

National Shipwreck Database of Sri Lanka: A non-Intrusive Documentation of Maritime Heritage in Sri Lankan Water

Anuradha Piyadasa¹, Rasika Muthucumarana², Indika Hewage², Dharshana Jayawardena³

1. Director, Institute of Archaeology and Heritage Studies, Sri Lanka.

2. Senior Archaeology Officer, Maritime Archaeology Unit, Central Cultural Fund, Sri Lanka. 3. Independent Underwater Explorer

ABSTRACT

The creation of the National Shipwreck Database of Sri Lanka (NSDSL) was initiated by the Maritime Archaeology Unit (MAU) to address the fragmented state of data collected from various shipwreck sites around the country. Established in 2001 in Galle under the Central Cultural Fund, the MAU teamed up with the Institute of Archaeology and Heritage Studies and the Cultural Heritage Agency of the Netherlands to centralise the data and make it accessible to interested parties. The primary objective of the database was to effectively administer the data amassed from maritime wreck locations and distribute this information to pertinent stakeholders while concurrently heightening public cognisance.

The NSDSL is valuable for diverse stakeholders, such as marine researchers, the tourism industry, the Sri Lanka Navy, universities, the public, and the media. It plays a critical role in protecting shipwrecks, preventing illegal activities like salvage work, and preserving heritage significance.

The database contains comprehensive information on 109 wreck sites, including 103 shipwrecks and six aircraft remains, curated by qualified researchers and professionals. Detailed data, such as name, operation period, wreck type, depth, and legal status, are provided for each site. Additionally, over 80 sites feature supplementary materials like videos, photos, descriptions, and research information.

A user-friendly web-based application was developed for data collection and entry, with a visually appealing front end for easy navigation. Key features include an interactive map of shipwreck locations; a maritime timeline; details on the oldest shipwreck in the Asia-Pacific region; a searchable shipwreck dashboard with interactive charts; publications by the MAU, and restricted access for researchers upon request.

The NSDSL successfully achieved its objective by implementing the database, thus facilitating effective data administration and stakeholder engagement.

Keywords: Underwater Cultural Heritage Documentation, Shipwrecks, Relational Database, Web Application

List of Abbreviations

CCF	Central Cultural Fund
GIS	Geographical Information System
IAHS	Institute of Archaeology and Heritage Studies
MAU	Maritime Archaeology Unit
NSDSL	National Shipwreck Database of Sri Lanka
RCE	Cultural Heritage Agency of the Netherlands

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INTRODUCTION

This paper introduces the importance of Sri Lanka's underwater cultural heritage (UCH) and the need to document and preserve it. Sri Lanka has a long history as a trading hub, connecting civilizations and facilitating cultural exchange.

Consequently, numerous submerged archaeological sites and shipwrecks in the surrounding waters provide valuable insights into the nation's history and contribute to understanding global maritime history. Recognising the significance of documenting UCH, the Maritime Archaeology Unit (MAU) of the Central Cultural Fund (CCF) initiated the National Shipwreck Database of Sri Lanka (NSDSL) project in 2001. Although the MAU had been collecting data in physical copies, this limited accessibility for various stakeholders. To address this issue, the MAU collaborated with the Institute of Archaeology and Heritage Studies (IAHS), the Cultural Heritage Agency of the Netherlands (RCE), and the CCF to develop a web-based NSDSL launched in December 2021.

This paper focuses on the collaborative process of constructing the online database and explores its impact and potential outcomes for maritime archaeology and preserving Sri Lanka's UCH.

UNDERWATER CULTURAL HERITAGE

Under the UNESCO 2001 Convention on the Protection of the UCH, UCH is defined as all human traces with cultural, historical, or archaeological significance, wholly or partially submerged for a minimum of 100 years. This encompasses sites, structures, artefacts, human remains, vessels, aircraft, prehistoric objects, and their respective archaeological and natural contexts (UNESCO 2001, 1-21). Sri Lanka's legislative framework currently does not encompass a distinct national definition of UCH. Consequently, while formulating the NSDSL, a comprehensive understanding of UCH and the policies and practices employed by other nations were considered.

LEGISLATION AND INTERNATIONAL CONVENTIONS RELATED TO THE UCH OF SRI LANKA

The Antiquities Ordinance legally protects the UCH in Sri Lanka, which defines archaeological heritage as all aspects of human existence, activity, and related material, including subterranean and underwater sites. The legislation and international conventions related to the UCH of Sri Lanka are listed below (Mandawala 2017, 50-80). Table 1 summarises the national legislation and international conventions pertinent to UCH in Sri Lanka.

Table 1 Overview of National Legislation and International Conventions Relevant to UCH in Sri Lanka

Type	Title	Description
National Legislation	1. Antiquities Ordinance (1940)	Sri Lanka's primary legal framework for protecting cultural heritage covers all "antiquities" found within its territory, defined as objects or structures over 100 years old with cultural, historical, or scientific significance (Antiquities - An ordinance to provide for the better preservation of the antiquities of Ceylon 1940 n.d.).
	2. Amendments to the Antiquities Ordinance	Introduced in 1998 and 2005, these amendments explicitly encompass underwater sites and artefacts, requiring permits for any activity involving UCH (Antiquities - An ordinance to provide for the better preservation of the antiquities of Ceylon 2005 n.d.).
	3. Long-Term Management Plan for Maritime Wrecks and UCH	Approved in 2011, this comprehensive plan, proposed by the Minister of Fisheries and Aquatic Resources Development, aims to manage Sri Lanka's maritime wrecks and UCH (Office of the Cabinet of Ministers, Sri Lanka 2011).
International Conventions	1. UNESCO Convention on the Protection of the Underwater Cultural Heritage 2001	The ratification process was initiated in 2010, the convention establishes guidelines for the management, research, and conservation of UCH, including the in-situ preservation of underwater sites, the prohibition of commercial exploitation, and the facilitation of international cooperation (UNESCO 2001, 1-21).

DEVELOPMENT HISTORY OF THE NSDSL

The MAU has endeavoured to advance the development of the NSDSL framework through three distinct iterations, leveraging collaborative partnerships and securing financial support from external stakeholders. (Muthucumarana 2018, 30). Table 2 on the next page summarises the historical milestones in developing NSDSL.

Table 2 Historical Milestones in the Development of the NSDSL

Year	Initiative / Development	Description
2009	Site Recorder Program Acquisition by MAU	The MAU acquired the Site Recorder program, a comprehensive software integrating Geographical Information System (GIS), finds database, dive log, and image management. It is suitable for small to large-scale excavations and evaluation projects due to its flexible and easy-to-use interface (Software n.d.).
2012	Establishment of a Rudimentary Shipwreck Database (Excel-based)	In 2012, the MAU enhanced an Excel spreadsheet encompassing rudimentary data from 50 shipwrecks originally supplied by Dharshana Jayawardene. These dialogues were expedited under the auspices of the Indian Ocean Maritime Affairs Cooperation.
2014	Development of a GIS Database for the UCH of Sri Lanka	The RCE provided funds for developing a dedicated GIS database for Sri Lankan shipwrecks, accumulating geographical data and other relevant information that served as a foundation for the NSDSL.

THE NECESSITY FOR A NEW NSDSL

A pervasive limitation in previous attempts to develop the NSDSL was the reliance on stand-alone databases, which precluded remote access by interested parties. This constraint undermined a fundamental objective of the NSDSL: to facilitate access for various stakeholders.

The 2009 and 2014 iterations of the database necessitated specialised software to retrieve information, while the 2012 version lacked a relational database structure. These factors severely impeded collaborative efforts to enhance the NSDSL.

Incorporating innovative Non-Intrusive Documentation techniques, such as 3D models, 360-degree photos and videos, and virtual tours, proved challenging within the constraints of these earlier databases. To address these issues, the MAU sought a web-based solution that could resolve the concerns above and be easily managed by individuals without specialised IT expertise.

OTHER SHIPWRECK DATABASES

Koutsis and Stratigea (2021) analysed 51 shipwreck databases, emphasising the vast diversity of information on global maritime incidents. The majority were characterised by national (35 per cent) and regional (33 per cent) coverage, indicating prevalent localised data sources.

The Australian National Shipwreck Database uniquely combines a legislative management module with diverse stakeholder requirements, catering to the public, tourists, historians, archaeologists, managers, agencies, students, researchers, curators, and conservators. (Luckman and Viduka 2013, 76–86).

In creating a shipwreck database, it is crucial to consider the intricate environment of the shipwreck site, employing various visual aids such as diagrams, tables, and maps to convey the information effectively (Craig 2015, 34-41).

RESOURCES

A combination of accurate data, historical records, visual materials, and advanced imaging techniques played a crucial role in the success of the NSDSL.

The MAU contributed over two decades of collected information to developing the NSDSL. Universities, Sri Lanka Navy and other government agencies shared their resources to enrich the database's content. The contributions of both professional and amateur divers were also indispensable in gathering and documenting valuable data on shipwrecks.

Technical resources constituted another crucial aspect of the NSDSL's development, and the IAHS supplied the necessary technical expertise and hosting facilities to support the database. Furthermore, RCE's financial assistance was pivotal in enabling the MAU to gather and process the extensive information required for the NSDSL.

AN INTEGRATED APPROACH TO DEVELOPING THE NSDSL

The following approach was used for the NSDSL development to provide a more comprehensive understanding of the complex interrelationships between shipwrecks and their surrounding environments, fostering responsible stewardship and appreciation of these valuable cultural and natural resources. The methodology employed can be succinctly classified into five overarching categories, as illustrated in Figure 1.

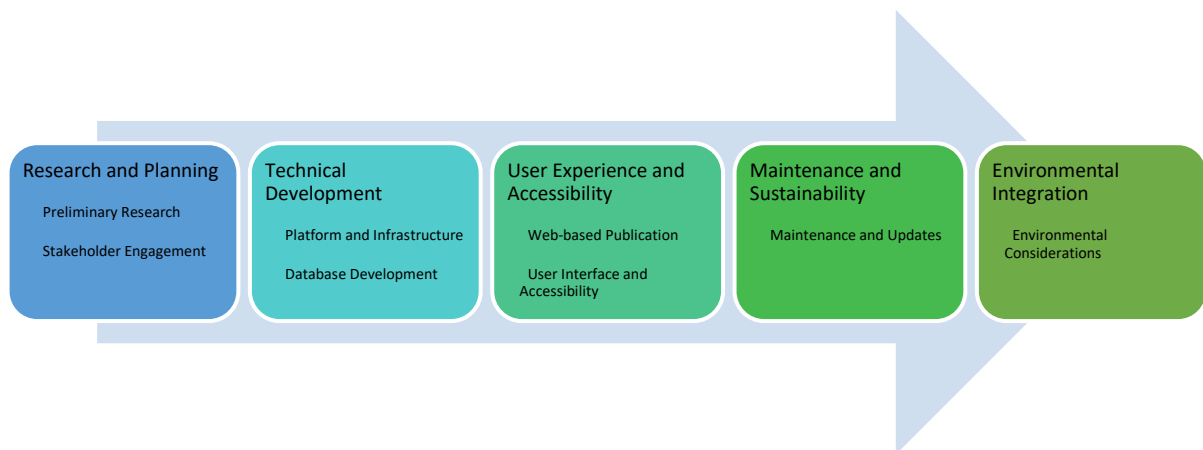


Figure 1 Methodology employed in developing NSDSL

The Table 1 gives principal stages of the NSDSL development categorised based on the approach given in the Figure 1.

Table 3 Principal Stages in the NSDSL Development, Organised by Approach Category

Category	Step	Description
Research and Planning	Literature Review	Review of existing literature, legislation, international conventions.
	Stakeholder Consultation and Information Gathering	Engaging with diverse stakeholders to collect data.
Technical Development	Platform Selection	Choosing a cost-effective, maintainable platform with open-source solutions for flexibility, scalability, and compatibility.
	Database Design and Implementation	Designing and implementing a relational database schema based on literature review and stakeholder consultation findings.
	Data Population and Validation	Populating the database with the collected information and implementing data validation and quality control measures.
User Experience and Accessibility	Web-based Publication	Publishing the database on the chosen platform and ensuring ease of use and accessibility for diverse stakeholders.
	Web GIS Integration	Integrating a Web GIS tool to enhance the visualisation and accessibility of shipwreck information and enabling spatial queries.
	Multimedia Integration	Supporting various multimedia formats enriches the user experience.
	Access Control	Implementing a robust access control system safeguards sensitive data and prevents unauthorised access.
Maintenance and Sustainability	Ongoing Maintenance and Updates	Establishing a plan for regular updates and maintenance involving stakeholder engagement, data verification, and periodic evaluation.
Environmental Integration	Identifying Environmental Components	Documenting and integrating information about marine flora, fauna, and ecosystems associated with shipwrecks to contribute to a holistic understanding of shipwrecks.

RESULTS

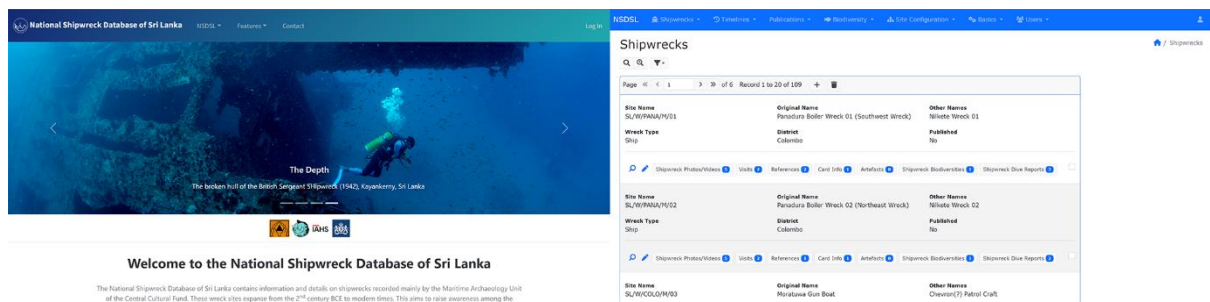


Figure 2 The Front End (Left) and the Back End (Right) of the NSDSL

The front end serves as a public-facing interface, granting access to a wealth of information on Sri Lanka's shipwrecks to a broad audience, including the public, tourists, and students. In contrast, the backend is tailored to the needs of authorised system users and researchers, offering enhanced functionality and access to more detailed or restricted information.

By implementing this dual-component structure, the NSDSL effectively balances the need for public accessibility and education with specialised research and data management requirements, fostering a multidimensional understanding of Sri Lanka's maritime heritage.

Currently, the NSDSL encompasses records of 103 shipwrecks and six aircraft wrecks.

Key features of the NSDSL

Interactive Map

The NSDSL has developed an interactive web-based GIS map, allowing users to explore shipwrecks with geospatial referencing and basic filtering options. The interact map is illustrated in Figure 3.

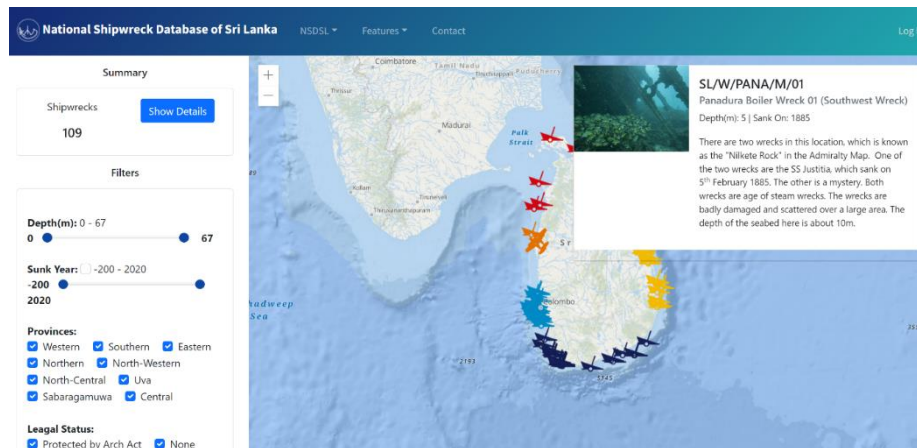


Figure 3 Interactive Map of NSDSL

Shipwreck Dashboard

The NSDSL features a shipwreck dashboard, which serves as an essential research instrument for scholars in the field. This dashboard presents analysed data through interactive visualisations, encompassing various aspects such as administrative areas, access restrictions, operational periods, depths, and historical periods of shipwrecks.

Maritime Archaeology Timeline

The development of Maritime Archaeology in Sri Lanka is comprehensively chronicled through an interactive timeline spanning from the 1960s to the present. This resource serves as an invaluable tool for individuals seeking to gain insights into the evolution of this field.

The Story of Godawaya

The NSDSL would be incomplete without a dedicated section addressing the Godawaya shipwreck, the oldest known wreck site in the country and, to date, the most ancient in the Asia-Pacific region, with an estimated age of 2,100 years (The Nautical Archaeology Digital Library n.d.). To effectively convey the fascinating narrative of the Godawaya Shipwreck, the NSDSL utilises a story map.

Biodiversity information

Currently, the system documents the environment's biodiversity surrounding shipwrecks, including species names, taxonomic groups, orders, families, conservation statuses, feeding types, visiting frequencies, and the economic significance of the species. While this information is not yet accessible to the public, plans entail making these data publicly available.

DISCUSSION

Through establishing the online NSDSL, the MAU has triumphantly realised its decade-long ambition of disseminating contemporary knowledge concerning UCH. This achievement transcends geographical boundaries and temporal constraints, ensuring round-the-clock accessibility to any interested party. The user-friendly backend facilitates efficient collaboration and expeditious sharing of findings, catering to many users.

Including interactive features, such as the map, story map, timeline, and dashboard, enriches the user experience, making exploring shipwreck-related data more engaging and informative. The modular-based design of the NSDSL can be used to encompass other aspects of UCH beyond shipwrecks.

In essence, implementing the NSDSL has not only fostered interdisciplinary collaboration but paved the way for sustainable development within the maritime domain.

Impact of the NSDSL

The NSDSL was officially launched by the Prime Minister of Sri Lanka, in December 2021. At this event, the Secretary to the Prime Minister revealed that a cabinet paper had proposed salvaging forty shipwrecks, in light of the new information provided by the NSDSL, the Secretary announced the decision to halt the proposed cabinet paper.

During a meeting to formulate a marine tourism master plan for Sri Lanka, the NSDSL was showcased. Impressed by the NSDSL's features, the Sri Lankan Tourist Board expressed their interest in collaborating with the CCF to enhance the NSDSL, making it more conducive for tourism.

The NSDSL's meticulous documentation of all known shipwrecks and surrounding biodiversity, achieving comprehensive coverage, earned commendation in the inaugural meeting of the Marine Spatial Planning and "Ocean 30x30 Campaign," signifying a significant contribution to marine conservation and the ambitious targets of the campaign.

At the e-Swabhimani National Award Ceremony 2021, conducted in March 2023, the NSDSL was duly honoured with a merit award.

CONCLUSION

In conclusion, the primary aim of the National Shipwreck Database of Sri Lanka was to amalgamate and centralise the diverse information held by multiple agencies and individuals whilst effectively disseminating this knowledge to pertinent stakeholders. The objective has been unequivocally accomplished through the successful implementation of this comprehensive database, paving the way for enhanced collaboration and informed decision-making within the maritime domain.

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Bibliography

- n.d. *Antiquities - An ordinance to provide for the better preservation of the antiquities of Ceylon 1940*. Accessed April 20, 2023. <https://www.lawnet.gov.lk/antiquities-2/>.
- n.d. *Antiquities - An ordinance to provide for the better preservation of the antiquities of Ceylon 2005*. Accessed April 20, 2023. <https://www.lawnet.gov.lk/antiquities-4/>.
- Craig, Jennifer. Value of Shipwreck Data in Database. *Journal of Indo-Pacific Archaeology* 36 (2015): 34-41. Accessed April 20, 2023. doi:<https://doi.org/10.7152/jipa.v36i0.14915>.
- Government of Sri Lanka. n.d. Antiquity Ordinance No 9 of 1940 | Sri Lanka Archaeology. *Sri Lanka Archaeology*. Accessed 04 20, 2023. <https://www.archaeology.lk/wp-content/uploads/2015/04/Antiquity-Ordinance-No-9-1940-sri-lanka-ceylon.pdf>.
- Koutsis, Dionisia, and Anastasia Stratigea. Shipwrecks' Underwater Mysteries—Identifying Commonalities Out of Globally-Distributed Knowledge. *Heritage* 4, no. 4 (2021): 3949–3969. doi:<https://doi.org/10.3390/heritage4040217>.
- Luckman, Grant, and Andrew Viduka. The new Australian National Shipwreck Database - its development, features, functionality, potential and utility for regional capacity building. *Journal of the Australasian Institute for Maritime Archaeology* 37 (2013): 76-86. <https://search.informit.org/doi/abs/10.3316/informit.741874306194447>.
- Mandawala, Prashantha. Protection of the underwater cultural heritage of Sri Lanka through international cooperation. (2017) 50-80. Amersfoort: Cultural Heritage Agency of the Netherlands. Accessed April 24, 2023. <https://openarchive.icomos.org/id/eprint/2191/>.
- Muthucumarana, Rasika. National Database for Underwater Cultural Heritage: building awareness for better management. *Fourth National Symposium on Maritime Environment Proceedings - 2018*. Colombo: Marine Environment Protection Agency 30. 2018.
- Office of the Cabinet of Ministers, Sri Lanka. 2011. “Press briefing of Cabinet Decision taken on 2011-02-15.” *Office of the Cabinet of Ministers, Sri Lanka*. 15 December. Accessed April 20, 2023. https://www.cabinetoffice.gov.lk/cab/index.php?option=com_content&view=article&id=16&Itemid=49&lang=en&dID=3889.
- Software, Site Recorder 4. n.d. *Site Recorder 4 Software*. Accessed April 23, 2023. <http://www.3hconsulting.com/ProductsRecorderMain.html>.
- The Nautical Archaeology Digital Library. n.d. “Godawaya Shipwreck.” *The Nautical Archaeology Digital Library*. Accessed April 28, 2023. <https://shiplib.org/index.php/landscapes/projects-2/sri-lanka/godawaya-shipwreck/>.
- UNESCO. 2001. “Convention on the Protection of the Underwater Cultural Heritage.” Accessed April 23, 2023. <https://unesdoc.unesco.org/ark:/48223/pf0000126065>.