

# Community Water Literacy of Sacred Natural Sites An Indigenous Alternative for Sustainable Groundwater Management

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## ABSTRACT

Water is an essential component of Balinese daily life, particularly in the spiritual realm, where holy water is required for rituals. This research employ descriptive analysis to describe water literacy among Hindu Balinese community, based on indigenous concepts related to sacred natural sites and sustainable groundwater management. To address this issue, a survey of 139 Balinese adults was undertaken in SARBAGITA (Denpasar Regency, Badung Regency, Gianyar Regency, and Tabanan Regency). According to the findings, the indigenous community network raised community awareness toward water management of sacred natural sites. They must be created and implemented because attitudes are shaped by knowledge of water management issues. In order to create and implement community water literacy and guide policy decisions on indigenous water resource management, more awareness and focused extension support are required. For further research, focusing on future education-based interventions should be based on specific policy decisions to include indigenous water knowledge in school curriculum and groundwater management methods, rather than simply sharing knowledge and raising awareness to achieve groundwater management sustainability.

**Keywords:** *Water Literacy, Sacred Natural Sites, Groundwater Management, Indigenous Knowledge, Sustainable Development.*

## 1. INTRODUCTION

Groundwater supports developing countries sustainable development by providing drinking water and supporting economic development, agriculture, livestock, industry, and tourism [1]-[4]. Uncontrolled development eventually resulted in uneven groundwater distribution, leading to inequalities in water availability, knowledge of how to obtain enough water, and water usage practices from one location to another. It is critical to manage groundwater in ways suited to the local water environment to live and utilize water sustainability [5],[6].

There are more compelling reasons why knowledge is crucial in achieving long-term water management and utilization. Managers of water resources who provide knowledge and information to their clients are thought to be more dependable as well as honest [7]-[9]. Furthermore, when people

understand the many challenges and hazards involved with various alternatives for action, or lack thereof, public support for water management decisions is considerably strengthened [9], [10].

Water knowledge is multifaceted, originating not only in western science but also in historical hydrologies, cultural traditions, and spiritual knowledge [11]. Water resources are also inextricably linked to economic and social processes. As a natural byproduct, all types of water knowledge, as well as their relationships within and between sectors and cultures, must be acknowledged whenever water sustainability is to be achieved. The field of water literacy has emerged as a result of the growing acknowledgment of the relevance of water knowledge [9].

A need for innovative water management principles has arisen as a result of the need to preserve and protect the long-term sustainability of

freshwater resources [12], [13]. Water literacy involves water knowledge, attitude, and action by integrating critical and active understanding of water sources, water management, and water security challenges [14]. Highlighting its significance and distinction from other, the term "water literacy" is becoming more common, reflecting the globalization of water challenges and conflicts [9].

Water (both surface and groundwater) is a means in establishing and developing Balinese culture for the Balinese Hindu indigenous people who have carried out traditional rites (rituals) until now [15],[16]. The role of water in maintaining the relationship harmony between God, humans, and the environment (*Tri Hita Karana*) is aided by the presence of *patirthan* (water temple with a sacred spring) as a sacred natural sites (SNS). *Patirthan* in this case is not only a hydrological resource because of its natural springs, but has an element of purity that makes it a sacred natural site [17].

However, there is a neglect to water issues, as evidenced by the diminished supply of clean and safe water [5]. Bali has been suffering from over-tourism prior to the COVID-19 outbreak. Over-tourism causes water scarcity, environmental degradation, sanitation difficulties, overcrowding, loss of authenticity, and rising living costs. The influx of 6 million international and local tourists each year has put a huge strain on the island's scarcity of resources [18]. Tourism accounts for 80% of Bali's GDP, while non-Balinese investors own around 85% of it [19].

Because it is linked to a sacred spring (groundwater discharged), over-extraction of groundwater owing to over-tourism, economic growth, and urbanization has become a much bigger problem for Balinese. Meanwhile, the research on Indonesia's water literacy [20] found that water literacy is still low among middle-income people aged 25 to 36.

Several scholars studied water literacy in a variety of locations, including Ladue *et.al* [21] in Arizona US, Wood [22] on students and parents in Nottingham UK, Fielding *et al.* [23] in Australia, Maniam *et al.* [14] in Southeast Asian context and Febriani [20] studied Indonesia's adults with middle economic levels. However, these studies only concerned how people behave and how much water they use in their daily activities, not social water literacy. Several studies have been conducted on the impact of community culture on behavior, such as the one conducted by Wilson and Inkster [24] that as

seen by indigenous peoples, water is often regarded as a living creature or a relative to whom they owe a sacred duty. This worldview frequently competes with colonial cultures' views of water as a "resource" that can be owned, managed, and exploited [24]. Also Hawke's study [11] on a cross-cultural approach to water pedagogy, sustainability, and human rights.

Furthermore, the complex religious and economic aspect that makes it important to achieve the sustainability of the existence of water related sacred natural sites by enhancing water literacy among peoples. Not only for Hindu Balinese community, but also for indigenous communities across the globe. This study employ descriptive analysis to describe water literacy among Hindu Balinese community, based on indigenous concepts related to sacred natural sites and sustainable groundwater management.

## **2. WATER LITERACY**

### ***2.1. Definition of Water Literacy***

Because there are few scholarly studies on water literacy, a precise and standard term's definition is unknown. Alternatively, Roth coined the term "environment literacy" in 1968. As a result, water literacy is a derivation of this phrase, and the principle of water literacy is primarily concerned with the definition of environmental literacy [20], [22].

Becoming water literate entails acquiring a fundamental understanding of what to do with or sustainably manage water to understand the value and noteworthiness of water in life. Water literacy includes generating a basic understanding of water sources as well as other aspects that are aligned to them (management and other related concerns) [9], [14], [20], [22].

Otaki *et.al* [6] advocating that water literacy is defined as the capacity to become acquainted with water, develop an active interest in water, and confront water as a personal concern. To be water literate encompasses how the water we use most often is provided and handled, along with the quality and reliability of that water, the quantity of water people use each day, and the purpose for how we use it [9].

## **2.2. Local Knowledge in Water Literacy**

A popular campaign for local knowledge has sparked a new notion. This category includes knowledge of local water supplies, water infrastructure, and current water demands and uses. [9]. Definitions stressing local knowledge rarely intersect with interpretations emphasizing scientific knowledge, showcasing a substantial literature gap. Rather, according to these sources, quite an advanced and powerful scientific understanding of the small complexities of waterworks may be perceived as strenuous and dispiriting [25].

Local knowledge is seen to be more appealing to the general population since it emphasizes more approachable and simplified water themes that are relevant to everyday living. Within the category of local knowledge, there is a special emphasis on knowing where one's water comes from [9], [25] with two definitions centered on the necessity for familiarity with the watershed where one lives.

These kind of examples demonstrate the need of context in water literacy. Water is a very context-specific resource, and what's really important to someone living in a rural setting is fundamentally different from what is essential to someone living in an urban setting [9].

## **2.3. Hydrosocial Knowledge in Water Literacy**

Hydrosocial knowledge refers to the ongoing and bidirectional connections between civilization and water resources. This category included description focusing on how human activities affect water quality and health, along with how such health and quality of water resources have a significant impact on human health and wellbeing [6], [8]. These themes, like local knowledge, were given in context, with authors highlighting the hydrosocial setting inside developed areas [26] or watersheds like the Great Lakes. However, this knowledge set explains why it may be difficult to obtain a consensus on a fixed definition. Researchers are increasingly acknowledging and emphasizing the hydrologic cycle as inextricably linked to societal processes both inside and outside of the watershed [27], [28], [29] as opposed to a static and self-contained natural system. Economic expansion is fueled by water, and economic and political institutions both influence pollution production.

## **3. MATERIALS AND METHODS**

### **3.1. Research Area and Population Sample**

The survey was carried out in the Sarbagita area for 2 months from May-June 2021. The Sarbagita area is a term for a system of cities in Bali Province (South Bali) that includes Denpasar City, some parts of Badung regency, Gianyar regency, and Tabanan regency. The area is the economic backbone of Bali Province, and the national government is primarily concerned with three significant sectors (tourism, agriculture, and tourist-related support industries). Sarbagita had endured water scarcity, environmental deterioration, sanitation concerns, overcrowded locations, a loss of authenticity, and a greater cost of living as a result of being a tourism buffer area while at the same time it must be able to maintain the presence of water from sacred springs for religious ritual purposes.

This study employed multi-stage and simple random sampling to determine where and who to conduct the questionnaire survey. Respondents were picked at random from a total of 139 Balinese adults in the Sarbagita district. The study was conducted via an internet survey with semi-structured questionnaires. The poll was conducted by well-trained university graduates. Respondents were also informed that their responses and personal information would be kept private.

### **3.2. Data Collection**

Water literacy challenges worsen sustainable groundwater management concerns, and resolving these issues requires a improved comprehension of what is understood, continued to believe, and performed in the field of groundwater management. Understanding of water issues refers to indigenous knowledge of sacred springs in this study (groundwater discharge). The responses were divided into two categories: 1 (yes) and 2 (no), with 1 denoting knowledge of sacred springs and 2 denoting ignorance of sacred springs.

The term attitude was described as a readiness to participate in particular long-term water resource management practices, such as sacred springs conservation. Respondents were given two alternatives from which to choose. Option 1 indicates willingness to join, while Option 2 indicates neutrality.

Meanwhile, the action term was described as activities carried out by individuals in the local community related to the use of holy water derived from sacred springs for ritual purposes, domestic needs, irrigation, and others. Respondents were given two alternatives from which to choose. Option 1 indicates the answer is Yes, and option 2 indicates No. The knowledge, attitude, and action factors were modified from previous research [26], [30], [31], [32].

**4. RESULTS AND DISCUSSIONS**

**4.1. Socio-Demography and The Study Population**

A total of 139 respondents were interviewed online (Table 1). 50.4% of respondents are male. And 50.4% of respondents are members of indigenous organizations (*banjar adat*). While 79.2% respondents never experience water supply limitations during the year of 2021.

**Table 1.** Respondents' socioeconomic and demographic features

Characteristic	Identification	Distribution (%)
Gender	Male	50.4
	Female	49.6
Membership	Member of indigenous organization	50.4
	Non-member of indigenous organization	49.6
Water supply limitation	Ever experience	20.8
	Never experience	79.2

**4.2. Community Knowledge of Sacred Natural Sites**

In terms of the community knowledge related to sacred springs, from total 139 respondents, 65,4% respondents know about the existence and the ritual attribute that intertwine to the terms of sacred springs in their adat village, while 34.5% respondents do not have the knowledge related to the sacred springs.

**4.3. Methods Use in the Household to Obtain Water**

When deal with water supply limitation, 56.1% respondents choose to save water usage beyond the usual need, 2.8% use water saving tools, 12.2% choose to reduce the behaviour that potential become

pollutant, and 28.7% respondents choose to looking for alternative water resources (river, springs, etc).

**4.4. Willingness to Participate in Sacred Natural Sites Conservation Program**

From the total 139 respondents, 79.8 respondents willing to participate in sacred springs conservation program. While another 19.04% choose to have a neutral position and only 1 respondents or 0.07% of total respondents choose not to participate in the sacred springs conservation program.

**4.5. Community Usage of Water From Sacred Natural Sites**

In terms of sacred natural sites water usage, from total 139 respondents, 89.2% use the water for ritual purposes, and 10.8% not. While for domestic uses, 58.9% respondents declare they use water from sacred natural sites compare to 41.1% who said they do not use water from sacred natural sites.

**4.6. The Community Water Literacy (Knowledge, Attitude and Action) Towards Sacred Natural Sites Sustainable Management**

There was a significant difference in expressing desire to participate in sacred natural sites conservation projects between those with knowledge and those without information, according to the descriptive cross-tab analysis. 81 respondents who were knowledgeable about water and sacred natural sites were willing to participate in the conservation program, compared to 30 people who expressed interest but lacked the necessary expertise. While participation in indigenous organizations is taken into account, 56.7% (63 of the 111 respondents) who want to participate in a conservation program are members

of indigenous organizations. Previous research backs up this conclusion [8], [26], [33], [34].

This research findings suggest that being a part of an indigenous community network can help people have a better comprehension of water-related issues. Participating in indigenous networks of community can assist in raising consciousness of concerns and increasing additional support of indigenous water policy, technology, and practices on daily basis. On the other hand, previous study by Dean et.al [8], Gilbertson et.al [35] and Oremo et.al [36] has demonstrated how knowledge about water issues may be efficiently shared through social networks and insufficient social capital has a substantial but negative influence on social learning and the sharing of knowledge.

Another aspect of this study that has to be noted is the approach that respondents employ to deal with the drop in their household's water supply. According to reports, multiple water sources are frequently exploited to meet household water needs in many developing countries. On the other hand, as seen in [37] implementers, development organizations, and researchers tend to concentrate solely on the "primary supply of drinking water". Numerous homeowners are using multiple sources of water, which is a common but rarely reported practice. As an example of this action comes in an increasing number of settings, researchers and implementers must assess, analyze, and apply it in a way that will help communities thrive and adapt to climate change [37], [38], [39].

## 5. CONCLUSION

This study looked at how demographic and socioeconomic characteristics influence respondents' water literacy (knowledge, attitudes and actions) towards sacred natural sites water resource management. Willingness to take part in the sacred springs conservation efforts was assessed using crosstab descriptive analysis.

According to the findings, indigenous community network raised community awareness toward sacred natural sites water management. They must be produced and implemented because understanding of water management issues informs attitudes. In order to create and execute, better awareness and focused extension support of water literacy of community and guiding policy choices are considered necessary on indigenous water resource management. For further research, focusing on future education-based

interventions should based on specific policy decisions to include indigenous water knowledge in school curriculum, and groundwater management methods, rather than simply sharing knowledge and raising awareness, in order to achieve groundwater management sustainability.

## AUTHORS' CONTRIBUTIONS

All authors provided critical feedback and helped shaped the research, analysis and manuscript that putting more emphasis on family firms and COVID-19 pandemic.

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