Management of water resource based on local wisdom: a development study of Kampung Naga as field laboratory of Geography Education in Tasikmalaya, West Java

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Abstract. Kampung Naga is a traditional village in Tasikmalaya, West Java which is unique in environmental management with a sustainable principle. The geography phenomenon in Kampung Naga can be developed through environmental conditioning as a geography education field laboratory. Field observations and field visits are the most basic needs of geography. The development of field laboratories can be developed by selecting locations that have the complexity of geographic phenomena. The purpose of this study was to study the management of water resources based on local wisdom as a study of the development of Kampung Naga as a Geography Education Field Laboratory. The method used in this study is qualitative descriptive. The steps of the research carried out are as follows: 1) delineation of Naga village area using satellite image data and maps, 2) data collection and inventory through surveys and interviews, 3) data processing by analyzing data to model water resource management based on the local wisdom of the indigenous people of Kampung Naga. The results showed that water management in Naga village had a pattern: water was used for rice irrigation, drinking, washing and bathing, and vegetation and animal habitat, the water source in Kampung Naga came from the Ciwulan river, and there was a pattern of water utilization by following the spatial pattern Kampung Naga village area with the concept of water conservation with forest conservation. Kampung Naga can be used as a field laboratory for Geography education, one of them is about the material of Hydrosphere in the material of water resources management.

1. Introduction
Water is the most abundant substance on the surface of the Earth which covers almost 71% of the Earth's surface area [1]. Water resources are a basic need for every living thing on the surface of the earth. Water resources management is an effort to plan, implement, monitor, and evaluate the implementation of conservation of water resources, utilization of water resources, and control of water damaging power (Law No. 7 of 2004). The existence of water is very important both in terms of quality and quantity because of maintaining a sustainable environmental sustainability.

Kampung Naga is a traditional village that is unique in sustainable principled environmental management. Kampung Naga has many phenomena that can be studied from a geographic point of view, one of which is in the management of water resources based on local wisdom. Local wisdom is all forms of knowledge, beliefs, understanding or insight, as well as customs or ethics that guide human behavior in the life of the ecological community [2].

Geography as science requires containers, places, and activities as learning resources that can transform the observations of geosphere phenomena into theories, concepts and feedback on the development of analytical methods and techniques. Practically, field laboratories can help develop psychomotor skills and conceptual-theoretical abilities. Field laboratories that function for research / practicum are important to develop.

Field studies are important because there is a direct learning process and provides an in-depth understanding of the problems being studied. Field studies can be developed by providing unique conditions.
experiences compared to classroom teaching [3]. The real world or environment provides true sensory authenticity, complexity and immersion [4]. By utilizing Kampung Naga as a field laboratory, it can provide convenience in understanding and testing, careful and accurate measurement of the phenomenon under study.

2. Methods
The location of the study was conducted in Kampung Naga Tasikmalaya, West Java Province. Kampung Naga settlement is geographically located at 7° 21'49" LS, 107° 59'40" BT. Kampung Naga settlement area has an area of 1.5 ha. Kampung Naga is a village located in a hilly valley. Kampung Naga has a very fertile type of soil, adjacent to the Ci Wulan River whose source of water comes from Mount Cikuray (Garut). Kampung Naga is at an altitude of approximately 584 meters above sea level. In accordance with its geographical conditions, Kampung Naga belongs to the tropical climate.

The research method used in this study is descriptive qualitative method. The stages of research carried out are: first, delineation of the area by using satellite image data and basic maps of the Kampung Naga area for spatial management. Second, the data collection stage was carried out to identify the character of Kampung Naga landscape in the form of physical and biophysical conditions of Kampung Naga. Third, data processing by modeling water resources management based on the local wisdom of the indigenous people of Kampung Naga. Data analysis is carried out interactively and lasts continuously until complete, so the data is saturated. The steps taken in data analysis are: reduction data, data display, conclusion drawing / Verification.

3. Results and Discussion
3.1. Description of Kampung Naga Research Area
The geographical location of Kampung Naga influences the activities and lifestyle of its people. The area which is between two hills and crossed by the Ciwulan river causes the area to be very fertile. The Kampung Naga community is one of the Indigenous Villages in Indonesia that still very closely maintains the values of its ancestral local wisdom. Community wisdom in safeguarding the environment has an impact on the life of the Kampung Naga community which is maintained by its sustainability.

![Figure 1. Satellite Imagery and Kampung Naga Settlement](image-url)
Figure 2. Map of Kampung Naga Region

Figure 3. Map of Water Index Kampung Naga
The lifestyle of the indigenous people of Kampung Naga is influenced by its geographical conditions. The Kampung Naga community manages the area with the principle of sustainability based on local wisdom. Spatial planning is arranged into 3 (three) principal areas:

1. Sacred area: Regions that have meaning that the area should not be visited carelessly and must be preserved.
2. Clean area: an area consisting of residents' houses and other buildings located in the Kampung Naga community settlement.
3. Dirty Area: The area in the valley area that is outside the clean area which is located adjacent to the Ciwulan river (bathroom, livestock pen). The function of dirty areas is for recycling material and efficient energy flows.

The division of the village area shows that the indigenous people of Kampung Naga already have a concept of sustainable life (eco-efficiency), where people have thought how to manage the limited land optimally so that the current needs are met properly and keep thinking about future needs.

The water source in Kampung Naga comes from the Ciwulan river. From the Ciwulan river there is a water channel that irrigates the surrounding villages called Garangkang Channels. Garunggang channels are made independently by the community in several villages in Salawu District. The use of water by the community for domestic water fulfillment such as for drinking, bathing, washing, and for water needs in rice fields and fish ponds. The water coming from the Garangkang channel will be channeled to the reservoir to be filtered simply, then the water is channeled to the ponds, bathrooms, and rice fields in Kampung Naga.

The placement of bathrooms in Kampung Naga is above fish ponds, so the waste from the bathroom will fall into the pond and can be used as fish feed. This shows that the people of Kampung Naga manage the environment on a sustainable principle.

3.2. Management of Water Resource Based on Local Wisdom: as Field Laboratory of Geography Education

The settlement conditions of Kampung Naga illustrate that the Kampung Naga community has a philosophy of noble values and ethics in managing their region. The Kampung Naga indigenous community builds positive reciprocity with its ecosystem. Learning means every natural phenomenon, showing the intelligence of the community. The Kampung Naga community is part of the natural existence of the environment. With this very close relationship, the community's proximity to the natural environment has a considerable influence both in behavior, way of life, the formation of objects produced.

The Kampung Naga indigenous people are not isolated and left behind. They are people who can adapt to the surrounding environment but within the scope have boundaries that remain firmly up to
The general pattern of the Kampung Naga landscape layout is quite in accordance with the concept of space for the application of ecovillage. The distribution of problems in the concept of space is divided into: residential zones, public service facilities zones, agricultural production zones, greenbelt zones, rivers, river border conservation zones, agricultural irrigation, and hill / mountain conservation areas (Figure 5).

**Figure 5. General Pattern of Kampung Naga Landscape**

Management of wastewater in Kampung Naga is good enough. The waste produced in Kampung Naga is not too heavy and the management is done traditionally, so the system can run in a balanced manner Kampung Naga.

**Figure 6. General Pattern of Water Resources Management for the Kampung Naga Community**

Water Resource Management in Kampung Naga is influenced by the sustainability of the Forest that is between the community settlement areas. The forest maintains the stability of the water body condition in Kampung Naga. These types of forests are rainforests, where mountain rainforests are very effective in providing protection for water bodies and in providing ecosystem services [5].
Water resource management in Kampung Naga is carried out by maintaining the principle of indigenous wisdom. Land use, forest conservation with a "Prohibited forest" system is the basis for water management in Kampung Naga. The values of local wisdom of the Naga community can be implicated in solving the current water crisis problem. Solving water and development problems using environmentally sustainable, socially equitable, and efficient methods can be done with Integrated Water Resources Management (IWRM) Integrated Management [6].

**Figure 7.** Land Use in Kampung Naga as Environmental Management for Water Resource

The existence of indigenous peoples is very important to maintain the sustainability of water resources. Local wisdom is a rule that has been passed down from generation to generation in certain groups. The most successful way in natural resources through traditional indigenous peoples who have knowledge, understanding and habits that are able to prevent damage to environmental functions. The local wisdom adopted is from the Naga Traditional Village, where traditional values can be a source of integration to foster awareness about the importance of preserving the environment.

The Kampung Naga community shows the existence of a pattern of sustainability as follows:

1. Environmental management is carried out on the basis of the value of local wisdom, namely: maintaining the area divided by its function (conservation function and function of life needs)
2. Sustainable environmental management is collaborated with cultural values carried out with traditional ceremonies.
3. The existence of taboos, prohibitions, and orders that have been carried out in a long period of time that are integrated as legal values for the community are used as a handle and principle of life.
4. Cultural inheritance is carried out through three educational institutions, namely: community, family, and traditional ceremonies.
5. Environmental management that is maintained according to the rules established for generations and passed on to the next generation.

**4. Conclusions**

Water management in Naga village has a pattern: water is used for rice irrigation, the need for drinking, washing and bathing, and vegetation and animal habitat, the water source in Kampung Naga comes from the Ciwulan river, and there is a pattern of water utilization by following the spatial pattern of Kampung Naga village with the concept of water conservation with forest conservation. Kampung Naga can be used as a field laboratory for Geography education, one of them is about the material of Hydrosphere in the material of water resources management.
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