Maritime Technology and Research

https://so04.tci-thaijo.org/index.php/MTR

Research Article

The Heritage Impact Study Assessment (HIA) in the sustainable development of the Coast of Melaka

Asyaari Muhamad, Amir Husaini* and Yasmin Amirah

Institute of The Malay World and Civilization (ATMA), The National University of Malaysia, 43600 Bangi, Selangor, Malaysia

Article information

Received: September 30, 2022
1st Revision: January 2, 2023
Accepted: February 4, 2023

Keywords
Coastal development,
Heritage impact assessment,
Melaka coast,
Sustainable development plan

Abstract

Through the strategic plan of Melakaku Maju Jaya 2035 (PSMJ 2035), the State of Melaka has implemented several modern development policies aimed at triggering the economy and increasing the state's revenue. One of the aspects applied is the question of land development in Melaka through the introduction of the *Melaka-Waterfront Economic Zone* (M-WEZ) project. This development project involves the development of an area of 10,117 hectares along the coast of Central Melaka. However, the results of this development planning have directly triggered a polemic among state policy planners and the National Heritage Department, since this development involves several very sensitive issues. Among the issues that are often raised is the preservation and conservation of the heritage and history of the state of Melaka. Therefore, the writing of this article will describe the role and process of Heritage Impact Assessment (HIA) as a conflict-solving tool in assessing the implications, as well as provide recommendations and mitigation measures that need to be implemented in any area to be developed, especially in the aspect of maritime HIA study, to enable both the sustainable development and maintenance of the historical heritage of the state of Melaka to move in line with development.

1. Introduction

1.1 Melakaku Maju Jaya 2035 strategic plan

The *Melakaku Maju Jaya 2035 Strategic Plan* (PSMJ 2035) in Malaysia has identified several objectives or flagships that are thought to be crucial elements for the state to accomplish by the year 2035. The creation of Melaka's economic zone through the *Melaka-Waterfront Economic Zone* (M-WEZ) project is one of the key objectives of this strategic plan. This project exemplifies a forward-thinking approach to land development along Melaka's coastline, fostering economic growth for the city while also advancing the goals of *MKRA 1: Revolusi Industri dan Ekonomi* (Industrial and Economic Revolution), where maritime services are slated to be one of the key services offered in this phase (Melaka State Economic Planning Unit, 2021). M-WEZ essentially functions as an iconic economic corridor to promote Melaka and Malaysia's sustainable economic growth. The state of Melaka can promote and complement the economic growth of areas near the core area of M-WEZ by taking advantage of the potential present in the sea embankment area. The

*Corresponding author: *Institute of The Malay World and Civilization, The National University of Malaysia, Malaysia*
E-mail address: arhusaini97@gmail.com

proposed region includes the 25,000-acre sea reclamation area that already exists along Melaka's 33-kilometer coastline, from Pantai Puteri in the north all the way to the south.

Melaka had an unparalleled construction and development boom because of the implementation of this coastal development plan. However, given that this development encompasses several extremely delicate problems, this strategic strategy has also generated some debate among policymakers, especially between the state Economic Planning Unit and the National Heritage Department (JWN). The impact on the preservation and conservation of the state of Melaka's heritage and history, particularly when preserving its centuries-rich underwater cultural heritage that is dispersed along the state's coast, is one of the issues frequently raised regarding the implementation of this strategic plan. Conflict arises when the value of the built historic environment is ignored or overridden in the development process.

1.2 Melaka-Waterfront Economic Zone (M-WEZ)

Conflicts in coastal development can happen for a variety of reasons, including rivalry for land and space, divergent views on how to use space, or a failure to recognize the creative reuse potential of old buildings and locations. Opportunities for holistic and sustainable development are lost in all of these situations (Rogers, 2017). Developers are more interested in pursuing commercial projects in the city's coastline area because of Bandar Melaka's designation as a UNESCO World Heritage Site in 2008 (Amat, 2019). These investment prospects are very lucrative, particularly for the travel and tourism industry. **Figures 1** and **2** show the map location of Melaka state in Malaysia and the proposed area for M-WEZ.

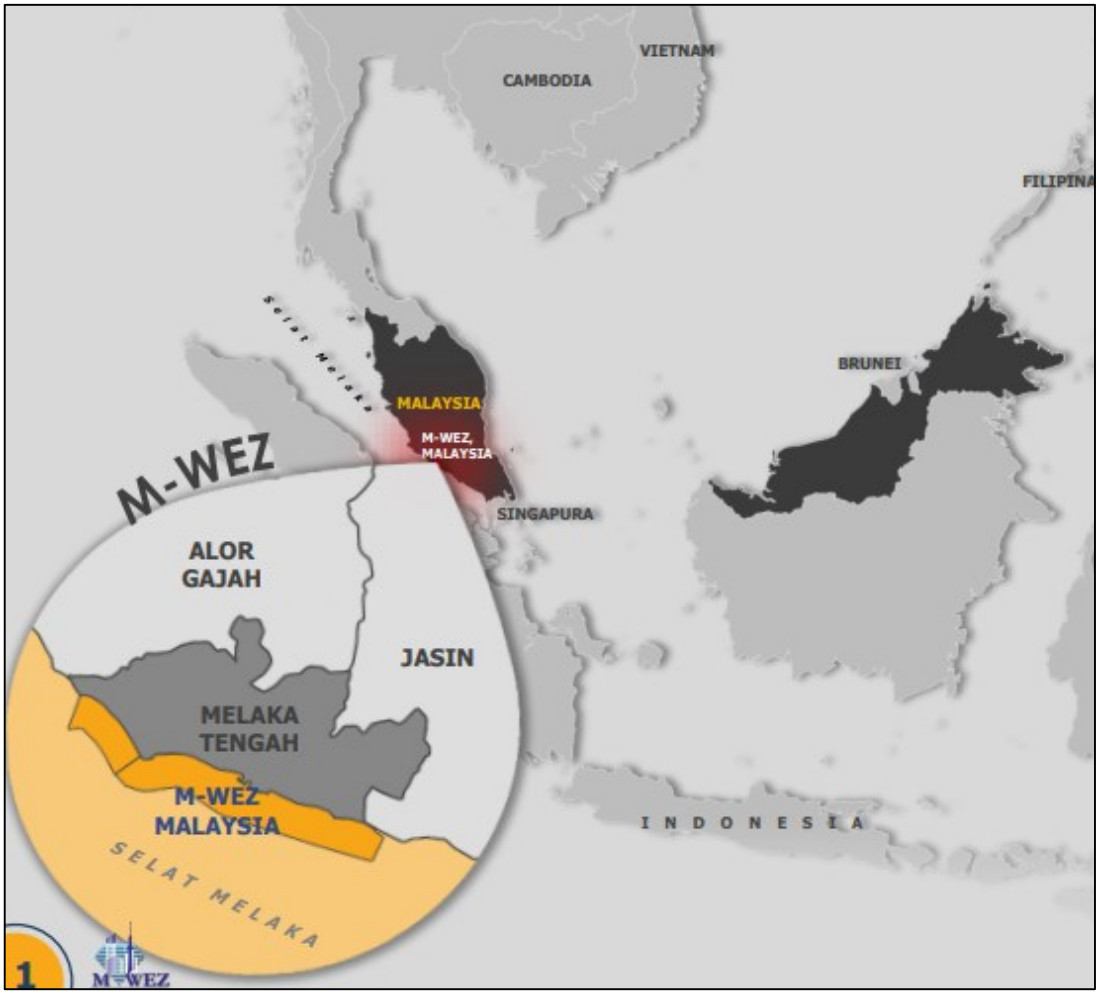

Figure 1 Map of the location Melaka Waterfront Economic Zone, Melaka, Malaysia.

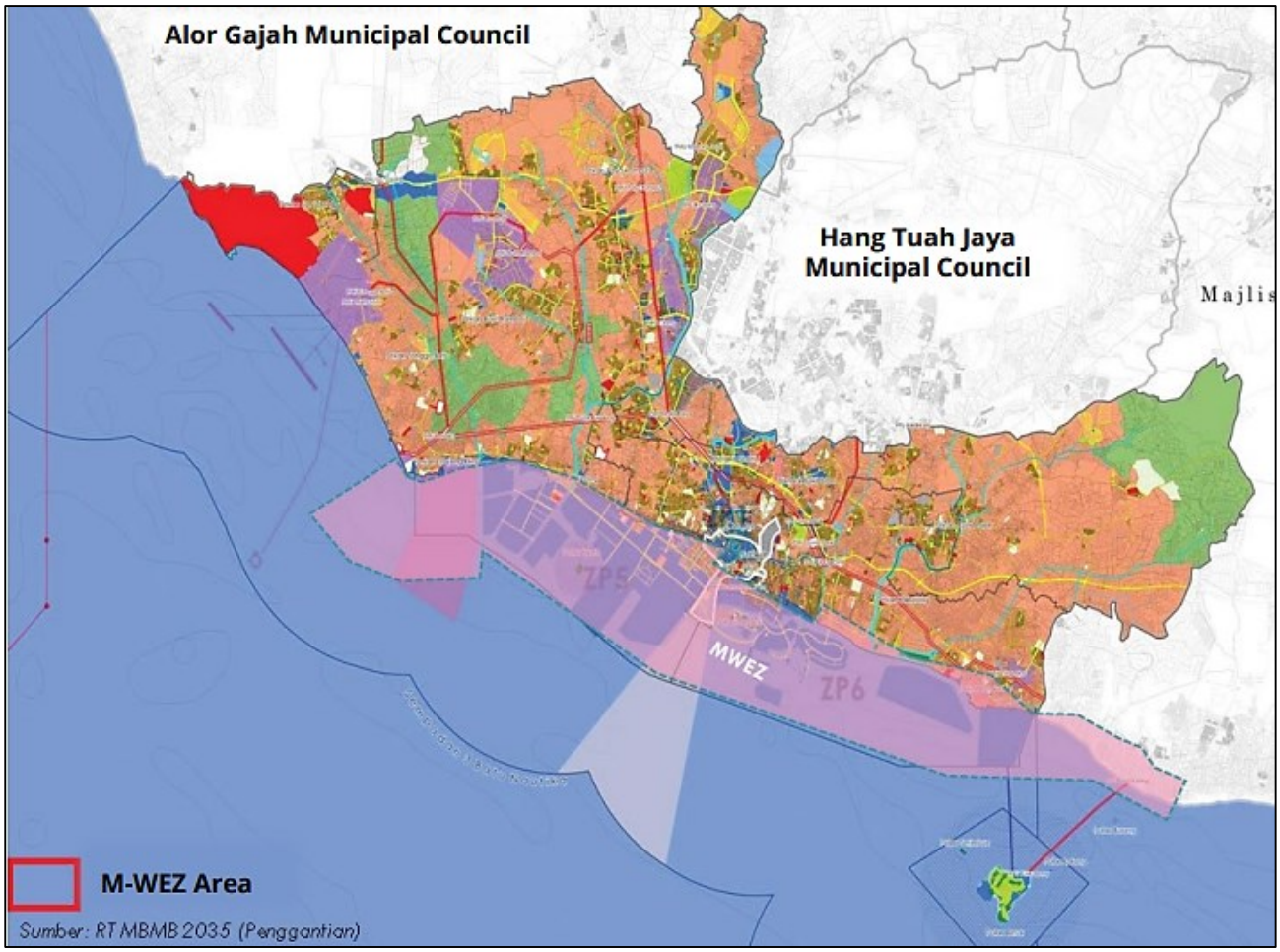

Figure 2 Melaka Waterfront Economic Zone (M-WEZ) covering almost the entire Central Melaka coastline

1.3 Protected zone of Malaysia's National Heritage

In addition to the historical component, the existence of the Protected Zone in **Figure 3**, which the National Heritage Department (JWN) announced in 2007, is another problem that has been brought up by the controversy produced by this strategic development plan. Nearly the whole Central Melaka coastline, from Merlimau in the south to Tanjung Beruas in the north, is covered by the JWN's Protected Zone. Due to the projected M-WEZ area's overlay into the JWN's protected area, disagreements between the JWN and Melaka Economic Planning Unit (UPE) are expected to result from this event.

As the development plan will most likely pose a threat to the preservation and conservation of the heritage and history of the state of Melaka, JWN has mandated the implementation of a Heritage Impact Study Assessment (HIA) in advance for any development project to be developed in the coastal area of Melaka, in order to reduce the negative effects of modern development such as sea-reclamation project along the state shores and sand mining that is conducted near or within the JWN'S Protected Zone. This implementation of the maritime HIA study is crucial to preserve what is left of the state heritage and history, especially the maritime heritage that lies beneath the ocean surface. As mentioned in UNESCO (2022), "Assessing the impacts of such projects - before deciding to proceed with their implementation - is essential to both prevent damage to World Heritage and identify sustainable options," (UNESCO, 2022).

Figure 3 JWN's Protected Zone, spanning the coast of Merlimau in the south to Tanjung Beruas in the north

2. Literature review

Traditionally, a literature review needs to be conducted before any HIA study can begin. Through this method, information about earlier or past reports on conservation and preservation projects, rules, and laws relevant to the project, and articles or books about the subject of research, are among the things that are sought. This method needs to be done to further complement the critical knowledge of HIA research in the study area.

2.1 On Heritage Impact Assessment

Recently, the Heritage Impact Assessment (HIA) has become a popular method for resolving disputes and enhancing World Heritage (WH) conservation by sustainable development principles (Ashrafi et al., 2022). A key tool for heritage planners and managers, HIA evolved from the Environmental Impact Assessment (EIA) concept. ICOMOS developed HIA within the context of EIA due to the absence of, and poor treatment of, the unique requirements of cultural World Heritage properties in EIA, particularly addressing the *Outstanding Universal Values* (OUV) (ICOMOS, 2011). The goal of HIA is to better safeguard cultural assets within the framework of sustainable development by identifying and analyzing major impacts on World Heritage items.

Because cultural heritages are not only being lost to development but are also being used at an unsustainable rate, it is necessary to analyze the impacts on heritage (Roders et al., 2017). Protecting the structure and significance of heritage assets from exploitation, misuse, and degradation because of change, as well as guaranteeing the continuity and ongoing relevance of culture in the community, are the two main concerns that heritage managers must address. In the face of these threats from development or other scenarios of external change, HIA provides the methodology to protect the integrity of heritage resources; to negotiate a sustainable balance between the forces of change, progress, and conservation in ways that maintain the authenticity of the threatened heritage, preserving its significance, meaning, and function in the life of the

community; and to mitigate the negative effects of development and change, enhancing community well-being.

The HIA study in Melaka typically examines two key regions: land areas and coastal areas. The land area comprises locations with historic architecture, including fortifications with historical, archaeological, and heritage importance as well as administrative structures, settlements, houses of worship, and heritage sites. All sites and building types are thought to possess an Outstanding Universal Value (OUV) that can be seen and recognized by many people in the neighborhood and are aged more than 100 years old; examples include the Melaka Sultanate Palace, the A Famosa Fort in Bukit Melaka, Bastion Middleburgh, Porte de Santiago, Tengkera Mosque, Peringgit Mosque, Kampung Keling Mosque, St. Paul Church, Christ Church, Stadhuys building, and many more (Muhamad, 2001). According to Malaysia National Heritage Act 2005 (Act 645), heritage item means "any National Heritage, heritage site, heritage object, or underwater cultural heritage listed in the Register," (National Heritage Act, 2005, p. 12), and National Heritage means "any heritage site, heritage object, underwater cultural heritage or any living person declared as a National Heritage under section 67," (National Heritage Act, 2005, p. 16).

The second location is the coast and estuary of the Melaka River, where there are remnants of old ports, shipwreck sites, and tens of thousands of items dating from the 15th to 19th century AD. Artifacts from the age of the Malay Melaka Sultanate, the Portuguese, the Dutch, and the British are among the discoveries that are connected to the effects of marine and underwater archaeological relics like historical shipwrecks. Coins, foreign ceramics, cannons, cannonballs, rifles, precious metals, beads, and other antiques are among them. Around the turn of the millennium, underwater archaeological studies were carried out, and the findings revealed 30 to 40 potential shipwreck sites on the Melaka coast. Due to limitations imposed by the government, the study of the location of the shipwreck has not been completed. The implementation of a maritime HIA study would be an effective strategy to preserve and conserve underwater heritage sites in the state of Melaka.

2.2 On laws and historical and past studies

In the case of preserving the underwater heritage of Melaka, *The National Heritage Act of 2005*, earlier reports on survey work on the Melaka coast, the *Guidance on Heritage Impact Assessments for Cultural World Heritage Properties of 2011* (ICOMOS, 2011), and several other historical books were used as guides and references before any HIA study could begin. The literature review conducted at several libraries in Malaysia, as well as online journals, has found several books and articles that are related to the historical background of the coast of Melaka from the 15th to 19th century AD.

Among the related books that summarize the results of historical writings related to Melaka are *Of Ships and Shipping: The Maritime Archaeology of Fifteenth-Century CE Southeast Asia* (Orillaneda, 2016), *Tomi Pires: Suma Oriental Journey from the Red Sea to China & Francisco Rodrigues* (Cortesao, 1944), an archaeological excavation study report in Kota Melaka (Muhamad, 2001), an underwater archaeological survey and salvage report in Melaka by Flecker (2005a) and Jabatan Warisan Negara (2007), and several past HIA study reports conducted within the state (Muhamad, 2020; Muhamad, 2022).

Literature studies have also found that the study area was once part of one of the most important routes used by traders since as early as the 11th century AD (Muhamad, 2018). Melaka was no exception to this, where the estuary of the Melaka River once served as the main port for the Melaka Sultanate that dominated the trade and shipping activities in the straits back in the 15th century (Halimi, 2021). Various trade activities, tax collection systems, and ship docks are in the vicinity. According to records in various reference sources, traders from the East and West stopped at the port of Melaka to trade. Among them were traders from China, Indian Gujaratis, Arabs, and traders from Southeast Asia (Mills & Cheah, 1997). The discovery of several shipwreck remains filled with weapons of war, such as cannons and cannonballs, are evidence of wars that involved the

old sultanate, as told by (Nordin, 2021). Melaka in the 14th to early 16th centuries, as is already widely known, once functioned as the capital and primary trading hub of the Malay Melaka Sultanate (Orillaneda, 2016). Thanks to its advantageous location in the center of the trade routes, the sultanate's capital played its role as a busy principal entrepôt town in the Strait of Melaka at its height. At the straits' narrowest point, traders from both inside and outside the Malay Archipelago rushed to trade products from both the West and the East. All the shipping and trade activities occurred at that narrowest point, including the siege of Malacca in 1511 and almost every attempt at the city's recapture by the Johors, Acheness, and the Dutch in the 16th to 17th centuries (Nordin, 2021).

The results of a survey of the shipwreck site in 2005 and 2007, conducted by researchers from outside and local agencies, found that around the project site (near Pulau Upeh), there is evidence of images of shipwreck remains, cannons, and other artifacts. However, follow-up studies, such as salvage and underwater archaeological excavations, could not be continued due to certain factors (Flecker, 2005b; Jabatan Warisan Negara, 2007). Some HIA studies that were conducted back in late 2020 and early 2022 also revealed several findings from ancient times, although the findings were not so significant in terms of state heritage and history.

All these reference materials are crucial to obtaining the historical background of the proposed project area, because it affects the historical value, archaeology, and heritage of the state of Melaka, from the past glory of the Malay Melaka Sultanate from the 15th century AD to the era of Japanese occupation (Cortesao, 1944). Therefore, when there are many traces of historical, archaeological, and heritage relics in Melaka, then the proposed development site must be carefully examined. Any possibility of finding any historically important artifacts must still be a concern. So, it must be made mandatory for any future development project, especially ones that are located within or near the potential area of underwater heritage sites, to undergo the HIA process first.

For the time being, since 2020, three projects of HIA regarding maritime area (archaeology) have been conducted by ATMA as the consultant chosen at three different locations in Melaka, Malaysia. Those three HIA projects depicted the relevance of the field, especially in Malaysia, which is considered as an archipelago and island country in Southeast Asia. It means that Malaysia's maritime area has the potential to be called the graveyard of ships. From the 1980s up until the early 2000, several shipwrecks were found by a private company hired by the Malaysian government to do research on shipwrecks, which mostly belonged to colonizers or were merchants' vessels. More than ten shipwrecks have been found by Sjostrand from 1993 until 2006 (Asyaari, 2018). Sjostrand, through the Nanhai Marine Archaeology Sdn. Bhd. (private company), also produced several books, with the collaboration of the Malaysia Museum, from 2001 until 2006.

3. Objectives of maritime HIA study

The goals of a maritime HIA study are marginally different from the goals of a land based HIA project. This is because each of these two domains has distinct development goals and objectives. For instance, the research of HIA in land areas needs to consider more important environmental factors, like the impact on the location of the building landscape, the impact of environmental pollution, the impact of tourism, the impact of culture, the impact as a heritage site, and so forth (Muhamad, 2020). Therefore, the following are the goals of the HIA study for coastal or maritime areas in Melaka:

i) To identify new underwater and heritage archaeological sites at development sites to be implemented.

ii) To protect and conserve maritime archaeological sites in development areas.

iii) To make further research if important evidence is found in terms of maritime archaeology, and studies in the form of salvage and underwater archaeological excavations should be done first to save underwater cultural heritage resources if necessary.

iv) To determine whether there is significant evidence, such as ancient shipwrecks, valuable artifacts, and impact on heritage, at the development site.

v) To record all underwater resource heritage impact study activities before development is implemented. Among the records that need to be available are records of scientific survey reports, analytical reports, and artifacts found.

vi) To provide suggestions, advice, and mitigation to developers so that they must follow certain conditions before a coastal site development project is conducted.

4. Methodology of the maritime HIA study

The collection of information during an HIA should consider all potential sources of data. Methods will include desk study or historical research, and site visits to check condition, authenticity and integrity, sensitive viewpoints, and so on (ICOMOS, 2011). The study of maritime HIA in the coastal area around Melaka involves the application of four main research approaches that are effective. The four approaches include a review of the literature, interviews with residents, scientific survey research, scuba diving, and Remotely Operated Vehicle (ROV) drone monitoring as shown in **Figure 4**. The collection of information gained during the HIA study is an iterative process that can often lead to the emergence of alternatives and options for the development proposal.

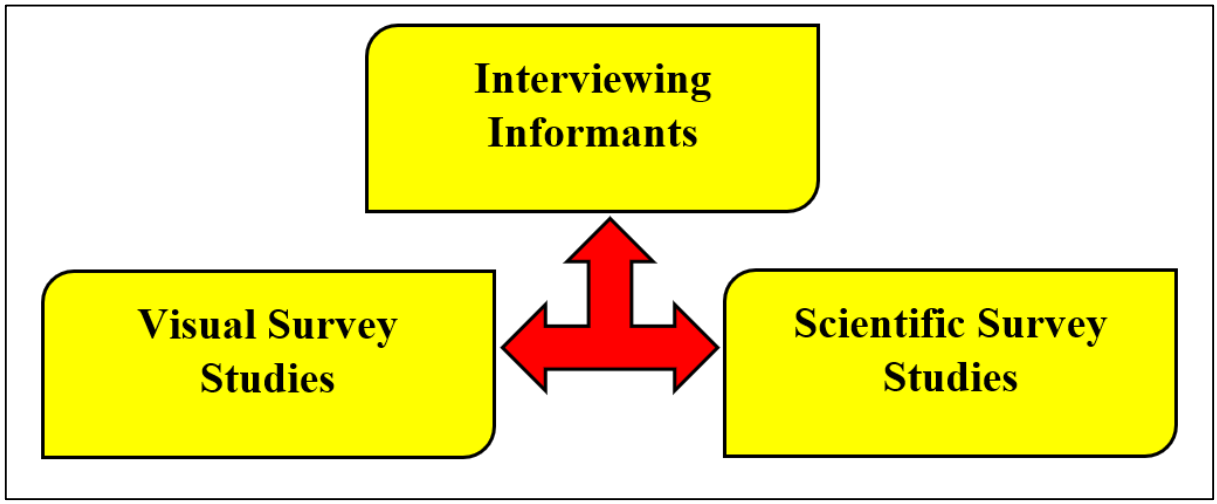

Figure 4 Three effective methods in maritime HIA study.

4.1 Interviewing informants

The method of questioning informants is used to collect any information not already present in written sources. Local populations and fishermen who frequently engage in fishing and shipping activities, such as erecting fishing nets close to possible sites, are some of the subjects of the interview when it comes to performing an HIA study on Melaka's undersea history.

These interviews will reveal details about any artifacts or shipwreck sites found in the project area. The next stage is to take images and measurements and examine the origin, use, and age of the artifacts if there is any indication that they were discovered by the informant. This approach is essential to further enhance the information that has already been obtained through the literature review. Below are some of the results obtained by the researchers during the HIA studies in 2022. Based on this method of interviewing informants. **Table 1** below shows the percentage of possibility of finding any artifacts in the area. As shown in the **Figure 5** map, a blue colour region located in Klebang possesses the highest percentage, which is 30 to 90 % of finding any artifacts if there were any, followed by the yellow region, which is in Pulau Panjang and possesses 40 to 60 %. **Figure 6** depicts some of the artifacts found and collected by the informants, some of which are indeed in good condition.

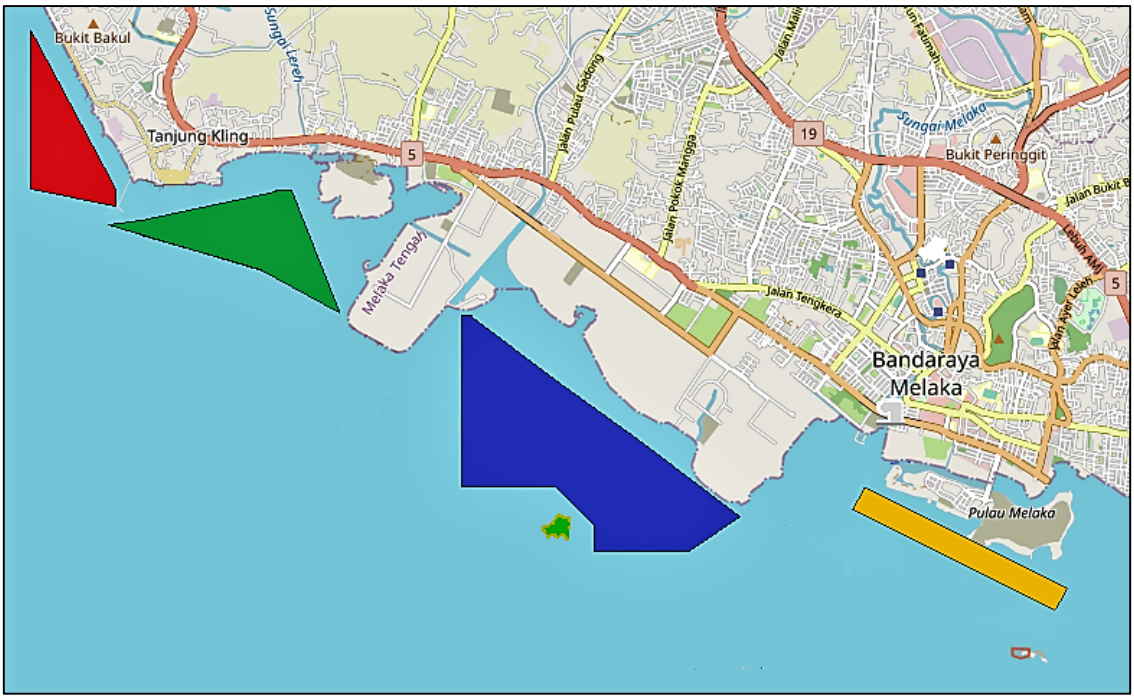

Figure 5 Map image of Central Melaka coast of artifact finding possibility, according to informants.

Table 1 Area and percentage of artifact findings possibility.

Area	Percentage of Artifacts Findings
Pantai Puteri (Red)	0 - 10 %
Lereh (Green)	10 - 30 %
Klebang (Blue)	30 - 90 %
Pulau Panjang (Yellow)	40 - 60 %

Figure 6 A collection of Chinese dynasties potteries from the Ming and Qing periods found by the informant during one of the HIA studies conducted.

4.2 Scientific survey study

The skills required to do an HIA, using modern information technology (IT)-based and highly scientific tools, can be very helpful, particularly in complex situations, but HIA should not depend solely on them. Good HIA documentation does not require a *Geographic Information System* (GIS), although this has been a powerful and useful tool where it has been available (ICOMOS, 2011). All approaches need to be systematic and follow rational guidelines.

In the case of the Melaka maritime HIA study, three main scientific survey methods that have had their efficiency proven are the *Multibeam Echo-sounder* survey, or MBES (sea-floor surface scanning), *Sub-Bottom Profiling*, or SBP (sea sediment penetration), and *Magnetometer* survey (magnetic response). These methods greatly helped in the detection of some images or artifacts that might have historical, heritage, and archaeological value during the HIA study. The implementation of these two scientific survey methods has managed to reduce the time, cost, and manpower consumed, because the subsequent focus will only be on areas that have images or signals that have sufficient potential for further investigation.

However, these scientific methods share a common flaw, which is the incapability of detailing the findings detected. Nonetheless, the implementation of this method still manages to produce the most precise locations of findings, which will be very useful when it comes to visual surveys that are conducted after scientific surveys are done.

4.3 Multibeam Echo-sounder

The first scientific survey method was called the *Multibeam Echo-sounder* Survey (MBES) as shown in **Figure 7**. The use of this tool is to detect any object stranded on the seabed. Typically, this method will detect if there is any medium-large object between > 1 square meter (Muhamad, 2022). However, it is not capable of identifying precisely what the object is, unless it is taken ashore or observed visually. The function of this tool is to reflect the object wave signal found at the bottom of the sea surface as shown in **Figure 8**.

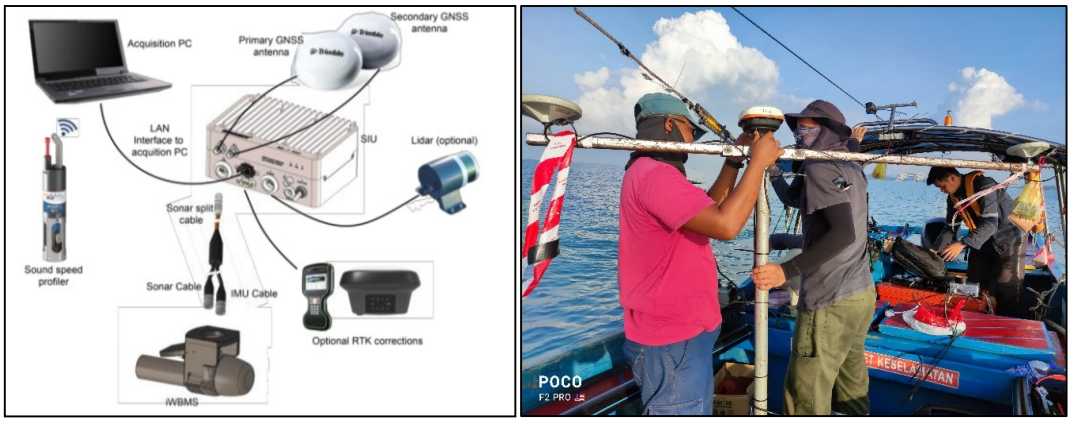

Figure 7 NORBIT Multibeam Echo-sounder Survey Equipment with Backscatter Data and preparation of the receiver device, is mounted to the side of the boat before the study begins.

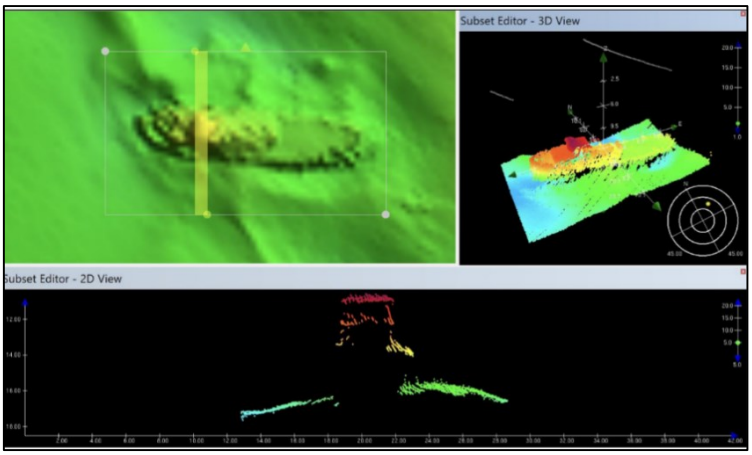

Figure 8 One example of a reading produced by the NORBIT MBES method showing a boat-like feature on the sea floor.

4.4 Sub-Bottom Profiling

The second scientific survey tool used for this study is *Sub-Bottom Profiling* (Pinger system) as shown in **Figure 9**. This tool is used to detect any findings that are submerged beneath the ocean floor as shown in **Figure 10**. This method is capable of penetrating and detecting embedded objects such as shipwrecks, artifacts, and other objects as deep as 5 to 10 meters in the seabed. Because the majority of the seabed along Melaka's coastline is muddy, this method was essential for the maritime HIA investigation (Muhamad, 2020). The ability of this technology to pierce down into the silt of the seabed offered crucial underwater data that was buried deep beneath the murky bottom.

Figure 9 Preparation of INNOMAR 2000 Sub-Bottom Profiling survey equipment- SBP (Pinger system) is placed to the side of the boat before the study is started.

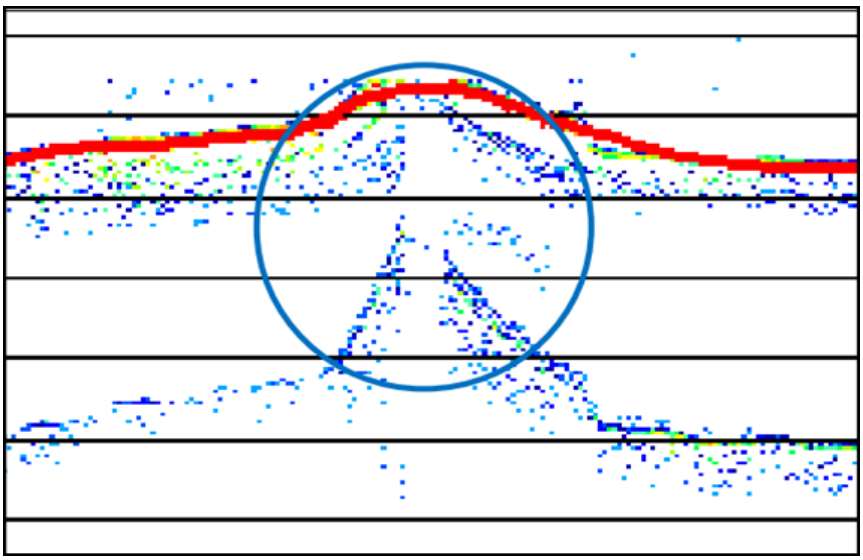

Figure 10 One example of a reading produced by the INNOMAR SBP method showing the penetration reading of the sea floor during one of the HIA studies.

4.5 Magnetometer survey

The last scientific survey method is the *Magnetometer* survey (**Figure 11)** which uses magnetic technology to detect and map the position of findings on the seabed that have a magnetic

response. This magnetic field reading will be reflected through a delayed detector; then, the reading will go through a cable connected to the computer system (**Figure 12**).

Figure 11 Preparation of SEA SPY 2 Magnetometer device to be towed at the back of the boat before the study begins.

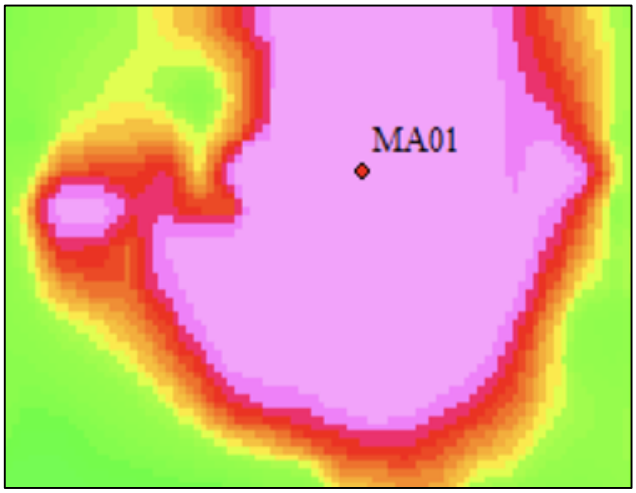

Figure 12 One example of reading produced by the SEA SPY 2 Magnetometer method showing the magnetic response in one of the scanned areas.

4.6 Visual Survey: Scuba diving methods and ROV drone monitoring

These visual survey methods will only be implemented if there is any evidence of potential data (designated as Suspicious Objects/SO) located from the scientific surveys done beforehand. The purpose of scuba diving (**Figure 13**) and Remotely Operated Vehicle (ROV) (**Figure 14**) drone monitoring is to ensure the existence of the findings obtained through the scientific methods done earlier. As the scientific survey done beforehand cannot precisely determine the exact shape or type of the findings detected, visual surveys are deemed necessary.

Among the focus of these visual surveys is to examine any remnants of underwater archaeological evidence such as shipwrecks, artifacts, or any ancient structures at the study site. Implementing ROV drones in conjunction with scuba diving methods reduces costs in terms of the expenses to identify potential objects. Also, the usage of the ROV will ensure the diver's safety, especially in areas with fast underwater currents (Muhamad, 2022). Suspicious Objects/SO is shown in map location **Figure 15** and **Table 2** while **Figure 16** shows the SO retrieved by the divers.

This method is the riskiest because of unpredictable sea conditions, especially in terms of weather, waves, currents, and limited visibility underneath the sea. Two situations threaten the safety of the divers; first, the issue of relatively fast underwater currents, and second, the limited underwater visibility which makes it dangerous and difficult for both the divers and the ROV drone to survey, identify, and locate any findings submerged in potential areas.

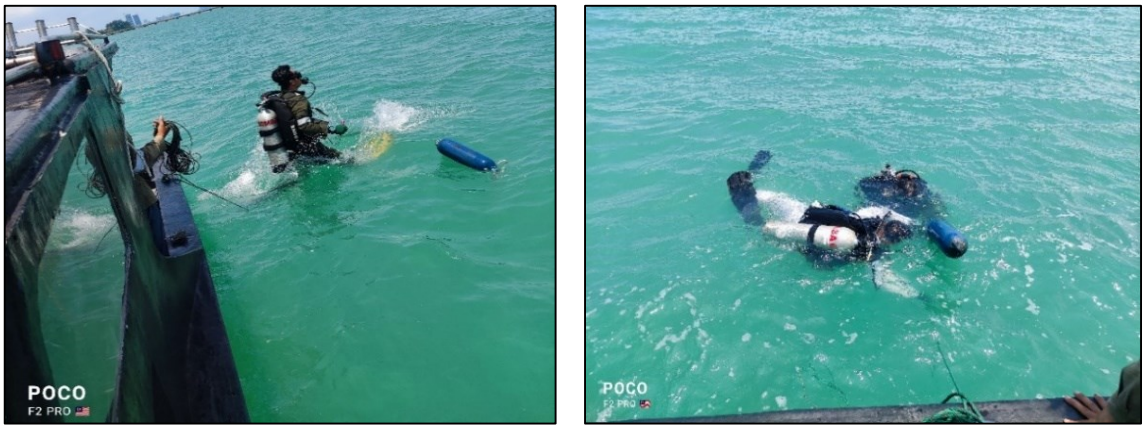

Figure 13 Scuba diving was implemented in potential locations detected by scientific methods earlier.

Figure 14 The Gladius Mini ROV is used by the surveyor to obtain visual images of potential locations.

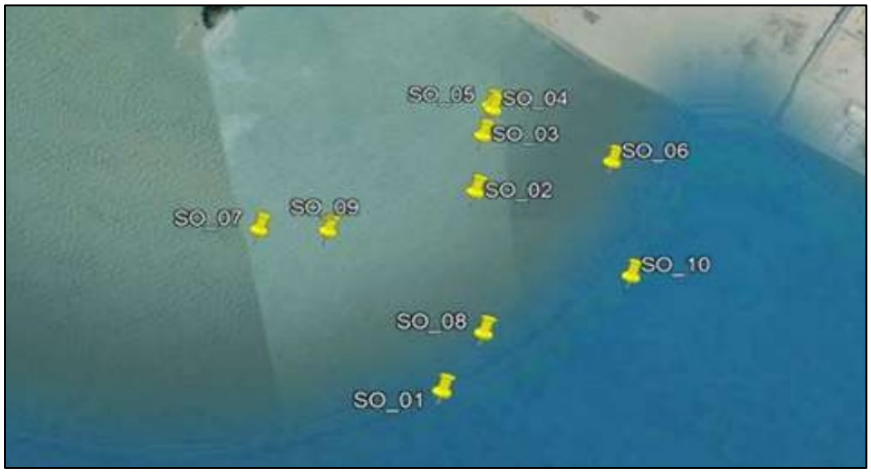

Figure 15 All of the locations that were detected as potential findings are marked with 'SO' (suspicious objects) and need to be examined with visual surveys.

Table 2 Coordinates of suspicious objects.

Label	UTM48N WGS84		Geographical WGS84	
	N	E	Latitude	Longitude
SO01	241298.4	189540.6	2° 10’ 49.7561” N	102° 12’ 32.6891” E
SO02	241928.9	189639.7	2° 11’ 10.2700” N	102° 12’ 35.8542” E
SO03	242119.2	189664.2	2° 11’ 16.4627” N	102° 12’ 36.6372” E
SO04	242208.9	189695.5	2° 11’ 19.3823” N	102° 12’ 37.6427” E
SO05	242222.3	189688.1	2° 11’ 19.8190” N	102° 12’ 37.4022” E
SO06	242017.9	190035.1	2° 11’ 13.1896” N	102° 12’ 48.6349” E
SO07	241820	189027	2° 11’ 06.6915” N	102° 12’ 16.0492” E
SO08	241473	189656	2° 10’ 55.4414” N	102° 12’ 36.4100” E
SO09	241810	189222	2° 11’ 06.3780” N	102° 12’ 22.3555” E
SO10	241640	190070	2° 11’ 00.8990” N	102° 12’ 49.7875” E

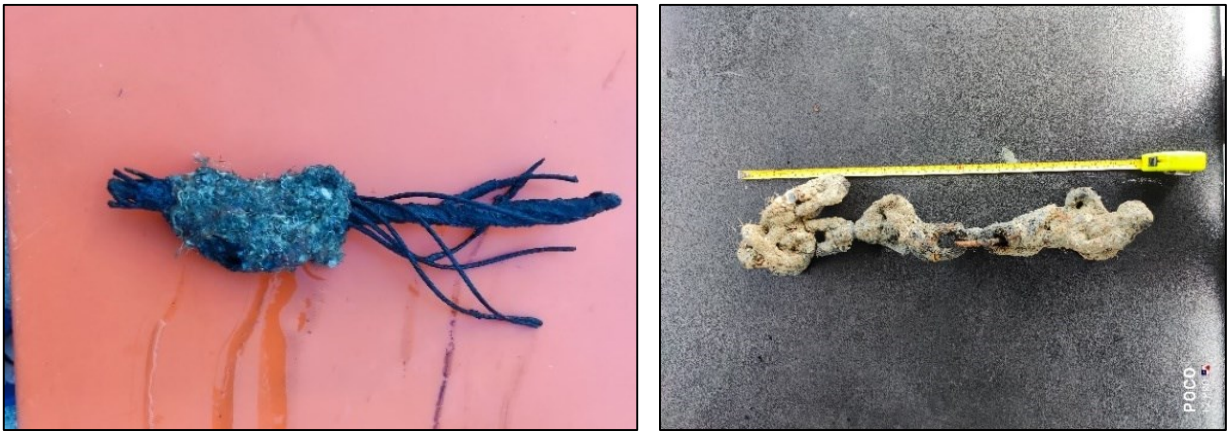

Figure 16 A 10-inch-long underwater cable and a 50 cm long iron chain were found by the divers in one of the dive sites detected earlier through the scientific survey.

5. Discussion

The research methods used throughout this HIA study have led to several results that can be used to predict some of the projected impacts of any proposed development in an area. Direct impacts are those that arise as a primary consequence of a proposed development which can result in the physical loss of part, or all, of an attribute or changes to its setting- the surroundings in which a place is experienced, its local context, and in how it embraces the present and past relationships to the adjacent landscape (ICOMOS, 2011). Looking at the various single steps of an HIA procedure, the stage of impact assessment comes to the fore as an especially important, and what is often considered the ‘technical heart’, of the HIA procedure. As noted in the HIA definitions, the crucial terms ‘identifying’, ‘predicting’, and ‘evaluating’ the impacts signify the major objectives of the HIA (Ashrafi et al., 2022).

The preparation of any HIA report will need to show the assessment for each OUV attribute- for example, in a simple table- and demonstrate how the results for each individual or collective heritage attribute have been obtained (ICOMOS, 2011). The artifacts or findings in the coastal environment of the Melaka Straits are shown as follows in **Table 3**. This should include qualitative, as well as quantitative, evaluation, as shown in **Table 3**.

Table 3 Underwater cultural heritage findings in Melaka maritime HIA study.

Methods	Findings			
	Literature Review	**Informants**	**Scientific Survey**	**Scuba Diving**
30 - 40 shipwreck sites	/			
Qing period porcelain plate		/		
18th century porcelain bowl		/		
Qing period clay plate		/		
Ming period jar		/		

Based on **Table 3** above, according to the report of JWN research, almost 30-40 images of shipwreck sites were taken in 2007, when a survey was conducted. However, according to the survey, continuous research has not been done, for undisclosed reasons. It might have happened because, at the time of 2007, Malaysia did not have its own experts in the maritime archaeology field and, thus, no support from experts could be gained, except from other countries.

5.1 Impact assessment, recommendations, and mitigation

Before the impact assessment, proposal, and mitigation of any HIA research can begin, several important aspects need to be considered as a guide, or an example of impact assessment on heritage in a place must be done first. Aspects that need to be taken into account include local conditions, especially if there are any remnants of objects, artifacts, ecofacts, monuments, or any building structures that symbolize the excellence of the universal heritage of Outstanding Universal Value (OUV) within the area. In addition, if the area to be developed does not have any impact on the heritage value of universal excellence, the aspect of heritage or local historical impact still needs to be given proper assessment before proposals and mitigation can start. It is also important to identify the scale or severity of a specific change or impact on a specific attribute, as this combination is what defines the significance of the impact, otherwise called "significance of effect" (ICOMOS, 2011).

The assessment, proposal, and mitigation in this coastal development area should take into account the factors of site excellence and local heritage, based on several criteria as stated below:

i) Impact on historical heritage (historical value, relics of underwater cultural heritage resources, shipwrecks, and archaeological artifacts).

ii) Impact on the tourism industry, based on historical and heritage site resources.

iii) Impact on heritage sites (shipwreck sites, underwater archaeological sites- building structures, artifacts, and ecofacts).

iv) Impact on the environment.

In this system, the value of heritage attributes is assessed in relation to statutory designations (international or national), priorities or recommendations set out in national research agendas, and ascribed values. Professional judgment is then used to determine the importance of the resource. Whilst this method should be used as objectively as possible, qualitative assessment using professional judgment is inevitably involved (ICOMOS, 2011). The value of the asset may be defined using the following grading scale. The following is an example of a display of the findings and evaluation of historical, heritage, and archaeological effects based on the above evaluation criteria.

Table 4 Assessment of impact on several aspects.

Value	Impact			
	Value Heritage / Archaeology	**Tourism Industry**	**Heritage / Archaeological Sites**	**Effect on Environment**
Very Important	30 - 40 shipwreck sites			
Important	-			-
Mediocre				
Low	Qing and Ming period potteries			
No Interest	Iron chain, rotten cable			

Table 4 assessments were based on the findings during the survey in the maritime area conducted by the authors. Each scale value depicts the importance of the findings towards the impact on a different field. In the Archaeology and Heritage field, the findings or the pictures scanned during the research show the existence of shipwrecks under the water. These were supposed to be researched before, or continuous research should have been done, by any research center in Malaysia. However, the lack of existence of such a center in Malaysia could not make continuous research be done.

5.2 Impact assessment (phases before, during, and after coastal development)

The evaluation of the quality and impact of the HIA study needs to take into account several factors and criteria. The effectiveness of quality assessment on HIA studies can be illustrated through the diagram below:

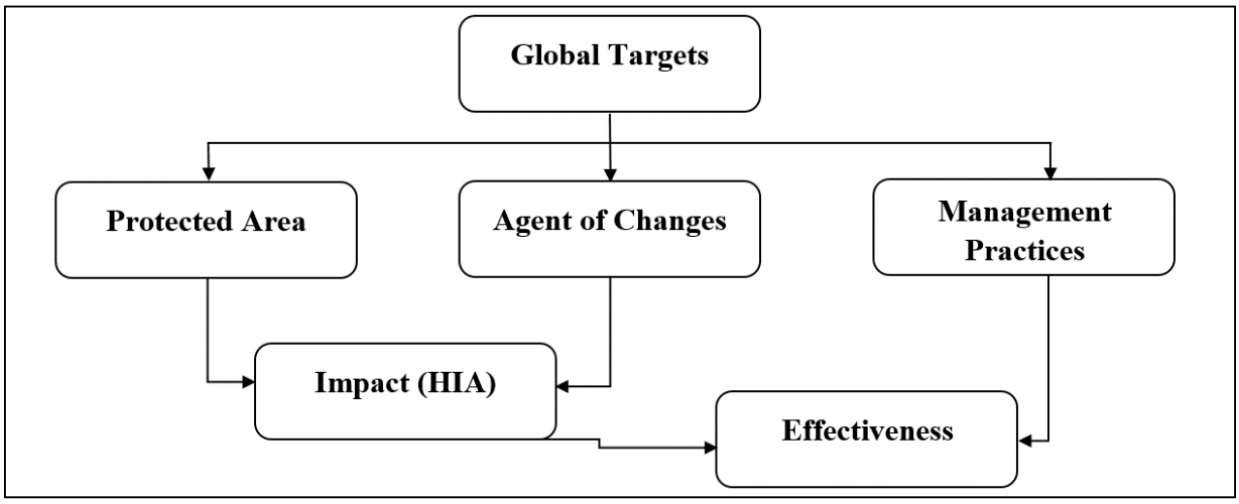

Figure 17 Effectiveness of the HIA study framework and the relationship between five additional evaluation factors.

Figure 17 above is a proposed framework to help determine the effectiveness of management practices, including HIA practices. It can be used as a guide to evaluating HIA and assessing the relationship between the five main sub-assessments. Among the subs are protected urban areas, agents of change, and management practices.

The assessment of the impact of agents of change, as well as the effectiveness of management practices applied, in the protected urban areas requires input from three previous assessments.

The assessment of a protected area is also known as an assessment of cultural importance, and is often contained in a Statement of Interest (Statements of Outstanding Universal Value for World Heritage property). All of these factors are used to determine the cultural significance covering cultural heritage properties, as well as to monitor the state of their preservation promptly.

Assessment of agents of change relates to known and potential factors found to influence protected areas, and is often considered a threat to, or cause of deterioration of, cultural heritage property conservation conditions. The evaluation of management practices focuses on the effectiveness of procedures, especially the stakeholders involved, their actions, and conditions.
The HIA study, as described earlier, considers assessments to determine the impact of agents of change on protected areas designated as cultural heritage, whereas effectiveness evaluation refers to the contribution of selected management practices, including HIA, to achieving targeted objectives in protected areas and agents of change (Roders et al., 2013).

Overall, the M-WEZ development plan has the potential to generate significant returns for the Melaka state government, based on the inflow of foreign investment, as well as for the tourism industry, especially in the coastal areas of the state. However, there are still two important issues that need to be considered: namely, the recognition of the state of Melaka as a World Heritage City by UNESCO since 2008 (Amat, 2019), and the JWN Protected Zone that overlaps within the M-WEZ development zone.

Therefore, sensitivity to any discovery of underwater heritage or artifacts related to the cultural heritage of underwater resources, such as shipwrecks, ancient structures, and artifacts that contain local historical value, needs to be saved, recorded, and preserved beforehand. Marine development work should be stopped temporarily if there is the discovery of any such valuable finds. In this case, the developer should seek views and advice from the JWN to take the next step whether to conduct a comprehensive underwater archaeological study in the affected area. If needed, a consultant with historical, archaeological, and environmental expertise should become involved in the comprehensive study.

5.3 Mitigation measures

After the HIA study is done in any proposed area, then the data from the study can contribute to the mitigation measures to reduce the adverse impacts on the World Heritage properties especially those with the OUV value as an essential requirement for the protection and management.

Consequently, the mitigation strategies can then be established to prevent, reduce, or offset the identified significant negative impacts of the proposal or project on any World Heritage site (Ashrafi et al., 2022) as shown in **Figure 18**. As the Melaka coast, in some areas, has high possibilities of containing some significant heritage findings, it is advised that any development follow the HIA regulations, including the mitigation measures set up by the authorities.

If there are no traces of any significant artifacts, there is no need for mitigation action. However, developers are advised to be careful during the reclamation stage as a precautionary measure. If there are any significant findings (artifacts, shipwrecks, etc.) related to the history and heritage of Melaka that are discovered while reclamation work is ongoing, the work progress must be halted temporarily. The developer then would have to take the initiative to bear the cost of salvage and excavation with the presence of an archaeologist. All the findings must be reported immediately to the Melaka Museum Corporation (PERZIM) and JWN. This is because there is a law stated in the National Heritage Act 2006, Part IX: Underwater Cultural Heritage (National Heritage Act 645, 2006), which states:

i) Any person who finds an underwater cultural heritage on the Malaysian coast shall, as soon as practicable, give notice of the discovery to the Commissioner or port officer.

ii) The port officer upon receipt of the notice shall as soon as practicable notify, and if possible hand over the underwater cultural heritage to, the Commissioner.

iii) The Commissioner may, when satisfied that the underwater cultural heritage has a significant cultural heritage, cause it to be listed in the register.

iv) Any person who fails to give notice under subsection (1) commits an offense.

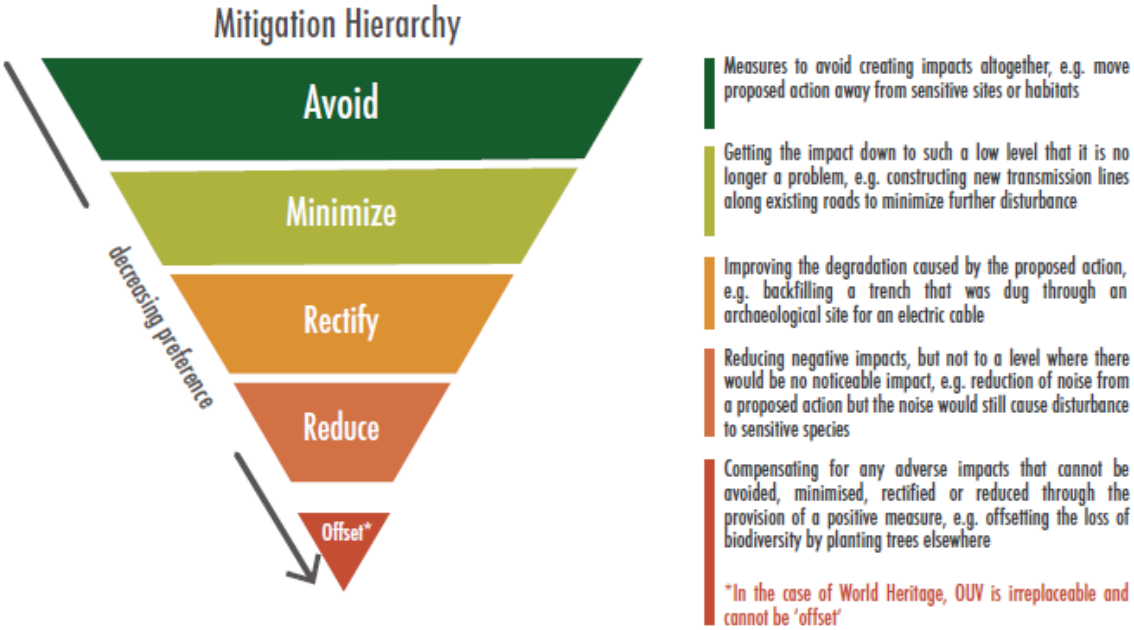

Figure 18 The mitigation hierarchy based on UNESCO (2022).

5.4 Impact of environmental waste, monitoring, and audit

Since HIA itself was originally established within the framework of the EIA, the study itself would have to adhere to the EIA guidelines. In case there are any significant findings in terms of underwater cultural heritage in any proposed development site that require salvage and excavation, then these activities conducted would have to comply with mitigations resulting from the assessment of environmental waste, monitoring, and audit. However, if there is no predictable environmental waste impact from any HIA study conducted, there is no need for any recommendation of environmental monitoring and audit requirements for underwater cultural heritage.

In the case of the studies in Melaka there are no requirements for any recommendation of environmental monitoring and audit requirements for underwater cultural heritage as there is no trace of significant findings that would require further salvage and excavation work on the project site. Hence, there will be not much effect on the environment around it.

6. Conclusions

The establishment of the Heritage Impact Assessment study is a significant step forward regarding the conservation and protection of the cultural World Heritage values concerning sustainable development objectives. In terms of Melaka Waterfront Economic Zone development, the strategic plan is the key point in boosting the economy of the state of Melaka. However, the conservation and preservation of the state's underwater cultural heritage must also be taken into account by implementing the HIA study. This study is an efficient methodology, as it employs a systematic examination of the full range of potential events and outcomes, combining an overview with detail.

As an HIA is not just for preserving Melaka state's heritage, it can also be used to provide benefits that enhance sustainable development planning in the future. The HIA study is becoming increasingly crucial to make sure that any proposed development will not infringe on any area of

archaeological and heritage interest of Melaka state and will reduce the direct or indirect impact on any underwater archaeological site along with the site of any marine development project.

However, it is emphasized here that, if there are any findings discovered either intentionally or unintentionally during the project, the developer must report the findings to the authorities in advance before proceeding with the development work. It is the hope of the authors that Malaysia can be more advanced in the maritime archaeology field, both in theoretical studies and in practical terms, and can share their findings with other ASEAN countries, as we mostly share history and heritage with each other.

Based on the development of M-WEZ in the Melaka coastal area, the HIA conducted is in line with the requirements of JWN before any project can be started. The location of the site that overlaps with the gazetted area of the Protected Zone became a conflict, as the development of urbanization cannot be held for a long time as it involves too many stakeholders. This conflict has been resolved as the outcome of the survey provides that there are no artifacts or underwater cultural heritage that can be found after three HIA surveys have been conducted. If there are any suspicious objects found when the development progress, the developer has been advised to notify the authorities and take the mitigation measures into account

Acknowledgements

I would like to express my special thanks and gratitude to the National Heritage Department, Malacca State Museum, and the government of Melaka for giving me this opportunity to get involved with several HIA studies conducted in the state, therefore allowing me to produce a research paper base on the studies. Hopefully, this project will provide a useful guide regarding the importance of heritage, environment, and preservation of areas with Outstanding Universal Value (OUV) in the state of Melaka and, at the same time, will not hinder the progress of creating sustainable development in the state.

References

Amat, R. C. (2019). Historic cities off the straits of Malacca UNESCO world heritage site: Threats and challenges. *Journal of World Heritage Studies, 2019*, 9-15. https://doi.org/10.15068/00157680

Ashrafi, B., Neugebauer, C., & Kloos, M. (2022). A conceptual framework for heritage impact assessment: A review and perspective. *Sustainability, 14*(27), 1-15. https://doi.org/10.3390/su14010027

Cortesao, A. (1944). *The Suma Oriental of Tom Pires: An Account of the East from the Red Sea to Japan.* Vol. 1. London: Hakluyt Society.

Flecker, M. (2005a). *Final Report Malacca Shipwreck Survey 1*. Maritime Explorations (M) Sdn. Bhd.

Flecker, M. (2005b). *Report Brief Shipwreck Survey Near Pulau Upeh*. Maritime Explorations (M) Sdn. Bhd.

Halimi. A. J. (2021). *Perkapalan dan Perdagangan di Melaka* (pp. 177-200.). In Ariffin, A. (Ed.). Kesultanan Melayu Melaka: Warisan, Tradisi dan Pensejarahan. Pulau Pinang: Penerbit USM.

ICOMOS. (2011). *Guidance on Heritage Impact Assessments for Cultural World Heritage Properties*. ICOMOS and World Heritage Centre.

Jabatan Warisan Negara. (2007). *Laporan Akhir Projek Survei Kapal Karam Bersejarah Selat Melaka*. Jabatan Warisan Negara, Kementerian Kebudayaan, Kesenian dan Warisan.

Melaka State Economic Planning Unit. (2021). *Melakaku Maju Jaya 2035 Strategic Plan*. Melaka State Economic Planning Unit.

Mills, J. V., & Cheah, B. K. (1997). Eredia's description of Malacca. *Journal of the Malaysian Branch of the Royal Asiatic Society, 71*, 137-141.

Muhamad, A. (2001). *Laporan Kajian Arkeologi Kota Melaka*. Jabatan Muzium & Antikuiti.

Muhamad, A. (2018). Hubungan Jalinan Laluan Sutera Maritim antara Semenanjung Tanah Melayu dengan Siam Sejak Abad 14 Masihi Melalui Bukti Arkeologi Maritim. *International Journal of the Malay World and Civilisation, 6*(2), 3-15.

Muhamad, A. (2020). *Penambakan Laut Seluas 300 Ekar Kawasan Bandar XLIV, Daerah Melaka Tengah, Melaka: Dari Perspektif Kajian Impak Warisan (HIA).* Institut Alam & Tamadun Melayu.

Muhamad, A. (2022). *Penambakan Laut Seluas 735 Ekar di Tanah Kerajaan, Kawasan Bandar XLV, Daerah Melaka Tengah, Melaka: Dari Perspektif Kajian Impak Warisan (HIA).* Institut Alam & Tamadun Melayu.

National Heritage Act 645. (2006). *Part IX: Underwater Cultural Heritage*. The Commissioner of Law Revision, Malaysia.

Nordin, M. (2021). *Peperangan pada era Kesultanan Melayu Melaka* (pp. 289-313). In Azmi Ariffin, A. (Ed.). Kesultanan Melayu Melaka: Warisan, Tradisi dan Pensejarahan. Pulau Pinang: Penerbit USM.

Orillaneda, B. C. (2016). *Of ships and shipping: The maritime archaeology of Fifteenth Century CE Southeast Asia* (pp. 29-57). In Chunming, W. (Ed.). Early Navigation in the Asia-Pacific Region: A Maritime Archaeological Perspective. Springer. https://doi.org/10.1007/978-981-10-0904-4_2

Rogers, A. P. (2017). Assessment Heritage Impact (HIA) (pp. 1-7). In Varela, S. L. L. V. (Ed.). SAS Encyclopedia of Archaeological Sciences. Wiley Online Library.

Rogers, A. P. (2017). Built heritage and development: Heritage Impact Assessment of Change in Asia. *Built Heritage, 1*(2), 16-28. https://doi.org/10.1186/BF03545660

Rogers, A. P., Bond, A., & Teller, J. (2013). Determining effectiveness in heritage impact assessments. In Proceedings of the 13 Conference Proceedings: Impact Assessment the Next Generation, 33rd Annual Meeting of the International Association for Impact Assessment. Alberta, Canada.

UNESCO/ICCROM/ICOMOS/IUCN. (2022). *Guidance and Toolkit for Impact Assessments in a World Heritage Context*. Paris: UNESCO.