

SANGKULIRANG MANGKALIHAT: THE EARLIEST PREHISTORIC ROCK-ART IN THE WORLD

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Abstract: Borneo island, a part of Sundaland -a great mainland in South East Asia thousands of years ago- is the largest island in Indonesian Archipelago. In the middle-eastern of East Borneo, lies a peninsula karst region named Sangkulirang Mangkalihat. The region's biodiversity contains many species of flora and fauna which are part of karst ecosystem.

Surprisingly, thousands prehistoric rock art paintings and engraving were found here, spread over 48 inland caves in seven different karst mountain areas. The rock arts are painted on the ceiling, wall, and hollow of the cave depends on the meaning. They illustrate forms such as spiritual images (zoomorphic and antropomorphic) for sacred spiritual meaning, and social phenomenon images (tools and weapons) for description of daily life. From all those rock-arts, hand paintings are the most common elements appeared. Compared to other paintings, these are the only negative images using different techniques.

Radiocarbon dating indicated that the rock-arts at Tewet Cave in Sangkulirang Mangkalihat is 40,000 BP. It is much earlier compared to Lascaux Cave (35,400 BP) and Chauvet Cave (32,000) in France which were previously known as the earliest one in the world.

Rock arts and some archeological findings also indicate the migration of Austronesian People. During the migration, Borneo's climate and land cover were changing from time to time. Continental climate occurred when all Sundaland was still dry (40.000-21.000 BP), followed by tropical savanna climate and archipelagic climate (12.000-

7.000 BP), and then Tropical Rainforest consecutively (1.000 BP). Correlatively, geological interpretations from such areas indicate land cover changes. These changes effected Austronesian ways of living, e.g. from hunting to fishing, and were depicted clearly on their paintings.

Today, -as observed from time series satellite images- industrial activities such as karst exploitation for cement production and land clearing for palm oil plantation are threatening Sangkulirang Mangkalihat as they are approaching this particular areas. Efforts were conducted to preserve these particular sites, from establishing local regulations to a great step to propose it as one of UNESCO's World Cultural Heritage.

To disseminate its importance as the world's earliest known rock arts, a particular map should be designed. The map should be able to describe multiple aspects regarding these sites, i.e. its location and position among other world rock arts, detail locations in the sites, climate and geomorphological changes occurred and its effects to these rock arts, its correlation to prehistoric migration, and threats faced today from industrial activities. An integrated, multiscale representation of such geospatial informations is considered.

Keywords: Rock-art, Borneo, Cartography

1. Introduction

Sangkulirang – Mangkalihat Karst Peninsula is the portion of Borneo Island that belongs to Indonesia, South-East Asia. This region recorded the brief history of human civilization in Borneo 100-40.000 years ago. Various paintings and hand stencils on the karst's walls are what we call evidence of interaction between human and nature in the region. There at least 49 archaeological sites which were identified and spread throughout the

karst region. These evidence leads to a better comprehension regarding ancient men's life.



Fig. 1. Indonesia (red lined) in South-east Asia and Borneo (red dot)

Rock-Arts is an important evidence of human intellectual evolution. The ancient phenomenon in the prehistoric era are depicted in the paintings. The rock-arts shows communication between human and spiritual living, and gives insight into the cosmology of prehistoric hunters and gatherers. A great number of rock art made by hunter-gatherers are found in Sangkulirang – Mangkalihat, more than anywhere else in South-East Asia.

Sangkulirang – Mangkalihat as one of the biggest karst region in Indonesia abounds with raw material of cement, which attract mining activities. Almost 90% of rock-arts were found on the fragile karst ecosystem. Preserving the rock-art sites is not only to protect the hand stencils, but also the milieu. In 2015, the region was submitted by the Indonesian government to the UNESCO to become a cultural world heritage, and has officially become a highly potential candidate to be recognized as one.



Fig. 2. Rock-Arts depicted in Tewet Cave

To complete the ‘dossier’ submitted to UNESCO, a documentation must be conducted. Maps is one among necessary documents to be completed in the dossier. Maps that not only present its location, but also its characteristics as well. These maps are then combined into a group of serial map which is designed to depict the story of this particular sites. The maps should be able to describe multiple aspects regarding these sites, i.e. its location and position among other world rock arts, detailed sites locations, sites classification and criteria, climate and geomorphological changes occurred and its effects to these rock arts, its correlation to prehistoric migration, and threats from industrial activities today.

This paper will discuss the process of constructing a comprehensive map that deliver the importance of these

rock arts and its surrounding area. The map design process comprises its philosophy, plot, layout, infographic, and also implementation of several cartographic aspects. An integrated, multiscale representation of such geospatial information is considered.

2. Methods

This research aims to generate a map based on prehistoric rock-art in Borneo. The map resulted can be used as a source for further study regarding the relation of ancient human migration and their culture. Moreover, the result is expected to convey certain knowledge to support Sangkulirang Mangkalihat submission as one of world heritage.

Thematic Maps is a map designed to demonstrate particular features or concepts (ICA). The map designed is a particular thematic map which contains serial multiscale maps, overlaid from various source maps. Rock-arts site distribution is one of the main theme. Three-dimensional mapping was held on one of its site location in order to illustrate rock-art condition in distinct and explicit way, presented digitally. Ancillary map containing land cover are also indicate the correlation with the rock imagery. Map which contains endangering activities to the region’s sustainability is also presented.

Data acquisition is conducted by primary survey in the field. Secondary data are obtained from government agencies and archived maps. Some maps used Digital Elevation Model (DEM) as it’s base map. Map symbol and map legend are designed to describe many types of rock-arts. Description and illustration are accommodated to strengthen the spatial information contained. Figure 3 illustrates the workflow of Sangkulirang-Mangkalihat map design.

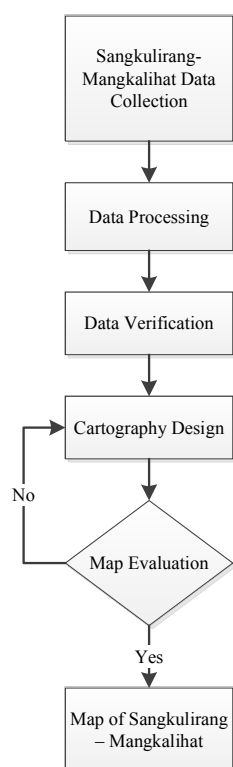


Fig. 3. Scheme of Workflow Sangkulirang-Mangkalihat Map Generation Process

2.1 Rock-Arts Dissemination in Indonesia

Indonesia, was part of Sundaland and part of Sahulland in ancient era. It was an important meeting place in south part of the preAustronesian and Austronesian Migration. Similar rock-arts spread in this archipelago from Sumatera to Papua. It is usually found in karst ecosystem such as in inland cave or shelter, sea-cliff, and karst island.. Figure 4 shows the map of of rock-arts dissemination in Indonesia. The locations of discovered rock-arts are represented by labelled points.



Fig. 4. Dissemination of Rock-Arts in Indonesia

2.2 Sundaland

Geologically, Savanna covered most part of Sundaland and Sangkulirang region respectively in ancient time. The form of rock-arts found confirm this condition. Rock imagery depicts hunter-gather phenomenon and activities which was logical related to savanna area. These images portrays prey animals (deer, buffalo), and various hunting tools e.g. spears.

According to geological investigations, 40.000 years ago the sea level of Sundaland was 120 meters lower respect to recent sea level. GEBCO data was used to estimate and illustrate Sundaland at that period. Raster data with the

elevation of lower than -120 m is intersected to represent the shape of Sundaland. Afterwards, shade relief is generated to produce a more aesthetic visual. This map is overlaid respectively to indicated land cover 40.000 years earlier (figure 5).



Fig. 5. The Sundaland 40.000 years ago.

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Sundaland also indicates a narrow slit situated between islands with the so-called Wallace line. This narrow slit are located in the middle of two rock arts locations, Sangkulirang and Celebes (Pangkep and Maros). Archeologists consider that this narrow slit were once Austronesian's path to cross to the Celebes. This indicated slit is represented as a zoomed-in area on the map.

Most Sundaland islands (or western Indonesian archipelago today) were began to form 5000 years ago. Climate change caused the transformation of most savanna to rainforest and seas. Several rock arts indicate marine activities e.g. pictures of boat. This map is generated to compare with the Sundaland's condition 40.000 years ago to expose the dryland and land cover transformation (figure 6).



Fig. 6. The Sundaland 5.000 years ago.

2.3 Dissemination of Rock-Arts in Sangkulirang – Mangkalihat

Rock images are spread in seven different karst mountains. The delineation of this particular region is

then conducted as protection regarding its submission to world heritage tentative list.

Topographical morphology of Sangkulirang-Mangkalihat region is generated using digital elevation model (DEM). Green gradation is used to represent the elevation change and to give impression of forest area. Rock images (grey) are identical to karst area, which shows karst and non-karst area on the map.

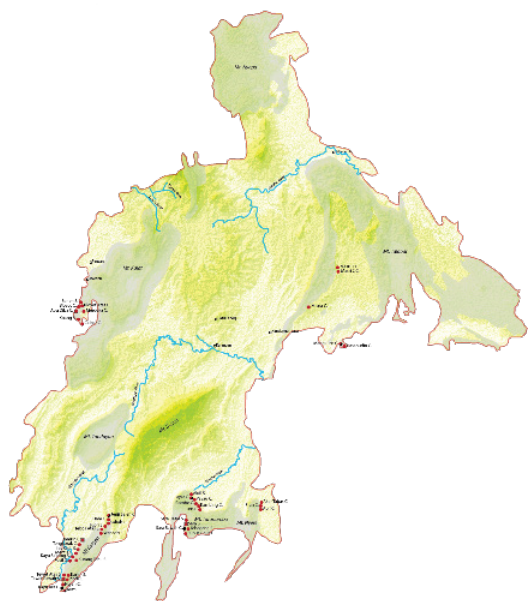


Fig. 7. Sites of Sangkulirang – Mangkalihat

2.3.1 Symbolology

Rock-arts are categorized as red rock art, black rock art, and engraving. Based on creation time, red rock art and engraving are made in approximately 40.000 – 23.000 years. Black rock art aged between 10.000 – 500 years. Rock arts can be found in cave or shelter. A cave or shelter can have one to two rock-arts categories. To represent these categories and sites, a set of symbols is created as follows.

- C Cave
- S Shelter
- Red Rock-Art
- Black Rock-Art
- Red and Black Rock-Art
- Red Rock-Art and Engraving

Fig. 8. Set of Rock-Art Site Symbols.

2.4 Tewet Cave

Possessing 240 rock arts, spread throughout the whole cave's roof, Tewet was the most considerable cave. Using compass and plan-table, the map was created in 2013. Shown rock arts on map are the result of generalized close-range photogrammetry acquisition technique. Three-dimensional mapping were also held to illustrate rock arts object in a more clear and vivid way. The result of 3D mapping is presented in digital.

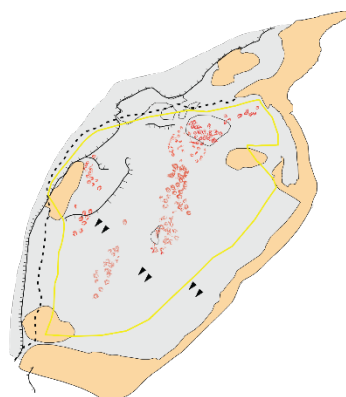


Fig. 9. Rock-Arts inside Tewet Cave.

2.5 Land Use

Borneo today is well-known for its palm oil plantation and mining activities, e.g coalmine. Unfortunately, land allocation for palm oil plantation and coalmines were explicitly disorganized along the area of Sangkulirang-Mangkalihat. Red part on the map indicates land use for mining concession, while the yellow part indicates palm oil plantation, and green part indicates protected forest. Figure 10 shows land use in the region of Sangkulirang – Mangkalihat.

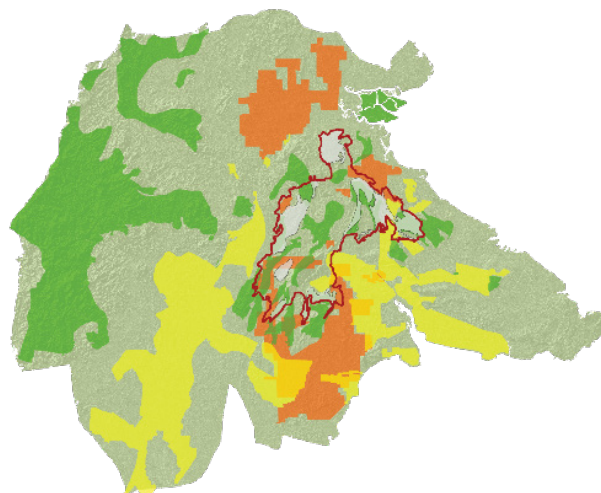


Fig. 10. Land Use in Sangkulirang - Mangkalihat

3. Conclusions

Designed as a wall map, contains a series of maps to convey a complete sequence of the history, Sangkulirang – Mangkalihat map was purposely exhibits not only present condition but also the formation process thousands of years ago which related to the rock art pictures and future threats from industrial activities. These significant geospatial informations on the map are essential part of the dossier submitted to UNESCO to strengthen the requisite and reason to be nominated as a World Heritage Site.

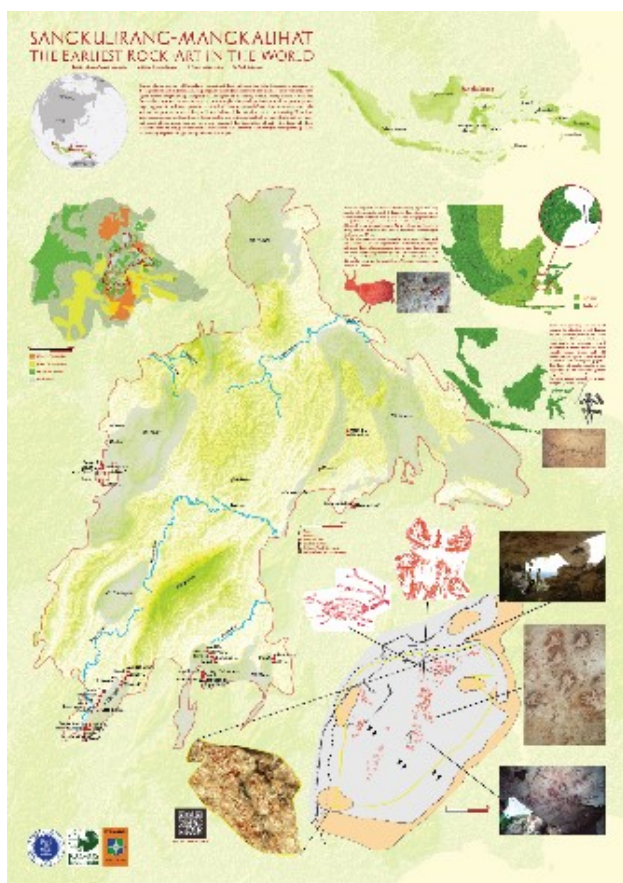


Fig. 11. The Result Map: Sangkulirang Mangkalihat

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