

## **Heritage, Knowledges and Memories on Pura Penulisan Architecture Bali at Ancient Mount Batur Caldera Area**

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**Abstract:** Bali island's beautiful nature in Indonesia are the result of volcanic activity under the sea, more than 23 million years ago. The geology of Bali island lies in the Sunda mountains arc, part of the volcanic rings of Pacific ring of fire. This causes the condition of Bali island is often unstable in ancient times, due to the shocks of volcanic eruptions. One of the beautiful areas caused by ancient volcanic activity is the Caldera of Mount Batur. On the northwestern side of the caldera of the ancient Mount Batur, the archaeological traces of statues in sacred venues have been found since the prehistoric Balinese civilization. The holy place built on the hill at the highest peak of this ancient Batur Mountain caldera, often called Pura Penulisan. This holy place is designed in accordance with local wisdom, the concept of punden berundak, a concept of the original architectural space of Indonesia since prehistoric times. The shape of the architectural space design follows the topography of the hills, in form of leveled terrace and equipped with plaza. Archaeological of Pura Penulisan merges with the caldera of Mount Batur, which was formed due to eruption 5,500 years ago. Therefore, Pura Penulisan architecture and the ancient Batur Mountain caldera, are both a valuable heritage, containing knowledge, and can knit memories.

**Keywords:** Punden berundak, Prehistory, Topography, Terrace, Plaza

### **INTRODUCTION**

Not many people know that Bali island's beautiful nature in Indonesia is actually formed by volcanic activity under the sea, more than 23 million years ago. Under the earth's skin at that time there was a very hot magma, melting the earth's crust above it called a hotspot. This resulted in the occurrence of sedimentation under the sea, which is thought to originated from rock erosion in eastern Java Island. As a result of that volcanic activity the island of Bali experienced elevation, which is caused by various erosion material that appears on the surface (Museum Geopark Batur in <http://regional.kompas.com>).

Based its geological conditions, it is generally known that the Bali island lies in the Sunda mountain arc (Bagus *et al.*, 1985: 5). Therefore, in ancient times the geology of Bali Island is part of the Sunda Continent. The position of these mountains stretches from West to East in the middle of Bali Island. Therefore, the mountains in Bali is included in active volcanic mountain in Pacific ring of fire region. This is also the cause of the ancient island of Bali is often shaken by the eruption of the volcano, that in the old manuscript condition of Bali island is mentioned *menggang-menggung* or labile.

One of the beautiful areas of Bali Island, as the result of volcanic activity in the past is the caldera of ancient Mount Batur, in Kintamani district, Bangli regency. On the northwest side of the caldera of ancient Mount Batur stands Pura Penulisan, a sacred place that has been glorified since ancient Balinese civilization. The distinctiveness of this shrine is the pattern of architectural space that apply the concept of *punden berundak* or terraced terraces. The concept of *punden berundak* is a concept of the original shrine space of the Indonesian nation, which has evolved since prehistoric times, similar to the concept of pyramid terrace or pyramid staircase.

The caldera of ancient mount Batur itself, since September 2012 has been established by UNESCO as part of a member of the Global Geopark Network, due to nature's beauty, archaeological and geological traces, and cultural peculiarities of its people. Lake Batur is also specially designated as a world heritage by the UNESCO World Heritage Committee, on June 29, 2012. Due to that, Lake Batur has an irrigation function that supports the "subak" system in Bali. Subak is a system of irrigated rice fields in Bali developed since ancient Balinese culture.

The object of the study of Pura Penulisan architecture in the caldera of Ancient Mount Batur in this article is more emphasized on the study of the concept of *punden berundak*, which is integrated with the geological heritage of the ancient Mount Batur caldera. Therefore, this assessment also contains knowledge about the processing of landscape spaces for sacred places in ancient Batur Mountain caldera region. Not only that, the object of this study also contains memories of ancient Balinese cultural heritage on the landscape of beautiful ancient Mount Batur caldera. The beauty of Geopark Batur landscape in the present, is a blessing behind the catastrophic eruption of ancient Mount Batur.

The benefits that can be taken from this assessment are analogous to the concept of *tri samaya* in Bali, namely *atita* (past), *nagata* (future) of

*wartamana* (present). The community must learn from the past (*atita*), try to predict what will be faced in the future (*nagata*), so as not to misconstrue the decision in the present (*wartamana*). Therefore, all people in the world are obliged to protect and preserve their cultural and natural heritage. This needs to be done, so as not to regret in the future as it loses its cultural footprint. Knowledge of the cultural heritage, also need to be understood, because it contains universal values that are beneficial to life. Memories that occurred in the past need to be assembled until now, to guide the journey of life so as not to go wrong into the future.

This article is the result of a preliminary study in 2002, then a more in-depth review in 2016-2017, using the design approach method. Rohrberger and Woods (in Ratna, 2010: 44-45) explain that the approach in research is the way to approach the object of study, so that the work of culture as a structure of meaning can be clearly expressed. The approach taken to study the concept of *punden berundak* space in Pura Penulisan, starting from the problem of design of architectural design space. It is intended to be able to understand the concept of *punden* space with architectural staircase as a typical pattern of religious space, indigenous Bali. Indigenous is everything that grows, lives, develops and comes uniquely in a particular (local) region (Piliang, 2005: 3).

## PURA PENULISAN

Pura Penulisan is located in Sukawana Village, Kintamani District, Bangli Regency, Bali Province. Pura Penulisan built on a hill in the northwest of the caldera of ancient Mount Batur, at an altitude of 1,745 meters above sea level. This hill is the peak of the mountains that extends around the caldera of ancient Mount Batur. Because this hill is the highest peak in the caldera region of ancient Mount Batur, then in the Old Balinese inscription also called by the name of Bukit Tunggul, means a stand-alone hill (Mirsha *et al.*, 1978: 62). The hill is located 6 km to the north of Kintamani, or about 74 km from Denpasar City and on the east side of Kintamani - Singaraja street.

Based on the Sukawana A-1 inscription written on 804 Saka (882 AD) in Panglapan, Singamandawa, it was revealed that in Bukit Cintamani (Kintamani hill) there is a sacred building called *ulan* (Goris 1954: 53). The term “ulan” is the same as upstream, meaning the most respectable place. The term *ulan* or *ulon* then turns into Hyang or Kahyangan, which

also means holy. In the reign of Dalem Waturenggong (1458-1550), the term *pura* began to be used in Bali as a designation for the holy place, then the term *pura* originally used for the term of the king's house, changed into *puri*. At that moment begin the usage of the term *Pura Kahyangan* to placed the *Yang Maha Suci* or Most Holy (Wiana, 2009: 4).

In the inscription Sukawana A-1, revealed also that *Pura Penulisan* have received less attention and often become a haven or resting place of the *pengalu* (<http://www.babadbali.com>). *Pengalu* is a merchant who looks for commodity away from his village. *Pura Penulisan* then received special attention of the ruler of Bali at that time. *Kumpi Marodaya* who served as *Senapati Danda* (Warlords), was assigned to rebuild *Pura Penulisan*, assisted by three monks, namely the monk *Siwakangcita*, *Siwanirmmala*, and *Siwaprajna*.

This shrine complex is actually named *Pura Tegeh Koripan*, which means a sacred place of higher life, as a source of life and sources of misery (Soebandi, 1983: 39). This shrine is also often called *Pura Tegeh*, because it is located very high. Sometimes also called *Pura Puncak Penulisan*, because the main building is at the highest peak of the hill on the area of the caldera of ancient Mount Batur (interview with I Wayan Muliarsa, Head of Balinese Heritage Preservation Hall, dated May 29, 2016). In ancient times, this temple was also called *Panarajon* and *Ukir Padelengan*, which means hill or mountain where to see or to view. Because, from the peak can look or see beautiful mountain landscape around *Pura Penulisan*. From the word of “*menoleh*” then comes the term “*penolehan*” or “*penulihan*”, which then merges into the word “*penulisan*” (Soebandi, 1983; 40). This word is later used to refer to this temple.

*Pura Penulisan* complex court is designed storeyed in the form of terraces, up to eleven levels. The *Tegeh Koripan* Temple complex consists of *Pura Dana* and *Pura Taman Dana*, a small temple erected on the third terrace of the West; *Pura Ratu Penyarikan* on the fourth terrace of the East; *Pura Ratu Daha Tua* on the western sixth terrace; and *Pura Panarajon* as the main temple, erected at the top of the eastern hill.

Although it is not known exactly when *Pura Penulisan* was built, but the warning against the inauguration day of the temple, which in Bali is called *piodalan*, has never been forgotten by its society from time to time. *Pura Penulisan's piodalan* day falls on every full moon in October (*puhnama kapat*). However, the new *piodalan* ceremony is held when the full moon falls on Sunday, Tuesday, Thursday or Saturday.

Pura Penulisan was first visited by Europeans in 1881, before other archaeological remains were discovered in Bali (Kempers, 1960: 88-90). After that, foreigners are rarely allowed visiting Pura Penulisan by local residents, so that the holiness of the temple is maintained.

## CALDERA OF ANCIENT MOUNT BATUR BECOME GEO PARK

Batur's Caldera consists of various volcanic layers divided into two forms of erupted caldera, namely Catur eruption (13 x 10 km<sup>2</sup>) and Batur (diameter 7,5 km) formed in the middle. The height of the caldera circle varies from 1,267 m to 2,152 m. The eastern side of the caldera is a lake. The active Batur peak (1,717 m) is at the center of the caldera. Hill where the Pura Penulisan stand in Sukawana village and Mount Abang (2,152 m) east of Mount Batur is the remains of Batur volcanic. Therefore, it is estimated that ancient Batur Mountain (pre-caldera) was higher than Mount Agung (3,142 m). The currently formed caldera is the result of a stratovolcano decay of the old (Kemmerling in <https://www.baturglobalgeopark.com>).

Based on the spatial aspect, Mount Batur has a caldera measuring 13.8 x 10 km, and is one of the largest and most beautiful caldera in the world (Van Bemmelen in <https://www.baturglobalgeopark.com>). The caldera embankment ranges from 1,267 m - 2,152 m. In the Caldera I is formed Caldera II, which is circular with a diameter of approximately 7 km. The base of Caldera II lies between 120 - 300 m, lower than *Undak Kintamani*. Inside the caldera is a crescent-shaped Lake Batur on the southeastern section of 7,5 km, a maximum width of 2,5 km, a circumference of about 22 km, and an area of about 16 km<sup>2</sup>.

To the northeast of Lake Batur can be found Trunyan Village, an ancient village whose people do not bury the corpse. The corpse was placed just above the open grave, then covered by some kind of bamboo fence, called the *ancak saji*. But strangely, the body is not smelly. Trunyan Village people call themselves Bali Mula, meaning the first person to occupy the island of Bali. Trunyan Village is one of the villages called Bintang Danu, which are villages on the shores of Lake Batur (Kedisan, Abang, Buahon, Trunyan and Songan).

In the southeast of the caldera of Mount Batur, precisely in Penelokan Village, there is Batur Geopark Museum. This museum presents information on national geopark (Indonesia) and global (world). The

museum show room is designed based on geopark concept, which consists of geological, biological, and cultural diversity. Geological diversity is generally filled by rocks product of Mount Batur eruption.

Before becoming Geopark Museum, this museum is Batur Volcano Museum, which was inaugurated by the Minister of Energy and Mineral Resources of Indonesia on May 10, 2007. Museum with 1,09 hectares of land was built in cooperation with the Directorate General of Geology of Mineral Resources Department of Energy and Mineral Resources with The Governor of Bali and the Regent of Bangli, and with the Directorate General of Forest Protection and Nature Conservation of the Ministry of Forestry, in relation to the utilization of Taman Wisata Alam Penelokan (Penelokan Nature Park).

Batur Geopark Museum was built after the Batur Caldera region was accepted as a member of the global geopark network by UNESCO in September 2012. The main demonstration materials are information on the aspects of disaster and the benefits of Batur volcanic mountain, plus other geopark information in Indonesia and the world (<http://museum.geology.esdm.go.id>). Batur Geopark area is located in the Kintamani district, Bangli regency, Bali Province. It is located at an altitude of 1,000 - 2,172 meters above sea level, so it has a cool air, with an average air temperature between 15° - 21° C.

From this museum, visitors can see the three cone of Mount Batur which lined from northeast - southwest, namely Batur I (1,717 meters), Batur II (1,589 meters), and Batur III (1,410 meters). The three grow in the Batur Caldera formed from two major eruption phases (about 29,300 years ago and 20,150 years ago), namely the Outer Caldera and the Inner Caldera. The elliptical outer caldera measuring 13.8 x 10 km stretches to the northwest - southeast. In the southeastern part of Inner Caldera is Lake Batur. The shape is like a crescent moon, 7 kilometers long and 1,5 kilometers wide, at 1,031 meters. This lake is fascinating Dutch geologist, Van Bemmelen (1949), so Lake Batur as one of the largest and most beautiful caldera in the world (see Figure 1).

In particular, Lake Batur has also been designated as one of the world heritage by the UNESCO World Heritage Committee, on June 29, 2012. Due to, Lake Batur has an irrigation function, a source of irrigating rice fields of the population, so as to sustain the *subak* system. *Subak* is a set of rice farmers in Bali, which regulates the watering system based on the soul of mutual cooperation, without distinguishing the origin, position

and class of its members. *Subak* is estimated to have developed in the 6th century and growing in the 11th century (Sushila, 1973: 7). The *subak* organization reflects the alignment of the relationship between man and nature, man with man, and man with God, which in Bali is called the philosophy of *Tri Hitakarana*. Therefore, *subak* is also closely related to the culture and belief system of traditional Balinese society.

## PURA PENULISAN AS CULTURAL HERITAGE

Pura Penulisan is a sacred shrine complex that is estimated to have stood in 882 AD, based on the Sukawana A-1 inscription. Pura Penulisan complex is designed in the form of leveled terraces, following the topography of the hill to the northwest of the caldera of the ancient Mount Batur (see Figure 2). The existence of terraces to the top of this hill signifies the continuation of the pyramid terrace pattern of the sacred building of megalithic culture (big stone) in Bali (500 BC). Therefore, according to Kempers (1960: 88-90), Pura Penulisan is built with the concept of *punden berundak*, as a place that has been sanctified since prehistoric times. This temple is also functioned as a place of worship of royal family's ancestor in Pejeng (Gianyar) in the mountains, to balance the existence of Pura Penataran Sasih in Pejeng Village. Pura Penulisan also became the shrine of some of the statues of the embodiment of the ancient Balinese king.

After Bali became part of the Majapahit Kingdom, Pura Penulisan performed *Srada* ceremony by King Dalem Ketut Ngulesir (Dalem Sri Semara Kepakisan). The *Srada* ceremony was held on March 4, 1430, to purify the spirit of King Sri Astasura Ratna Bumi Bhannten, the last ancient Balinese king, who had been defeated by Majapahit (Ginarsa, 1986: 46; Soebandi, 1983: 44). At the ceremony was made a statue of warning tangible Bhatara Guru, in accordance with the religious sect of King Astasura Ratna Bumi Bhannten. Political policy is what causes the people of Bali (Bali Aga) to support the government of King Sri Semara Kepakisan, as representative of the Majapahit Kingdom in Bali based in Gelgel, Klungkung.

Based on the above description, Pura Penulisan is a cultural heritage in the area of the ancient Mount Batur caldera, which needs to be maintained, protected and preserved. This sacred place that applies the concept of *punden berundak*, as a continuation of megalithic culture and

preserves the ancient Balinese heritage of prehistory, the period of Ancient Bali (10<sup>th</sup> century) to the beginning of the Bali Madya (Mid) era in the 14<sup>th</sup> century. Since there are historical elements, styles of a certain era, collectively are memories for the people and become hereditary heritage, the temple has met the criteria as an asset of cultural heritage (interview with I Gede Semadi Astra, Professor of Archeology Faculty of Cultural Sciences Udayana University, dated September 28, 2016).

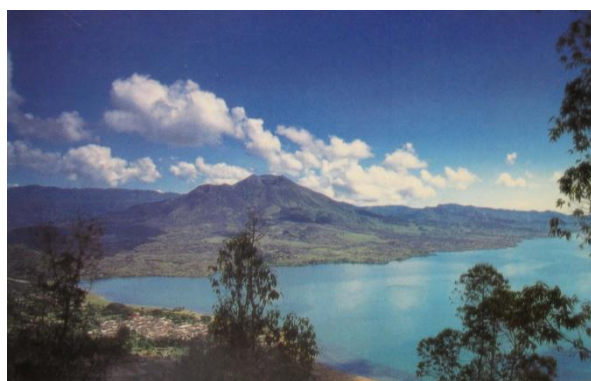


Figure 1:  
Batur Geo Park  
and Beautiful Lake,  
in Kintamani, Bali  
(Source: Repro from Postcards)

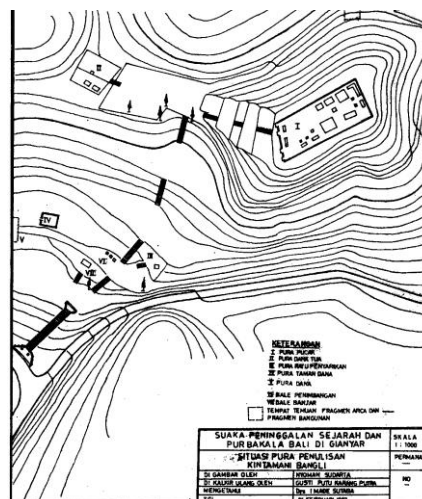


Figure 2:  
Master Plan of Pura Penulisan  
(Source: Archaeological Museum in  
Bedulu, Gianyar, Bali)

## PUNDEN BERUNDAK AS PREHISTORIC CULTURAL HERITAGE

Punden berundak is a place of worship, a form of local wisdom of Indonesia's prehistoric culture. The term punden berundak stems from the Javanese language. The word "punden" means a glorified person. The word "berundak" means leveled or terraced. Based on the term, in the prehistoric period, punden berundak functioned as a sacred building where ancestral spirits worshipped in terraced form. Terrace structure by Geldern (in Kusumawati, 1997: 149), is a tradition that developed from the old megalithic period or the great stone age (500 BC), to glorify ancestor's sacred spirit. The multi-level punden form signifies the journey of the spirit of the ancestors to the sacred realms. The sacred world is symbolized as the summit of the mountain, which must be

reached through the terraces. Then, the ancestral spirit is symbolized by a stone statue called as *menhir*. Thus, in prehistoric times the ancestor's holy spirit worshipped at the top of the mountain, which was sanctified by the supporters of the megalithic culture.

In 2011-2014 in Indonesia has done great efforts, to examine a relic of punden berundak in Gunung Padang, Karyamukti Village, District Campaka, Cianjur regency, West Java. Although the research has not been completed, but it can be estimated that these artifacts are the result of the high civilization of the Indonesian ancestors ([www.hukumonline.com](http://www.hukumonline.com)). The team from the Indonesian Archaeological Society who participated in researching Gunung Padang, said that the site of Gunung Padang is the oldest civilization site in the world. Gunung Padang site is the largest punden berundak in Southeast Asia. The Gunung Padang site is estimated to be built around 13,000 BC, with an area of 10 times the area of Borobudur Temple (Muthahari and Rudini, 2016 in <http://www.koran-sindo.com/news>).

After a change of belief in some areas in Indonesia, many punden berundak then become prehistoric artifacts only. However, on the island of Bali, a sacred place with the concept of punden berundak is still functioning, becoming a living monument. Therefore, it is still used as a holy place for Hindus in Bali, such as punden berundak Pura Candi in Selung Village, which is in the west of Kintamani Village. The punden berundak building, estimated to be built during the prehistoric transition period with the infiltration of Hindu influence in Bali (Pardi and Margi, 2013). However, the concept of punden berundak at Pura Penulisan appear different, because it follows the topography of the hills, similar to the pattern in Gunung Padang. Its peculiarity is with the pattern of terrace space designed, so it becomes distinctive, as an ancient Balinese cultural heritage.

#### KNOWLEDGES OF PURA PENULISAN DESIGN SPACE

As an architectural piece, Pura Penulisan architect has succeeded in implementing the concept of punden berundak on a hill in the area of the ancient Mount Batur caldera. Kumpi Marodaya who became Senapati Danda in the ancient Balinese kingdom (9<sup>th</sup> century), got the task of rebuilding *Pura Penulisan* which was abandoned, assisted by bhiksu (Monk) Siwakancita, Siwanirmala, and Siwaprajna.

In Balinese tradition, mountain peaks or the highest peak of the mountains are sanctified, as it is believed to be the place of the gods. Mount Batur itself in the belief of tradition in Bali is place for Dewi Danuh and Lake Batur is for *Kahyangan* Betari Uma, which has conferred the safety and prosperity for the people of Bali Island (Surpa, 1990: 3). Based on these beliefs, the highest peak in the northwest of the ancient Batur Mountain caldera qualifies as the location of the shrine, which in ancient Bali was called ulon.

Since the highest peak in the northwest of the ancient Mount Batur caldera is a steep hill, so to reach the summit, a circulation pattern is designed through the terraces following the topography of the hill. This can help the people who will pray, not tired heading to the main courtyard of Pura Panarajon at the top of the hill. At each level of terrace provided open space, a kind of plaza to rest. On the sixth terrace, there is a rather broad plaza to support religious activities at Pura Ratu Daha Tua. From this plaza circulation is then designed to turn right up a few more terraces to the courtyard of Pura Panarajon at the top of the hill. The process of climbing the steps from the first terrace to the sixth terrace equipped with plaza, then turn right past several terraces to the courtyard of Pura Panarajon, its function is similar to the process of climbing ladder stairs in modern storeyed buildings.

Therefore, the architectural design of punden berundak in Pura Penulisan is very unique, can be a source of knowledge of indigenous architectural space design of Bali, as well as a source of learning the history of ancient Balinese culture. At the Pura Penulisan complex, architecture and interior design students can learn how the ancient Balinese architects designed an architectural space on a hill on the ancient Batur Mountain caldera. The knowledge of space on archaeological architecture is also part of the space lesson in architecture (interview with Putu Rumawan Salain, Architectural Professor of the Udayana University Faculty of Engineering, dated 3 July 2017).

The principle of Pura Penulisan architectural space design is similar to the concept of a ladder pyramid, which was built by the Indians tribes in the South American continent. Prior to the influx of Western influence, the Indians had built their holy place on a hill in the form of ladder pyramid, like the Mayan Sun pyramid at Teotihuacan in the 8<sup>th</sup> century (Sumintardja 1981: 212). What is amazing is the Inca tribe in Manchu

Picchu (Peru), successfully built the city by combining stone building techniques with the natural environment (Myers, 1994: 120). In addition to security reasons, the construction of settlements on the mountain, is closely related to their religious observance, which places the mountain as a holy place, the place of the gods.

### PURA PENULISAN CONTAINS MEMORIES

As a relic of ancient Balinese culture at the highest point of the ancient Mount Batur caldera, Pura Penulisan complex has a natural charm and can knit memories for those who visit it. At each topographic level of the hill, from the lowest level to the top of the courtyard, each can provide a different architectural space sensation. It can create memories amid the beauty of the vast landscape (macro landscape). Although Pura Penulisan is often shrouded in thick fog of the mountainous area of Sukawana Village, Kintamani District, but from the top of Penulisan at any time can be seen the beauty of Mount Batur and its lake, and pine forest in the Kintamani mountains.

Pura Penulisan complex is an ancient Balinese historical monument, as it documents some of the ancient Balinese kings in the form of embodiment statue. In addition to the statue of Bhatara Guru as the embodiment of King Astasura Ratna Bumi Bhanter (the last ancient Balinese king), in the courtyard of Pura Panarajon also found several statues of other ancient Balinese king manifestation. Among them are paired statues as a tribute and a memory of the couple King Udayana and Empress Gunaprya Dharmapatni (989-1001). This paired statue has been replicated and kept in the Archaeological Museum (Gedong Arca) Bedulu, Gianyar (interview with I Wayan Muliarsa, Head of Balinese Heritage Preservation Hall, dated May 29, 2016). The pair of King Udayana and Empress Gunaprya Dharmapatni were highly respected, having successfully reconciled the religious sects and had formed Balinese society that has social religious characteristic. On the recommendation of Mpu Kuturan, King Udayana also has obliged every village in Bali to build *Kahyangan Tiga* (Pura Desa, Pura Puseh and Pura Dalem).

In the main courtyard Pura Panarajon also found the statue of the embodiment in the memory of King Udayana's son-in-law, the Empress King Anak Wungsu (1049-1077). The statue of the Empress King of

Anak Wungsu was made in 1077 and was named Bhatari Mandul statue. This name is given, because Empress King Anak Wungsu can not bear offspring, so King Anak Wungsu married again. This is what causes the empress to leave the palace and do *yogha samadhi* in Panarajon forest. After the death, a statue was made of a queen, named Bhatari Mandul (Soebandi, 1983: 41-44).

## ANCIENT BATUR CALDERA AS HERITAGE

Although all the volcano diversity developed as geosite is a geological heritage, but Mount Batur in Bali has its peculiarities. Because, Mount Batur has traces of ancient caldera geology and around the region found archaeological relics. The culture of the community is also distinctive and the landscape is beautiful. This is among other things into consideration UNESCO to established the area of the caldera of Mount Batur Ancient member of the Global Geopark network. In addition, Lake Batur has also been designated as one of the heritage by UNESCO, related to its function as a *subak* irrigation water source, a local wisdom of traditional Balinese farmers.

In accordance with the concept developed by UNESCO, the concept of Geopark Batur is the integration of the management of geological heritage with the ancient Balinese cultural heritage in the region of the ancient Mount Batur caldera, which has the goal of conservation, education and sustainable development in Indonesia (<https://www.baturglobalgeopark.com> ). So far, volcanic material that was ejected from the eruption of Mount Batur in the period 1804-2000, has become a source of mining and community income in Mount Batur caldera region. Sand and partial ignimbrites (pyroclastic flow sedimentation associated with caldera formation) are excavated and utilized by residents as materials for the manufacture of sculptures, temples and ornamental objects.

After UNESCO established Lake Batur as one of the world heritage associated with *subak* system that only exist in Bali and the caldera region of Mount Batur also as a member of Global Geopark network, the area of Mount Batur caldera and Lake Batur now not only as a heritage of the people of Bali or Indonesia alone, but also become part of the world community heritage.

## KNOWLEDGE IN ANCIENT BATUR MOUNT CALDERA

Knowledge is one of the elements of a universal culture. All human beings in the world gain knowledge after learning from nature. The result of interaction between humans and nature then became a culture. Knowledge of nature arranged systematically, grouped, then interpreted to obtain the objective truth and has been scientifically verified, it can become a science.

When visiting Pura Penulisan, in addition to religious activities or sightseeing, where the founding of Pura Penulisan also can be a source of knowledge and learning resources about geology and volcanology. Therefore, the hill where the Pura Penulisan stand is part of ancient Mount Batur caldera. In order to easier understand the knowledge of Mount Batur and its caldera geology, can also visit the Geopark Museum Batur in the southeast of Mount Batur. The informations of this museum, is not only about Mount Batur and its caldera only, but also knowledge of Bali Island geology and its volcano.

Based on Kemmerling's research in 1918 (in [baturglobalgeopark.com](http://baturglobalgeopark.com)), it can be known that there are five historical stages of Mount Batur. In the first stage, the old Batur Mountain formed as a large strato-volcano, with a height of about 3000 m. In the second stage (29,300 years ago), cataclysmic eruptions resulted in the collapse of the old Batur Mountain and the formation of large caldera, as well as producing a large amount of ash clouds at a speed of 40 meters/sec (150 km/h). The eruption can be regarded as the first period of Mount Batur destruction. The temperature of the ash cloud is estimated to be between 6000°-8000° C, spread to the outskirts of Denpasar, about 90 km south of Batur. After cooling down, it becomes a layer of rock that is rich in silica composition, called Ubud Ignimbrite.

The second Batur Mountain construction was formed again in the third stage of development, accompanied by the rise of other volcanoes in the large caldera and around it. One of them is Mount Abang (2,172 m) east of Mount Batur, which is the highest mountain in the Batur region. In the fourth stage, about 20,150 years ago, the second Mount Batur erupted with great power. Volcanic sediment products occur in Mount Payang and Bunbulan. This powerful eruption produces Gunung Kawi Ignimbrite. The evidence of magma ignimbrite material can be seen in the ancient relics of Pura Gunung Kawi in Tampaksiring

(Gianyar). Construction of the temple material was formed around 1100 BC. This location is close to Pura Tirta Empul and the Presidential Palace in Tampaksiring. At that time, some of the peaks of the third volcano were destroyed by the eruption. Later in the fifth stage, about 5,500 years ago, another eruption began producing andesitic ignimbrite including volcanic rock layers, which then form the current strato-volcano Batur.

However, the existing report document only mentions the eruption since 1804. The resulting product consists of a lava block flow generated from the three mountains of Mount Batur and from eruption. In 1917, Mount Batur with 1000 casualties. On August 2 to September 21, 1926, another great eruption, which destroyed the village of Batur located at the base of the caldera. However, about 2000 residents managed to evacuate. In 1963 a strong eruption of Mount Batur occurred again, several months after Mount Agung erupted (Surpa, 1990: 1 and baturglobalgeopark.com). The lava flow coming from the Batur caldera-3 extends and covers most of the caldera. Basaltic lava consists of 51-53% silica. Batur eruption does not cause fatal damage. New peaks are formed, although some are broken again by eruptions and replaced by new peaks covered by younger-age deposits.

If the historical search of Mount Batur is comparable with civilization in Bali, it can be estimated that after the formation of Batur strato-volcano 5,500 years ago, there were prehistoric Balinese residents, especially those who settled around the caldera of Mount Batur. Therefore, prehistoric Bali is estimated to begin in 2000 BC, according to the archaeological findings of the neolithichum (Ardika and I Made Sutaba (ed.), 1996: 2).

Therefore, based on the structures of Pura Penulisan and archaeological remains of prehistoric statues, it can be estimated that the beginning of Pura Penulisan was built around 500 BC, when the megalithichum culture developed in Bali. Megalithic era in Bali is also known as the period of *perundagian*, because at that time it was known there are skilled people in the field of building (*undagi*), skilled in carving sarcophagus, skilled at making prehistoric statues, pottery and skillfully make bronze *nekara* (Sutaba, 1980: 23-34 ). Prehistoric statues, leveled terraces, in general much made after the mastery of metal technology, along with the development of megalithichum culture. Like the prehistoric statue in Trunyan Village, which is on the northeast side of the ancient Batur

Mountain caldera region. The prehistoric statue is in the form of datonta statue as high as 4 m. Trunyan residents call it Ratu Gede Pancering Jagat, meaning the great energy that controls the world.

#### ANCIENT MOUNT BATUR CALDERA CONTAINS MEMORIES

From the edge of the Caldera of Mount Batur in the south, can be witnessed a beautiful caldera landscape. Without realizing it, the beauty of the landscape is actually created by the fifth Mount Batur eruption, 5,500 years ago. By sunset, Batur strato-volcano landscape of the fifth stage of the big eruption, looks more beautiful when viewed from Penelokan Village, on the east side of the caldera.

From the edge of the caldera to the east, visitors of the ancient Mount Batur caldera can knit the memories, in accordance with the *tri samaya* philosophy (three agreements in time). What exactly happened to the past (*atita*), how likely the caldera of Mount Batur in the future (*nagata*). Therefore, at this time (*wartamana*) everyone is required to maintain the sustainability of Mount Batur caldera, so that memories can still be knit from time to time.

Pura Penulisan complex can also knit memories of the Balinese prehistoric civilization, ancient Bali, until the civilization of *Bali Madya*. At each topographic level of the hill, from the lowest level to the top of Pura Panarajon, each can give a different architectural space sensation. The existence of Pura Penulisan still continues until modern Balinese civilisation, because Balinese Hindu society holds to the philosophy of *tri hitakarana*. *Tri hitakarana* are the three poles that make a life on earth, consisting of soul (*atma*), physical (*angga*) and energy (*kaya*). This philosophy has a universal value, because every human being is required to maintain a harmonious relationship with God, with fellow human beings, and their environment (including the culture). Based on this philosophy, the architecture is also accepted as a life after going through the ritual process at the time of its construction.

#### CONCLUSIONS

The beautiful nature of Bali Island is the result of the formation of volcanic activity under the sea, more than 23 million years ago. One of the beautiful areas of Bali Island, the result of ancient volcanic activity is the caldera of Mount Batur in Sukawana Village, Kintamani.

On the hill to the northwest of the ancient Mount Batur caldera, has been built sanctuary in the megalithic period (500 BC). At the time of ancient Bali, this holy place was developed into a complex of shrines named Pura Tegeh Koripan. This holy place is later better known as Pura Penulisan. Pura Penulisan is a sacred place built with the concept of *punden berundak*, as the original culture of the Indonesian nation. In accordance with *punden berundak* concept, Pura Penulisan is designed with terraced space pattern, following the topography of the hill and equipped with *plasa*.

Pura Penulisan archaeological merges with the ancient Mount Batur caldera, which was formed due to eruption 5,500 years ago. Therefore, Pura Penulisan and the ancient Mount Batur caldera are both a valuable heritage, containing knowledge (architecture, archeology, geology and volcanology). Pura Penulisan and the ancient Mount Batur caldera can also knit memories of prehistoric Balinese civilisation to modern Balinese civilization.

Preservation of Pura Penulisan in the region of the ancient Mount Batur caldera, is based on the philosophy of *tri hitakarana* in Balinese culture. This philosophy has a universal value, which teaches every human being constantly maintains the harmonious relationship with God, between fellow human beings and their environment. The philosophy of *tri samaya* in Bali also provides a foundation for the preservation of Pura Penulisan and the ancient Batur Mountain caldera. This philosophy teaches that people always learn from the past (*atita*), predict the possibility that could happen in the future (*nagata*), so it can take the best decision at this time (*wartamana*).

To integrate the geological heritage with Balinese culture, conservation, education and sustainable development in Indonesia, UNESCO has established the Mount Batur caldera region to be a member of Global Geopark network. Lake Batur has also been designated as one of the heritages by UNESCO, related to its function as a *subak* irrigation water source, part of the local wisdom of traditional Balinese farmers.

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