

# The Management of Water Resources in Cultural Heritage on The Coastal Area of Bali

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**Abstract.** Managing water resources has become one of the most pressing concerns of human life, which requires wise water use. The wise management of water resources in the history of the Balinese people is reflected in their cultural heritage. Various studies in spatial archaeology, environmental archaeology, and hydro-archaeology have provided an overview of the connection between cultural heritage and water resources management. However, research has yet to specifically address managing water resources in cultural heritage sites in coastal and inland areas. Therefore, researching water resource management in coastal cultural heritage sites is essential. Technical terminology abbreviations will be explained upon first use. The study explores two key issues: (1) the various forms of cultural heritage related to managing water resources in coastal areas and (2) the models of water resources management of cultural heritage in coastal areas. Data collection methods were conducted by observation, interview, and documentation. The findings indicate that the forms of cultural heritage related to water resources management in coastal areas include the Masceti Temple Gianyar, Taman Ujung Sukasada Karangasem site, and the Tanah Lot Temple Tabanan. It is important to note that the language used in this study adheres to objective and formal principles while maintaining precision and clarity. The cultural heritage water management model includes two aspects: (1) using rice field ponds for agricultural purposes, which promotes community prosperity, and (2) distributing water as holy water (tirta) for religious and medicinal purposes. This model reflects effective water resource management.

**Keywords:** Management; water resources; cultural heritage.

## 1 Introduction

In recent times, water resources have emerged as a pressing concern. Due to human activities such as agricultural pesticide use and increased waste disposal, the availability of clean water has decreased in quality. In addition, there has also been a decrease in the quantity of water resources due to environmental degradation and the effects of global warming. As is evident nationally and regionally, Indonesia is rich in natural resources, including water, which has become an increasingly expensive commodity. As a vital component of human existence, water is necessary for all living beings. As a vital component of human existence, water is necessary for all living beings on earth; therefore, the sustainable management of water resources is crucial. The sustainable management of water resources can be achieved through the study of historical methods of water use over generations.

The management and use of water resources in ancient times have become an essential topic of study for cultural historians. Moendardjito's (1998) research on the location of Hindu-

Buddhist temples in Central Java concludes that the temple sites were chosen close to water resources, for example, on the banks of rivers or the sides of mountains. This thesis is also supported by the study of Balinese cultural heritage by Setiawan et al. (1997). Proximity to water sources is consistently prioritized in Balinese heritage site selection. Dang Hyang Nirartha built sacred temples that followed water flow, often on the shoreline. Examples of coastal cultural heritage include Tanah Lot Temple, Pulaki Temple, Uluwatu Temple, Sakenan Temple, Goa Lawah Temple, and Silayukti Temple. The temples are located near water. They have a specific purpose in managing these resources. Hydroarchaeological research on several archaeological sites in Bali shows that using water resources indirectly affects their long-term sustainability and contributes to preserving the natural environment. Suarbawa's (2022) study of archaeological sites along the Petanu River and Petang Badung is closely related to managing and enhancing water resources and the environment.

Although there are spatial and hydro-archaeological studies, there still needs to be research focused on managing water resources in cultural heritage, especially concerning Balinese cultural heritage located near water resources, and there needs to be more attention to the management patterns of water resources in cultural heritage. The research problems investigated in this study are: (1) How are the forms of Balinese cultural heritage related to water management in Bali's coastal regions, and (2) what is the water management model of this cultural heritage? This research aims to analyze the forms of Balinese cultural heritage related to water resources in coastal areas and to examine the water management model of cultural heritage.

## **2 Methods**

The study focused on managing water resources related to Bali's coastal cultural heritage and identifies the need for conservation efforts to preserve Bali's cultural heritage for future generations. The research used primary and secondary data sources. The primary data includes the forms of cultural heritage, the related historical source texts, and the collective memory information about the cultural heritage. Secondary data includes information from government officials, community leaders, reports, articles, and pictures relevant to water resource management on cultural heritage in coastal regions. The researcher served as the main instrument in this study and was further assisted by supplementary instruments such as record forms, measurement tools, interview guidelines, and audio-visual documentation tools via smartphones during the implementation. Data collection techniques include observation, interviews with key informants, and documentation. Physical aspects of artifacts, sites, and water resources were observed as part of the environmental context of the cultural heritage. In-depth interviews were conducted to explore historical background collective memory and to corroborate physical data collected through observation. Documentation techniques were utilized to gather secondary data from written sources, such as reports and historical records pertaining to cultural heritage in a specific location. The collected data were then analyzed, classified, and organized to allow for further analysis. The analysis is based on descriptive qualitative and quantitative methods. In addition, contextual analysis was also done to examine the relationship between data within the scope of a particular area and similar data in other areas. It was complemented by a study of stone elements, the management of water resources, and environmental aspects to observe the relevance of cultural promotion and ecotourism to empirical reality. The technique of presenting the results of data analysis was done by combining

informal techniques (descriptive-narrative), which were conducted by describing the condition of the subject under investigation as it is, based on facts at the time the research was conducted (Nawawi & Hadari, 1992).

### **3 Results and Discussions**

#### **3.1 Forms of Cultural Heritage: Representations of Water Resource Management in The Coastal Areas of Bali**

Cultural heritage is the tangible and intangible products of social customs and spiritual achievements that function as fundamental components of the identity of a group of people, passed down from previous generations (Davidson, 1991).

Tangible heritage is classified into immovable heritage and movable heritage. Immovable cultural heritage is a cultural heritage that cannot be moved, usually located outdoors, such as sites, historical places, land and water landscapes, and ancient historic buildings (Galla, 2001; Davidson, 1991). Movable cultural heritage is a form of cultural heritage that can be easily moved. Such heritage is usually indoors, such as artworks, records, documents, photographs, tapes, videos, and films (Galla, 2001). Material cultural heritage, according to Indonesian Law No. 11/2010, consists of cultural heritage objects, structures, buildings, and territories. This grouping is similar to the classification determined by The World Heritage Convention, which categorizes physical cultural heritage into three parts, namely monuments, buildings, and sites (World Heritage Unit, 1995). Intangible heritage is often identified with the past cultural value system (intangible heritage) derived from local cultures in the archipelago, includes: traditions, folklore and legends, native languages, oral traditions, customs, creative dance, songs, drama performances, adaptability and uniqueness of indigenous peoples (Galla, 2001).

Referring to the abovementioned considerations, the cultural heritage in this research refers to the physical cultural heritage in coastal areas related to water resources management. The cultural heritage selected as samples are Masceti G Temple Site, Taman Ujung Sukasada, and Tanah Lot Temple as representatives of several regencies in Bali, namely Gianyar, Karangasem, and Tabanan Regencies. The cultural heritage is as follows.

#### **3.2 Pura Masceti Temple Sites**

The site of Masceti Temple is located on the side of Masceti Beach (Subak Ceti), about 500 meters from the intersection of I Gusti Ngurah Rai bypass or about 22 KM east of Denpasar. This temple is located in the administrative area of Medahan and Keramas village, Blahbatuh Regency, Gianyar, Bali. Structurally, Masceti Temple consists of three courtyards (tri mandala), namely an outer courtyard (jaba), a middle courtyard (jaba tengah), and an inner courtyard (jeroan). In each courtyard, there are both sacred and secular buildings (pelinggih). Several structures can be found in the Jabaan Yard, such as Bentar Temple, Sedahan Kelabang Apit, Pelinggih Pasar Agung, and Wantilan. Various buildings in the form of Candi Kurung (Kori Agung), Sedahan Apit Lawang, Pamedal Bintang Aring, Palinggih Ida Ratu Gede Batan Tapang, Bale Pegambuhan, Bale Geguritan, Bale Kulkul, and Paletasan can be found in the middle courtyard. To the east of the main yard is the Taman temple. This temple has a pond. A natural water source in the northwest feeds it. Also present are two buildings: pelinggih dewa-dewi and sedahan agung (Raka, 2015). Within the inner courtyard are various structures,

including Pelinggih devoted to worshipping the goddess Danu (Ratu Ulun Suwi) and Pelinggih Ratu Masceti, devoted to worshipping Sang Hyang Baruna. There are also coral Tapasana temples, which serve as places for fishermen and farmers to ask for prosperity and Ratu Ngurah Agung's temple at the intersection of Mount Bee and Mount Agung. Other notable temples include Meru Tumpang Lima, Meru Tumpang Tiga, and Pelinggih Ida Bhatara Segara. Pelinggih Sedahan Segara Kiwa-Tengen, Pelinggih Sedahan Ngrurah, Pelinggih Dasar/Sapta Petala, Pelinggih Petirtaan, which serves as a source of holy water for Masceti temples, Bale Pewedaan, Bale Pengaruman, Bale Pesanakan, Bale Piasan Agung, Bale Panggungan, Bale Gong, and Pelinggih Gedong (Raka, 2015).

Functionally, Pura Masceti serves as a place of worship for the deities Dewi Danu and Bathara Baruna. Dewi Danu is the fertility goddess, believed to be the presiding deity over the agricultural lands. Bathara Baruna, on the other hand, is considered the god of natural resources and is believed as the ruler of the sea. Therefore, for farmers and fishermen, the Masceti Temple is a religious site to promote fertility and prosperity. As a place of worship dedicated to Dewi Danu, the locals believe that the Masceti Temple provides spiritual support for crop fertility and protection from pests, including rats, which they believe are under the goddess's influence. In addition, to ensure successful fishing ventures and to avoid disasters at sea, the community seeks the favor of Bathara Baruna. Because of its association with the Subak Ceti, the Masceti temple is classified as a Swagina or Subak temple. In addition, the temple is revered by the villagers of Medahan, Keramas, and Gianyar, as well as the Balinese population, giving it the status of a Kahyangan Jagat.

### **3.3 Taman Ujung Sukasada Sites**

The Taman Ujung site is located in Banjar Ujung, Tumbu Village, Karangasem Regency, Bali. Besides functioning as a resting place for the king, Taman Ujung can also be used to welcome guests of the Karangasem kingdom. The site was completed in 1921 and has undergone several renovations, including conservation by the World Bank. The site has been registered as a cultural heritage based on the Cultural Heritage National Registry number CB.1497. It has been designated as a conservation and cultural heritage at the regency level based on Decree No. 302/HK/2018, Dated March 15, 2018 (Mugiraharja, 2019).

Taman Ujung Sukasada has several notable structures, including 1) Bale Kambang, located in the heart of the southern water pond and connected by a bridge with six entrances. Historically, Bale Kambang was used as a court for villagers charged with criminal offenses and a venue for meetings and banquets held for royal guests. In addition, three ponds are located in the north, south, and adjacent areas (dirah ponds). 3) The Bale Kapal is the main entrance to Taman Ujung Sukasada, representing the seat of government and metaphorically alluding to a vessel that leads the people to prosperity. 4) The Bale Lunjuk, located in the northwestern terraced area, is a rectangular structure connected by 108 steps, symbolizing the separation between the physical body and the spiritual realm. 5) The Balai Bundar features a spherical roof and floor, representing a room where the king can meditate. 6) The Bale Bengong is a long rectangular shape used as a communal resting area or waiting room for the king. 7) The Bale Gili is located in the center of a pond and is accessible via two bridges. 8) The Bale Gili is a resting place for the king's family and important guests.

### **3.4 Tanah Lot Temple Sites**

Tanah Lot Temple is located in Beraban Village, Kediri District, Tabanan Regency. Looking at the temple's structure, which is located right in the middle of the sea, the Tanah Lot Temple consists of two courtyards: the outer courtyard (jabaan) and the inner courtyard (jeroan). The outer courtyard is an unenclosed outdoor space, yet it has a sacred significance as it is only accessible to those who wish to pray. In the outer courtyard of the Temple of Tanah Lot, there are two entrances, one facing west on the east side and the other facing south on the north side. The inner courtyard contains cultural heritage objects, including menhirs and lingga fragments, which serve as a medium for honoring the throne of spirit arrivals and commemorating individuals, as well as worshipping and praying for protection (Soejono 1975, 200; Laksmi 2014). In addition, holy springs of fresh and salty water are located at the temple. The freshwater spring is located under Tanah Lot Temple on its northern side. The site is known as Goa Air Suci. It takes the form of a beji tabah used for tirta, which serves as a medium for physical and mental purification (penglukatan). In addition, on the southern side, under the cliff, there is holy water in the form of salt water or beji segara, which is believed by the community to have healing properties for various ailments (Laksmi, 2014).

### **3.5 Water Resources Management for Cultural Heritage Model**

The shape and location of the cultural heritage sites, including the Masceti Temple Site, Taman Ujung Sukasada Site, and Tanah Lot Temple Site, provide evidence of water resource management. These three cultural sites close to water, including one in the middle of the sea, demonstrate a distinctive approach to managing water resources in cultural heritage.

The water management model implemented at the Masceti temple site uses the river flow of Subak Ceti, derived from Pura Selukat's flow. The river flows into Subak Ceti and then into a pond at Taman Temple. In addition, the groundwater of the Masceti Temple is used to supply the pond water. A holy well provides spring water for ritual purposes in the courtyard of the Masceti Temple. Thus, water management at the Masceti Temple site can effectively enhance the availability of water sources such as river and groundwater springs for multiple purposes, including religious rituals (tirta), rice field agriculture, and environmental fertility. Implementing proper water management can empower these resources to support these activities.

Pura Masceti is a sacred site dedicated to worshipping Dewi Danu, reminiscent of Pura Ulun Danu Batur, which is recognized as Bali's primary water reservoir. The temples dedicated to Dewi Danu serve as a testament to the efforts to preserve, manage, and utilize water resources as one of the most fundamental elements of humanity. The worship of Dewi Danu is associated with agricultural fertility and the pursuit of prosperity in human life. Agricultural fertility and the pursuit of prosperity in human life are associated with the worship of Dewi Danu. In addition, the god of the sea, Dewa Baruna, who is regarded by the local community as the ruler of the sea, is worshipped at the Masceti temple site. The temple establishment on the seashore can raise public awareness of beach conservation and mitigate the destruction of the coastal environment. Masceti Beach is an essential site for the Melasti ceremony (a primary purification ritual), motivating the community to (directly or indirectly) conserve the coastal environment.

Water management in Taman Ujung Sukasada Cultural Heritage is demonstrated by creating a vast and impressive park that effectively utilizes abundant water resources. The water

management system in Taman Ujung is established by connecting the water source from Subak Tukad Jangga to the south, specifically to the Warak Statue (Bale Warak area), before flowing to the Lembu Statue and finally to the pond. The area has three large ponds; the first is located in the northernmost area where the Bale Gili building is located. The second pond has the Bale Kambang building on its banks and is located in the southern region of the first pond. The third pond, called Dirah Pond, was initially built by the King of Karangasem and is located east of the second pond. Each pond contains groundwater sources (springs); particularly, the Bale Kambang pond has an impressive 30 groundwater springs. Bale Gili Pond has 30 groundwater springs, while Dirah Pond has about 11. Taman Ujung is a cultural heritage site demonstrating a thoughtful, appropriate, and efficient water resource management system. Thoughtful because the water channel system is combined between ponds, using sequential downstream movement to its final destination, the sea. It is appropriate and efficient because it was built using appropriate technology that utilizes the water source from each pond, providing irrigation benefits to farmers in the rice fields around Taman Ujung.

The management of water resources at the Tanah Lot Temple site derives from the temple's location in the middle of the sea, reflecting the ancestors' approach to harnessing the natural landscape to create an architectural masterpiece imbued with philosophical and religious significance. In this cultural tradition, fresh and salty water sources are managed as holy water (tirta), which is believed by the community to have healing properties for various ailments and as a medium for physical and mental self-purification.

#### **4 Conclusion**

Based on the above discussion, the coastal region is a suitable and strategic location for constructing a sacred building due to its proximity to a water source or the sea. Water plays a crucial role in sustaining life. Therefore, its protection, utilization, and proper management are essential. Our ancestors' recognition of the importance of water resource management is reflected in our cultural heritage. In coastal areas, there are cultural heritage sites related to water resources management, such as the Pura Masceti Keramas site, Taman Ujung Sukasada Karangasem site, and Tanah Lot Tabanan Temple. These sites showcase water resources management methods developed over time and provide insight into traditional practices. Water resources management in the cultural heritage model includes two models. First, the water resources management model for welfare and fertility involves storing water in ponds for agricultural purposes. Second, the water resources management model in the religious and magical sense is based on distributing water as holy water (tirta) for self-purification and healing properties for various ailments.

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