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Elfilali Djazia
Tahri Mohamed University Algeria
https://orcid.org/0009-0008-5190-9552
djazia.elfilali@univ-bechar.dz
Kadi Mohamed
Tahri Mohamed University Algeria
https://orcid.org/0009-0000-8979-7279
mohamed.kadi@univ-bechar.dz
Chibane Yamina
Tahri Mohamed University Algeria
https://orcid.org/0009-0006-7478-1024
chibaneyamina88@gmail.com

The Preventive Measures Adopted in the Process of Preserving and Enhancing Underwater Cultural Heritage and Their Role in Achieving Sustainable Development Goals

Abstract

Underwater cultural heritage (UCH) represents a significant aspect of human history and cultural identity. However, it faces increasing threats due to natural and anthropogenic factors, including climate change, pollution, and illegal excavation. Preventive measures play a crucial role in preserving and promoting UCH, ensuring its protection for future generations. This paper examines various strategies, including legal frameworks, technological advancements, and community involvement, in safeguarding underwater cultural resources. The importance of these measures in achieving sustainable development goals (SDGs) is also discussed, highlighting their role in fostering environmental, social, and economic sustainability. By integrating preservation efforts with sustainable practices, UCH can contribute to the development of coastal and marine areas while maintaining cultural integrity. The paper emphasizes the need for collaborative action between governments, local communities, and international organizations to ensure the long-term conservation of underwater heritage.

Keywords: *underwater cultural heritage, preventive measures, sustainable development, cultural preservation, marine conservation*

Elfilali Djazia
Əlcəzair Tahri Mohamed Universiteti
https://orcid.org/0009-0008-5190-9552
djazia.elfilali@univ-bechar.dz
Kadi Mohamed
Əlcəzair Tahri Mohamed Universiteti
https://orcid.org/0009-0000-8979-7279
mohamed.kadi@univ-bechar.dz
Çibane Yamina
Əlcəzair Tahri Mohamed Universiteti
https://orcid.org/0009-0006-7478-1024
chibaneyamina88@gmail.com

Sualtı mədəni irsin qorunması və genişləndirilməsi prosesində görülən qabaqlayıcı tədbirlər və onların davamlı inkişaf məqsədlərinə nail olunmasında rolu

Xülasə

Sualtı mədəni irs (UCH) bəşər tarixinin və mədəni kimliyinin mühüm aspektini təmsil edir. Bununla belə, o, təbii və antropogen amillər, o cümlədən iqlim dəyişikliyi, çirklənmə və qeyri-qanuni qazıntılar səbəbindən artan təhlükələrlə üzləşir. Profilaktik tədbirlər UCH-nin qorunmasında və təbliğində, gələcək nəsillər üçün qorunmasının təmin edilməsində həlledici rol oynayır. Bu sənəd sualtı mədəni sərvətlərin qorunmasında qanunvericilik bazaları, texnoloji irəliləyişlər və ictimaiyyətin iştirakı da daxil olmaqla müxtəlif strategiyaları araşdırır. Bu tədbirlərin davamlı inkişaf məqsədlərinə (DİM) nail olunmasında əhəmiyyəti də müzakirə edilir və onların ekoloji, sosial və iqtisadi davamlılığın təşviqində rolu vurğulanır. Qoruma səylərini davamlı təcrübələrlə birləşdirərək, UCH mədəni bütövlüyü qoruyaraq sahil və dəniz ərazilərinin inkişafına töhfə verə bilər. Sənəd sualtı irsin uzunmüddətli mühafizəsini təmin etmək üçün hökumətlər, yerli icmalar və beynəlxalq təşkilatlar arasında birgə fəaliyyətin zəruriliyini vurğulayır.

Açar sözlər: *sualti mədəni irs, profilaktik tədbirlər, davamli inkişaf, mədəni qoruma, dənizlərin mühafizəsi*

Introduction

Underwater cultural heritage is one of the components of archaeological heritage that encompasses the remains of the history and civilizations of nations. It forms an important scientific and cultural legacy in identifying historical sites related to human activity throughout the ages. It is one of the heritage aspects that must be preserved and promoted within its environmental context. Due to its nature, it is a non-renewable resource, both locally and internationally, especially since it faces various environmental, human, and natural threats. Naturally, it is essential to identify the types of risks and the explicit methods of examination, their objectives, approaches, and expected outcomes concerning this heritage, ensuring its continuity and presentation by guiding the areas of planning, management, and utilization, aiming to achieve sustainability in alignment with the requirements of sustainable development dimensions and goals.

To fully understand all aspects of this important topic, we will attempt to answer the following question: What is the concept of underwater cultural heritage, how can we preserve it, and what are the mechanisms for utilizing and ensuring the sustainability of this type of human heritage?

To address this issue, we followed a scientific methodology that involves exploring some general concepts that will guide the preservation and promotion of underwater cultural heritage. These include identifying key concepts such as the exploration of submerged and maritime archaeological sites, the threats and risks facing underwater cultural heritage, and the role of global organizations in preserving and promoting underwater cultural heritage and their impact on it (Al-Zahrani, 2012).

1) Definition of Underwater Cultural Heritage, Maritime Archaeology, and the Differences Between Them:

1. A) Definition of Underwater Cultural Heritage

Underwater cultural heritage is defined in Article 1 of the 2001 UNESCO Convention, which refers to any remains of cultural, historical, or archaeological significance that are partially or fully submerged under water for at least one hundred years. This article provides three examples of underwater cultural heritage: sites, structures, buildings, artifacts, and human remain, along with their archaeological and natural contexts.

Research

They also include ships, airplanes, and other means of transportation, including any part of them or their cargo, along with their archaeological and natural context. They also encompass items from prehistoric times (Abdullah, 2022).

Based on the aforementioned article, the heritage item is classified as underwater cultural heritage using both spatial and temporal criteria. The spatial criterion refers to the presence of the artifact submerged partially or fully, either periodically or continuously. The temporal criterion requires the artifact to have been submerged for at least one hundred years. However, pipelines, cables on the seabed, and other structures have been excluded from underwater cultural heritage, as they do not

hold historical or cultural value. The reason for this exclusion is that these structures do not possess the historical or cultural significance that distinguishes them (UNESCO, 2001).

Article 1 of the 2001 UNESCO Convention defines underwater cultural heritage as all human remains that are of cultural or historical significance and have remained submerged under water, either partially or fully, periodically or continuously for at least one hundred years. The article also provides three examples of underwater cultural heritage.

1. B) Concept of Maritime Archaeology:

Underwater archaeological sites are defined as offering a unique insight into the activities and tools used in ships and the lives of sailors during periods of sinking, often due to emergencies like storms or battles. These maritime sites can be accidental or the result of natural conditions such as earthquakes, providing a realistic image of daily life in maritime societies of the time. Additionally, coastal sites like harbors can be randomly submerged during natural disasters. These sites also offer a precise and realistic glimpse into daily life in coastal communities, contributing to our understanding of the impact of catastrophic events on these marine environments (Imad, 2013).

One of the distinguishing features of underwater archaeological sites is the ability of wet environments to preserve artifacts better than when exposed to air. This preservation is especially notable for artifacts made of organic materials such as wood and leather, due to the nature of wet environments that are low in oxygen. Oxygen is the primary source of oxidation of metallic materials and the corrosion of organic materials. The thicker the layers of sediment above the artifacts, the greater the reduction in oxygen levels, which improves the preservation of the artifacts. This effect enhances the condition of underwater archaeological finds, as the wet environment plays an active role in preserving these historical relics (Khmo, 2017).

Another characteristic appears in the temporal alignment between the archaeological site and its contents. The ship, along with its cargo, carries a single temporal character, with everything related to the cargo belonging to the same time period. This makes the archaeological site have precise and distinct features. For example, if a ship sank in the 2nd century AD, its cargo would also date back to the same period. This property provides a unique opportunity to understand and explore history through the study of shipwreck sites. Valuable information can be inferred about past eras, trade interactions, and cultural exchanges during that time (Rafiq, 2015).

Maritime artifacts are part of the underwater cultural heritage and are related to the sea and ocean areas. This includes submerged marine structures, ships, and aircraft, as well as marine organisms and life forms. The preservation of maritime artifacts is enhanced by the impact of the wet environment, which helps preserve organic materials like wood and leather. In summary, underwater heritage includes all artifacts beneath the water's surface, while maritime artifacts specifically focus on oceans and seas (Ibrahim, 2010).

This directs the study of submerged and maritime artifacts under the term "Underwater or Submerged Archaeology," which refers to "the scientific systematic study of past human life, behaviors, and activities through the examination and analysis of their material remains, including sites, structures, and artifacts, as well as other evidence found in the water or submerged environment." Such evidence can be found in both freshwater (inland) and saltwater (marine) environments, and may be visible on the waterbed (e.g., seabed) or buried under sediments. The submerged archaeological sites consist of the remains of ships (wrecks), boats (discoveries), other watercraft, or ships and aircraft, as well as cultural archaeological hearths that were accidentally lost, sunk, or deliberately placed in the water. These include the remains of structures originally built entirely or partially underwater, such as fish traps, cranes, bridges, and maritime docks. They also include remains of human activity that originally occurred on dry land or in marshes that were later submerged due to rising water levels or erosion (whether marine or river erosion). Contemporary definitions of underwater archaeology overlap with the following (Labib, 2008):

- **Maritime archaeology** refers to the archaeological study of human interactions with the sea, which may also include sites not underwater but related to maritime activities, such as lighthouses, port constructions, or whaling stations on the coast (maritime architecture).

- **Marine archaeology** refers to the archaeological study of remains created by humans who lived in the marine environment or in saltwater, such as submerged aircraft.
- **Nautical archaeology** (marine navigation) refers to the archaeological study of shipbuilding and their structural composition, including the remains and wrecks of ships in terrestrial environments or shipyards.

2) Threats and Risks Facing Underwater Cultural Heritage: Cultural heritage in all its forms faces many natural and human threats that endanger its security and integrity, exposing it to deterioration and destruction. Among the main threats are (Khalil):

- **Natural factors:** These include environmental characteristics such as solar radiation, climate (temperature, winds, rains), natural disasters (earthquakes, lightning, volcanoes), and biological factors such as animals, plants, and microscopic organisms.
- **Human factors:** These involve human encroachment on cultural heritage sites, causing significant damage to these sites.

A) Chemical Hazards: Chemical processes can also affect the integrity of artifacts. One of the most common processes is the corrosion of iron and other metals, altering their appearance, especially in oxygen-rich environments. Generally, the lower the oxygen levels, the less corrosion occurs. However, even under anaerobic conditions, iron can corrode.

This results in the production of low-corrosion iron products, such as iron sulfide. These elements can be distributed within the decaying structure of organic materials, such as wood near corroded iron. Additionally, iron sulfides and other sulfides can form through sulfate-reducing bacteria in low-oxygen conditions. Once organic material is recovered from a site, sulfides embedded in it can oxidize in the presence of free oxygen (Khalil, 2023).

These oxidation reactions produce acidic iron sulfates and other sulfates, such as sulfuric acid, which can destroy cellulose, lignin, and collagen through various chemical reactions. These processes have occurred multiple times with ships recovered from the seabed, such as wrecks found in Sweden, England, Western Australia, and the BZN 3 and NZB 15 wrecks off the coast of Edinburgh, Netherlands.

B) Natural Hazards:

The marine environment is complex and dynamic, with several environmental factors that can negatively affect submerged cultural heritage sites. Among the most significant of these factors are waves and ocean currents, which can have destructive effects on submerged sites, particularly ancient shipwrecks. The movement of water can cause damage to artifacts on the seafloor, and in the case of fragile artifacts, especially those made from organic materials, it can result in complete deterioration over time. These forces can also alter the features of the submerged archaeological site by shifting sands and sediments, covering or revealing areas of the site (Khalil, 2023).

Other natural threats include the growth of living organisms that can damage artifacts. Organic materials are particularly vulnerable, as various types of bacteria, algae, and fungi can grow on or feed on them, leading to their decomposition. There is also the threat posed by shipworms, a type of marine mollusk that burrows into and feeds on the wood of shipwrecks. They grow inside the wood and form colonies with thousands of small tunnels, ultimately leading to the erosion and decay of the wood (Jamila).

Human Threats: Human activities can pose a threat to submerged cultural heritage. Some activities and practices, such as treasure hunting and looting, directly target archaeological sites, while submerged cultural heritage is also threatened by the side effects of industries such as fishing, particularly trawl nets, or oil and gas exploration, among others. Recent advances in underwater research over the last decade have made submerged archaeological sites more accessible than ever to those with both legitimate and harmful intentions, including those located in deep waters and remote areas. Many countries lack the necessary legislation, research systems, or management frameworks to protect their submerged heritage from human threats. Data from UNESCO indicates that treasure hunters have recovered artifacts from numerous ancient shipwrecks around the world and sold them in recent years. Therefore, strict local and international laws and agreements are essential to combat these illegal activities (Kabashi, 2008).

This submerged cultural heritage is increasingly exposed to human threats, as exploration techniques have rapidly advanced, facilitating access to and exploitation of the seabed. In many cases, submerged archaeological sites are subjected to looting and vandalism, often resulting in the loss of valuable scientific and cultural material.

Additionally, illegal trafficking of artifacts that are discovered has become common, as this activity represents a source of significant profit. These human threats require joint efforts to preserve underwater cultural heritage, including the development of better protection policies, raising awareness of the importance of safeguarding this unique cultural heritage, and intensifying efforts to combat looting and illegal trade (Asad, 2023).

Submerged cultural heritage is exposed to the risks of looting, destruction, and exploitation for commercial purposes. Artifacts submerged in saltwater for long periods also face rapid deterioration when recovered from the seabed if not properly treated before exposure to air. For example, when artifacts recovered from the famous Mary Rose shipwreck in 1840 were displayed, the effect of exposure to air was observed. The 32-pound iron cannonballs decreased in weight to 19 pounds shortly after being exposed to air due to heating and oxidation. Furthermore, when the seawater that the materials were submerged in was dried, salt crystallization occurred, increasing the damage to their mineral structure. It is evident that excavation without taking necessary conservation measures can be destructive, as exposure to air without proper treatment leads to harmful effects on the physical structure of artifacts, whether they are made of metal, ceramic, or wood (Al-Jumaili, 2020).

3. Procedures for Protecting and Enhancing Submerged Cultural Heritage Legally and Technically:

3.A. Organizational Methods: According to the cultural systems and legislations in force at UNESCO, the term "protection" refers to the efforts needed to create suitable conditions that help preserve historical landmarks, archaeological sites, or historic areas. This concept is primarily used in the context of the physical protection of historical and archaeological sites to secure them from theft or vandalism. Legal protection is based on legislative frameworks and planning standards, aiming to ensure defense against any action that might harm cultural sites. This protection provides guidelines for correct procedures and determines penalties for those who violate cultural sites. Cultural protection includes four main forms: legal protection, administrative protection, technical protection, and security protection (Majdoub, 2021).

3.A.1. Legal Protection: Achieving effective protection for cultural heritage requires the activation of three levels of protection: international, regional, and local levels. The preservation of cultural heritage goes beyond the national identity of countries and becomes part of human heritage in general. Therefore, the international community must collaborate to protect it. and tracking those who engage in theft, trade, smuggling, and destruction of cultural heritage. The integration of these levels contributes to strengthening efforts to preserve cultural heritage and prevent illegal activities that could lead to its destruction (UNESCO, 2002).

- **International Level:** This involves cooperation between countries to establish and implement international legislations for the protection of cultural heritage and international agreements. International organizations such as UNESCO play a significant role in promoting this cooperation.
- **Regional Level:** This involves mutual understanding and cooperation between countries in the same geographical region to exchange information and develop common strategies for the protection of cultural heritage.
- **Local Level:** This focuses on the role of local governments and communities in applying and implementing protective measures and raising awareness about the importance of preserving cultural heritage.

Submerged archaeology often faces legal and ethical challenges, particularly concerning the ownership and protection of cultural heritage. International laws and agreements, such as UNESCO's Convention on the Protection of Underwater Cultural Heritage, provide guidelines for responsible exploration and conservation of underwater sites. Striking a balance between scientific research interests, cultural preservation, and commercial exploitation remains a complex issue that requires ongoing dialogue and cooperation among stakeholders (Exploring the Untouched Depths of History).

3.A.2. Administrative Protection: This issue revolves around the nature of the organization or administrative entity primarily responsible for managing cultural heritage, as well as the procedures involved in these administrations, which vary from country to country based on social, economic, and religious conditions, as well as the external influences each country faces. The following should be considered:

- The organization and administrative entity that manages cultural heritage affairs, whether under the supervision of a cultural ministry or a specialized heritage body.
- Administrative procedures, including policies and actions taken by the administration to protect and manage cultural heritage, such as documentation, classification, conservation, and promotion.
- Social, economic, and religious influences on the management of cultural heritage, where efforts should be directed with consideration of local values and beliefs.
- External influences arising from cross-border cultural interactions, as well as international and regional effects on cultural heritage management.
- **3.A.3. Technical Protection:**

Modern technology, through tools, machinery, and devices that control temperature, humidity, and other factors, has significantly contributed to the protection of cultural heritage. Electronic information banks, for example, have played an essential role in preserving heritage by recording and documenting information and images. Alarm systems have also helped protect artifacts from theft, destruction, and fires. Modern assessment technologies assist in analyzing the condition of artifacts and estimating the environmental impacts on them. Additionally, these technologies contribute to the development of restoration techniques used to preserve artifacts and ensure their continuity. Innovations in technology enhance cultural heritage preservation efforts and make documentation and conservation processes more efficient and accurate (Youm7).

- **3.A.4. Security Protection:**

The protection of cultural heritage integrates three levels: international, regional, and local. Around the world, heritage violations occur daily, making it essential to have specialized entities responsible for protection through the issuance of regulations that specify penalties for these crimes.

- **4. Preventive Measures in the Enhancement of Submerged Cultural Heritage:**
- Exploring the depths of the world's oceans unveils a hidden world of submerged history, where ancient civilizations and lost treasures lie waiting to be discovered. Underwater archaeology, a unique field combining archaeology and marine sciences, allows us to delve into this fascinating world. However, this field faces technical and scientific challenges.
- Cultural heritage submerged in water must be preserved by taking all appropriate and necessary measures using the best practical methods available according to the capabilities of the countries involved. This requires the use of modern and effective technologies to detect archaeological sites, assess the environmental impacts on these artifacts, and take necessary measures to preserve them.
- Prioritizing the preservation of submerged cultural heritage at its original location is vital, as it involves maintaining the integrity of the artifacts and preventing their deterioration and destruction. Giving priority to in-situ protection is due to the high costs of transporting and processing artifacts in specialized laboratories, along with the extended time required for this work, which could lead to the degradation of the pieces. On the other hand, recovering artifacts from shipwrecks or submerged archaeological sites requires large museum spaces, which is often not feasible. Therefore, preserving submerged cultural heritage in its original location remains the primary method for its conservation and recognition as a testament to historical events. Recovery of artifacts may be authorized in cases of necessity, such as for identification, protection, or enhancement, especially when archaeological sites are threatened by human or natural factors (Delgado).
- **4.A. Surveying Submerged Artifacts Using Archaeological Survey Techniques:**

This type of survey is used to detect submerged artifacts in bodies of water (seas and oceans) resulting from shipwrecks due to climatic conditions or wartime battles. This type of survey is costly and challenging, utilizing several methods, including:

1. **Diving Machines:** These are used by researchers to explore the depths of seas and oceans. One such machine is the "Trieste" submarine, designed by Swiss scientist Jacques Piccard and Jacques

Cousteau in 1964. It was equipped with a television camera and mechanical arms for lifting archaeological remains. Currently, advanced technologies are used, such as remotely controlled robots that can reach great depths.

2. Sonar: This is a sensing device that uses sound waves to locate objects (such as shipwrecks) and measure the depth of the seabed by detecting the echo of the sound waves.

3. Remote Sensing Technologies: One of the main techniques used in underwater archaeology is remote sensing, which includes the use of advanced tools like sonar, magnetic measurement devices, and side-scan sonar to create detailed maps of the seabed's topography. These tools help identify potential archaeological sites, locate shipwrecks, and provide maps of submerged landscapes. For example, side-scan sonar played an effective role in discovering the wreck of the famous RMS Titanic, providing valuable insights into the past.

Virtual Diving Technology: Advanced information and communication technology tools, such as virtual reality (VR), augmented reality (AR), and mixed reality (MR), which have become widely used in the digital age, help unify visitor experiences and learning processes at heritage sites through intelligent systems, wireless communications, and smart devices. Due to the intangible nature of tourism services, marketers have heavily relied on visual images and sensory experiences to create and promote the destination's image. Virtual diving systems use VR and modern 3D reconstruction algorithms to offer virtual tours of maritime operations. These systems rely on the same concepts and principles that allow VR to enhance tourism experiences and promote heritage sites. A study of virtual reality systems at underwater archaeological sites in southern Italy, at Capo Colonna and Cala Mignola, was conducted. The first took place in the Ionian Sea along the coast. The study site in Calabria's eastern coast, located about 10 kilometers from Crotone, revealed that a Roman cargo ship had discarded raw and semi-finished stone objects at a depth of seven meters. Another site in Levanzo in the Tyrrhenian Sea, a few kilometers off the western coast of Sicily, showed a Roman transport ship anchored at a depth of 30-27 meters. The study's results indicated that the proposed virtual reality system can offer a dynamic educational experience with a deep emotional impact, which is preferred by many students. Previous researchers used virtual reality techniques and digital imaging to visualize marine life and capture ultraviolet photography. These frameworks have enhanced cultural heritage and increased its value, according to Joel and Pavascar, in the field of tourism (Blot, 1995).

4. B) Use of Diving and Excavation Techniques in the Discovery of Submerged Artifacts:

When identifying potential sites, underwater archaeologists rely on diving and excavation techniques to explore and recover artifacts. Divers equipped with specialized gear and trained meticulously document and retrieve objects from the sea bed. Underwater excavation work requires careful planning and execution to ensure the preservation of fragile artifacts. For example, excavation tools used in the "Antikythera Shipwreck" in Greece led to the discovery of the ancient Antikythera Mechanism, a complex astronomical device.

4. C) Preservation of Submerged Artifacts:

The preservation of underwater artifacts presents unique challenges due to the impact of seawater and the sensitivity of many objects. To overcome these challenges, preservation techniques such as desalination, freeze-drying, and chemical stabilization are employed. Restoration efforts aim to stabilize artifacts and prevent deterioration, enabling them to be studied and displayed for future generations. An example of successful preservation is the "Vasa" warship, which sank in 1628 and was salvaged in Sweden (Pender, Sharpley, 2005).

Over the years, preserving archaeological sites in situ has become increasingly important, including for underwater sites. A representative portion of our maritime past must be preserved for enjoyment and future research. The "inventory" of shipwrecks with archaeological significance is vast and unorganized, and there are numerous reasons why preserving the site environment should be the first choice, according to international standards. Therefore, it is essential to study underwater sites and assess their value and importance.

Modern international standards state that in situ preservation should be the first option to consider when managing a site. This means managing the site in a responsible and sustainable manner so that the locations and the information derived from them are safe. Over a long period of time, it is essential

to verify sites according to regulations and international agreements such as the UNESCO Convention on the Protection of the Underwater Cultural Heritage (Barry, 2001) in the management of submerged cultural heritage. Archaeologists, environmental conservation advocates, and policymakers participate in the management of submerged cultural heritage (Scovazzi, 2003).

Site preservation is an integral part of this management process. Over the past decades, underwater archaeology has evolved from a profession concerned with objects to a field that encompasses submerged cultural heritage, a non-renewable resource that offers a unique opportunity to investigate and learn from our past. Shipwrecks are essentially time capsules (closed discoveries), and their informational strength lies in the total value of all the objects associated with them. This can be achieved through the assessment of these wreck sites. After evaluation, the preservation of the condition of selected shipwrecks must be undertaken, considering that without effective protection, many shipwrecks could be adversely affected.

Site preservation, which has been practiced since the 1980s, aims to maintain something for future generations through projects such as MoSS (Monitoring Shipwreck Sites) and BACPOLES. In-situ preservation can slow down degradation; however, it is impossible to stop it entirely.

4. C) Conducting Environmental Impact Studies at Submerged Archaeological Sites:

Underwater excavation operations can have significant environmental impacts. These impacts include disruption of the seabed, displacement of marine life, and the introduction of pollutants. To mitigate these effects, researchers adopt non-destructive survey techniques where possible and adhere to strict environmental guidelines by implementing sustainable practices such as using biodegradable markers and minimizing disturbance to marine ecosystems. Underwater archaeologists aim to protect the fragile underwater environment while uncovering its hidden treasures.

Underwater archaeology provides a fascinating window into our past, shedding light on civilizations that have long since disappeared. Through the use of remote sensing techniques, diving and excavation, conservation technologies, and adherence to legal and ethical considerations, researchers are able to overcome the challenges of the underwater world. By striking a balance between exploration and preservation, underwater archaeology continues to unveil the secrets of our submerged history, enriching our understanding of the world beneath the waves.

5. **The Impact of Protecting Submerged Cultural Heritage on the Economic Valuation and Development of Its Exploitation:**

It should be considered whether the site has significant heritage value due to its specific connection to the life or works of individuals, their importance, or their events in cultural history, or its association with people, events, or places. The role can often be viewed as a reflection of the scale within which values operate. These matters are often considered at international, national, regional, and local levels, but they may, in fact, be culturally specific or have practical consequences. There is still much to evaluate based on the criteria used to determine this, and this is a critical issue primarily because little is usually known about the role and significance of submerged cultural heritage in the following aspects:

1. **Economic Importance**: The site may have current or future economic importance. This importance can be both a blessing and a curse. It is a blessing because it is often more valued in the eyes of key stakeholders (such as politicians) and is more likely to be preserved. Since it has significant economic value, it is likely to be preserved.
2. **Aesthetic Importance**: The site may have significant heritage value due to its importance in showcasing certain aesthetic characteristics valued by a community or cultural group. This is especially true for submerged cultural heritage sites, which divers may regard as places of extraordinary visual beauty.
3. **Scientific, Research, or Technical Importance**: Consideration must be given to whether the site represents a period of scientific, research, or technical importance. A site may have or be considered to have research significance if it holds substantial potential for further examination or scientific study. Viewing the site within the landscape and its strong connection to memory value can create a unique mood or character that enhances the site's significance.

Thus, the process of integrating the conservation of submerged cultural heritage can have various positive socio-economic and environmental benefits in achieving sustainable development principles and their objectives by making this heritage a valuable resource. The key outcomes behind this objective can be summarized as:

Tourism Attraction: Submerged cultural heritage is a source of curiosity and tourism appeal. Tourists and divers can explore submerged archaeological sites and old buildings, which contributes to attracting more tourists and boosting the local economy. Heritage tourism plays an important role in developing relationships between peoples through cultural exchange. Tourism acts as a bridge between countries and helps foster understanding and communication between different cultures. The tourist plays a role in conveying their cultural heritage and raising awareness. and introducing it to others, while tourists learn about the heritage and culture of the host country. The heritage industry is considered the foundation of cultural tourism, as cultural heritage serves as an attraction for tourists and stimulates demand for tourism in a particular country. Cultural heritage enhances depth and diversity, and the richer the heritage, the greater the interest in visiting these areas. Heritage entrepreneurs play a vital role in preserving and promoting this heritage, contributing to its transmission, processing, and documentation (UNESCO, 2012).

- **Scientific Research and Cultural Heritage**: These areas contain important historical monuments and landmarks, which can be a source of scientific and historical research. Submerged cultural heritage serves as time windows that open up to the worlds of ancient nations, their technologies, and rituals. Archaeological studies and research related to submerged cultural heritage can significantly contribute to understanding human history and ancient cultures. Through underwater exploration and excavation, scientists and researchers can recover rare pieces of human history and analyze them in detail. These artifacts could be architectural, artistic, or everyday tools, telling stories that are yet to be uncovered. Thus, these studies help shed light on the traditions and technologies of past civilizations and understand how people lived during those times.
- **Development of Tourism and Sports Industries:** The presence of submerged heritage opens up new possibilities for developing tourism and water sports industries, where these areas can be utilized to offer unique and exciting experiences for visitors. Diving trips can be organized to explore submerged ruins and underwater archaeological sites, attracting diving enthusiasts and explorers from around the world. In addition, various water sports activities can be organized in these areas, such as surfing, glass-bottom boat diving, kayaking, and fishing. This enhances tourist interaction and provides visitors with the opportunity to enjoy the beauty and diversity of marine life and coastal culture. By developing these industries, local employment can be improved, and the local economy can be boosted. The increased interest in these areas encourages the development of tourism infrastructure, such as hotels and restaurants, which contributes to sustainable development and improves the quality of life for local communities (Virtual Reality and Virtual Diving Technologies: Innovative tools to promote maritime and underwater cultural heritage in the Red Sea, 2022).
- **Encouraging Heritage Preservation:** Encouraging the preservation of submerged heritage is a key aspect of maximizing the benefits of these areas. By highlighting their importance and focusing on the cultural and historical value of underwater monuments and landmarks, attention can be directed toward the need to preserve this heritage. Raising awareness of submerged heritage can stimulate local communities, government agencies, and non-governmental organizations to take steps toward preserving these sites. Educational programs and awareness sessions for youth and local communities about the importance of preserving cultural heritage and contributing to the preservation of cultural diversity can be developed.

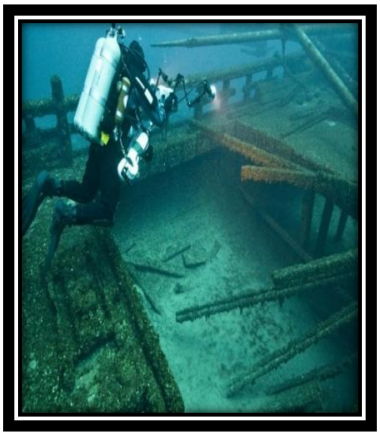
Stimulating research and scientific studies on this heritage enhances the public understanding of its value and historical significance. The findings can be used to guide conservation and sustainability policies, providing the public with guidance on the best practices for preserving this unique and important heritage.

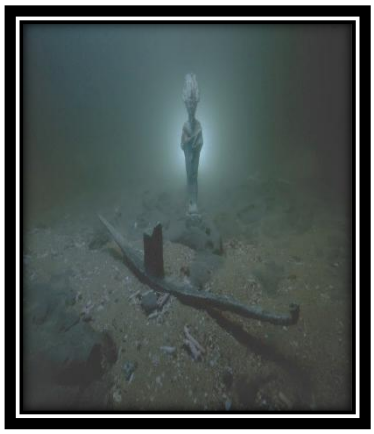
- **Stimulating Local Investment:** The presence of submerged heritage serves as a driving factor for seeking new investment opportunities in the region. The discovery and utilization of this heritage can increase interest in the area as a tourist and sports destination. These investment opportunities

allow businesses to establish projects in areas such as hotels and restaurants, thus enhancing tourism infrastructure. Additionally, the development of water sports and related activities can attract more tourists and enthusiasts. These investments can contribute to improving local services and creating new job opportunities, thereby boosting the economic development of the area impacted by the submerged heritage.

Conclusion

Submerged cultural heritage and maritime artifacts today represent unique windows into human history and lost cultures. Beneath all water bodies such as oceans and rivers, ancient cities and sunken ships recall the memories of past civilizations and reveal stories we did not know. With this richness and beauty, however, this heritage faces serious challenges, including environmental changes and unsustainable human activities. Therefore, the role of global organizations and advanced technology in enhancing its protection and contributing to sustainable development is crucial. Preserving this heritage is not only a humanitarian duty, but also a living window through which we can learn from the wisdom of past generations and understand important details of our rich history.





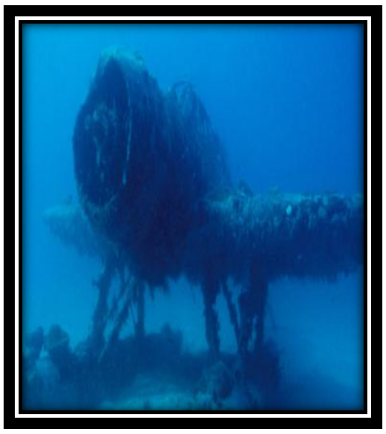


Image (1) represents the remains of a sunken city, quoted from the website of National Geographic Arabic magazine

Image (2) representing the remains of warplanes from World War II, quoted by the website Independent Arabia

Image (3) represents exploration in the ocean by diving technique, quoting from the website of National Geographic Arabic magazine

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