



## Sustainable Water Governance Based on the Local Wisdom of Tri Hita Karana and Sad Kertih Values: Impact for Environmental Sustainability

I.G.NG.G.A Pradipta<sup>1</sup>, L.G. Saraswati Putri<sup>2\*</sup>

<sup>1</sup>School of Environmental Science, Universitas Indonesia, Jakarta 10430, Indonesia

<sup>2</sup>Faculty of Humanities, Universitas Indonesia, Depok 16424, Indonesia

Corresponding Author Email: [lg.saraswati@ui.ac.id](mailto:lg.saraswati@ui.ac.id)

Copyright: ©2024 The authors. This article is published by IETA and is licensed under the CC BY 4.0 license (<http://creativecommons.org/licenses/by/4.0/>).

<https://doi.org/10.18280/ije.070203>

### ABSTRACT

**Received:** 16 April 2024

**Revised:** 25 May 2024

**Accepted:** 1 June 2024

**Available online:** 30 June 2024

#### Keywords:

*Tri Hita Karana, Sad Kertih, water governance, environmental discourse, sustainability*

Bali is one of the areas in Indonesia prone to water crisis due to the ever-increasing demand for water in line with population growth and economic activity. The cultural values of Tri Hita Karana and Sad Kertih inspire the Balinese perception of water. This study aims to evaluate water management policies in Badung Regency, Bali Province, by incorporating the cultural values of Tri Hita Karana and Sad Kertih. This research used qualitative methods, and the data analysis used document analysis and environmental discourse methods. The results of this study indicate that water governance in Badung is not optimal because it is still centralized and needs to involve cultural roles in the local community. This study concludes that the involvement of local communities, especially customary villages, is essential to realize sustainable water governance in an integrated manner. In addition, it is necessary to strengthen the appreciation of the values of Tri Hita Karana and Sad Kertih, which support the principles of environmental sustainability.

## 1. INTRODUCTION

At the turn of the 21st century, the discourse and agenda regarding environmental sustainability reached momentum. Governments and civil societies worldwide are increasingly committed to tackling the impact of climate change [1]. One imminent threat of climate change is water scarcity. As the world population increases rapidly and the pressure of climate change becomes the challenge of our time, the demand for clean water is getting more challenging to meet [2]. More than four billion people live under severe water scarcity for at least one month of the year [3]. The increasing pressures on water resources demand a more robust, holistic, and inclusive water resource governance. In addition, there are much more profound and multifaceted water and human life issues. More than water is needed for existence or availability. Its scarcity and abundance may create benefits and disasters depending on the context of water's role in society. As society differs, so does the role of water. Hence, the availability and condition of water resources have become crucial issues and need to be strategically managed.

There is a strong correlation between the role of water and the way society perceives its value. The UN-Water Report [4] highlighted the value of water, which plays an extended role beyond its physical life-support and economic values, including more intangible values. Aside from being essential for basic needs such as drinking, hygiene, and sanitation, and as an essential economic resource, water also has subtle features of socio-cultural values such as mental health, spiritual well-being, emotional balance, and happiness [4]. Unfortunately, measuring these values is very challenging, so

it is often neglected or taken for granted. It is paramount to manage water sustainably because water is a precondition of life and plays a significant role in societies' evolution and growth [5]. Water's political and cultural nature may correspond to the motivation for formulating water-driven and people-driven policies [6]. Furthermore, managing resources with a community approach usually correlates strongly with adherence to traditional local culture or religion [7-9].

Bali is one of the regions in Indonesia that has the potential to experience a water crisis. Besides the increasing water demand, Bali is also a remote island vulnerable to the impacts of climate change [10]. Traditionally, the Balinese are agrarian society that depends on the agricultural sector. Irrigation needs for agriculture in Bali require high amounts of water [11]. The water demand for tourism exacerbates this. Since the 1970s, Bali began to develop as a popular tourism destination. Water demand for tourist amenities is known to be very high [12, 13]. This competition in the use of water resources between agriculture, tourism, and domestic creates inequality in access to water, which leads to a decline in the quality and quantity of Bali's water resources [14] and conflict among users [15].

To overcome the environmental challenge, the Provincial Government of Bali for the period 2018-2023 adopted the vision of 'Nangun Sat Kerthi Loka Bali', which is based on the philosophical values of 'Tri Hita Karana' (three causes of happiness) and 'Sad Kertih' (six virtues). One of the dimensions of this vision is to maintain the balance of nature, people, and Balinese culture. The Balinese firmly adhere to their cultural values in daily life and in traditional traditions [16]. This is slightly different from other more multicultural areas [17]. The movement to restore Bali's nature and culture

to be sustainable has even more strongly campaigned in the public sphere through the 'Ajeg Bali' or Sturdy Bali movement [18]. The cultural values of Sat Kerthi and Tri Hita Karana (THK) are exciting topics to study from the perspective of environmental science because they indicate the dominant role of local culture, especially when these two values are adopted into environmental policy.

The relationship between the social and cultural meaning of society towards the surrounding environment is often used as a source of political authority and power so that it can be continued as a binding policy [19]. The link between culture and Bali's development vision for the 2018-2023 period is shown through government policies that focus on advancing the Balinese economy while preserving its natural environment by utilizing the value of local wisdom and active community participation. Specifically, regarding water resources management, the government issued an unprecedented new regulation that focuses on maintaining and protecting coastal areas and water sources and involves local communities. Governor Regulation No. 24 of 2020 concerning the Protection of Lakes, Springs, Rivers, and Coastal Areas aims to maintain water resources' carrying capacity, capacity, and function. This is done with various efforts to protect surface water resources and coastal areas from damage and pollution due to human activities. In addition, this policy also involves indigenous peoples in integrated water resources management.

Balinese customary communities are managers of water resources at the site level and are also members of various forums. This community-based management group has the right to utilize water resources and the duty to protect them from damage and pollution. For example, communities can make customary rules (awig-awig) prohibiting garbage and waste disposal in the rivers. In addition, water resources are considered an inseparable part of the community's cultural life. Lakes, rivers, springs, and beaches are considered sacred areas, so their preservation and spiritual (niskala) purity must be preserved through various rituals and purification ceremonies according to their respective customary rules.

Currently, empirical research in the field needs to focus on cultural values in sustainable water management in Bali Province. Previous studies in other countries state that community-based water management is the best strategy to maintain the sustainability of water resources [7, 20, 21]. The previous research also stated that the management of water resources could have been more efficient due to corruption, weak institutional capacity [22], and limited financing [23]. However, research that looks at the role of culture in water management still needs to be improved. This article aims to investigate the implementation of water governance in Badung District as the case study for Bali. The research highlights the role of environmental discourse within Balinese local wisdom values to water governance sustainability. The Badung district is chosen as the study area due to its abundance of tourism accommodation development in the south and the wide area of agriculture in the north.

## 2. METHODOLOGY

This research employs a qualitative method with in-depth interview data. The study interviewed ten key informants representing government agencies in central, provincial, district, NGOs, and local communities. The analysis was

conducted using the environmental discourse method [24]. Discourse means a shared way of apprehending the world [25]. The analysis of discourse can be used to understand the specific interpretation of a group of society toward the environment. This study uses environmental discourse analysis to understand how the issue of water governance in Badung District is constructed within the prevailing narrative, which transformed into water policy.

The transcript data was then analyzed using the software NVIVO 12 with 17 codes to examine 1) theme mapping, 2) stakeholder relations, and 3) water governance discourse. This study utilizes NVIVO12 software and 17 codes to analyze transcript data, employing a specific analysis plan. The steps include importing the transcripts into NVIVO12, creating 17 codes based on the identified themes such as "perception", "challenges", "Tirta Hita Karana", and others, categorizing the data into these codes, and conducting thematic analysis to identify patterns and trends. Additionally, the analysis will focus on relationships between stakeholders using relevant codes like "Stakeholder Participation" and "Partnerships," aligning findings with Ostrom's theory on common resource governance principles. The results will be presented in a comprehensive report integrating direct quotes from transcripts, interpretations, and connections to relevant literature and theories, highlighting the theoretical significance and practical implications of the research in sustainable water governance based on THK and Sad Kertih cultural values. The mapping of themes is then divided into four aspects: a) governance structure, b) cultural role, c) stakeholder participation, and d) challenges. The selection principles of these four aspects are related to the analysis objectives aimed at achieving the water governance and discourse under study. Several principles guide selecting these four aspects: Relevance to research objectives, comprehensiveness, and interconnection and interdependence. These aspects are then reflected in the conceptual or theoretical framework used in the research, ensuring that they encompass relevant and crucial dimensions in the specific analysis of water governance.

The mapping results are then presented in the form of matrices and flow diagrams to visualize the analysis outcomes. Meanwhile, source triangulation is conducted by comparing arguments from various informants to assess the credibility of the research results. This study also compares research findings with applicable policies. Additionally, the study evaluates consistency and reproducibility by examining whether the research findings align with previous research findings in the same field. This step also aims to validate the findings generated from the analysis.

## 3. RESULTS AND DISCUSSION

The result of the hierarchy analysis of coding shows that the informants are mostly concerned about 'challenges' and 'perception'. 'Challenge' is a code used for categorizing expressions and arguments about the challenge in implementing water governance in Badung and Bali. According to the informants, 'Perception' is another code for any best idea and practice of water governance. These two significant topics reflect the weaknesses and gaps in Bali's Water Governance. Codes like 'Tri Hita Karana' and 'Sad Kertih', which are used to categorize the role of both philosophies in water governance, are rarely talked about.

Local culture still plays a small role in the current water governance.

### 3.1 The water governance structure

Water governance structure is a theme that includes a discussion of perceptions about the structure of water governance in Bali, particularly in Badung. This category

includes the various actors involved, their relationships with each other, and the powers they have in water governance. Thematic analysis regarding the governance structure is presented in the matrix of Table 1. The Sentiment in Table 1 shows informants' perceptions and attitudes towards the current water governance structure. The authors give a "+" sign for positive sentiment and a "-" sign for negative sentiment.

**Table 1.** Perception of water governance structure

	<b>A: Perception about the Current Water Governance</b>	<b>B: Sentiment</b>	<b>C: Perception about the Ideal Water Governance</b>
<b>Government</b>			
Informant 1 (BAPPEDA Badung)	Many parties involved with overlapping authority. Problem with coordination. Conflict potential is high. Even though there are many parties involved, the coordination is going well.	-	All parties must collaborate equally without sectoral egos and be open to each other.
Informant 2 (BWS Bali Penida)	The problem of miscommunication occurred with local communities regarding the initiation of water supply installation (IPA) development.	+	It only needs to increase community assistance to support the development program.
Informant 3 (Energy, Mineral, and Human Resource Office of Bali Province)	Only carrying out the duties by the regulations.	No Data	Not mentioned.
Informant 8 (Badung Water Company)	Water companies find it difficult to maintain the water distribution pipelines because of overlapping authorities. The government is considered to be less assertive in regulating the use of groundwater. Coordination between actors went well; community participation is also good.	-	Optimal use of piped water can reduce the use of underground wells by residents.
Informant 9 (Badung Public Works Office)	A conflict arose in water management with the Tabanan district government. The office only focuses on irrigation networks and river utilization.	+	Not mentioned.
Informant 10 (Vice Governor of Bali Province)	Coordination between actors is good; regulations rule authority properly; and there is no conflict.	+	It has been ideal.
<b>Society</b>			
Informant 4 (IDEP Foundation)	There are many parties involved, but no one takes full responsibility. Governance is still partial in administrative areas, even though water is a cross-spatial issue. Governance is top-down, with minimal local community participation.	-	Water management should be integrated in the one-island management.
Informant 5 (Konservasi Indonesia Foundation)	Water management is still compartmentalized, confusing authority. Water management is too dependent on infrastructure, even though there are local cultural values.	-	There should be an integrated water management board.
Informant 6 (Head of Southern Cangi Subak)	Water management in <i>Subak</i> is good. There was a conflict of interest with PDAM.	-	The role of customary villages needs to be strengthened to ensure the sustainability of subak.
Informant 7 (Chief of Sembung Customary Village)	The role of customary villages has not been seen in water management. There was a conflict of interest with PDAM.	-	The role of customary villages needs to be strengthened to conserve water sources.
<b>Summary</b>	Although many parties are involved in water governance, there are significant problems related to overlapping authority, lack of coordination, and a high potential for conflict.		Current water governance involves many parties with overlapping authority, causing coordination problems and a high potential for conflict. Even though there is good coordination in some cases, miscommunication and conflicts of interest, especially with PDAM and local governments, still often occur. Water governance tends to be top-down, with minimal local community participation.

The matrix in Table 1 shows that most informants have a negative attitude or are dissatisfied with the current water governance. This dissatisfaction can even be seen in informants' arguments from government agencies. Informant #1 of Badung Regional Planning & Development Agency (BAPPEDA) explained a lot about the challenges experienced in water governance in Badung. According to the informant, water management in Badung involves many parties, so they overlap, coordination problems arise, and there is a high conflict of interest. For instance, when the informant explained about the slow handling of repairs to irrigation canals by the Bali Penida River Basin Office (BWS Bali Penida). According to him, the Badung District government will not have an issue repairing the broken irrigation channels (tertiary) within their jurisdiction. However, they cannot repair the ones (primary) that belong to BWS Bali Penida's jurisdiction, which has been neglected for almost four years.

Another story discovered during the interview is that district governments may need to collaborate in integrated water governance. Informant #1 explained that Subak Balangan (Mengwi Sub-district) and Sembung Village (Abiansemal Sub-district) depend on irrigation canals from water sources in Tabanan District. However, Badung and Tabanan Districts have had a prolonged conflict over water. Even though there has been a customary agreement called *paras-paros* (togetherness in preserving the harmony with nature) assisted by the Bali Regional House of Representatives (DPRD) and BWS Bali Penida, there has been no clarity regarding the distribution of water that is more equitable for Subak Balangan [26]. According to Informant #1, this is because there is sectoral ego from the Tabanan Regency government, which prioritizes the water for irrigation in its area. BWS Bali Penida is also committed to normalizing irrigation canals, which still needs to be implemented [26]. Informant #1's argument about overlapping governance was also supported by arguments from other informants, such as Informant #8, Informant #4, and Informant #5.

The all-powerful BWS Bali Penida is a particular agency under the Ministry of Public Works of the Republic of Indonesia. It mainly concerns water resource use and damage prevention within river basin areas. According to Presidential Decree No. 12/2012 on Determination of River Basin, all 391 river basins in Bali Island belong to the national strategic basin. Therefore, its management largely falls to BWS Bali Penida, allowing it to enjoy full authority. This is criticized by informant #4 of IDEP Foundation and informant #5 of Konservasi Indonesia Foundation. This makes water governance ineffective and partially managed. Both informants support the idea of one-island integrated water governance with an integrated management board of all related stakeholders. According to them, the water governance in Bali will become more effective and justified with a bottom-up approach.

The government's argument concerning the existing approach to water management carries a relatively positive sentiment compared to the community's perspective. Government representatives, specifically informants #2, #9, and #10 have highlighted the effectiveness of coordination and implementation in water management, notwithstanding a few challenges. The authors' analysis suggests that the disposition of these government informants differs from that of the public informants, exhibiting negative sentiments. Government informants evaluate the water governance structure based on

their own units' performance, while community informants adopt a broader viewpoint. Government informants believe adhering to established authority and rules within their units will mitigate significant issues. This viewpoint is evident in the arguments presented by Informants #2, #3, and #9. Informant #10 (Vice Governor of Bali) even stated that the existing water governance structure is ideal. The informant believes there are no conflicts or challenges in the coordination among stakeholders, which has been proven untrue.

The research findings also reflect contradictions among government departments regarding jurisdiction and coordination. A lack of effective coordination among government departments in water governance signifies underlying issues in the governance logic that have an impact. The governance logic reflected by the lack of effective coordination among departments is the Fragmentation Logic, which indicates that the lack of coordination among departments can reflect fragmentation in water governance. This context occurs when various departments or institutions have separate and overlapping jurisdictions in managing water resources. The lack of coordination also often reflects power dynamics and strong separations between departments or institutional units. This lack can be caused by differences in agendas, priorities, or political interests among departments. The lack of effective coordination among departments also indicates competition among departments. This lack happens when departments compete for resources, budgets, or influence in water-related decision-making. Such competition can hinder practical cooperation and collaboration among departments. The lack of coordination also reflects silo logic or separate work among departments. Departments often focus on their tasks and responsibilities without considering the impact or relationships with other departments. The lack of coordination also reflects uncertainty or ambiguity in department roles, responsibilities, or authorities. Such uncertainty can create gaps or voids in water management and hinder effective decision-making. As described above, it is crucial to enhance departmental coordination in the context of governance logic. This context involves establishing more effective coordination mechanisms, clarifying roles and responsibilities, and building awareness and shared understanding of holistic water management goals and strategies. Thus, this research indicates that emphasizing potential contradictions and departmental issues is urgently needed to improve water governance.

The community also demands increased participation in water governance. This was articulated by informants #6 (Head of Subak Cangi Selatan) and #7 (Head of Adat Village Sembung). Both argue that the water governance structure should provide better space for local participation, which can be achieved by empowering the role of traditional village authorities. For example, they suggest that traditional villages can enact regulations requiring all residents around the traditional village to obtain customary citizenship, regardless of whether they adhere to the Balinese Hindu religion. Customary citizenship means all residents must adhere to local norms and rules to live harmoniously with each other and nature. With the strengthened role of traditional villages, they are empowered to establish regulations using a *wig-a-wig* (written laws) or *perm* (norms). These regulations would govern the sustainable utilization and preservation of water resources.

### 3.2 The role of culture

The theme of the role of culture emerged from the informants' responses to their perceptions of the cultural roles of THK and Sad Kertih on water management. THK is a Balinese Hindu philosophy that means three causes of happiness. Balinese believe that true happiness in their daily lives can be attained by maintaining the harmony relations between human and God (parahyangan), society (pawongan), and nature (palemahan) [25]. Meanwhile, Sad Kertih is another philosophy that inspires the development vision of the Provincial Government of Bali period 2018-2024 called "Nangun Sat Kerthi Loka Bali." Sad Kertih means six virtues which become life guidance for Balinese such as 1) Atma Kertih (maintaining the purity of the soul), 2) Jana Kertih (striving for knowledge), 3) Jagat Kertih (maintaining social harmony), 4) Wana Kertih (protecting forest), 5) Danu Kertih (maintaining water sources), and 6) Sagara Kertih (maintaining marine and coastal sustainability) [26].

Two arguments are discovered in the study. First, some informants feel that the role of culture is crucial and relevant in water management. Second, other informants feel cultural

roles are no longer relevant because of a lack of appreciation (Table 2). Balancing two different governance philosophies, namely traditional cultural wisdom and modern technology, in water governance is essential for further debate and discussion. Traditional cultural wisdom is often closely related to collective practices and social values that encourage active community participation in resource management, including water. However, traditional practices may only sometimes be applicable on a larger or more complex scale, especially when facing modern challenges such as urbanization or industrialization. Nevertheless, traditional practices have often been tested for centuries and follow sustainability principles that align with natural environmental balance. However, in some cases, rapid environmental changes or excessive resource exploitation have rendered traditional practices irrelevant or ineffective. Local communities also often have a deep understanding of water resources and local environmental conditions, which may need to be possessed by external parties or modern technology. However, traditional cultural wisdom may need more access or knowledge of modern technology to enhance efficiency and effectiveness in water management.

**Table 2.** Perception about the role of culture

	<b>A: Role of Culture</b>	<b>B: Sentiment</b>
<b>Government</b>		
Informant 1 (BAPPEDA Badung)	THK also influences water governance, although in a subtle way. Its manifestations are in the form of rituals and tree planting to protect water sources, especially in Subak. <i>Sad Kertih</i> was not mentioned.	+
Informant 2 (BWS Bali Penida)	THK and <i>Sad Kertih</i> do not have much influence on water governance because the governance principles already apply aspects of environmental sustainability which happen to be similar with the Balinese cultural values.	-
Informant 3 (Energy, Mineral, and Human Resource Office of Bali Province)	THK and <i>Sad Kertih</i> becomes the guideline in the water management according to the vision of the governor of Bali; Water must be preserved and respected by everyone.	+
Informant 8 (Badung Water Company)	THK teaches the Balinese to respect water, not to dig wells, and to preserve nature with reforestation and infiltration wells. The informant do not have knowledge about <i>Sad Kertih</i> .	+
Informant 9 (Badung Public Works Office)	THK and <i>Sad Kertih</i> play a unifying role for the community to manage water collectively within the <i>subak</i> structure.	+
Informant 10 (Vice Governor of Bali Province)	THK as a philosophy for the Balinese to respect the water cycle as they respect life, both physically ( <i>sekala</i> ) and spiritually ( <i>niskala</i> ). <i>Sad Kertih</i> is a more detailed elaboration of THK.	+
<b>Society</b>		
Informant 4 (IDEP Foundation)	THK is no longer relevant for Bali's water governance because it is not reflected in Balinese behavior and government budgetary support. <i>Sad Kertih</i> was not mentioned.	-
Informant 5 (Konservasi Indonesia Foundation)	Culture plays a major role in shaping the <i>subak</i> system which encourages optimal and sustainable utilization of surface water sources.	+
Informant 6 (Head of Southern Cangi Subak)	THK acts as a strong norm in the use of water for irrigation in <i>subak</i> ; water is honored with religious rituals; if not done, there will be disaster. <i>Sad Kertih</i> has no effect on water governance.	+
Informant 7 (Chief of Sembung Customary Village)	THK and <i>Sad Kertih</i> should become strong cultural norms so that people respect water in its use, especially for <i>subak</i> irrigation.	+
<b>Summary</b>	Tri Hita Karana (THK) subtly influences water governance through rituals and tree planting to protect water sources in the context of Subak. THK and <i>Sad Kertih</i> serve as solid cultural norms, teaching respect for water and nature, encouraging reforestation and infiltration wells, and uniting the community to manage water within the Subak structure collectively. However, they are not fully reflected in community behaviour and government budgetary support.	

In general, informants' responses to the influence of culture on water governance in Bali and Badung had positive

sentiments. However, THK and *Sad Kertih*'s appreciation differs for each informant. *Sad Kertih* is more popular among

the government than the public, while THK has always been seen as life guidance. According to informants, culture can influence the behavior of Balinese people to respect water physically and spiritually. Physical respect for water manifests in activities to protect water resources through reforestation and the belief not to dig wells (underground water conservation). Informant #8 of Badung Water Company further explained how THK values became a pattern of traditional habits that shape the beliefs of traditional Balinese society. Historically, the Balinese believe that digging a well to fulfill household needs is not good because it contradicts the ideal place to live in called "Asta Kosala Kosali". Thus, according to the informant, the use of surface water must be optimized. A more detailed description of the relationship between local wisdom values and the water cycle can be found in the arguments of Informant #10 as a government leader as well as a cultural practitioner:

Danu Kerthi is (the reflection) of the sky and acts as a reservoir for water that falls as rain. We maintain the purity and cleanliness. This is important because we see the sky as the source of water. On a general physical ('sekala') basis, Bali currently has regulations regarding green islands and the use of battery-based vehicles. to reduce air pollution. Spiritually('niskala'), we maintain the sanctity of the sky. in ceremonies. we listen to (preach) prayers to 'Bhatara Luhur Ring Akasa' (God who is in the sky), which is manifested in the form of dragon called 'Taksaka'. The Balinese consider the sky to be Father. Then rainwater falls, which the Balinese consider as 'Sang Hyang Basuki's' (dragon) scales, which are then captured by the trees. then stored in the lake. for human welfare. 'Hyang Basuki' is guarding Mother Earth ('Pertiwi'), becoming 'Wana Kerthi'. to preserve all the land. Balinese believe that 'Pertiwi' is Mother. Then the water flows back into the sea, received by 'Sang Hyang Baruna' with the manifestation of the 'Anantaboga' dragon. So, there are three dragons, 'Taksaka', 'Basuki', 'Anantaboga'. Anantaboga then raises the water again to become steam toward the sky; that is the cycle.

Informant #10's argument illustrates that the THK and Sad Kertih local wisdom is a fundamental concept that can be explained by the hydrological cycle. Balinese people must respect and preserve all elements in the cycle as a form of respect for God. This informant's argument implies that appreciating local wisdom values leads to human welfare in harmony with nature and God. In this case, the authors view that this argument is by the concept of the environmental sustainable society [27]. Informant #10's argument is also supported by informants from both the government and the community, who say that the THK concept has a fundamental role in managing water in Bali, especially in Badung.

The role of culture within water governance at the grassroots level is strongly associated with the local belief that water is a source of life and must be utilized with respect. For instance, informant #6 stated that the spring near Metaung Temple once wanted to be used by the Tabanan District government, which was run by PDAM (water company). The informant believes that God is not pleased with the project because they see sacred springs as mere resources for human needs. The family who owns the land surrounding the spring and permitted PDAM Tabanan suddenly fell ill. Due to this, the family decided to give back the spring to the eight 'Subaks' (Balinese traditional irrigation system) association called 'Asta Buana Cangi' to be managed. This strong belief becomes social capital for village communities, especially

farmers, always to manage water fairly and sustainably. The village community believes that springs that are considered sacred must be respected and preserved and must not be controlled for the sole benefit of humanity.

Two informants conveyed negative sentiments towards the role of culture in water governance: Informant #2 of IDEP Foundation and Informant #4 of BWS Bali Penida. Informant #2 is not Balinese; thus, she admits that she needs to understand more about THK and even knows about Sad Kertih. Informant #2 argues that the principles of sustainability in water governance implemented in Bali so far are coincidentally similar to what the community believes. Thus, according to her, the role of culture in water governance is feeble. Informant #2 further explains that the principle of subak irrigation slightly deviates from modern water management principles. For example, rice field irrigation canals in Bali made in such a way by the community for generations can be more efficient when using modern principles. Informant #2 feels that irrigation channels can be narrower than they were. She argues that 60 cm wide can irrigate rice fields with good water pressure. The authors understand the perception of Informant #2 as a non-Balinese who compares the effectiveness of water management with local wisdom and modern techniques. From a technical point of view, modern water management principles may be superior to traditional principles. However, the principles of water management with local wisdom have been proven to last thousands of years and with the physical and spiritual appreciation of the people to protect water. This high level of public trust should be a good capital for participatory and independent water management. However, the perception of Informant #2 reflects that the current form of water governance in Bali still needs to be centralized and top-down, which does not involve the community on a general basis. Regarding the practice and manifestation of THK values, Informant #4 delivers sharp criticism in the interview. He said that what is happening on the island of Bali today can be described as the death of Lord Vishnu at the center of the water civilization. What the Balinese believe often contradicts their actions. They believe in water as a manifestation of God but also continue to throw waste into the river. According to him, the concept of THK no longer exists in Balinese society. This concept only lives in literature and discussions but has yet to be realized in action. Balinese Hindus worship the God Vishnu and the Goddess Danu as personifications of God who controls water sources. The criticism conveyed by Informant #4 stems from his observation of the behavior of the Balinese who are no longer in line with the THK principles. According to him, THK is only often said but not practiced. The informant also explains many other phenomena, such as how Balinese people forgot the THK teachings. For example, the holy water, which the Balinese use for ceremonies and usually comes from the sacred spring at Beji Temple (water temple), is now polluted. The informant argues that this was caused by waste disposal in water bodies. The younger generation, who knows that this holy water is polluted, no longer uses this water as a means of worship. They have switched to using bottled water, which is considered to be of better quality. Informants feel this is a significant shift in values.

### 3.3 The stakeholder participation

The theme of stakeholder participation includes responses regarding the inclusiveness of water governance in Badung.

There are several main arguments for this theme. Some informants believe that local community participation in water governance is essential. On the other hand, some informants think that water governance is best handed over to formal, centralized government institutions.

Government informants generally believe that water governance in Bali is already inclusive because coordination between water governance agencies is well established. However, the authors consider this argument to be in contrast with reality. Informant #1 mentions that there had been a conflict between BWS Bali Penida and the Badung Public Works Department regarding the dredging of the Tukad Mati River. BWS Bali Penida accused the public works department of violating its jurisdiction for dredging the river without written consent. In addition, Informant #1 also admits that he has never heard of the Unda Anyar Watershed Management Center (BPDAS) in implementing Badung water governance. So far, the informant only often coordinates with BWS Bali Penida. The informant feels that the authority of BPDAS Unda Anyar overlapped with BWS Bali Penida. BPDAS Unda Anyar is the Technical Implementation Unit (UPT) of the Ministry of Environment and Forestry (KLHK), which is tasked with maintaining the sustainability of river watersheds and protected forests [28]. Meanwhile, BWS Bali Penida is an agency under the Ministry of PUPR tasked with managing water resources in river areas [29]. The interview results with Informant #1 show that coordination between government agencies could be more optimal in water governance, especially between aspects of utilization and preservation.

The imbalance of power relations between actors is also revealed by Informant #4. The informant said that around 12 to 16 agencies are relevant to water governance in Bali. He obtained this information when the IDEP Foundation intensively approached the government from 2015 to 2018 regarding the Bali Water Protection program. Even though there are many relevant agencies, they want fully avoid taking responsibility when a water-related disaster occurs. This will hinder efforts to find solutions to water problems. In addition, Informant #8 also needs help managing the clean water channel that crosses the main road because it would clash with the authority of the National, East Java, and Bali Road Implementation Center. Suppose the agency is on a project such as building an underpass. All underground utilities, such as telephone cables, electricity, and clean water pipes, must be cut off temporarily. This means additional cost for PDAM Badung.

Most informants aspire to have water governance that is able to involve active participation of the community, especially customary villages, and youth. Informant #4 mentions that the participation of local communities must be improved and present within the water governance structure. He emphasizes that the engagement of local communities in all decision-making regarding water governance is not optional; it is a necessity, not a supplement. Apart from that, Informant #5 argues that the role of the younger generation is also essential to be involved in water management as the next generation. For instance, the Youth Conservation Initiative (YCI) carried out a campaign about water problems in Bali and offered a rainwater harvesting system as one solution. Strengthening the role of customary villages is also considered necessary in Bali's water governance. Informant #7 mentions that, up to this point, the individuals most involved in water governance within customary village areas are Subak members or farmers. However, the customary village

authorities need to enhance their role by establishing 'awig-awig' (customary rules) to prevent land conversion, thus ensuring the preservation of water sources.

### 3.4 The challenge

Informants must discuss the theme of challenges in water governance. All informants expressed various obstacles and challenges in water governance, such as partial governance authority, budgets, conflicts of interest, clean water processing capacity, etc. In general, all the challenges expressed can be summarized in 4 points:

#### a. Surface water management is not yet optimal

Surface water management that is not optimal is a major issue in water resource governance in many countries. Surface water encompasses various sources such as rivers, lakes, reservoirs, and irrigation systems, which are crucial for meeting drinking water, agricultural irrigation, and industrial needs. However, surface water management often faces various challenges. One of these is the lack of adequate infrastructure to store, flow, and distribute water efficiently. Many dams and irrigation systems are old and damaged, thus unable to function optimally. Additionally, surface water management is often poorly coordinated among various institutions and government levels, leading to fragmented and less effective decision-making. Another issue is the lack of accurate data and information regarding water availability and needs, hindering evidence-based planning and management.

#### b. Massive underground water extraction

Massive groundwater extraction poses significant challenges for water resource sustainability. Groundwater often serves as the primary source of drinking water and industrial needs in many areas, especially in regions with limited access to surface water. However, uncontrolled groundwater extraction can cause drastic declines in groundwater levels. This not only threatens water availability for future generations but also leads to various environmental problems, such as saltwater intrusion threatening coastal water quality and land subsidence damaging building infrastructure. Moreover, ecosystems dependent on groundwater, such as wetlands, are also at risk. These challenges are exacerbated by weak regulations, limited monitoring, and low public awareness regarding the importance of groundwater conservation.

#### c. River pollution

River pollution is one of the biggest challenges in water resource management. Rivers often become dumping grounds for untreated domestic, industrial, and agricultural waste. Domestic waste like household trash and wastewater contains various harmful substances that can pollute river water, reducing water quality and endangering human health. Industries are also major contributors to river pollution, especially in developing countries where environmental regulations are often lax. Industrial waste contains hazardous chemicals that can damage river ecosystems and threaten biodiversity. Pollution from agricultural activities, such as pesticide and chemical fertilizer use, can also cause eutrophication, reducing oxygen levels in water and causing mass deaths of aquatic organisms. River pollution not only harms the environment but also has negative impacts on the economy, especially sectors like fisheries and tourism that

depend on clean river water.

#### d. High land use change

High land use changes pose a significant challenge to water governance as they directly impact hydrological cycles and water availability. Rapid urbanization, for example, leads to the conversion of green spaces into residential, commercial, and industrial areas, reducing water infiltration areas and increasing flood risks. Unsustainable infrastructure development often results in surfaces covered by concrete and asphalt, hindering rainwater infiltration into the soil and increasing surface runoff, leading to erosion and sedimentation in rivers. Additionally, the conversion of agricultural and forest lands into commercial plantations or industrial areas significantly affects water quality and quantity. These changes often reduce the soil's ability to absorb and store water, resulting in decreased groundwater levels and reduced river flow during dry seasons. Land use changes also disrupt natural ecosystems and reduce biodiversity crucial for maintaining environmental balance and a healthy water cycle.

The government then carried out various programs to overcome challenges in water governance. Badung Environmental Index report (IKPLHD) [30] and the interview results reveal that those programs are primarily curative and in the form of infrastructure development to support water governance. Meanwhile, community group informants generally wanted a more integrated change in water management, strengthening local communities' role and capacity, optimizing surface water use, and increasing the appreciation of THK values in people's behavior. This discrepancy between the government and the community in offering solutions illustrates the different discourses on water governance. The government thinks water resources can be easily handled by developing various supporting infrastructures. This means that issues regarding water degradation and increasing water consumption do not require the role of local communities. Increasing pro-environmental community behavior patterns, such as not throwing garbage in rivers, using water wisely, and preserving water sources, is equally important. Local community involvement seems only complementary. The community is involved as a supporter of government programs. The Badung water governance discourse described through this research is that water governance is still centralized and controlled by the government, while the community is considered water users.

The community group informants present an alternative discourse to enhance local communities' involvement and capabilities in water governance. Their intention is not to establish community dominance over governmental water governance efforts. Instead, the community group informants seek equitable participation in water governance policies in Bali, precisely in Badung District. Moreover, their vision encompasses integrated water management that transcends administrative boundaries.

## 4. CONCLUSIONS

The results of this study indicate that water governance in Badung is not optimal because it is still centralized and needs to involve cultural roles in the local community. The centralized and top-down approach of water governance means that the community is less involved, so the space for

culturally based sustainable water governance could be more optimal. As a prospect, discussing the empowerment of communities and indigenous villages in water governance can be a progressive step to stimulate their enthusiasm for participation. Recognizing and strengthening the role of indigenous villages in decision-making, developing participatory mechanisms such as village water committees, enhancing understanding through educational programs, empowering economically through water-based initiatives, and implementing reward systems and incentives for good water management practices can enhance community involvement. Collaboration among government, NGOs, the private sector, and local communities will also enhance the capacity and effectiveness of water governance, creating a more inclusive and sustainable environment in Badung Regency. Nevertheless, such space is needed for cultural practices to grow and develop. The current Badung government water governance policy trend is more oriented towards science and technology. Informant #2's argument states that the principles of water governance have fulfilled the sustainability aspect without considering the values of local wisdom, which is perceived to be slightly contradictory to the principles of science. This discourse gap hinders optimizing sustainable water governance based on THK and Sad Kertih culture.

The discourse gap in optimizing sustainable water governance based on THK and Sad Kertih culture requires an approach that integrates Ostrom's theory with an understanding of local culture. Integrating Ostrom's theory of joint resource governance with the cultural values of THK and Sad Kertih culture can reveal crucial connections between local institutions, community participation, and collective management in maintaining water resource sustainability. Thus, this research provides practical contributions to water management and presents a significant theoretical perspective in understanding the complexity of joint resource governance in the context of local culture.

On the other hand, the Balinese people want higher involvement in water governance. Their high belief in local wisdom causes the community to feel responsible for managing and maintaining water as a form of respect for God. This means that the Balinese people do not want to be passive if problems occur in water governance. Apart from that, Balinese culture is full of ceremonial rituals and customs, making the role of customary villages so crucial for the community that they need to be involved in water governance at the grassroots level.

This study concludes that the involvement of local communities, especially customary villages, is significant to realize sustainable water governance in an integrated manner. In addition, it is necessary to strengthen the appreciation of the values of Tri Hita Karana and Sad Kertih which support the principles of environmental sustainability.

## ACKNOWLEDGMENT

Acknowledgment is given to The Directorate of Research and Community Engagement Universitas Indonesia (Hibah PUTI 2022) Contract Number NKB-357/UN2.RST/HKP.05.00/2022; Research Ethics Committee of Universitas Pembangunan Nasioanl "Veteran" Jakarta No: 374/VIII/2022/KEPK.



## REFERENCES

- [1] Fawzy, S., Osman, A.I., Doran, J., Rooney, D.W. (2020). Strategies for mitigation of climate change: A review. *Environmental Chemistry Letters*, 18: 2069-2094. <https://doi.org/10.1007/s10311-020-01059-w>
- [2] Witze, A. (2018). More than 2 billion people lack safe drinking water. That number will only grow. *Science News*, 194, 14.
- [3] Mekonnen, M.M., Hoekstra, A.Y. (2016). Sustainability: Four billion people facing severe water scarcity. *Science Advances*, 2(2): 1-7. <https://doi.org/10.1126/sciadv.1500323>
- [4] United Nations. (2021). The United Nations world water development report 2021: Valuing water. <https://www.unwater.org/news/un-worldwater-development-report-2021-%E2%80%98valuing-water%E2%80%99>.
- [5] Movik, S. (2010). Return of The Leviathan? "Hydropolitics in the developing world" revisited. *Water Policy*, 12(5): 641-653. <https://doi.org/10.2166/wp.2010.132>
- [6] Wehn, U., Montalvo, C. (2018). Exploring the dynamics of water innovation: Foundations for water innovation studies. *Journal of Cleaner Production*, 171: S1-S19. <https://doi.org/10.1016/j.jclepro.2017.10.118>
- [7] Berkes, F., Colding, J., Folke, C. (2000). Rediscovery of traditional ecological knowledge as adaptive management. *Ecological Applications*, Wiley, 10(5): 1251-1262. <https://doi.org/10.2307/2641280>
- [8] Berkes, F. (2008). *Sacred Ecology. Environment and Sustainability*, Geography, New York: Routledge, <https://doi.org/10.4324/9780203928950>
- [9] Dudley, N., Higgins-Zogib, L., Mansourian, S. (2009). The links between protected areas, faiths, and sacred natural sites. *Conservation Biology*, 23(3): 568-577. <https://doi.org/10.1111/j.1523-1739.2009.01201.x>
- [10] Chairunnisa, N., Arif, C., Perdinan, P., Wibowo, A. (2021). Analisis neraca air di Pulau Jawa-Bali sebagai upayaantisipasi krisis air. *Jurnal Teknik Sipil Dan Lingkungan*, 6(2): 61-80. <https://doi.org/10.29244/jstil.6.2.61-80>
- [11] Parwita, I.G.L., Mudhina, M., Yasada, G., Rachsiriwatcharabul, N. (2020). Water management study in Denpasar, Badung, Gianyar and Tabanan (SARBAGITA) area. *Journal of Physics: Conference Series*, 1450(1): 012028. <https://doi.org/10.1088/1742-6596/1450/1/012028>
- [12] Sun, Y.Y., Hsu, C.M. (2018). The decomposition analysis of tourism water footprint in Taiwan: Revealing decision-relevant information. *Journal of Travel Research*, 58(4): 695-708. <https://doi.org/10.1177/0047287518757371>
- [13] Cole, C. (2012). A political ecology of water equity and tourism. a case study from Bali. *Annals of Tourism Research*, 39(2): 1221-1241. <https://doi.org/10.1016/j.annals.2012.01.003>
- [14] Strauß, S. (2011). Water conflicts among different user groups in south Bali, Indonesia. *Human Ecology*, 39(1): 69-79.
- [15] Putri, L.S. (2020). The persistence of an ecological society: in-depth critical analysis of the community movement in Geriana Kauh, Karangasem. *Journal of Environmental Science and Sustainable Development*, 3(1): 142-155. <https://doi.org/10.7454/jessd.v3i1.1030>
- [16] Herdiansyah, H. (2019). Recycling groundwater in urban multicultural society. *Journal of Physics: Conference Series*, 1175(1): 012208. <https://doi.org/10.1088/1742-6596/1175/1/012208>
- [17] Nordholt, S. (2007). *Bali, an Open Fortress 1995-2005*. Leiden: Leiden, KITLV Press. <https://nuspress.nus.edu.sg/products/bali-an-open-fortress-1995-2005>.
- [18] Cox, M., Arnold, G., Tomás, S.V. (2010). A review of design principles for community-based natural resource management. *Ecology and Society*, 15(4): 38. <https://doi.org/10.5751/ES-03704-150438>
- [19] Eliasson, J. (2015). The rising pressure of global water shortages. *Nature*, 517: 6. <https://doi.org/10.1038/517006a>
- [20] Porras, G.L., Stringer, L.C., Quinn, C.H. (2019). Corruption and conflicts as barriers to adaptive governance: Water governance in dryland systems in the Rio del Carmen watershed. *Science of the Total Environment*, 660: 519-530. <http://doi.org/10.1016/j.scitotenv.2019.01.030>
- [21] Molle, F., Closas, A. (2020). Why is state-centered groundwater governance largely ineffective? A review. *WIREs Water*, 7(1): e1395. <https://doi.org/10.1002/wat2.1395>
- [22] Kanazawa, M. (2017). *Research Methods for Environmental Studies*. Environment and Sustainability, London, Routledge. <https://doi.org/10.4324/9781315563671>
- [23] Dryzek, J.S. (1997). *The Politics of the Earth: Environmental Discourses*. Oxford, Oxford University Press. [https://books.google.co.id/books/about/The\\_Politics\\_of\\_the\\_Earth.html?hl=pt-PT&id=cw1\\_AAAAMAAJ&redir\\_esc=y](https://books.google.co.id/books/about/The_Politics_of_the_Earth.html?hl=pt-PT&id=cw1_AAAAMAAJ&redir_esc=y).
- [24] Armando, R. (2021). Rebutan air irigasi, dua subak di perbatasan tabanan-badung ini geruduk DPRD Bali. *Tribun Bali*. <https://bali.tribunnews.com/2021/06/08/rebutan-air-irigasi-dua-subak-di-perbatasan-tabanan-badung-ini-geruduk-dprd-bali>.
- [25] Ostrom, E. (1990). *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge: Cambridge University Press. <https://doi.org/10.1017/CBO9780511807763>
- [26] Roth, D., Sedana, G. (2015). Reframing Tri Hita Karana: from 'Balinese culture' to politics. *The Asia Pacific Journal of Anthropology*, 16(2): 157-175. <https://doi.org/10.1080/14442213.2014.994674>
- [27] Wiana, I. K. (2018). "Sad Kertih": Sastra agama, filosofi, dan aktualisasinya. *Jurnal Bali Membangun Bali*, 1(3): 169-180. <https://doi.org/10.51172/jbmb.v1i3.29>
- [28] Miller, T.G., Spoolman, S.E. (2016). *Environmental science (15th ed.)*. Cengage Learning. <https://www.cengageasia.com/>.
- [29] BPDAS Unda Anyar. (2023). *Tentang Kami*. <https://bpdas-undaanyar.net/>.
- [30] BWS Bali Penida. (2020). *Tugas Dan Fungsi Balai*. <https://sda.pu.go.id/balai/bwsbalipenida/profil/tugasdanfungsi>.
- [31] Dinas Lingkungan Hidup dan Kebersihan Kabupaten Badung. (2022). *Laporan Kinerja Instansi Pemerintah (LKJIP) Tahun 2022*.

