

## Explore to Mantai, the Ancient Port-city and the International Trade-hub of Maritime Silk Road in Northern Coast of Sri Lanka

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### Abstract

Mantai Ancient Port City is located in Mannar, Northern Coast of Sri Lanka, archeological reserves declared by the Department of Archeology in Sri Lanka. In concern with historical international trades for almost 2000 years, Mantai had been an excellent port city as discovered by 1980<sup>s</sup> investigations. Today, this historically valued archeology reserves are being covered by various unauthorized constructions. The artifacts found in 1980<sup>s</sup> excavations figured out in further research directives to unveil the ancient cultural and social relations that had been experienced over two millennium around the globe. This research paper elaborates change detection of temporal aspects of unauthorized constructions within the respective geographical domain. Change detection researches are based on the historical maps, aerial photographs, satellite images and recent spatial data sources played over the application software. The investigation mission deployed in 1980 had unveiled evidences of civilization history and artifacts from many countries. However the archeological research and investigations were disrupted in 1983 with escalation of civil war in Northern Province. The Research elaborates visual facts and figures of the constructions erected after 1980 against their chronological measures. The research team further discusses about the tremendous variety of fields that Mantai opens to collaborate with the international research organizations.

### 1 Introduction

The ancient Maritime Silk Road, which facilitated trade between Persia<sup>1</sup> and East Asia, passed through the historical Taprobana, now modern-day Sri Lanka, with Mannar city serving as a renowned harbour along its route. Mantai Ancient Port City, situated within the Archeological Reserves designated by the Department of Archeology of Sri Lanka, holds significance in the narrative of historical international trade spanning nearly two millennia. Through investigations initiated in the 1980s, Mantai emerged as a horseshoe shaped, prominent port city, yet today, its invaluable historical landscapes face encroachment from unauthorized constructions. Figure-1 shows the relative location of Mantai at the Gulf of Mannar.

“Decades of archaeological exploration has sought to uncover evidence for the rich kingdoms of ancient Sri Lanka. Mantai (also written as Manthai and known as Manthottam / Manthota), on the northern tip of the island, was one of the port settlements of the Anuradhapura Kingdom (377BC to 1017AD) and has been recently radiocarbon dated to between about 200BC and 1400AD... The site was excavated in the 1980s; during three seasons of excavation an amazing array of artefacts were uncovered, including semiprecious stone beads and ceramics from India, Arabia, the Mediterranean and China.” (UCL, 2018)

“Mantai, situated on the north-western coast of Sri Lanka, close to Mannar, was ideally located to act as a coastal trade and transport ‘hub’ between the Arabian Sea, the Bay of Bengal and the east and west coasts of India. It was also a key gateway to the interior of Sri Lanka.” (globalhistory.org.uk. 2021, *Sino-Persian Exchange along the Silk Road*)

This research paper elaborates the change detection of constructions erected over the archeology reserve. The researches were conducted through a study of diverse geospatial data; 1980 onward excavation reports and survey plans, old maps, old aerial photographs, Remote sensing Images, Drone images as available in archives and also

integrated knowledge discovery; written books and investigation reports etc.



Figure-1 Relative Location of Mantai

The research paper details about 1980<sup>s</sup> investigation reports of Mantai ancient port city as the international trade hub of ancient Maritime Silk Road, run over two millennium with triggering future research directives. Figure-2 shows the historical international connectivity of Sri Lanka with Indian ocean through Mantai, reflecting the ancient maritime Silk Road.

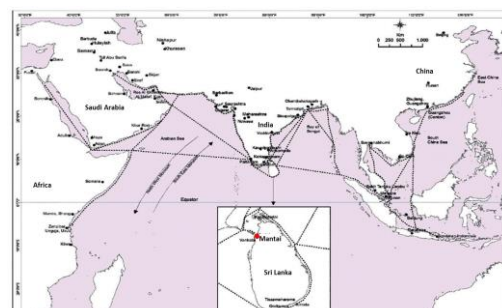


Figure-2 Sri Lanka's international connectivity with Indian Ocean during the history (Bohingamuwa; 2017)

<sup>1</sup>Persia: Iran has been referred as Persia by Greek historians (Wikipedia)

Mantai as an internationally profound port city, run over two millennium, had immensely contributed to the trade missions while it served the country as a commercial center. The table-1 compiled by Bohigamuwa, 2017 shows the details the Mantai phase dates against the cultural periods.

Phase	Time period	Cultural period
Phase - Disturbed	Post-date 8 <sup>th</sup> /9 <sup>th</sup> century to 12/13 <sup>th</sup> century	Late middle historic
Phase - VII	Early/mid-8 <sup>th</sup> to late 9 <sup>th</sup> century	Mid-Middle historic
Phase- VI	Early/mid-8 <sup>th</sup> century	Middle historic
Phase – V	Early 7 <sup>th</sup> to mid-8 <sup>th</sup> century	Middle historic
Phase – IV	Mid-3 <sup>rd</sup> to early 7 <sup>th</sup> century	Middle historic
Phase – III	Late 1 <sup>st</sup> to late 2 <sup>nd</sup> / early 3 <sup>rd</sup> century	Upper early historic
Phase – II	Ca. 2 <sup>nd</sup> century BCE to mid-1 <sup>st</sup> century CE	Mid-early historic
Phase – I	Ca. 1600 BCE	Late Mesolithic (? Neolithic)

Table-1: Māntai Phase dates (Bohigamuwa 2017)

John Carswell, the author of the publication MANTAI CITY BY THE EARTH, after unexpected suspension of the archeology excavation in 1984, in his foreword mentioned "as commented by Dr. B.K.Thapar, if properly excavated, Mantai may well establish itself as the greatest urban complex in all South Asia". (John Carswell and others; 2013)

Archeological research had been carried out by a several international missions in many attempts. There are a collection of archeological trenches excavated by different research teams from 1887 to 1984. The research teams had been enthusiastically engaged to find the historical artifacts and relations with world trade missions had over thousand years.

## 2 Research Scope and Objectives

The geographical area covered by the Mantai port-city, surrounded by the moat is about 50 hectares as it had been surveyed during the excavations in 1980<sup>s</sup> by the Department of Archeology, Sri Lanka. The figure-3, below, shows an aerial view of Mantai as appeared in 2020 google earth image. The port-city looks in horseshoe shaped, surrounded by the moat.

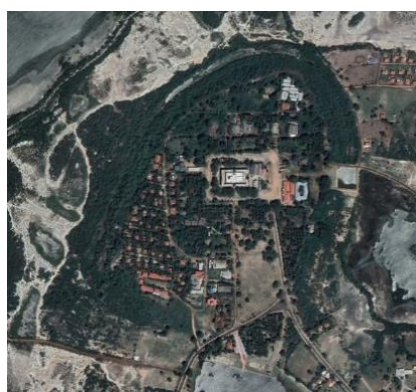


Figure-3 Mantai: aerial view (Google Earth: image@2020 CNES/Airbus)

Generally, protecting ruined ancient archaeological sites serves several important purposes. Firstly, these sites are invaluable windows into our past, offering insights into the

cultures, technologies, and lifestyles of ancient civilizations. By preserving them, we can continue to study and learn from them, advancing our understanding of human history. Moreover, ancient archaeological sites can also have economic benefits. They attract tourists, researchers, and scholars, contributing to local economy through tourism revenue, job creation with development of related industries.

The technical paper discusses the current issues of Mantai ancient port city with overall general objective; to encourage the readers to understand the value of Mantai that had been run over two millenniums connecting the world through trading and integrating the global culture.

Meanwhile, the specific objectives of the research can be formulated in three main facts;

1. Study the geographical domain of Mantai ancient port city using modern GIS and Remote Sensing tools.
2. Elaborating the bitter truth that harms the Mantai archeological reserves with unauthorized constructions, occupying with various personnel businesses.
3. Publication with geomatics perspectives, researchers can easily locate the Mantai geography, which is generally known only by the name.

## 3 Methodology

Even for a geomatics professional, it is quite difficult to pinpoint Mantai location correctly without the help of known site identifier. With reference to the publication of "Mantai City by the Sea", and the land surveys carried out in 1980, illustrated in the same publication, those sketches could firstly be georeferenced and identified the correct geography of Mantai.

Subsequently, as the main task, gathering of available geospatial data was carried out through various sources. Especially, finding of old data was rather a critical task. The Survey Department of Sri Lanka (SDSL), as the national mapping organization had its archives with oldest aerial photographs acquired since 1980s and the topographical mapping compiled in early 1980s. These data were georeferenced and used as based data for analysis in respect of subsequent satellite images. QGIS software was used for GIS analysis against temporal data sets acquired in different time frames after 1980. The 10k digital topo-data compiled since 1990s were immensely used for identifying the subsequent constructions. The satellite images; Iconos-2002, QuicBird-2007, WorldView2-2011 and 2020 and GeoEye-1 2014 images were georeferenced and used for temporal analysis.

## 4 Geospatial Visuals of Mantai



Figure-4: Mantai appears on 10k Topo mapping

As referred in several descriptive articles, Mantai location has not been correctly identified. Some had referred to the Mannar Fort established by Portuguese in 1560. Mantai can clearly be identified as its specific shape of horseshoe, once it figures out correctly. The figure-4 shows the relative locations of Mantai and the Portuguese Fort as encircled illustrations. The aerial view of Mantai shown in the figure-5 as appeared in aerial photographs acquired in 1980.



Figure-5: Mantai appears on 1980-Aerial Photograph (SDSL)

### 5 Analysis of Results

The application software; QGIS tools were effectively used for interactive analysis of the vector and raster data with georeferencing and visual interpretation. It was quite easier to georeference the satellite images and aerial photographs in respect of the specific horseshoe shape structure of Mantai.

The 10k geospatial data layers; transport, land-use, building, hydrography and terrain, were compared with the respective satellite and aerial photo images to differentiate the construction periods. After the results of logical analysis, three main timeframes could be identified as unauthorized constructions were made between 1980 and 2020.

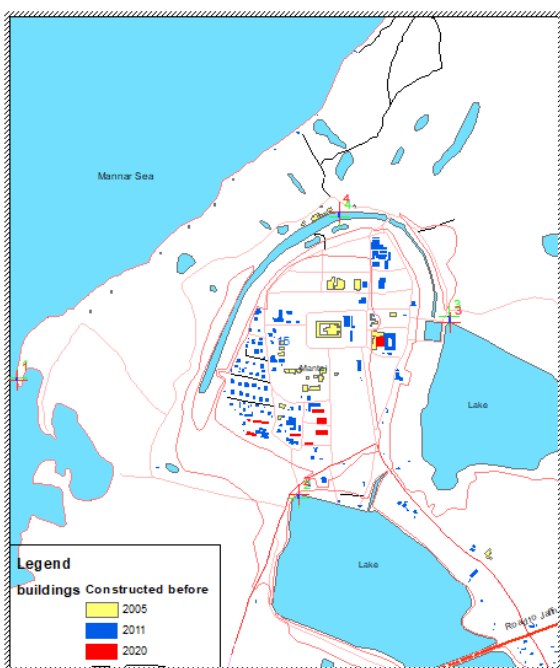


Figure-6: Interpretation of Constructions erected after 1980.

The temple was the only construction appeared in 1980. Thereafter, with commencing the civil war in 1983, the research team had left the site due to the escalation of terrorism activities. The unauthorized constructions erected from 1984 to 2005 could be counted as 39. Since 2005 to 2011, a bigger number of construction could be traced as 237. From 2011 to 2020, the number of constructions could be counted as 9. The figure-6 shows the unauthorized constructions made in different time frames as colour interpretation.

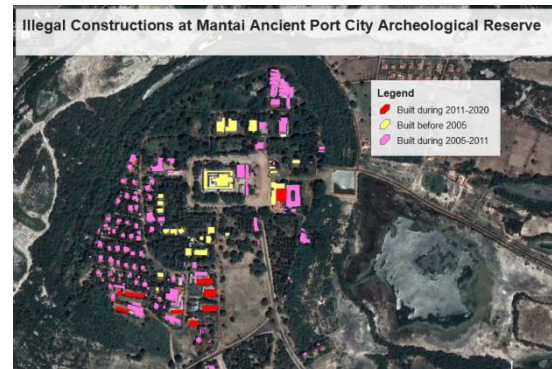


Figure-7: Google Earth overlay of the Constructions after 1980.

In summary of the results, the new constructions made after 1980, can be tabulated as shown in the figure-8.

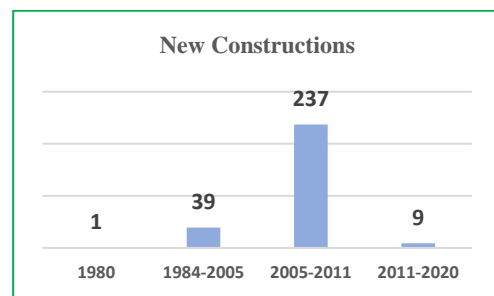


Figure-8: New constructions over the Mantai Site

### 6 Prospective Research Approach

Ranging from the discovery of stone tools made by early humans to the discovery of artifacts belonged to historical civilizations and ruined infrastructure with archaeological investigations have played a crucial role in shaping our understanding of how we see the world. Mantai as a historical city connecting the world trade for a range of eras reflects various cultural and social regimes, opens a tremendous fields of research that can be integrated with the modern technology.

Architectural archaeology as the study of historical artifacts, structures and buildings through archaeological method, involves examining of ruins, foundations, and construction materials to understand architectural styles, construction techniques, and cultural significance.

World heritage has a several classes (*i.e. Natural, Cultural, Tangible, Intangible, Movable and Immovable etc.*) that are linked together as illustrated by the UNESCO (*figure-9*). Every artifacts can easily be classified in to these basic heritage classes.

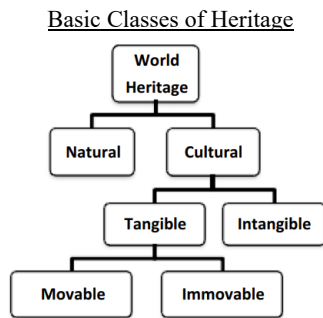


Figure-9 Cultural Heritage Classification from UNESCO

### 6.1 Research provisions in Architectural Archeology

Architectural Archeology, as a tool in cultural heritage, provides an incredible science at geomatics context enabling dynamic and interactive visualization technics.

In 1980<sup>s</sup> archeological excavations, research team had published a variety of artifacts and the detailed profiles of excavation trenches. The figure-10 illustrates a section of excavated trench G with a detailed profile contains. These profiles can be published with modern geomatics tools against the correct location coordinates so that prospective researchers would begin with broad evidences.

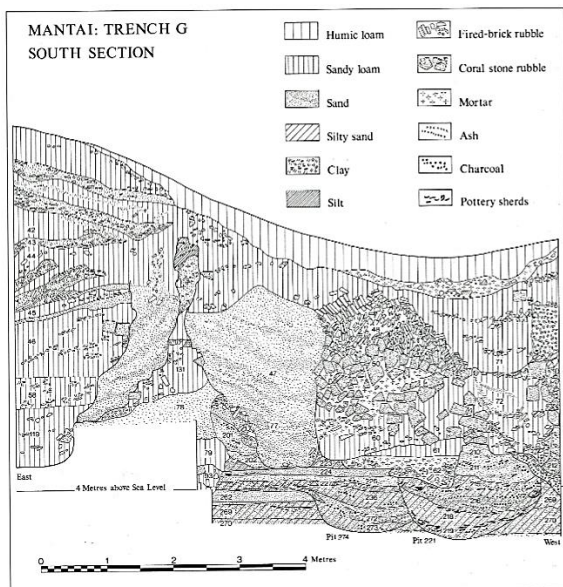


Figure-10: Mantai Excavated Trench Profile in 1980<sup>s</sup> (Mantai City by the Sea: Page-152)

The figure-11 illustrates a set of Sherds Collected in Mantai Excavation in 1980<sup>s</sup>. The sherds can also be visualized with modern dynamic 3D visuals to help the prospective researchers.



Figure-11: Sherds Collected in Mantai Excavation in 1980<sup>s</sup> (Mantai City by the Sea: Page-28)

Study of the archeological artifacts through the science of geomatics can build imaginative hypothesis that can be related with intangible heritage; the knowledge domain, resulting an extended Heritage Information System (HIS). A meaningful HIS can be built up on the basis of a Heritage Domain Model (HDM) which is represented by an interactive Geomatics and Knowledge domains as illustrated in the figure-12.

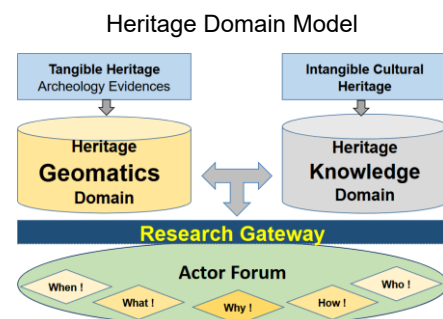


Figure-12: Heritage Domain Model & Research Gateway

Heritage Domain Model opens broad access to research gateway to play dramatic roles in actor forum exploring an imaginative thought of queries; when, what, why, who and how.

### 6.2 Classification of Geomatics Domain

The essential elements of Geomatics domain can be detailed under the followings aspects.

1. Artifacts Type
2. Location
3. Identification
4. Spatial Representation
5. Chronological Events
6. Respondent Authority
7. Recognition
8. Visualization

These elements can give an identical picture of the artifacts to

begin research with referring to the already known factors. It will be a big research opportunity to classify the artifacts found in 1980's excavation in respect of these elements.

**6.2.1 Artifacts' Subtypes:** Archeological artifacts are in a broad range and they can be categorized in to a few main items as tabulated in table-2.

Artifact subtype	Definition
Heritage Site	Heritage Site as identified
Structure Fixed/Movable	Building foundation or pieces
Monument Fixed/Movable	Unit or part of artifact entity
Statue Fixed/Movable	Statutes of Buddha and God
Building	Any type of buildings
Palace/Castle	Palace, Castle, Monarch etc.

Table-2: Artifacts Subtypes

**6.2.2 Artifacts Location:** Record of artifact's location is very important in future research. In conventional documentation, mostly in book format, locations have been recorded in sketches and drawings. However, with today's geomatics technology, it is much convenient to record the respective latitude and longitude values even by the smart phones. In concerned with the Mantai, any artifact in book record can be restudied at location based and update the system. Further, the location can be identify with map or drawing references too. Table-3, shows the proposed location attribute table.

Artifact Location	Definition
Location Coordinates	Latitude & Longitude values
Location Reference	Within the site reference
Location Reference	Old map or drawing reference

Table-3: Artifacts Location

**6.2.3 Identification and Recognition:** Identification and recognition details are crucial to document in easy traceable format. In most cases, the recognitions are just filed in paper folders and they are not noticed to the people. Therefore, unauthorized interventions can harm the artifacts. Therefore, Table-4 shows some important attributes to records in a digital system.

Artifact Identity	Definition
Heritage ID	Artifact Identity by heritage
Archeology ID	Archeology Department ID
Reference Code	If any reference code avails
Name and Notations	Given names and notations
Status of Recognition	If artifacts recognize to heritage link
Recognition Authority	Recognized by whom
Publication Reference	If any publication avails; reference
Date of Action	Date of publication or recognition

Table-4: Artifacts Identification and Recognition

**6.2.4 Maintenance Authority:** The value of Mantai as an archeology reserve is known to a very limited personnel, who are in touch with relevant historical events and those who are engaged with researches. The unauthorized constructions done in Mantai are due to lack of awareness of its historical value. Therefore, appointing a maintenance authority and publication of responsibility can assure the protection of the heritage site. Table-5 shows some important attributes to publish under the

maintenance authority.

Maintenance Authority	Definition
Heritage-site Owner	Declared heritage site ownership
Artifact ownership	If artifact personally owned by
Maintenance Authority	If maintained by other party
Responsibility	What is individual responsibility
Restrictions	If any restriction imposed
Reference Notification	Reference notifications if any
Action Date	Date of related action

Table-5: Maintenance Authority

**6.2.5 Multimedia Chamber:** Heritage Information System, should generally consist the artifact visualization facility. In today's context, visualization has an extended technology approach and will grow faster.

Visualization Aspects
Stereo Photo
Video Clip
Multi-view images
VR application
AR application
AI tools
Action Date

Table-6: Multimedia Chamber Content

Therefore, leaving room for tomorrow's development, multimedia chamber should be created for interactive services. Table-6 shows the necessary content as visuals of current mission.

### 6.3 Heritage Knowledge Domain

As illustrated in the figure-12, geomatics domain and the knowledge domain are linked together through spatial relations. The knowledge domain is intangible and it has an expandable digital space for updating with hidden stories. Access should be allowed to general public for updating and retrieval.

### 6.4 Provisions in Digital Reconstruction of Ruined Artifacts

A large amount of artifacts had been found in excavation in 1980s. Among the hundreds of various types of artifacts; ornaments, stone scripts, carved drawings, pieces of pottery were led to predict the country of origin and further processed in digital reconstruction to direct extended research directives. The figure-13 shows a few pieces of pottery that had been imagined as parts of utensils draft in figure-14. Therefore, modern Digital Reconstruction technology may be immensely helpful to imagine the complete artifacts in order to research for trade mission extension and to study social and cultural impacts over the ancient maritime Silk Road.



Figure-13: Pieces of Pottery Artifacts found in 1980 Excavations (John Carswell and others, 2013)

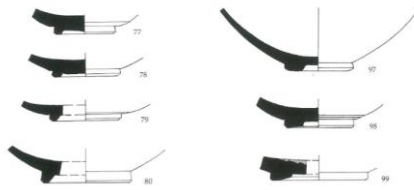


Figure-14: Pottery pieces are learned for imagination to complete artifacts (John Carswell and others, 2013)

## 7 Concluding Remarks

Mantai as an ancient famous port city operated over two millennium, throughout the Anuradhapura dynasty and so forth, shows evident of Mesolithic artifacts and found excavation of relevant strata structures as reported in the publication: '*Mantai City by the Sea; chapter-5 Mesolithic activity on the ancient shore line*'. The explorations illustrated therein inspire the readers to follow up further more research to unveil the truth behind the historical trade missions of the ancient Maritime Silk Road.

Due to the worst effects of the civil war that had over thirty years, the historical values of Mantai had not been preserved. However prior to that with Europeans arrival and colonization of the country, rather than trade missions, the deeper sea to the south and the Colombo harbor would be considered as crucial in entering of heavy vessels.

Digital restoration as the modern technology, can effectively be introduced for commencing researches in investigation of Mantai artifacts that would direct towards the trade mission origins and study the hidden social status in the past.

Establishing of an international research center at Mantai is another great endeavor that the Sri Lankan government should facilitate the international community.

There are vital facts and figures that Mantai may be declared as world heritage site enabling to conduct extended research and investigations subject to further explorations.

It is advisable that the research publication "Mantai the city by the sea" may be digitalized to create Heritage Domain Model (HDM) with classifying the artifacts found in 1980's excavation.

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