

# Digital Heritage Platform for Supporting of Phra That Phanom's Nomination File in Thailand

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## Abstract

Digital heritage is the new sort of presentation on cultural heritage, by using a lot of computer-based materials to generate the information for understanding on the context of urban environment digitally. The permanent value could be kept for future generations, and easily to access in many platforms. Digital heritage derives from different information including geography information, planning, design, and all 3D presentation together. As well as, the outcome of people participation could be maintained in the digital sense, and stakeholder could be understood on the master plan digitally in the same perspective. Moreover, digital materials could be used for enduring value, and requires active preservation approaches. This paper will explain the process of publication of Phra That Phanom's master plan in digital dimension, from collecting geography data, and overall projects development together. The outcome of this paper has published on Universal Resource Locator (URL), for assessor and whom it may concern to access Phra That Phanom's digital heritage.

**Keywords**— digital heritage, geography information, Phra That Phanom

## I. INTRODUCTION

Nakhon Phanom Province and their residents has proposed a guideline for proposing Phra That Phanom to be a world cultural heritage site from the United Nations Educational, Scientific and Cultural Organization or UNESCO (UNESCO) (Boonlua et al., 2022). The province has appointed a working committee to register Phra That Phanom as a world heritage site and conducting a preliminary accounting proposal (Tentative List) through the approval of the Ministry of Natural Resources and Environment (Chaiyasan and Boonlua, 2021). Phra That Phanom is proposing the preliminary list by applying three cultural criteria from UNESCO, including Criteria 1, representing the display of a masterpiece prepared by Human ingenuity, the second criterion is the most influential to drive further developments in architectural design, monuments, sculptures, gardens, and landscapes, as well as the

development of related arts. The development of human settlements has occurred at any one time or on any part of the world where culture. Other criterion 6 has ideas or beliefs that are directly related to the event for outstanding in history (Office of Natural Resources and Environmental Policy and Planning, 2018). The World Heritage List Nominations Process requires the provision of management approaches through a process of participation for those involved within 10 years and must be able to propose guidelines for improvement of urban management (Umbangtalat, 2012). This is considered an important process for the necessary to prepare documents for submission to the World Heritage Committee. Furthermore, digital materials can be used for enduring value to support including a map document of the boundaries of the area, aerial photographs, satellite photo and geographic information databases (GIS) will be imported on digital

heritage platform (Sitachitta, 2017). Therefore, the study of the process of preparing this city information database as a tool for collecting important physical information, with prepares various information before the World Heritage Committee's decision-making process whether to visit the World Heritage-listed areas. As well as it is necessary platform for consideration by government agencies and parties responsible for that area for urban management. It is also a study of the important process of preparing urban information systems (Urban Information System) and can be used to create a three-dimensional model city in terms of City Information Modeling (CIM), which is an important study to be a tool for analysis and designing important urban communities.

## 2. Research objective

2.1 Integrating digital information and master plan to the digital heritage platform.

2.2 Using the technique on digital information to present the context of urban cultural heritage

2.3 Publishing all attribute data of Phra That Phanom on the digital heritage platform.

## 3. Research outcome

3.1 Achieve the physical information database digitally in the area to nominate to be a world heritage site.

3.2 Derive the digital heritage of Phra That Phanom for understanding the physical perspective on the platform of the digital heritage platform.

## 4. Scope of research

### 4.1 Area boundary

The area boundary is included the boundary of Wat Phra That Phanom is a temple in the That Phanom District in the southern part of Nakhon Phanom Province, northeastern Thailand, and the surround radius area about 2 Square Kilometer (200 Hectare).

### 4.2 Scope of content

Research begins with a study of the observation and collecting data both primary and secondary in the case study area, and the general preparation of the geography database contains the following information.

1. Study the basic information of the surrounding context, origin, importance.

2. Study physical characteristics and geographic information systems (GIS), field work observation for understood the general condition of the area, location, topography, and utilization of the current building

3. Field visits to observe the building utilization data including building name, number of floors, height, building type, building materials for input the geographic Information system database, attribute data, data verification, data storage and editing and map output.

4. Integrate all variety of data to publish on digital heritage platform including:

Part 1 Studying the needs of the study area to provide the necessary basic information of the case study.

Part 2 Preparation for importing data into digital heritage platform to

specify the details of the reference coordinates, and number of data layers required for linked on topology.

5. Publish on digital heritage platform and can be access on Universal Resource Locator (URL).

## 5. Research method

5.1 Digitize and collect urban geography information including:

1) Digitize a polygon of various buildings by using the open source of base map covered the surrounding area about 2 Square Kilometer (200 Hectare).

2) Up to date the building information by ground survey to achieve the data on intangible information such as the value of buildings in terms of cultural heritage, authenticity and building conditions and threats.

3) Input the attribute data from ground survey on the polygon of various buildings and the physical information on the surrounding area such as the boundaries of the study area, the information of buildings for example: building code, building name, building type, style of building, number of floors, roof shape, roof material, structure, construction materials, year of construction, use of the same or the same materials etc.

4) Map preparation by preparing a map of the boundary of the study area, using the area of Phra That Phanom temple as the center and set a boundary from the center to about 2 square kilometers to cover the study area.

5.2 Prepare building information data in the study area by categorizing the building utilization code according to the structure by Department of Public Works and Town & Country Planning (2007) divided into 7 groups: 1) Residential area type 2) Type of commercial area 3) Type of industrial area 4) Type of recreational area 5) Type of area for utilities and public utilities 6) type of area for mixed use activities and 7) type of area for other miscellaneous activities 8) number of floors of the building 9) building materials and 10) type and building activities.

5.3 Build a Digital Heritage Platform on a 3D modelling of physical features in the study area, and to be installed in the geographic database. The detail of 3D modeling of physical features on urban design by entering the SuperMap program, initially define the scope of the study area to cover, import the shapefile under the format of Department of Public Works and Town & Country Planning, base map from aerial photography, and urban design projects imported in the Digital Heritage Platform.

## 6. Summary of research results

6.1. Digital Heritage Platform can be imported the geography information system (GIS) data to show on 3-dimension platform, these made the participation can be understood an urban context. The Digital Heritage Platform has developed to import city information database and can be able to query the information and identify, search, modify and analyze information from digital heritage platform effectively. The data can be connected to spatial data such as the location of the building, the name of the building, the utilization of the building, building height construction materials, etc. The result data can be displayed in 3D formats that can be applied in urban design and planning. It can use the information in the field of urban planning, master plan preparation and manage the infrastructure of public utilities to support the needs of the people in the community. Both government and private agencies can be used this platform as a tool to help decision-making in city and heritage management, land use planning and effective management of building resources.

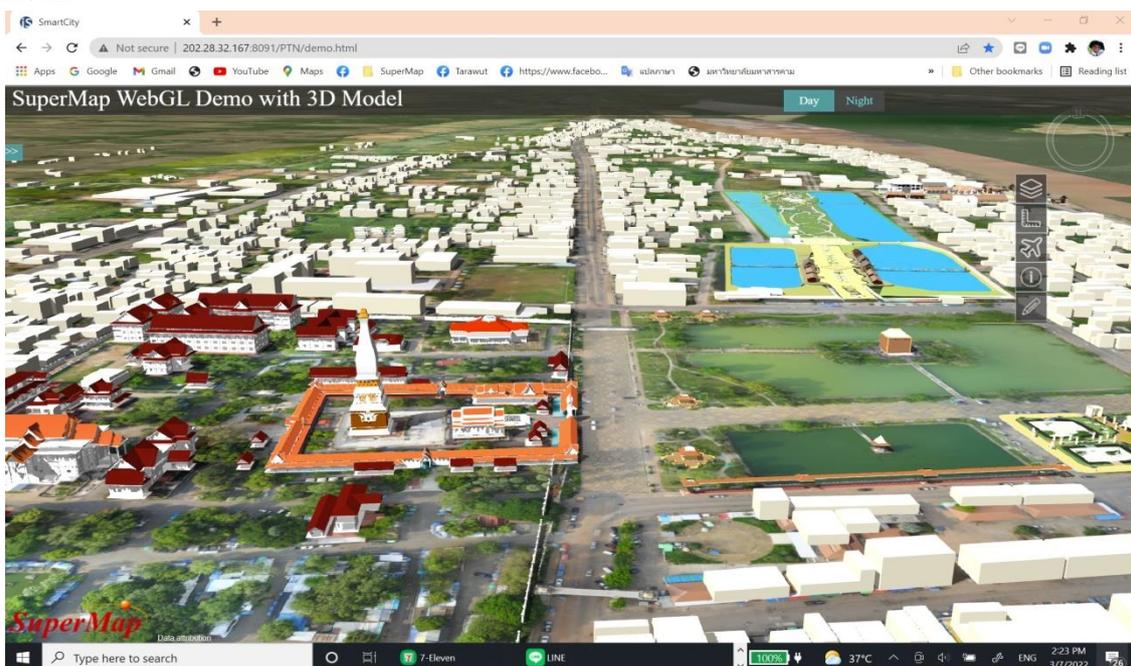


Figure 1: Digital Heritage Platform

6.2 High resolution of Base map can be imported into digital heritage platform, it can help to understand the physical information on the ground such as urban infrastructure, utilities in detail. These can give the information how to manage the preservation and maintenance on the heritage and can be fast to make the decision from the physical information on the platform.

6.3 Preparation of building uses data from the data collected and surveyed, it was found that there were buildings and structures in different density areas. From this set of base data, it was found that in the area around the case study. There are a total of 4,634 buildings in total imported into the platform and can be classified by group and the types of databases for each group, Building uses are detailed as follows the residential area area was found that the utilization can be classified into 2 major uses, comprising the residential and civil servant housing, most of the settlements are in the upland area. Which has a topography with an average height of about 140-143 meters above sea level, living near the road, which is the main transport route. and on the banks of the Mekong River in the east can be shown on the platform (ARCH-MSU, 2019a; 2019b).

The commercial area was found with a proportion of the number of commercial buildings. Retail stores and services, restaurants, beauty salons, grocery stores, followed by hotels. The financial institutions are scattered throughout the area because there is only one shopping mall in the area, followed by hotels, which are distributed according to the community and for accommodated tourists who come to stay to see the scenery along the Mekong River.

The other use such as industrial area was found few numbers of industrial buildings and divided by factories, slaughterhouses, and specialized industries for used as a storage facility for exports to neighbor countries. The recreation area was found as a proportion of buildings for

the conservation of Thai arts and culture, ancient monuments, and monuments, located in the middle of the area. Which is around Wat Phra That Phanom Woramahawihan.

The public utilities found that divided into other public utilities, followed by educational institutions, and nursing homes. It is concentrated along the transportation routes in the central, north, and east of the area. Mixed of use area was found mostly in the form of semi-serviced residences such as grocery stores, restaurants, and residential semi-offices, with concentrations in the central region and along the transportation routes of the area. Other miscellaneous activities were found that this type of building was utilized, and other uses include a bus waiting pavilion, restrooms, guard towers, storage rooms, fire reserve rooms, etc.

6.4 Digital Heritage platform can be show on 3D modeling of physical features in the geographic database. The data collected and surveyed the area has shown the utilization of the building height of the build and rendered in a 3D modeling. The Master Plan and further urban development plan have also imported into digital heritage platform, guiding to whom it may concern to follow the master plan for project development. Moreover, the platform can also show the terrain texture by using the data of a high-level numerical model or contour, which is a digital model of geographic characteristics of surfaces and elevations. It helps to understand the meaning of the history of Phra That Phanom that is enshrined on the banks of the Mekong River and located on the orphanage. This physical feature can make sense of this physical context from 3D models and from history, the platform can show that Wat Phra That Phanom is located at the bank of the Mekong River. Currently, it has been deposited with soil to form the present-day relic, therefore the platform can clearly show this evidence and the findings from this 3D model, regarded as important scientific evidence to visualize the historical results.

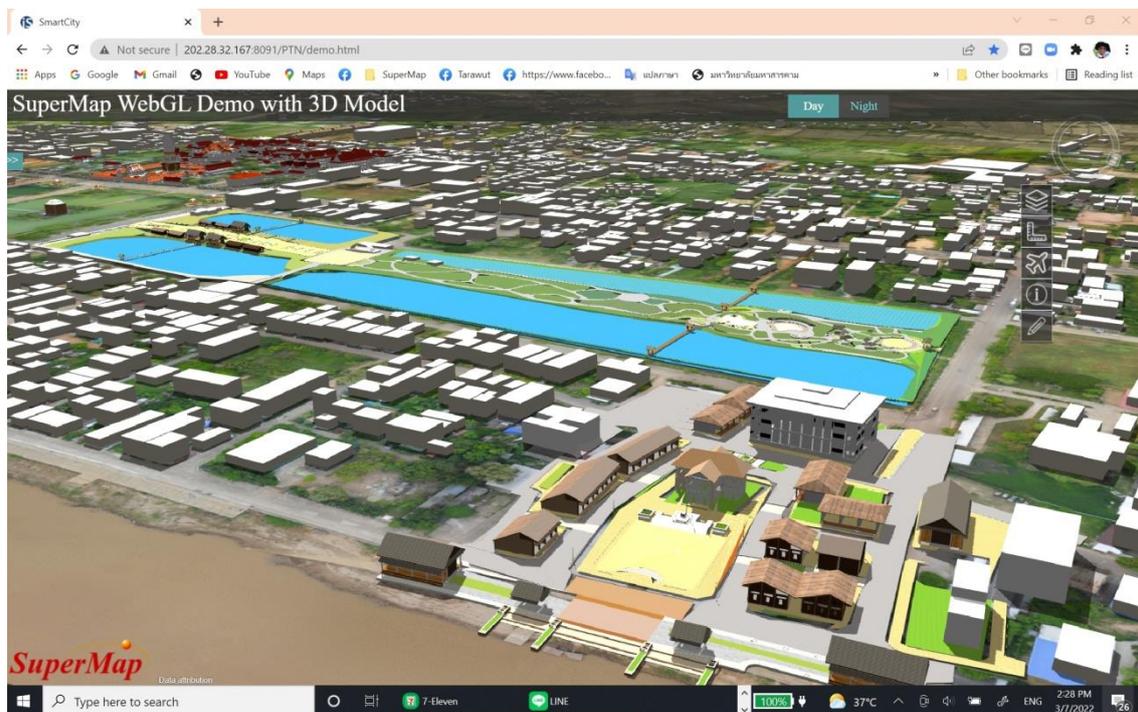


Figure 2: The Master Plan and further urban development plan

## 7. Discussion of Results

### 7.1. Prepare and collect geography information system

The preparation and data collection of the developed city information database system is accurate and able to retrieve, identify, search, modify and analyze information from the city information database efficiently. Stakeholder can bring information from the city information system to be used in real and accurate according to the geographical location. The characteristics data consisted of 4 issues 1) Current survey data 2) Value of buildings in terms of cultural heritage 3) Building conditions and threats the resulting data can be displayed in 3D formats that can be applied in urban planning and project development (Phiriyawat, 2009). It can use the information in the field of urban planning, urban design, and the preparation infrastructure in the area, utilities, and database systems that can be exported and run conveniently via the digital heritage platform.

### 7.2. Building Use Information

Buildings in the study area a total of 4,634 buildings, which are stored and classified according to groups and types of databases in each group. can be classified into 7 types,

namely 1) Residential 2) Commerce 3) Industrial 4) Recreation 5) Utilities and public utilities 6) Mixed use activities and 7) other miscellaneous activities. Most of them found utilization in the residential category, followed by the commercial category and mixed activities.

### 7.3. Digital heritage platform for 3D modeling of physical features.

The digital heritage platform can be established a city information modeling (CIM) to obtain geographic information (GIS) and building information modelling (BIM), it is also able to bring information that is performed urban planning and urban design by using this platform. City Information Modeling (CIM) can be applied as an urban scenario to understand the characteristics of More urban planning, urban design, architecture design work and geography features. It would be able to create a 3D model by configuring the coordinates, which are considered as accurate data obtained at the urban information and architectural by importing a shapefile and objects into the digital heritage platform. It can be applied as a tool to support decision-making for city management such as urban planning and urban

development, and can be understood urban environment digitally.

## 8. Recommendation

From the study of the urban information system preparation process, a case study of the area boundaries to be proposed for the World Heritage List, the important scientific evidence would be discovered in a tangible historical. It can be shown on the digitilly display by showing evidence historical traces in physical location from the past to be understood until the present. This trace can be taken, such as the orphaned hill and the lake that is along the former Mekong River, and can be used as evidence in the determination of the boundaries of the World Heritage. Moreover, should study the area to cover the whole That Phanom District in order to see the physical characteristics of the area, activities and use of the building more clearly. As well as, it should use aerial photographs obtained from the drone as a base map to digitize and display the results of the study and keep the information as current as possible in the digital heritage platform.

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