End of a Ship's Life Between Environmental Protection Requirements and Maritime Safety

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Abstract:

The ship is the primary instrument for carrying out maritime transport activities. Given its economic importance, various national and international legislations have surrounded it with integrated legal regimes regulating every stage of its life, starting from its construction, then its operation, up to the termination of its seaworthiness. This latter stage is considered one of the most sensitive stages due to the threats it poses to the environment as well as to workers' safety, since the process of disposing of end-of-life ships raises challenges related to how they are dismantled and recycled in a manner that preserves the environment and ensures the safety of workers and maritime facilities.

In this context, international attention has been directed toward establishing legal rules to regulate this stage, most notably the Hong Kong Convention of 2009 on the safe and environmentally sound recycling of ships, along with the Basel Convention of 1989 concerning the transboundary movement of hazardous wastes and their

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disposal. In addition to these specific conventions, the general conventions related to the prevention of pollution from ships, namely MARPOL for the years 1973 and 1978, as well as the SOLAS Convention for maritime safety of 1974, remain the fundamental rules applied to protect the environment and ensure maritime safety.

Keywords: End Of a Ship's Life; Environmental Protection; Maritime Safety.

1. INTRODUCTION

The ship is the principal instrument for carrying out maritime navigation activities, which makes it a pivotal element in the global economy. With the enormous development of commercial fleets and the diversification of transported goods, the damage caused by ships to the marine environment has increased, as have safety threats, which has led to the need to pay attention to regulating every stage of a ship's life, including the stage of the end of its life.

In the past, the end-of-life stage of a ship did not raise any problems, as end-of-service ships were disposed of by sinking them in the open sea, and this sinking did not result in significant damage, since ships were made of wood and without engines. However, the current development in shipbuilding makes disposal by sinking at the end of a ship's life cause serious damage to the marine environment, because ships are now made from materials that are more polluting than before, and their wreckage does not decompose easily. In addition, ships have become more numerous and larger in size. Consequently, the end of a ship's life is no longer viewed as a purely technical matter, but rather as a legal and environmental issue of great importance, since the end of a ship's life—regardless of its cause, whether due to the expiry of its service life, its wrecking, or its abandonment—brings it

into a new stage, namely the stage of dismantling and recycling.

The processes of ship dismantling and recycling involve highly significant risks, whether environmental risks due to oils and hazardous substances that leak from ships during the dismantling stage, or risks related to workers' health and safety resulting from their inhalation of toxic gases and their handling of rusted metals.

In view of the international community's awareness of the seriousness of the damage resulting from this stage, an international legal framework has been established to manage it in a manner that ensures a balance between safety requirements and the necessity of environmental protection, including the Basel Convention of 1989 concerning the transboundary movement of hazardous wastes and their disposal[1], the Nairobi Convention on shipwrecks of 2007[2], as well as the Hong Kong Convention of 2009 on ship recycling[3].

The study of this topic is of great importance, whether legal, environmental, or even economic, due to the legal issues it raises, particularly with regard to the responsibilities of states and shipowners for damages generated at this stage, in addition to the issues raised concerning the legal nature of the ship after the end of its life and the deletion of its registration: does it remain subject to the international conventions relating to ships, such as the MARPOL and SOLAS Conventions, or does it lose the designation of a ship and become merely waste?

As for environmental importance, it is certain that managing the dismantling and recycling stage of ships in a way that ensures environmental protection is among the top priorities of the Hong Kong and Basel Conventions, given the catastrophic damage caused by this process in recycling

centers, especially in some developing countries that lack monitoring and preventive mechanisms.

Although the end of a ship's life causes it to lose its status as an important economic element in maritime commercial life, it may acquire greater importance after being recycled by being economically exploited in several fields, such as tourism, where many ships have been converted into hotels and high-end restaurants that generate considerable profits for their owners.

Despite the existence of international frameworks that have established standards to regulate the end-of-life stage of ships in a manner that ensures safety and environmental protection, the practical application of these standards still faces major challenges on the ground. Hence, the following problem arises: how can a balance be achieved between protecting the marine environment and ensuring the safety of workers during the end of a ship's life?

To answer this problem, we adopted the analytical method by analyzing the legal frameworks governing the end of a ship's life, and we also used the descriptive method by explaining and describing the various technical operations that take place during this stage.

The study of this topic requires dividing it into two sections: in the first section, we address the conceptual framework of the end of a ship's life, while in the second section, we address the legal framework for regulating the end of a ship's life.

2. The Conceptual Framework of the End of a Ship's Life

The end of a ship's life refers to its transition from the stage of operational readiness to the stage of withdrawal from service and its final disposal, whether through

dismantling, recycling, demolition, or scrapping. This stage is associated with a set of material, economic, legal, and environmental factors, among the most important of which are the aging of the ship's hull and the corrosion of its components, the high costs of maintenance, or its non-compliance with safety and marine environmental protection standards stipulated in international conventions[4].

The end-of-life stage of a ship raises multiple legal issues due to the obligations and effects resulting from it, especially with regard to maintaining the safety of maritime navigation and reducing potential negative impacts on the marine environment. Therefore, defining the concept of the ship and clarifying its legal characteristics constitutes an essential step toward understanding the legal framework governing the end of its life.

Establishing the conceptual framework of the end of a ship's life requires addressing the concept of the end of a ship's life in the first requirement, then addressing the effects of the end of a ship's life in the second requirement.

2.1 The Concept of the End of a Ship's Life

Determining the concept of the ship and defining its legal nature is an essential step toward understanding the legal regime governing the various stages it goes through, including the stage of the end of its life. This is because the legal nature of the ship raises a major issue at the end-of-life stage, as it transforms from being a navigational instrument subject to the rules of maritime

law into a dilapidated structure.

The end of a ship's life occurs for multiple reasons and causes serious effects and repercussions, which we will attempt to encompass in this requirement. In its first section, we address the concept of the ship; in the second section, we address the legal nature of the ship at the end of its life; and in the third section, we address the reasons for the end of a ship's life.

2.1.1 The Concept of the Ship

Determining the concept of the ship requires defining it (First) and then determining the conditions for an installation to acquire the description of a ship (Second).

A. Definition of the Ship:

Defining the ship is of great importance in order to distinguish it from maritime installations that have emerged as a result of current technological developments, such as tourist devices like the water bike (jet ski), hovercraft, and sailboards, as well as other installations such as drilling and hydrocarbon exploration platforms[5].

The Algerian legislator defined the ship in Article 13 of the Algerian Maritime Code by stating: A ship, within the meaning of this law, is considered to be every maritime structure or floating mechanical device that carries out maritime navigation, either by its own means or by towing, or intended for such navigation[6]. Jurists have also defined it as a floating installation intended for maritime navigation as a regular activity, while others have defined it as an installation capable of facing the dangers of the sea and used habitually and specifically

for maritime navigation[7].

B. Conditions for an Installation to Acquire the Description of a Ship:

From the definition of the ship, we can derive the conditions for an installation to acquire the description of a ship, which are as follows:

B.1 Condition of the ship's seaworthiness for maritime navigation:

This condition means that the ship must be capable of navigating at sea and confronting its dangers. It is noted that the Algerian legislator stipulated the ship's ability to carry out maritime navigation, while ignoring river navigation, and the reason may be attributed to the absence of rivers suitable for river navigation in Algeria[8].

It is observed that the Algerian legislator, through Article 13 of the aforementioned Maritime Code, did not require the ship's ability to move at sea by its own independent means, as understood from the phrase either by its own means or by towing. Consequently, cranes, marine docks, and all other floating devices that do not move autonomously fall within the concept of a ship. This is contrary to what doctrine and jurisprudence have held, which require the addition of another condition, namely the installation's ability to move by its own means and not merely its ability to float on the surface of the water[9].

B.2 Condition of the ship being intended for maritime navigation as a regular activity:

An installation is not considered a ship unless it carries out maritime navigation as a regular activity or is allocated for it.

- **Condition of allocation of the ship for maritime navigation:** This means that an installation is considered a ship once it is allocated for maritime navigation even if it does not actually carry it out[10]. Accordingly, all floating installations allocated for inland or river navigation fall outside the scope of the ship, as do all floating installations that operate in ports, such as floating docks and floating cranes, and others. Also excluded from the description of a ship are seaplanes, water bikes (jet skis), boats, and sailboards, despite their ability to float and move on the surface of water, due to their lack of allocation for maritime navigation[11].
- **Condition of practicing maritime navigation on a habitual basis:** Although the Algerian legislator did not stipulate the condition of habitual practice, the majority of doctrine holds that if an installation does not carry out maritime navigation on a habitual basis, it is not considered a ship, such as when it undertakes, on an exceptional basis, one voyage or several scattered maritime voyages[12].

2.1.2 The Legal Nature of the Ship at the End of Its Life

Jurisprudential opinions have differed regarding the legal nature of the ship at the end of its life, between those who consider it to become merely waste or scrap, a second opinion that sees it as an economic commodity, and a third opinion that considers it to continue to bear

the status of a ship until its dismantling is completed. Each opinion has its arguments and justifications, which we address as follows:

A. The ship at the end of its life becomes hazardous waste:

This view holds that a ship at the end of its operational life is considered hazardous waste, as confirmed by the Basel Convention on hazardous waste. This is due to its containing toxic substances such as asbestos, persistent organic compounds, and heavy metals, which pose a risk to the environment and public health[13].

B. The ship at the end of its life becomes an economic commodity:

Some jurists argue that classifying the ship at the end of its life as hazardous waste does not reflect its economic nature, since it contains valuable materials such as recyclable steel, which also makes it an economic commodity with market value. For this reason, it is necessary to establish a balanced legal framework to regulate the end of a ship's life in a manner that ensures environmental protection and safety on the one hand, while preserving, on the other hand, the economic interests of shipowners[14].

C. The ship at the end of its life continues to bear this status:

Some doctrine holds that most ships destined for dismantling are still seaworthy, which is considered the most important condition for bearing this status. From this perspective, there is no objection to continuing to consider it a ship so as to prevent its owners from

evading the application of the international conventions governing it, which aim to protect the environment and workers from its risks. However, adhering to this status also has its drawbacks, as it enables shipowners to evade the application of the Basel Convention, one of whose most important provisions is not allowing the export of hazardous waste to developing countries except with authorization from the exporting, importing, and even transit states[15].

However, the prevailing opinion holds that a ship at the end of its life, whether it is still seaworthy or has lost its seaworthiness, cannot continue to bear this status because it is no longer allocated for maritime navigation nor does it practice it. Rather, it has a dual nature: hazardous waste and, at the same time, an economic commodity.

Accordingly, it can ultimately be said that the ship at the end of its life constitutes a complex legal entity due to the overlap of its economic, environmental, and legal dimensions. On the one hand, it is considered hazardous waste requiring strict control, and on the other hand, it is regarded as an economic asset of value, which makes its regulation a complex challenge.

One of the most prominent cases confirming the controversy over the legal nature of the ship at the end of its life is the case of the ship Clémenceau, an old French aircraft carrier built in the 1960s. At the end of its operational life, there were plans to dismantle and recycle it, but it sparked major controversy due to potential environmental risks. The question arose as to whether the ship should be considered a material asset

owned by the French state and thus subject to its control and laws, including the choice of the dismantling location—which it indeed chose to be India, a country that does not possess effective and strict mechanisms for oversight of this process—or whether it should be considered hazardous maritime waste subject to international environmental protection laws and to safety standards when carrying out dismantling and recycling operations.

The case concluded with pressure being imposed on the French state to respect environmental standards and to comply with the Basel Convention on hazardous waste, and it also increased awareness of the necessity of establishing a precise and clear legal framework regulating the end of a ship's life[16].

1.2.3 Causes and Implications of the End of a Ship's Life

The end of a ship's life represents a decisive stage in its life cycle. A ship reaches this stage for several reasons, whether technical, environmental, or economic (First), and the end of a ship's life results in several effects, including environmental, legal, economic, and social effects (Second).

A. Causes of the End of a Ship's Life:

The causes of the end of a ship's life can be divided into technical, environmental, and economic causes.

A.1 Technical causes of the end of a ship's life:

Technical causes refer to the set of factors that render a ship, from an engineering or operational standpoint, incapable of continuing to sail safely or efficiently.

Among these factors are the following:

A.1.1 Structural aging of the ship and the decline of its operational efficiency:

The average age of ships heading for dismantling is about 30 years, and it is expected to decrease to approximately 20 to 25 years. As a ship ages, its steel structure deteriorates and corrodes, and the need for costly repairs increases, which do not sufficiently guarantee safety[17].

In addition, the aging of the ship leads to the deterioration of its mechanical systems, such as engines, boilers, pumps, pipes, and propulsion systems, which may expose it to sudden stoppages. Moreover, old ships do not keep pace with modern developments in navigation systems, such as radar and tracking systems. This makes them unable to meet modern navigation requirements or the new maritime safety standards imposed by international organizations and conventions[18].

It should be noted that neither international nor national law has specified a statute of limitations for ships or a maximum operational lifespan, which raises a problem regarding the moment at which a ship transitions from a state of activity to a state of end of life.

A.1.2 Damage to the ship as a result of a maritime accident[19]:

A ship may be exposed during its navigation to serious accidents that lead to the loss of its seaworthiness and its inability to be repaired, or even to its sinking and loss. Such accidents may include explosions, fires, and

maritime collisions. An example of ships that lost their seaworthiness as a result of an accident is the ship Prestige, which encountered a severe storm off the coast of Galicia, Spain, causing damage to its hull and the leakage of water into it, leading to its sinking in the ocean on November 19, 2002[20].

A.2 Environmental causes of the end of a ship's life:

The continued operation of old ships leads to serious environmental risks due to the accumulation of hazardous materials on board, such as asbestos, lead, mercury, ballast water carrying toxic gases, oils, and oil residues, not to mention electronic waste that releases dioxins when burned. The older the ship, the greater the risks of these materials leaking, which puts pressure on coastal states to expedite removing the ship from service[21].

A.3 Economic causes of the end of a ship's life:

As ships age, maintenance and repair costs increase, such as the costs of replacing engines, repairing the hull, and maintaining pipes and tanks, in addition to rising insurance expenses. Consequently, the ship becomes a financial burden that its owner seeks to dispose of. Furthermore, with the developments in modern ships, their lower fuel consumption, and higher speed compared to old ships, the latter have become less in demand on the market or are sought at very low prices. Accordingly, dismantling becomes the most rational option for their owner[22].

B. Implications of the End of a Ship's Life:

The end of a ship's life leads to its entry into a new stage,

namely the stage of dismantling and recycling. International legislators have surrounded this stage with a legal framework through the conclusion of many international conventions aimed at regulating this stage due to the serious implications that may result from it, whether environmental, legal, economic, or social.

B.1 Environmental implications:

The end of a ship's life is one of the most environmentally sensitive stages due to the major risks resulting from the presence of hazardous materials within its structure. End-of-life ships contain enormous quantities of asbestos, oils, and waste. Moreover, traditional dismantling methods in some developing countries, particularly beaching, lead to the leakage of toxic substances into the marine and terrestrial environment, which harms biodiversity and exposes coastal communities to direct danger[23].

B.2 Legal implications:

Despite the existence of an international legal framework governing the end-of-life stage of ships, this stage still raises complex legal issues mainly resulting from the overlap between the international conventions concluded in this field, particularly the overlap between the Basel Convention of 1989 concerning the transboundary movement of hazardous wastes and their disposal, and the Hong Kong Convention of 2009 on ship recycling. While the Basel Convention classifies end-of-life ships as hazardous waste and subjects them to strict transport and disposal procedures, the Hong Kong Convention considers a ship at the end of its operational life merely

recyclable material. This difference leads to a conflict of legal rules applicable when ships are transferred between states, as each convention establishes a legal regime different from the other[24].

B.3 Economic implications:

Ship recycling constitutes an economic activity of great importance, as it allows for the recovery of about 90 percent of metallic materials, especially steel, thus contributing to reducing the extraction of raw materials and preserving natural resources. Investment in this activity also contributes to the creation of many jobs and enhances the sustainable circular economy by transforming waste into usable materials. However, this important economic activity faces major challenges mainly related to the weak regulatory capacity of the states receiving these ships, in whose territories dismantling and recycling are carried out, which may lead to lower-than-expected economic returns[25].

B.4 Social implications:

One of the most significant negative effects resulting from the end of a ship's life and its entry into the dismantling and recycling stage is the harm suffered by workers in dismantling facilities, as they work under hazardous conditions lacking health protection and occupational safety, especially since they operate in an environment filled with toxic materials. This leads to the spread of occupational diseases and injuries. Ship dismantling also raises ethical and legal issues related to the exploitation of labor in developing countries, where workers are subjected to the harshest conditions in

exchange for meager wages[26].

2. The Legal Framework of the End of a Ship's Life

The end-of-life stage of a ship is considered one of the most sensitive stages, as it is no less dangerous than the construction stage or even the operation stage, due to the risks it poses to the safety of workers as well as to the environment. At this stage, the ship transforms from a mere means of maritime transport into a structure that may pose a danger if the process of its disposal is not regulated within a clear and precise legal framework.

Given the international community's awareness of the seriousness of this stage, it has paid attention to concluding a set of international conventions aimed at protecting the marine environment from leaks and polluting emissions that may result from ship dismantling or handling of their components, as well as ensuring the safety of workers at dismantling sites. This will be addressed through two requirements: in the first requirement, we address legal measures for protecting the environment at the end of a ship's life, and in the second requirement, we address legal measures to ensure workers' safety at the end of a ship's life.

2.1 Legal Measures for Environmental Protection at the End of a Ship's Life

Protecting the environment from the harmful effects of ships at the end of their life cycle finds its legal framework within three main conventions: the Basel Convention on the control of transboundary movements of hazardous wastes and their disposal, the Nairobi Convention on the removal of wrecks of 2007, and the

Hong Kong Convention for the recycling of ships of 2009. At the national level, the Algerian legislator did not regulate this stage in a specific and detailed manner, as it merely provided, in some of its laws—particularly the Maritime Code and Law No. 03-10 relating to environmental protection—for general rules to protect the marine environment from pollution, without dedicating specific provisions to ship dismantling or recycling. Therefore, in this requirement, we will confine ourselves to studying environmental protection measures under the aforementioned international conventions, addressing in the first section environmental protection measures under the Basel Convention, then environmental protection measures in the Nairobi Convention, and in the third section environmental protection measures in the Hong Kong Convention.

2.1.1 Measures of the Basel Convention for Protecting the Environment from the Harm of Ships at the End of Their Life

The Basel Convention was concluded with the aim of confronting the phenomenon of transferring hazardous waste from one country to another without oversight, which threatens public health and the environment, especially in developing countries that lack the necessary capabilities to deal with such waste. The Basel Convention considers end-of-life ships to be hazardous waste if they contain polluting and hazardous materials such as oils, asbestos, and paints containing heavy metals. To achieve its objectives, this convention is based on three main principles, which are:

A. Prior informed consent of the competent authorities:

This principle requires that the owner of an end-of-life ship may not transfer it from one country to another for dismantling unless prior consent is obtained from the exporting state, the importing state, and the transit state. Any state that considers the passage of such a ship through its territory to pose a threat to its marine environment may prohibit it and refuse to grant the necessary authorization, or may impose conditions for that purpose[27].

B. The principle of environmentally sound management:

The Basel Convention stipulates that every operation of transporting or disposing of hazardous waste must be carried out in accordance with the principle of environmentally sound management, which is defined as: the application of technical and administrative measures that ensure the protection of human health and the environment from any harmful effects that may result from waste, starting from its production or collection, through transport, and up to its final disposal[28].

The principle of environmentally sound management also applies to ships at the end of their life, due to their classification as hazardous waste under the Convention. Accordingly, the owners of such ships are required to comply with the provisions of the Basel Convention in order to achieve this principle. This is done by inventorying hazardous materials prior to transport or dismantling, classifying them according to their type and

level of hazard, notifying the concerned states in order to obtain a transport permit, dismantling the ship in prepared and licensed facilities in accordance with strict environmental standards[29], and disposing of its waste in a safe manner. Disposal of such waste at sea is prohibited, as the Convention requires the treatment of all hazardous materials in a manner that reduces their impact on the environment, in addition to requiring the issuance of waste tracking documents from the source through to final treatment[30].

2.1.2 Measures of the Nairobi Convention for Protecting the Environment from the Harm of Ships at the End of Their Life

A maritime accident is considered one of the most important causes of the end of a ship's life—as previously mentioned—as it may cause damage to the ship that cannot be repaired, leading the owner to abandon it, or may result in its sinking, thereby giving the ship the status of maritime wreck.

In the past, owners of dilapidated ships used to dispose of them by abandoning them, leaving them, or sinking them in the open sea, an area that was referred to as ship graveyards. Due to the catastrophic environmental damage caused by this method of disposing of ships to the marine environment, the Nairobi Convention on the Removal of Wrecks was concluded on May 18, 2007, and entered into force on April 14, 2015. However, the application of this Convention is limited in scope to the exclusive economic zone of the States Parties, provided that the zone does not exceed 200 nautical miles. Wrecks

located in territorial waters are subject to the national laws of the state in whose waters the wreck is found, while those located on the high seas fall under the discretionary authority of the judge with regard to the rules governing their removal[31].

The Nairobi Convention established a set of rules aimed at removing shipwrecks in an environmentally sound manner. It set out a number of procedures that must be taken, namely:

A. Identification of wrecks that pose a danger to the environment:

The Convention requires the coastal state to assess any wreck located in its waters to determine whether it poses a risk to the marine environment or navigation, in order to take the appropriate decision on how to remove it or control it before it causes environmental harm[32].

B. Placing warning signals on the wreck:

If it is determined that the wreck poses a danger to the environment, the affected state must place warning signals on it using floating markers or any other appropriate means, in addition to the necessity of announcing the location and characteristics of the wreck to maritime authorities to ensure environmental safety and to avoid collisions with it[33].

C. Environmentally sound removal of the wreck:

The Convention obliges the coastal state to remove the wreck in a manner that minimizes its impact on the environment, through the use of modern equipment and techniques that protect health and the marine environment, in coordination with the shipowner[34].

D. Charging the shipowner with the costs of wreck removal:

The Convention obliges the shipowner to bear all the costs of removing and marking the wreck, unless it is proven that the damage occurred for reasons beyond the owner's control, such as war, or due to the fault of the coastal state, etc[35].

E. Obliging the shipowner to provide a financial guarantee covering the costs of wreck removal:

The Nairobi Convention requires every ship exposed to risk to have financial insurance or a financial guarantee to cover the cost of wreck removal. This document must be issued by a competent and accredited authority, ensuring that the owner is capable of paying the costs of wreck removal when necessary, and sparing the coastal state from bearing these costs[36].

2.1.3 Measures of the Hong Kong Convention for Protecting the Environment from the Harm of Ships at the End of Their Life

Given the development of the shipbuilding industry, old ships have become an economic resource that can be utilized through their dismantling and recycling. The first convention specifically concerned with ship recycling was concluded in Hong Kong in 2009, and it only entered into force on June 26, 2025[37]. This Convention aims to control the environmental impact resulting from the dismantling and recycling of ships, and for this purpose it imposed several rules, including the following:

A. Dismantling and recycling must be carried out in licensed facilities:

The Convention requires ship dismantling and recycling facilities to obtain a license to practice this activity from the competent authorities of the state in whose territory dismantling takes place. Such a license is only granted if these facilities meet the conditions and standards imposed by the Convention, such as the presence of technical mechanisms that prevent or reduce waste spillage, and the availability of equipment for temporary treatment and safe storage of such waste[38].

B. The necessity of establishing a ship recycling plan:

Before commencing the process of dismantling and recycling a ship, the Convention requires the establishment of a plan. This plan must take into account all necessary measures and precautions to protect the environment from pollution resulting from this process, and must not focus solely on economic interests such as reducing costs and increasing profits. Rather, environmental protection and ensuring the safety of workers must be the top priority[39].

C. Ensuring environmentally sound management of waste resulting from dismantling:

The Convention emphasizes the necessity of environmentally sound management of waste and hazardous materials resulting from dismantling, by preparing an inventory of hazardous materials in order to identify the nature of the polluting substances present and how to limit their danger. It then obliges recycling facilities to take all necessary measures and provide the required means to prevent pollution by these materials. The Convention also prohibits the random disposal,

burning, or dumping of these materials into the sea[40].

2.2 Legal Measures to Ensure Workers' Safety During the End-of-Life Stage of a Ship

The end-of-life stage of a ship is considered one of the most dangerous stages for workers' health and physical safety, due to the physical and chemical risks they are exposed to in dismantling and recycling facilities[41]. Practical experience confirms this. Given the international community's awareness of the seriousness of this stage for workers, strict rules were established to protect them in the Hong Kong Convention, especially since this Convention was jointly prepared by the Parties to the Basel Convention, the International Labour Organization, and the International Maritime Organization. Therefore, it placed workers' safety among its priorities and imposed several measures to protect them, most of which are preventive measures, leaving remedial measures after the occurrence of an accident or damage to the general provisions of the labor law of the state where the accident occurs. Accordingly, in this requirement, we address preventive measures before the commencement of work (preparatory), then preventive measures during work (operational).

2.2.1 Preventive Measures to Protect Workers Before the Commencement of Work

These are the measures taken before workers begin the dismantling and recycling operations of the ship, some of which relate to preparing the ship, and others to preparing the recycling facility, in order to ensure workers' safety from the outset. Among these measures

are:

A. Inventory of hazardous materials:

Before commencing work, it is necessary to inventory the hazardous materials on board the ship—as previously mentioned—not only for the purpose of taking the necessary precautions to protect the environment, but also in order to enable workers to understand the degree of danger of the materials they handle and to clarify how to protect themselves from their harmful effects on their health and physical safety[42].

B. Preparation of recycling facilities:

This refers to equipping these facilities with all the machinery and equipment necessary to ensure the security and safety of workers. This is what is often lacking in dismantling facilities in developing countries, which lack even the most basic means of worker protection, as these facilities aim to carry out the activity at the lowest possible cost, which constitutes a very serious human rights crisis[43].

C. Establishing a recycling plan that ensures workers' safety:

This is done by establishing safe and clear procedures for dealing with hazardous materials during dismantling in a manner that reduces the likelihood of exposure to accidents and occupational diseases[44].

2.2.2 Preventive Measures to Protect Workers During Work

These are the set of measures that recycling facilities must comply with during the course of work, which can be summarized as follows:

A. Securing working conditions:

This is achieved by providing suitable and safe working conditions for workers, in particular by providing designated areas for welding and cutting operations where the heat generated by this activity is controlled, and where sparks and friction with flammable materials are prevented. It is also necessary to provide personal protective equipment such as gloves and heat-resistant suits. In addition, enclosed work areas must be equipped with appropriate ventilation systems and devices to monitor toxic gases or oxygen deficiency, as well as the provision of safety equipment such as breathing apparatuses before allowing workers to enter[45].

B. Training of workers:

The Convention requires the training of workers in the use of protective equipment, in addition to educating them on safety procedures when handling hazardous materials, with the necessity of assigning supervisors to oversee the implementation of these procedures[46].

C. The necessity of establishing an emergency and first-aid plan:

The Convention requires dismantling facilities to establish an emergency plan that includes procedures for dealing with fires, chemical leaks, and accidents, and to ensure the availability of properly equipped first-aid points[47].

D. The necessity of reporting accidents and occupational injuries:

The Convention requires the recording of every work accident or occupational disease resulting from

dismantling and recycling operations and analyzing it in order to accurately determine its causes, and then taking the necessary precautions to avoid it in the future, with the requirement to send reports in this regard to the competent authority.

It should be noted that the Hong Kong Convention is the only convention that has regulated the end-of-life stage of ships in a precise manner, taking into account environmental protection and workers' safety[48].

Nevertheless, there remains a major problem in the practical application of the provisions of this Convention due to the lack of effective oversight mechanisms, especially in developing countries, in addition to its exemption of warships, ships of less than 500 tons, and ships that navigate exclusively in internal waters from the application of its provisions[49].

3. CONCLUSION:

International legislation has not been limited to regulating the creation or operation of ships, but has also given great attention to the end of their life, given that ships constitute an economic asset that must be exploited. However, this exploitation may cause serious harm to both the environment and workers' health. Therefore, the international legislator has sought to regulate this stage through three main conventions: the Basel Convention on hazardous waste, the Nairobi Convention on the removal of shipwrecks, and the Hong Kong Convention on ship recycling. The latter is considered the most recent and most specialized convention in this field, as it sets out how ships should be utilized at the end of their life in an

environmentally safe manner, while at the same time taking workers' safety into account.

The end of a ship's life, regardless of the reason, may have serious consequences, particularly for the environment and workers' health, if the provisions of these conventions are not respected. Through this study, we have arrived at a set of results, based on which we present a set of recommendations.

Results:

- The life of a ship ends for multiple reasons, including the end of its operational life. What is criticized in legislation is the failure to precisely define the operational lifespan of a ship, or even to establish a precise criterion or require the ship to undergo specific inspections in order to determine whether it is fit for maritime navigation or not.
- There is a contradiction in defining the legal nature of a ship at the end of its life among international conventions: the Basel Convention considers it hazardous waste, whereas the Hong Kong Convention considers it a maritime installation capable of being recycled and therefore subjects it to its provisions, especially since this Convention was concluded under the auspices of the International Maritime Organization, despite the fact that ship recycling is primarily a land-based industry.
- International conventions establish a clear legal framework for regulating this stage of a ship's life, taking into account environmental protection and

workers' safety, but they suffer from challenges in practical implementation due to the failure of dismantling facilities to comply with the provisions of these conventions, especially in the absence of strict oversight and the pursuit of quick profit.

Recommendations:

- Establishing specific criteria for considering a ship at the end of its life, and thus applying the provisions of this stage to it, whether by determining the maximum operational lifespan, or by requiring it to be periodically presented to experts to assess its seaworthiness.
- The necessity for international legislation to adopt a unified interpretation of the nature of a ship at the end of its life in order to eliminate any conflict in safety and environmental protection obligations.
- The need to establish strict procedures to monitor dismantling facilities and to impose severe sanctions for violations of environmental safety and workers' safety obligations and standards.

5. Margins:

1- The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, concluded on March 22, 1989, in Basel, Switzerland, and entered into force on May 5, 1992, ratified by Algeria on March 20, 1994, Official Gazette No. 24.

2- The Nairobi Convention on the Removal of Wrecks, concluded in Nairobi, Kenya, on May 18, 2007, and entered into force on April 14, 2015.

3- The Hong Kong Convention for the Safe and Environmentally Sound Recycling of Ships, concluded in China from May 11 to 15, 2009, and entered into force on June 26, 2025.
4- Boukhamis Wanasah, The Effects of the Ship's Legal Personality on the Safety and Security of Maritime Navigation, Doctoral thesis, Business Law specialization, Faculty of Law, University of Sidi Bel Abbes, 2016–2017, pp. 82–83.
5- Ariyout Wassila, "The Legal Regime of the Ship as a Means of Maritime Navigation," Algerian Journal of Maritime Law and Transport, Issue No. 07, 2018, p. 359.
6- See Article 13 of Ordinance No. 76-80 dated 29 Shawwal 1396 corresponding to October 23, 1976, containing the Algerian Maritime Code, Official Gazette No. 29, as amended and supplemented by Law No. 98-05 dated 1 Rabi' al-Awwal 1419 corresponding to June 25, 1998, Official Gazette No. 47.
7- Wanasah Boukhamis, "The Legal Regime of the Ship in Algerian Maritime Law," Al-Ijtihad Journal for Legal and Economic Studies, Issue No. 01, 2012, p. 70.
8- Article 162 of the Algerian Maritime Code provides: "Maritime navigation includes the following:

- Commercial navigation relating to the transport of goods and passengers.
- Navigation related to fishing, aquaculture, and the exploitation of aquatic resources, and everything related to fishing in general.
- Pleasure navigation for recreational purposes.
- Service navigation practiced at sea and in ports and roadsteads by warships, national naval vessels, and coastal guard vessels."

9- Al-Arabi Boukaaban, The Comprehensive Guide to Maritime Law, Dar Houma, 2020, p. 68.
10- See the text of Article 13 of the Algerian Maritime Code.
11- Al-Arabi Boukaaban, Op. Cit, p. 66.
12- Ibid, p. 66.

13- See Articles 02 and 03 of the Basel Convention on hazardous wastes and their disposal.
14- Lucas Estelle, Le démantèlement et recyclage des navires, Master 2 thesis, University of Nantes, Academic Year 2017–2018, pp. 17–18.
15- See Articles 04 and 06 of the Basel Convention.
16- Yann Aguilia, "À propos des tribulations du 'Clemenceau' (CE, February 15, 2006, Association Ban Asbestos France, Association Greenpeace France, Comité anti-amiante Jussieu, Association nationale de défense des victimes de l'amiante) – Conclusions," Revue du droit public, No. 6, November 2006, pp. 1671–1686.
17- Robin des Bois, Les navires en fin de vie, Press Conference: Cherbourg, Brest, Le Havre, and Marseille, 2005, p. 01.
18- Ibid, pp. 01–05.
19- The Algerian legislator stipulated the end of a ship's life and consequently its deletion from the registration book as a result of its exposure to a maritime accident through the text of Article 37 (a, b) of the Maritime Code, stating: "The ship shall be deleted from the registration book in the following cases:
a- If it sinks, is wrecked, or is damaged.
b- If it is lost or considered lost."
20- Robin des Bois, op. cit., p. 02.
21- Ibid, p. 03.
22- Ibid, pp. 01–05.
23- Boukhamis Wanasah, The Effects of the Ship's Legal Personality on the Safety and Security of Maritime Navigation, Op. Cit, p. 89.
24- Drissi Salah Eddine, Op. Cit, p. 38.
25- Ibid, p. 32.
26- Human Rights Council, Report of the Special Rapporteur on the adverse effects of the movement and dumping of toxic and dangerous products and wastes on the enjoyment of human rights, Mr. Okechukwu Ibeanu, Twelfth Session, Agenda Item 03, A/HRC/12/26, July 2009, pp. 10–13,

available at https://documents.un.org/doc/undoc/gen/g09/145/73/pdf/g0914573.pdf, date accessed: 28/11/2025, time: 22:03.

27- See Articles 04 and 06 of the Basel Convention.

28- Article 02, paragraph 08 of the Basel Convention provides: "taking all practicable steps to ensure that hazardous wastes or other wastes are managed in a manner which will protect human health and the environment against the adverse effects which may result from such wastes."

29- See Article 04, paragraph 02 (b) of the Basel Convention.

30- See Article 04, paragraph 02 (c) of the Basel Convention.

31- Boukhamis Wanasah, The Effects of the Ship's Legal Personality on the Safety and Security of Maritime Navigation, Doctoral thesis, Business Law specialization, Faculty of Law, University of Sidi Bel Abbes, 2016–2017, p. 84.

32- See Articles 06 and 08 of the Nairobi Convention.

33- See Article 08 of the Nairobi Convention.

34- See Article 09, paragraph 01 of the Nairobi Convention.

35- See Article 09, paragraph 06 of the Nairobi Convention.

36- See Article 09, paragraph 01 of the Nairobi Convention.

37- Drissi Salah Eddine, "Ship Recycling between the Basel Convention and the Hong Kong Convention," Journal of Legal Studies, Volume 12, Issue 01, 2025, p. 42.

38- Ibid, p. 42.

39- Ibid, p. 43.

40- See Regulation 20, paragraphs 01 to 04, of the Annex to the Hong Kong Convention for the Recycling of Ships of 2009.

41- Drissi Salah Eddine, Op. Cit, p. 41.

42- See Regulation 05 of the Annex to the Hong Kong Convention for the Recycling of Ships of 2009.

43- See Regulation 22 of the Annex to the Hong Kong Convention for the Recycling of Ships of 2009.

44- See Regulation 18 of the Annex to the Hong Kong Convention for the Recycling of Ships of 2009.

45- See Regulation 22 of the Annex to the Hong Kong Convention for the Recycling of Ships of 2009.
46- Ibid.
47- See Regulation 21 of the Annex to the Hong Kong Convention for Recycling of 2009.
48- See Regulation 23 of the Annex to the Hong Kong Convention for Recycling of 2009.
49- Drissi Salah Eddine, Op. Cit, p. 44.