Traditional wisdom as a starting point for conservation: 
A review

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Abstract. Traditional wisdom was established on familiarity and concern for the homeland, where people are very dependent on their local resources and they developed management values based on their cultural beliefs. Traditional wisdom and its application can be useful for ecological management plans, especially conservation programs. The application of traditional wisdom as a starting point for conservation is based on: (1) Community institutional system (2) Community collective knowledge (3) Community relationship with their environment. Traditional wisdom is part of the basic theoretical framework in strengthening research designs with specific local knowledge, including environmental relationships that occur in the area. When conservationists recognize usefulness of traditional wisdom, they can engage in knowledge exchange and foster sharing of responsibilities with indigenous peoples. This type of exchange can also provide opportunities for indigenous peoples to develop scientific infrastructure.

1. Introduction

Some scientists in the field of biology and environmental ecology have historically marginalized traditional wisdom in generating hypothesis validity on the response to resource phenomena [1], because much traditional wisdom are difficult to accept in scientific studies based on empirical data obtained in the field. However, along with observing natural events that occur at this time, they often forget about the predictions of traditional wisdom that have previously been put forward and proven what natural phenomena are facing when they only observe phenomena of natural conditions. Although traditional wisdom is only spawned by oral tradition and developed from generation to generation by the next generation, it automatically creates the value of transmitting a culture of familiarity with the environment, so that indirectly there is a strong interaction process to understand natural conditions. Some indigenous peoples perceive resources as subjects that need to be treated wisely, for example the implementation of ritual events or traditional ceremonies with the aim of asking for permission from nature before utilizing resources for consumptive needs within a predetermined time. Scientifically this is difficult to understand, but with wise thinking it is possible to answer that with the timeliness of traditional ritual events before resource utilization, it is possible to synergize with the existence of resources that are ready to be utilized through the interpretation of observations of natural conditions carried out by

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local communities. In addition, the prohibition of specific areas suspected of being mystical or sacred areas. However, based on the results of research studies, it is predicted that such area is thought to be a protected reserve for the continuity or sustainability of resource use for later generations [1], [2].

Focusing on importance of understanding traditional wisdom for resource management, in this paper we present the definition of traditional wisdom and the important elements in traditional wisdom that include: (1) Religious values and social ethics (2) Customary norms/rules, (3) Local knowledge and skills gained from empirical experience. Values of traditional wisdom are characteristics of local community which are used as noble cultural values, so that they realize the virtue of a rule that is applied.

In literature study of resource conservation, traditional wisdom is rarely mentioned or associated with scientific knowledge. However, in various commodities, local wisdom in the world is highly recognized. This guarantee is proven by universal acknowledgment in the United Nations Declaration on the celebration of World Indigenous Peoples Day in 2007 on the Rights of Indigenous Peoples, article 4 which reads: ‘Indigenous people, in exercising their right to self-determination, have the right to autonomy or self-government in matters relating to their internal and local affairs as well as ways and means for financing their autonomous functions”.

In this review, the author will present three categories of discussions regarding applications of traditional wisdom as a starting point for conservation, namely: (1) Community institutional system, (2) Community collective knowledge, and (3) Community relationship with their environment. This paper aims to describe some local wisdom as a source of conservation knowledge in natural resource management. By considering the values of traditional wisdom elements, the author will examine the starting point in conservation, so that the implementation of local wisdom becomes a cultural treasure that can be applied in sciences of resource management.

2. Definition of traditional wisdom

"Traditional wisdom” can be defined as knowledge gained through experience of living in a particular place regarding human relations with their natural environment as an 'ecological' knowledge in the broadest sense [4]. This refers to a body of knowledge, practices, and beliefs that are culturally transmitted for generations. Traditional wisdom was established on familiarity and concern for the homeland, where the community is very dependent on their local resources, so that the community itself develop management values based on existing culture and beliefs [3]. Traditional wisdom can be interpreted as knowledge, practices, and beliefs, which developed based on adaptation from generation to generation regarding relationship between living things (including humans) and the environment. In short, traditional wisdom is a product of the historical continuity of natural resources utilization in a particular place.

Traditional Wisdom is rational knowledge that has been developed through generations through the intimate contact of indigenous people with local resources. Historically, however, Traditional Wisdom has often been marginalized, by the scientific community [5]. Both knowledge systems produce detailed empirical information on natural phenomena and the relationships between ecosystem components. Both scientific and traditional knowledge have predictive power, and in both intellectual traditions, observations are interpreted in a particular cultural context. Traditional knowledge includes various biological information, one of which is about conservation. Some of the scopes of traditional wisdom include empirical knowledge, population biology, resource assessment and monitoring, succession dynamics, climate and resource fluctuation patterns, species interaction, ethno taxonomy, sustainable harvesting, and adaptive management and manipulation of disorder regimes [1].

2.1. Value elements of traditional

Local wisdom contains three important elements, which are. First, religious values and social ethics that underlie the practices of managing biological resources. Second, customary
norms/rules, which regulate relations between communities and their natural environment. Third, local knowledge and skills obtained from empirical experience.

2.1.1. Religious values and social ethics

Some indigenous peoples are familiar with customary rules by using religious values and social ethics related to resource management activities [6]. As an example of the customary sawen ceremony. Sawen is a Sasak language which means sign, sign or prohibition. Thus, every marine area in which marine fish resources are harvested may not be caught, so that sawn is defined as a prohibition to carry out fishing activities in a zone within a time that has been determined through the agreement of the local community. The purpose of carrying out the sawen traditional ceremony is so that the fish become tame so that optimal results will be achieved. Sawen customary rules in the management of fishery resources are habits that have been passed down from generation to generation and are not written down, but the local community strictly adheres to these rules.

Understanding of religious values and social ethics grows from the belief that the local community has established intimacy so as to create a dependency between the community and nature. Therefore, the local indigenous people make the implementation of traditional ceremonies aimed at asking for blessing or permission in carrying out the utilization and prohibition of the required resources.

2.1.2. The customary norms/rules

The rights and authority of local (customary) communities in determining a rule because they believe they can provide the welfare of their people's lives. The rules for managing coastal fisheries resources in Nusa Penida, Bali Province are called Awig-awig [6]. Awig-Awig is a hereditary rule written in Kawi or Old Javanese writing on palm leaves, then translated into Latin writing using Balinese in 1982 into 8 (eight) chapters and 92 articles. The contents of the rules concerning the management of coastal fishery resources are determined by the village government, traditional officials, and religious or customary leaders as follows: (i) Indigenous Peoples of Jungut Batu Village are prohibited from taking and utilizing mangrove wood for any purpose (ii) Village Indigenous Peoples Jungut Batu is not allowed to take coral rocks because it can damage the ecosystem causing coastal abrasion and damage the beauty (iii) For the needs of residential construction, the taking of beach sand is allocated in certain areas in the traditional village with the knowledge of the customary head.

In East Lombok Regency also known as awig-awig in the management of marine fishery resources based on the Traditional Law of the Village Community Institution (LMD), precisely in Tanjung Luar Village, Keruak District, East Lombok Regency [6]. On November 14, 1994 this village institution issued a written customary regulation as outlined in Village Decree Number: 04/LMD/1994. The village decree is known as Awig-awig Regulation of Fishing Routes for Fishermen or Awig-awig Sea Route. This decision regulates the existence of 4 (four) fishing routes for traditional fishermen who carry out fishing activities at sea. The determination of this route is the implementation of the formal regulations stipulated in the Decree of the Minister of Agriculture Number 607/KPTS/UM/1976 concerning Fishing Routes, namely: (1) Fishing lane I is waters with a width of 3 nautical miles; (2) Fishing lane II is waters with a width of 3-6 nautical miles; (3) Fishing lane III is waters 6-12 nautical miles wide; (4) Fishing lane IV is 12 miles of water.

2.1.3. Local knowledge and skills gained from empirical experience

The growth of the value of trust in a noble culture makes the community integrate into a rule/norm. In this management system, local indigenous peoples have the responsibility to manage their resources based on empirical experience gained from their ancestors, where the community itself is able to define its needs, goals and aspirations and the community also makes decisions for their welfare. So based on the rules/norms of community-based management (PBM/CBRM) it is a natural resource management system in a place where
local communities are actively involved in the natural resource management process contained therein. Management here includes various dimensions such as planning, implementation, and utilization of the results. For example, the Lubuk Ban wisdom in the Riau region, where conservation is carried out by the community in the Lubuk Ban local wisdom, namely preventing river environmental damage, tackling river damage and restoring environmental damage [7]. The advantages of implementing lubuk prohibition for the community socially and culturally are as follows:

a. Being for the community to increase their love and concern for the preservation of fishery biological resources;

b. The fostering of harmony and a sense of social solidarity in the local community and making it a customary tradition in the annual “Mancuak/Harvest” event, the proceeds being used as funds for social activities;

c. The realization of community social institutions through customary institutions in an effort to preserve fishery biological resources.

3. Traditional wisdom that is not represented

Traditional knowledge does not represent a single body of knowledge, but a construction that represents knowledge gathered from different activities, such as hunting, collecting medicine, preparing for spiritual ceremonies, or managing household economy. These activities are common activities found in traditional societies and are characteristic of the ways in which indigenous peoples interact with nature. This interaction, carried out over many generations, is the origin of traditional wisdom. Traditional knowledge arises through trial and error. The activities that allow for optimal task completion are passed down from generation to generation. For example, if a fisherman is consistently able to maximize his catch, then the individual will be technically successful until the next generation. The technique or fishing ground is not the starting point in determining success. Thus, indigenous peoples who maintain traditional wisdom are holders of the body of knowledge created over centuries by activities on the environment in which they have lived [4]. Furthermore, because traditional wisdom is modelled repeatedly, it can reflect modern changes in society’s environment or culture [8].

The use of traditional wisdom in the form of customary ecological management practices has been recognized as a strong and potential conservation mechanism, especially in countries where indigenous cultures are largely still present [9], [10]. Community support in conservation plans has consistently emerged as one of the most important factors in sustaining plans’ long-term, and programs that incorporate customary ecological management practices in their designs by attracting more support from local communities [10], [11], [12]. Results of studies in Samoa [11], Vanuatu [13], Fiji [14], Solomon Islands [15], Belize [16], Hawaii, and other areas of the Pacific [10] demonstrated that local-based management can have beneficial impacts on the aquatic environment and that in comparison community-based management plans tend to work better than top-down conservation approaches [17]. If the trial-and-error component is integrated with the research program, it will lead to: (1) site-specific knowledge, (2) increased knowledge of environmental relations, and (3) increased local capacity and power sharing [18].

3.1. Site-specific knowledge

Many research projects are conducted in remote areas, rarely visited areas. Local communities can assist researchers by providing further information on species presence and distribution, particularly about specific areas such as juvenile habitat [15] or spawning areas [10]. Because of their remoteness, many sites are poorly studied, and indigenous peoples may be the only source of local biological information, especially when species classifications in certain countries are unlikely to be recorded on a sufficiently good scale. In addition, in areas where the flora and fauna of an area are not well described, indigenous peoples may have knowledge of species or interactions that are not recorded in the scientific literature [16].
3.2. Increased knowledge of environmental relationships
As many indigenous peoples describe their environment holistically, they may be aware of the relationship between various ecological processes, multiple species, and abiotic factors that affect biological species [19], [20]. For example, when [21] examined the description of trophic aquatic structures in Piracicabaia, India, they found that food webs were constructed by indigenous peoples, which closely matched formal research from universities, but added that some of the movement fish migration previously unknown in the Western world. Knowledge of this environmental relationship is the result of a long-term relationship with a particular area and may not be obvious to those unfamiliar with the area.

3.3. Local capacity building and power sharing
For cultural reasons, the discourse of scientific research (particularly in the tropics) is largely dominated by one mode of transfer of knowledge and power [22]. Local capacity building through training, education, and cultural empowerment can help reduce this inequity. Creating indigenous peoples research programs is a common partner with scientists in overall intellectual development in one’s own country.

When indigenous peoples are integrated into a research programme, they develop ownership in the research project. Such goals and successes may lead to pride and more successful programs [23], [12], [24], [25]. The use of traditional wisdom in conservation programs is not based on the timing of information. On the contrary, their use provides opportunities for long-term cooperation and information development.

4. Application of local wisdom in conservation
In assessing the application of traditional wisdom as a starting point for conservation, the authors present three sub-categories related to conservation research, namely community systems, population level knowledge, and relationships to the environment. Each of the three subcategories is applied in a structured chart where each category has a function in translating conservation. The application of local wisdom is quite helpful in explaining such shifting syndromes [26] and has proven useful in the formation of new societies based on ecological management practices.

4.1. Community system indigenous
People can be defined as a group that has a history of community development with territory, economic life, including a common culture and language [27]. Meanwhile, the Alliance of Indigenous Peoples of the Archipelago (AMAN) at the first congress, in 1999 defined the indigenous people’s system as a group of people bound by their customary law order as joint
citizens of a legal alliance because of the similarity of residence or on the basis of descent. Indigenous peoples are groups of people who have ancestral origins (from generation to generation) in a certain geographical area, and have their own values, ideology, economy, politics, culture and territory.

Community systems have different ways of managing their environment. They investigate how culture can relate to its environment. This investigation was carried out on the relationship of flora and fauna to the environment, humans to organisms in nature, and humans to their environment [28], [29]. The system of indigenous peoples that has spawned a rule/norm in resource management has a characteristic in regulating the implementation of management starting from utilization, prevention, and preservation. This rule is formed where the community is able to translate what is contained in the resources and predictions that will be faced if there is a violation committed by the community. Therefore, the system of indigenous peoples in management provides an important value for conservation knowledge.

4.2. Population level knowledge
In traditional knowledge there is a population level study that needs to be studied. At the population level, the focus is on behavioural ecology, population genetics, and population biology levels. Traditional people who harvest from their environment through cultivation or hunting can be aware of their impact on the population, especially around islands surrounded by oceans that do not yet have local philosophies/norms [10]. Because of their dependence on local resources, indigenous peoples can learn about natural fluctuations in population size, habitat specifications, and dietary preferences that have not been recorded in the scientific literature. Local fishermen have a lot of biological information. For example, they can provide insight into spawning and ontogenetic habits and enhancement within populations [15]. I-Kiribati is the indigenous people of Kiribati, a country in the tropical Pacific. They have a long history of customary practices in ecological management [30], [31], but the existence of these practices diminished during British colonial rule and continued to disappear after independence [32].

![Figure 2. The diagram flow of local wisdom existing (modified) [33]](image)

The majority of people live in the capital, Tarawa, which lies along the lagoon. One of the most important traditional food sources for I-Kiribati is *Albula glossodonta* and others *Albula* spp., whose spawning density is in the lagoon area but due to several development projects, such as the construction of a pedestrian crossing in one of the spawning areas, the bonefish population has decreased in the Tarawa waters. [32]. Other fish stocks have been depressed [34] and communities have raised concerns about the management process. The local community requested that researchers come to Kiribati to help manage the resources in an integrated manner. Older people in the Tarawa area recognize the customary marine tenure system and recognize that they can help produce management plans for the future. Older traditional fishermen know about productive areas in the lagoon i.e. information about species habits before and after mating, including use of certain habitat types and susceptibility to various fishing practices [32]. Although traditional forms of management
serve as the basis for conservation plans, there is something interesting about the ontological shift. Informants reported that marine wealth is an allocation of food for the community compared to conservation [32]. Restoration of this area would not have been possible without fishermen's knowledge of bonefish habits. In addition, catch-per-unit data is not recorded in the lagoon, so it is not possible to know about its abundance.

4.3. Ecological relationships
In addition to being aware of the existence of a population level biology, the practices of some traditional societies reflect knowledge of certain multi-taxon interactions ranging from relationships to host parasites to forest succession. For example, Ntumu, who practices agriculture in Cameroon by leaving certain species at a location in order to restore forest ecology [35]. Similarly, traditional wisdom about disturbances is influential in helping to generate management plans for the future. Older traditional fishermen manage productive areas in the lagoon i.e. information on species habits before and after mating, including use of certain habitat types and susceptibility to various fishing practices [32]. Although traditional forms of management serve as the basis for conservation plans, there is something interesting about the ontological shift. Informants reported that marine wealth is an allocation of food for the community compared to conservation [32]. Recovery of this area would not have been possible without the knowledge of fishermen from the practice of developing traditional management plans. By developing multi-taxa plants, Polynesians guarded cyclones by spreading integrated farming systems [36]. The population of San Kung in southern Africa alternate between hunting, herding and cultivation based on environmental fluctuations societies may have a wealth of knowledge about species interactions gained through observation over a period of several years, and this knowledge may be useful to biologists in carrying out ecological restoration or regime management [19]. An example of protected area management resulting from traditional wisdom being applied at the Gladden Spit in Belize. Gladden Spit is a mesomeric barrier reef area located off the coast of Belize, which has long been known by fishermen as a spawning ground for snapper (Lutjanus analis). Local fishermen have had knowledge of this area since the 1920’s [16], but this knowledge was only reported in the scientific literature in 2001. Apart from being a spawning ground for snapper, the Gladden Spit is also a seasonal habitat for whale sharks (Rhincodon typus). These great sharks come to feed on gametes released from spawning snappers. It is difficult to observe whale sharks which are pelagic fish, and this area is a suitable area for collecting whale shark migration and biology data.

Gladden Spit is a “Marine reverse” area that can assist in long-term conservation protection. This existence resulted from the knowledge of local fishermen. Spawning sites that are protected area status were obtained from the interaction of information between traditional fishermen and researchers in Solomon Islands [15], and Glover Reefs in Belize [37]. Therefore, it is necessary to examine new techniques in spawning conservation to respond to various ecosystem threats faced in the future [44], [45].

5. Local wisdom as a source of knowledge for conservation
The basic principle of biology is that diversity is the basis of evolution. Without adequate diversity, adaptation to environmental changes is impossible, and then extinction can occur. Based on these biological principles, traditional wisdom has the same principles in interpreting information about relationships in nature. Thus, it provides intrinsic value to science, especially in managing resources.

The World Conservation Union (IUCN) recognizes the importance of traditional wisdom to contemporary sciences such as ecology, conservation biology, pharmaceutical botany, forestry, and fisheries and wildlife science. Some evidence in the field of science that uses traditional wisdom for the application of environmental science, namely: new biological knowledge, resource management, development planning, environmental assessment, and commodity development. Traditional wisdom also has benefits in informing the restoration of ecological science [38], [3], [39] points out that traditional Wisdom plays an important
role in monitoring ecology by providing early warning signs of ecosystem change. Traditional knowledge is not limited to the subsistence of biological activities, but also includes detailed observations of population ecology and species interactions, arising from long-term relationships with certain flora and fauna. These types of observations can be valuable in validating scientific hypotheses and guiding new research. For example, [40] compared the extent to which information about the eider (sea duck) in Hudson Bay was collected by wildlife biologists with traditional knowledge of the eider collected by hunters from the Inuit (a group of indigenous people living in the arctic region).

| No | Name of Local Wisdom | Area of distribution | Description |
|----|----------------------|----------------------|-------------|
| Awig-awig | West Lombok and Bali | Customary rules that must be obeyed by every member of the community as a guide in behaving and acting, especially in interacting and managing natural resources and environment. |
| Sasi | Maluku and Papua | Customary rules that serve as guidelines for managing the environment and utilizing natural resources include a closed fishing system to maintain the availability of fish stock. |
| Macerra Tasi | Luwu-South Sulawesi | A traditional ceremony whose message is about the responsibility to respect the sea, keep it clean, not damage it, and not drain the potential of marine fish excessively. |
| Mane’e | Talaud Archipelago | This tradition is that the community carries out abstinence or prohibits, regulates, disciplines a product of wealth on land and at sea so that its utilization is directed and gives maximum results, in order to prosper the family and generally the community with the aim of protecting existing resources such as fish, coral reefs and other biota, in order to be safe from the ignorant hands of humans, as well as excessive exploitation of the community. |
| Trust of Tomanuru or Karampua (God as creator of universe) | Community in National Park of Lore Lindu | Trust is manifested in the form of palia (prohibition), one of which is the prohibition of cutting down the ‘nunu’, ‘sarao’ trees, and trees whose roots hang down because these trees can be a barrier to erosion, landslides, and as a buffer for springs. |

Such knowledge from the Inuit has been debunked as an unreliable "Eskimo report". However, following interviews with Inuit hunters, it became clear that the knowledge of Inuit hunters far exceeds that of wildlife biologists. Traditional Inuit lore contains new information on the science of winter habits, mortality, and demographics of the eider. In addition, according to [41] that the translation of an ancient song “OOdham” explains in detail the behaviour of eagles eating *Datura metalloids*. Another thing was stated by [19] that biological information embedded in indigenous languages is thought to be of value in biological conservation. Songs, poems, and stories found in oral traditions have an important value in validating and broadening scientific understanding. The scientific richness of the
oral tradition forces scientists to confront assumptions about the validity of this traditional information, which in this regard have been marginalized by many scientists. The wealth of ecological information in indigenous language is very supportive for the relationship between biodiversity conservation and conservation of cultural diversity.

Traditional wisdom not only offers new knowledge in the field of biology but is also suitable for validating scientific hypotheses. Observations of indigenous peoples can offer concrete considerations for contemporary interpretations of models in nature. Documented that the oral traditions of many tribes contain accurate information about past geological events, such as floods, tsunamis, and earthquakes, which are confirmed in contemporary hypotheses [42]. There are several things that present the truth that traditional wisdom is able to predict natural habits both in scientific information, such as predictions about the arrival of the rainy and dry seasons [43].

Traditional wisdom has far more information about ecological relationships than empirical scientific knowledge, because traditional wisdom cannot be separated from spiritual and socio-cultural contexts. In the local knowledge tradition, nature is treated as a subject, not an object. Such as understanding ways to utilize natural resources for consumptive needs, which is preceded by a ritual event to ask the blessing of nature. These methods may not be scientifically acceptable, but if they are understood fundamentally, they carry out these events in a timely manner, these resources can be utilized by observing natural phenomena. In addition, the prohibition of the use of resource areas suspected of being mystical or magical areas. However, many researchers are aware that the area is a protected reserve for the continuity of resource generation [1], [2]. In addition, traditional wisdom not only conveys knowledge biologically but also spawns a cultural framework in solving environmental problems by prioritizing human values. Therefore, traditional wisdom really needs to be maintained and developed so that local cultural values are able to maintain the balance of local resource conditions.

6. Conclusions

Traditional wisdom is a term that includes knowledge from various activities in indigenous peoples. The application of traditional wisdom has been able to answer several challenges by implementing customary ecological management that is carried out through practices, which in recent years has attracted the attention of biologists in creating a theoretical framework for building conservation management plans. Local wisdom is a body that is rich in knowledge, so that researchers are expected to be able to translate a cultural sensitivity that regulates resources through norms/rules that are carried out wisely by the community. Traditional ecological knowledge is not disseminated quickly, and requires a certain amount of trust. Applications of traditional wisdom can be offered to build collaborative long-term relationships in sustainable management of biological resources. Traditional wisdom provides a mutually beneficial relationship between the local community and the environment, thus creating a rule for wise management and generating conservation value. Conservation of resources arising from rules/norms provides a long-term relationship if the next generation of people can maintain the cultural values left by their ancestors. In turn, local communities gain a sense of ownership over the existence of these resources. Biological conservation continues to evolve to be more dynamic to the complexity of biodiversity, because resources continue to evolve.

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