Yahia Ounas, *Legal Mechanisms for Environmental Protection in Algeria*, PhD Thesis, University of Tlemcen, p. 305.

<sup>36</sup> Naima Amara (2008), *The Precautionary Principle and the Responsibility of Professionals*, PhD Thesis, University of Tlemcen, p. 307.

<sup>37</sup> Yahia Ounas, previously cited, p. 302.

<sup>38</sup> Sheikh Bousamaha, *Environmental Protection in Light of the Precautionary Principle*, Al-Baheth Journal of Academic Studies, Algeria, p. 109. See also: Amal Fekiri, *Adoption of the Precautionary Principle in the Field of Health Risks*, *Journal of Legal and Political Research and Studies*, Vol. 1, No. 1, 2015, p. 78.

<sup>39</sup> Yahia Ounas, previously cited, p. 302.

<sup>40</sup> "Lamia Hamadou Filali, *The Precautionary Principle as a New Dimension of Civil Liability from Compensation to Prevention*, PhD Thesis, University of Algiers, 2021, p. 221. Yazid Dellal, Thani Asra Qazi, *Civil Liability for Damage to the Natural Environment in Court*, *Journal of Ijtihad for Legal and Economic Studies*, p. 826."

<sup>41</sup> Abdelrahman Boufelja, *Civil Liability for Environmental Damage and the Role of Insurance*, PhD Thesis, University of Tlemcen, 2016, p. 112.

<sup>42</sup>"Naima Amara, previously cited, p. 307."

<sup>43</sup> "Olivier Claud, *The Precautionary Principle in Environmental Law*, Presses Universitaires de France, pp. 71-43."

<sup>44</sup>Olivier Claud, previously cited, p 44. "What happened during the Seveso disaster available at: ar.histoire.ucad.org, accessed on 07/01/2020, at 10:20. Mohamed Ben Ali, Kouider Chaachou, Establishing the Precautionary Principle in Algerian Environmental Law, *Al-Mi'yar Journal*, Vol. 12, No. 01, 2021, p. 186, available on the website: asjp.ceriste.dz, accessed on: 06/09/2023, at 20:58."

<sup>45</sup> Guy Canivet, the precautionary principle in the jurisprudence of the Court of Cassation, *Risques.fr* magazine, No. 57, March 2004, p. 68, consulted on: 26/09/2020 at 18:13.

<sup>46</sup> Guy Canivet, op. cit., p. 72

<sup>47</sup>Prieur Michel, op.cit, p5.

<sup>48</sup> The most famous environmental disasters caused by chemicals available on the website: NOTA.NET, accessed on 1/07/2020 at 21:08."

<sup>49</sup>The most famous environmental disasters caused by chemicals are available on the website: NOTA.NET, accessed on 1/07/2020 at 21:08.

<sup>50</sup> Mohamed Abdelrahman Al-Wakil, previously cited, p. 3.

<sup>51</sup>From Texas to Germany, the worst disasters involving ammonium nitrate are available on the website dw.com, accessed on 11/01/2021 at 23:17.

<sup>52</sup> "Yahia Ounas, previously cited, p. 307."

<sup>53</sup> Khaled Bousafsaf, (2009), *Legal Mechanisms for Prevention of Natural and Technological Hazards and Disaster Management in Algeria*, PhD Thesis, University of Setif, p. 28.

<sup>54</sup>Shahida Qada, *Objective Liability System of the Producer and the Issue of Financial Ease*, paper presented at the Fifth National Forum on 'Consumer Protection and Issues of Civil Liability', held on December 9-10, 2015, p. 14, available on the website: univ-adrar.edu.dz, accessed on June 9, 2023, at 20:43.

<sup>56</sup> Medine Amel, *Classified Facilities*, Master's Thesis, University of Algiers, 2013, p. 170

<sup>57</sup> Fawaz Saleh, Zouzan Ibrahim Mohammed, *Causal Link and its Difficulty to Prove in Environmental Damages*, *Journal of Tishreen University for Research and Scientific Studies*, Vol. 36, No. 6, 2014, p. 130."

<sup>58</sup> Naima Amara, previously cited, p. 344.

<sup>59</sup>Yahia Ounas, previously cited, p. 77.

<sup>60</sup> Abdelrahman Boufelja, (2016), *Civil Liability for Environmental Damage and the Role of Insurance*, PhD Thesis, previously cited, p. 76.

<sup>61</sup> Fawaz Saleh, Zouzan Ibrahim Mohammed, previously cited, p. 132.

<sup>62</sup> The same reference, p. 132.

<sup>63</sup> Fawaz Saleh, Zouzan Ibrahim Mohammed, previously cited, p. 133.

<sup>64</sup> Abdelrahman Boufelja, previously cited, p. 78.

## **Bibliography :**

### **First - Books:**

- Ibn Manzur, (no publication year), *Lisan al-Arab*, Volume 6, Dar Sader, Beirut, 1952, available on the website: Wsq Feya.com, accessed on: 22/06/2020 at 09:05.
- Amer Ahmed Ghazi Mona, *Industrial Environment and Its Protection Methods*, Dar Dijla, Iraq, 2010.
- Mahmoud Shakir Abdul Hussein, *Chemical Industries*, Dar Al-Yazouri for Publishing and Distribution, Jordan, 2007.

- Soil Amendments, Lecture available on the website: [iku.atu.edu.iq](http://iku.atu.edu.iq), accessed on: 05/05/2023, at 12:30.
- Majd al-Din Muhammad ibn Ya'qub al-Fayruzaḅadi, (no publication year), *Al-Qamus al-Muhit*, Al-Risalah Foundation, Sixth Edition.
- Mazhar Ahmed Dawood al-Mawsili, *Plant Nutrition*, Dar Al-Kutub Al-Ilmiyya, Cairo, Egypt, 2019.

### Second: University Theses

- Wanas Yahya, (2007), *Legal Mechanisms for Environmental Protection in Algeria*, Ph.D. Thesis, University of Tlemcen.
- Boflah Abderrahman, (2016), *Civil Liability for Environmental Damage and the Role of Insurance*, Ph.D. Thesis, University of Tlemcen.
- Bousafsaf Khaled, (2019), *Legal Mechanisms for Prevention of Major Natural and Technological Hazards and Disaster Management in Algeria*, Ph.D. Thesis, University of Setif.
- Ammara Naïma, (2018), *The Precautionary Principle and Professional Responsibility*, Ph.D. Thesis, University of Tlemcen.
- Lamia Hamadou Filali, (2021), *The Precautionary Principle as a New Dimension of Civil Liability from Compensation to Prevention*, Ph.D. Thesis, University of Algiers.
- Medin Amal, (2013), *Classified Establishments*, Master's Thesis, University of Algiers.

### Third - Articles:

- Akram Thabit al-Rawi, Nadia Hanoun Salman, Aswan Hamdallah Aboud al-Biyar, *Production of Yeast Extract*, *Journal of Biotechnology Research Center*, Volume 5, Issue 2, 2011, pp. 36, available on the website: [www.iasi.net](http://www.iasi.net), accessed on: 05/05/2023, at 12:52.
- Most Famous Environmental Disasters Caused by Chemicals, available on the website: [NOTA.NET](http://NOTA.NET), accessed on: 01/07/2020, at 21:08.
- Boussamahe El Sheikh, (2015), *Environmental Protection in Light of the Precautionary Principle*, *Al-Bahith Journal for Academic Studies*, Algeria, Issue 5, pp. 102-113.
- Ben Ali Mohammed, Shashoua Gaidar, *Dedication of the Precautionary Principle in Algerian Environmental Law*, *Al-Mu'ayyad Journal*, Volume 12, Issue 01, 2021, pp. 181-193, available on the website: [asjp.ceriste.dz](http://asjp.ceriste.dz), accessed on: 09/06/2023, at 20:58.
- Hassan Hatim Al-Yasiri, *The Impact of Chemical Control on Soil Pollution West of Akla City*, *Journal of Babylon University for Human Sciences*, Volume 24, Issue 26, 2016, pp. 1141-1151.
- Fawaz Saleh, Zouzan Ibrahim Mohammed, (2014), *Causal Connection and the Difficulty of Proving it in Environmental Damage*, *Tishreen University Journal for Research and Scientific Studies*, Volume 36, Issue 6, available on the website: [shamra.sy](http://shamra.sy), accessed on: 02/07/2020, at 20:30.
- Mohamed Abdel Rahman El Wakil, *Urea and Ammonia Fertilizers Incidents Worldwide*, available on the website: [asp.mans.edu.eg](http://asp.mans.edu.eg), accessed on: 2/07/2020, at 01:28.
- What Happened During the Seveso Disaster, available on the website: [ar.histoire.ucad.org](http://ar.histoire.ucad.org), accessed on: 01/07/2020, at 20:57.
- Mustafa Khaled, *Agricultural Fertilizers, Their Uses and Damages*, available on the website: [arebixvpapers.arabxiv.ar](http://arebixvpapers.arabxiv.ar), accessed on: 12/06/2020, at 16:30.

- Muhammad Alaa al-Din Osman, Muhammad al-Sayed Hussein, Mukhtar Abdul Hafeez, Current Situation of Production and Consumption of Nitrogen Fertilizers Used in Egyptian Agriculture, Egyptian Journal of Agricultural Economics, Volume 27, Issue 1, March 2018.

#### **Fourth - Interventions:**

- Shahida Leaders, Objective Liability System for Producers and Financial Ease Issue, Intervention Presented at the Fifth National Forum on "Consumer Protection and Problems of Civil Liability", held on 9-10 December 2015, available on the website: univ-adrar.edu.dz, accessed on: 09/06/2023, at 20:43.

#### **Fifth: Legal Texts**

- Law No. 03-10 dated July 10, 2019, on Environmental Protection within the Framework of Sustainable Development, Official Gazette No. 43.
- Presidential Decree No. 98-158 dated 16/05/1998 Approving with Reservations the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, Official Gazette No. 32 issued on May 19, 1998.
- Executive Decree No. 06-198 dated May 31, 2006 Regulating the Equivalent Organization of Classified Institutions for Environmental Protection, Official Gazette No. 37.
- Executive Decree 07-144 dated 2 Jumada al-Awwal 1428 AH corresponding to May 19, 2007, Establishing the List of Classified Establishments, Official Gazette, No. 34.
- Executive Decree 07-145 dated Jumada al-Awwal 1428 AH corresponding to

#### **2-1- Articles:**

- Fabien KNITTEL, 2017, Agronomy of fertilizers in France in the 19th century, history and rural societies, Vol 49, on the website: CAIRN.info, consulted on 21/06/2020 at 18:55.
- Guy CANIVET, 2004, the precautionary principle in the case law of the Court of Cassation, Risks Review, No. 57, consulted on 26/09/2020 at 18:13.
- Louis ROBERT, Demystification of organic and mineral fertilizers. On the website: mapaq.gouv.q.c.ca, consulted on: 07/01/2020 at 19:15.
- Moussa NDOYE, 1998, Quality and treatment of domestic and agricultural wastewater, course of the National Center for Agricultural Research, on the website: intranet.isra.SN, consulted on: 10/07/2020 at 19:15.
- Michel PRIER, the precautionary principle, legiscompare.fr, consulted on: 26/06/2020 at 17:11.
- Olivier Claud DORON, 2009, the precautionary principle from environment to health, on the website: CAIRN.INFO, Presses Universitaires de France, consulted on: 21/06/2020 at 19:30.
- MARENDET, François, GOELLER, Jérôme, PASKAL, Michel, Risk management related to the presence of ammonium nitrates in maritime and river ports, General Council for Environment and Sustainable Development, France, May 2021, p81.

#### **2-2- Websites:**

- ELmaany.com, consulted on: 22/06/2020 at 20:30.
- [www.marefa.org](http://www.marefa.org), consulted on: 25/01/2022 at 18:52.
- Asmidal.dz.com, consulted on: 27/01/2023 at 15:08.