

# Revitalization of Local Wisdom in the Conservation of the Upstream Watershed Region, on Java Island, Indonesia

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**Abstract.** Human resources are the primary factor in watershed management, so the presence of local wisdom and social capital are important components in conservation efforts. This research aims to describe the revitalization of local wisdom and social capital in conservation. The research was conducted in the upstream watershed region of the Solo River, in Wonogiri Regency, which includes Gemawang Village in Ngadirojo District, Sambirejo Village in Jatisrono District, Pingkuk Village in Jatiroto District, Sukoboyo Village in Slogohimo District, and Sembukan Village in Sidoharjo District. The research used a qualitative method with a phenomenological approach to investigate developing social phenomena. Data were collected from in-depth interviews with informants who were selected through purposive sampling, including village officials, religious leaders, community leaders, and farmers. The research results show that the revitalization of local wisdom and social capital is implemented through community empowerment, developing community participation, establishing a cooperation network for all stakeholders from the government, corporations, and the community, and providing extension, mentoring, and training in the utilization and conservation of the natural resources of the watershed region.

## 1 Introduction

The Keduang watershed, which is part of the watershed region of the Solo River (the longest river in Central Java with a watershed region covering  $\pm 16.100$  km<sup>2</sup> and a total length of  $\pm 600$  km), is in the southeastern part of Central Java. The main waterworks situated in the Keduang watershed is the Gajah Mungkur Reservoir, also known as the Wonogiri Reservoir. Construction of the reservoir began in 1976 and was completed in 1982, but filling of the reservoir first started in 1980. The Gajah Mungkur Reservoir, with a maximum inundation area of 88 km<sup>2</sup> and a full water volume of 735 million m<sup>3</sup>, functions as a flood control in the rainy season (with an inundation area of over 93,000 Ha), provides water during the dry season, and functions as a hydroelectric power plant. Therefore, it is important to carry out proper soil and water conservation in this area.

Since most of the sub-watershed region of Keduang is privately owned land, it is essential that landowners are involved in efforts to improve its conditions because they have the right

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to decide how the land is managed, including land use, planting patterns, and conservation techniques. A number of programs for watershed management involving the community have already been carried out in the Keduang sub-watershed. These include Forest and Land Rehabilitation (*Rehabilitasi Hutan dan Lahan/RHL*), National Movement for Water Conservation Partnerships (*Gerakan Nasional Kemitraan Penyelamatan Air/GN-KPA*), Upstream Watershed Conservation, Development of Integrated Land Conservation Farming (*Pengembangan Usahatani Konservasi Lahan Terpadu/PUKLT*), and construction of a Micro Watershed Areal Model (*Areal Model DAS Mikro/MDM*). Community empowerment is one of the elements of the activities that are carried out to achieve the goals of these programs. The importance of community empowerment in watershed management is also stated in Government Regulation No. 37 of 2012 about Watershed Management in paragraphs 61-63, and Minister of Forestry Regulation No. P.17/Menhut-II/2014 about Procedures for Community Empowerment in Watershed Management Activities. Nevertheless, the results of a number of studies show that community empowerment in watershed management has not yet been successful because it has been directed more towards participation mobilized by incentive, which has not led to community independence for supporting implementation of the program [1-4]. Therefore, there is a need for the revitalization of local wisdom in carrying out conservation.

A number of efforts have been made by the government and environmental activists to implement soil and water conservation programs. These efforts include those regulated by existing laws, such as Law Number 37 of 2014 about Soil and Water Conservation. Paragraph 2 of Law Number 37 of 2014 states that the implementation of soil and water conservation should be based on principles of (1) participation; (2) integration; (3) balance; (4) justice; (5) benefit; (6) local wisdom; and (7) sustainability.

Local wisdom, in Law No. 32 of 2009 about Protection and Management of the Living Environment, is defined as the noble values that are applied in the life system of a community, amongst others to protect and manage the living environment in a sustainable way. Paragraph 2 states that the protection and management of the living environment should be carried out based on a number of principles, one of which is local wisdom. In the explanation of Paragraph 2 letter (l), it states that the “principle of local wisdom” means that in the protection and management of the living environment, it is essential to pay attention to the noble values that are applied in the life of the community.

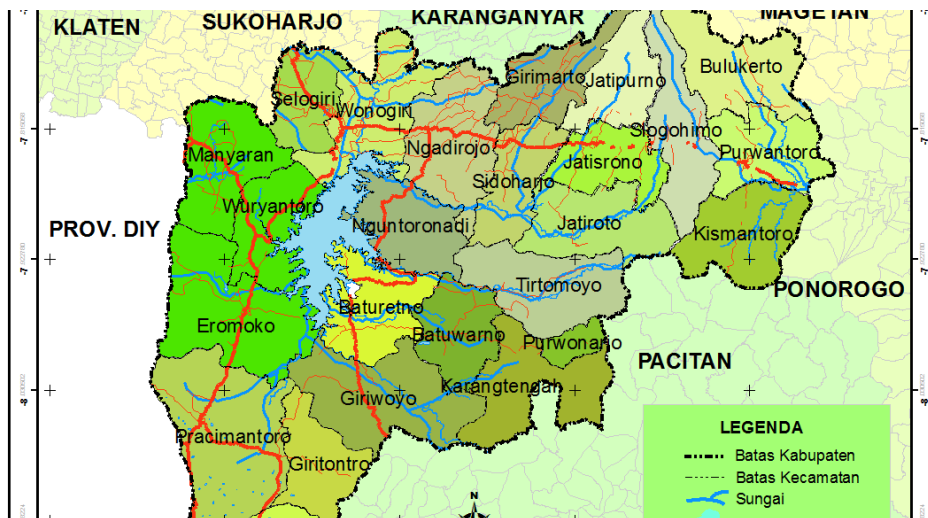
Local wisdom is the elements of a culture which have crystallized to become elements that are engrained in the physical and non-physical order of the culture of a society or nation [5-9]. These elements become a conception of life and existence. This conception is the product of deep thought and contains values that become established as life views and serve a reference for members of the supporting community in living their lives [10]. Local wisdom is also defined as the wise views of a local community. The views that are formed as the manifestation of this local wisdom are understood as principles for living life that are provide guidelines and are implemented by the local community [11-12]. These principles are manifested in value systems and norms. Therefore, local wisdom not only preserves tradition or customs that have been passed down over generations but also provides a number of good life management values that are in harmony with the social and natural environment, and with the Creator [13-16].

The local wisdom and culture of a region can serve as a learning resource because the community possesses prior knowledge and carries the cultural values originating from its environment to surrounding communities [17-19]. Local wisdom can be described as something that already exists and is applied as the tradition of a community. This tradition becomes part of the culture of the community concerned [21-23]. The role of local wisdom is to form the basis of implementation of the noble values of civilization of a nation. Local wisdom is a medium for introducing cultural values to promote a sense of pride and affection

for one's own culture. In addition, it can act as a filter to prevent influence from outside cultures and avert conflict in a community. The local values, ideas, and views that a community implements to fulfil its needs are a part of local wisdom [24]. Based on this fact, the current research will describe how the local wisdom of a community is used in conservation, and how the mechanism for the revitalization of local wisdom is used by a community in its conservation efforts.

## 2 Research Method

This research was carried out in the upstream watershed region of the Solo River in Wonogiri Regency (Figure 1), which includes Gemawang Village in Ngadirojo District, Sambirejo Village in Jatisrono District, Pingkuk Village in Jatiroto District, Sukoboyo Village in Slogohimo District, and Sembukan Village in Sidoharjo District, an area that is controlled by farmers and requires a great deal of attention to encourage proper land conservation efforts.



**Fig. 1.** Wonogiri district map.

According to [25-26], a qualitative method is inclined to be connected to the subjective nature of a social reality, thereby creating an understanding from the perspective of stakeholders, and enabling the researcher to view various phenomena as they are viewed by their subjects. The research is a case study, which according to [27] is an empirical inquiry that investigates a real-life phenomenon. The study was carried out from March to June 2022. Qualitative research data were obtained from in-depth interviews, observation, focus group discussions, a document analysis [28-30], along with a Participatory Rural Appraisal (PRA) and Participatory Action Research (PAR) [31]. The documentation in this research was primarily the collection of supporting research data. The PAR method involved members of the community in the process of social change. The research used four triangulations with reference to [32], namely data triangulation, methodological triangulation, researcher triangulation, and theoretical triangulation. The informants were selected through purposive sampling. The respondents were officials from all the institutions that play a role in the management of the upstream watershed region of the Solo River. In-depth interviews were conducted to discover the level of interest and influence of the people concerned. The data collection was carried out through Focus Group Discussions (FGDs) and in-depth interviews. The FGDs involved community figures, head of the Soil and Water Conservation Group (*Kelompok Konservasi Tanah dan Air/KKTA*), head of the farmers group, and a Joint

Farmers Group (*Gabungan Kelompok Tani/Gapoktan*) at the research location. In-depth interviews were held with people directly connected to the MDM, RHL, GNKPA, and PUKLT activities, which included community leaders, agricultural and forest extension workers, a number of Regional Work Units (*Satuan Kerja Perangkat Daerah/SKPD*) in Wonogiri Regency (Regional Development Planning, Research and Development Agency; Forestry and Plantation Department; Department of Agriculture, Food Crops and Horticulture; and Department of Livestock, Fisheries, and Marine Affairs), Solo Watershed Management Office (*Balai Pengelolaan DAS/BPDAS*), and the main Solo River District Office (*Balai Besar Wilayah Sungai/BBWS*). Secondary data were also gathered from these institutions. The collected data and information were then analyzed qualitatively. The unit of analysis in this research covers a single area, so a single case analysis was used with an interactive analysis model that included data reduction, data presentation, and conclusion or verification [32].

### 3 Research results and discussion

#### 3.1 Community conservation activities in the watershed region

The vegetative soil conservation techniques implemented by the community in the watershed region are reforestation; agroforestry, including alley cropping, strip cropping, grass strips, crop residue lines, and cover crops; and cropping patterns, including crop rotation, intercropping, and relay cropping (Table 1).

**Table 1.** Community conservation activities in the watershed region.

Activity and conservation goal	Impact on conservation
<b>Reforestation</b>	
To restore and improve ecological and hydrological conditions with trees	A number of perennial plants have high interception and evaporation and therefore consume large amounts of water, example: <i>Samanea saman</i> (Rain Tree), <i>Ficus benjamina</i> , ( <i>Mangifera indica</i> )
To increase soil organic matter content from litter	Increase in soil fertility
To restore water management function	Improved water flow, reducing the risk of landslides
<b>Agroforestry</b>	
To reduce erosion and improve soil quality	Perennial plants have a relatively greater leaf cover area to retain kinetic energy from the rain, so the water that reaches the soil in the form of stemflow and throughfall does not cause erosion (example: <i>Anacardium occidentale</i> , <i>Gnetum gnemon</i> )
Mixed garden	Prevents erosion because of the tight ground cover conditions which prevent rain droplets falling directly onto the soil surface. Crop yield from non-annual plants is able to reduce the risk of crop failure
Optimum use of land potential	Crop yield from non-annual plants can provide added value for farmers

**Table 1.** Community conservation activities in the watershed region. (Continue)

<b>Activity and conservation goal</b>	<b>Impact on conservation</b>
To reduce intensity of sunlight and protect young primary crops	Tiered plant crowns create a forest-like system in which only a small amount of water falls directly onto the soil surface
<b>Grass strips</b>	
To reduce surface flow and provide a source of animal feed	Suppresses levels of erosion
<b>Mulch</b>	
To protect the soil surface from the direct impact of rain droplets, thereby reducing splash erosion	Increases the content of soil organic matter and nutrients. Mulch can preserve the stability of soil temperature at a condition that is good for microorganism activity. Relatively low evaporation has implications on the stability of soil moisture
<b>Crop rotation</b>	
To break the cycle of pests and plant diseases and to diversify crop yield	Maintains ground cover because the second crop is planted after the first crop is harvested, thereby maintaining the intensity of ground cover all year round. These conditions will reduce the risk of soil erosion due to the impact of rain droplets and surface flow
<b>Intercropping</b>	
Tight ground cover is highly beneficial for preventing erosion and maintaining soil moisture content by inhibiting evaporation	Multiple crop yield from a single plot of land can increase farmers' income, for example in one land planting peanuts, corn and cassava
<b>Relay cropping</b>	
Regulates harvest and planting times to increase the intensity of land use, where the second crop is planted just before the harvest of the first season crop	Prevents erosion. In addition, crop residue that is turned into mulch will optimize the soil's ability to withstand erosion as well as providing the plants' needs for nutrients

Apart from the aspect of soil conservation, the application of vegetative techniques produces additional organic matter for the land. The combination between livestock and vegetation conservation for animal feed has multiple benefits [33], in line with the research of [34-35], which explains how erosion can be suppressed to the lowest level while crop yield can be used for animal feed. In addition, livestock waste in the form of dung and urine can be used as manure for primary crops.

### 3.2 Local wisdom of the community in conservation of the watershed region

Native Indonesian culture contains various philosophies that favor the living environment. In Java, for example, there is a well-known philosophy, *Hamemayu Hayunig Bawana* (Make the World Beautiful). The various religions that exist in Indonesia, including Islam, Hinduism, Christianity, Buddhism, and Confucianism, also teach their followers to always take care of their surrounding environment. Local wisdom can encourage community participation in development activities. Communities throughout Indonesia have a wide variety of local wisdom. This makes the community participation in every area different in

terms of its processes and results. Knowledge, skills, and culture, including local wisdom, are important to know in the development of participation. Values of local wisdom that play a role in developing participation in conservation are shown in Table 2 below.

**Table 2.** Values of local wisdom in watershed conservation.

<b>Values of local wisdom</b>	<b>Role in watershed conservation</b>	<b>Impact</b>	<b>Level of Impact</b>
Customs, including obedience, togetherness, education, and mutual respect	Provides a guideline for the community in carrying out conservation	Builds mutual collaboration and a strong sense of togetherness in carrying out conservation	strong
	Supports ritual traditions (village cleansing, including “ <i>merti gunung</i> ”, “ <i>meti bumi</i> ”, or “ <i>nyadran</i> ”)	Develops values of social capital in the community (solidarity, mutual cooperation, togetherness, intimacy, empathy, and harmony)	strong
	Controls all activities that exploit the natural resources of the forest and water	Water sources can be protected, and forest and land damage prevented	middle
	Respects the mountain and forest as spaces that are believed to be inhabited by spirits or supernatural powers	Promotes an attitude of respect and the desire to preserve nature, thereby protecting the balance of the ecosystem	low
Positive Attitude Towards Nature	Encourages love for the land and prevention of land damage around the watershed region	Raises community awareness about the need to preserve the river flow and keep the river clean	middle
		People feel they have been blessed by God with a natural wealth that can be utilized by the community	strong
Activities based on aspects of religion, education, and socio-culture	Promotes community behavior that respects and honors the values of local wisdom	Encourages community participation in conservation activities	middle
Ancestral advice	Offers a guideline for people to make the decision to participate and motivation to carry out conservation	Provides recommendations and prohibitions about excessive use of water sources and land, or even sanctions for those who fail to comply	strong

Customs are actions that are performed repeatedly and have become a permanent habit or stasis that is respected by a community. According to [36-38], customs are unwritten laws that are believed and followed by a community and are a source of national law. In conservation, customs play an important role by serving as a life guide for a community [39]. This means that if a conservation program design conforms to the customs of a community, it will be easy to develop community participation. On the contrary, if the conservation measures are contrary to the customs of a community, it is inevitable that the community will

not participate in the conservation efforts. For example, in a rural community that still has a strong sense of mutual cooperation, if the conservation carried out is for the common good of the community, founded on a sense of kinship, and involves mutual cooperation, there will be a high level of community participation in the conservation. A positive attitude towards the environment is an attitude that shows love for the environment and the desire to prevent damage by human beings [40]. This attitude of respect and appreciation for the environment will lead to values of love and obedience in the current generation for the regulations and prohibitions that were established by their ancestors. One example of local wisdom that is associated with this is the large areas of forest land that are still controlled and protected by customary law. Community participation in conservation will appear if the activity does not go against customary law and does not cause damage to the customary forest or other aspects of nature. A community environment that is founded on religious, educational, and socio-cultural knowledge will accelerate a development program. For example, in a community that is predominantly Muslim, a planned program that does not go against syariah law, and is not related to anything that is forbidden or haram will increase the motivation of the community to participate in the conservation activities.

Ancestral advice is the advice given by ancestors which contains moral virtue and is believed to have the ability to bring benefit and prosperity [41]. Ancestral advice becomes rooted in a community and serves as a guideline for the way people lead their lives. Communities that still believe the proverbs and advice of their ancestors will use it as a guideline when deciding whether or not to participate in a conservation activity. If the conservation is in line with the advice of their ancestors, this will provide motivation for the community to participate. Based on this explanation, it can be understood that local wisdom plays a role in encouraging community participation in a development program. Local wisdom can become a supporting factor for community participation. Apart from paying attention to the needs of the community, the government or other parties acting as planners and facilitators must understand the conditions and characteristics of the community that is the target of development by carrying out an analysis. In this way, the planners and facilitators will be able to know and understand about the local wisdom that is part of a particular community. After learning about the local wisdom of a community, the next stage of the development program design must be adapted to conform to this local wisdom. The goal is to be able to increase and encourage community participation in the development program. A community will feel respected and appreciated when its local wisdom is respected and not underestimated.

### **3.3 Mechanisms for the revitalization of local wisdom in watershed conservation**

Community empowerment in watershed conservation has been carried out through activities initiated by a number of related ministries. These activities include Forest and Land Rehabilitation (*Rehabilitasi Hutan dan Lahan/RHL*), National Movement for Water Conservation Partnerships (*Gerakan Nasional Kemitraan Penyelamatan Air/GN-KPA*), Development of Integrated Land Conservation Farming (*Pengembangan Usahatani Konservasi Lahan Terpadu/PUKLT*), and construction of a Micro Watershed Areal Model (*Areal Model DAS Mikro/MDM*). RHL is an endeavor to restore, maintain, and increase forest and land function so that its supporting capacity, productivity and role in bolstering the life support system is protected. The RHL program implemented by the Ministry of Forestry (now the Ministry of the Living Environment and Forestry) includes Presidential Instruction 180 Kawistara, afforestation and reforestation from 1976-1998, and a National Movement for Land and Forest Rehabilitation (*Gerakan Nasional Rehabilitasi Hutan dan Lahan/GNRHL/GERHAN* from 2003-2009).

**Table 3.** Revitalization mechanisms.

<b>Revitalization mechanism</b>	<b>Activity</b>	<b>Impact</b>	<b>Level of Impact</b>
Development of community participation	<ul style="list-style-type: none"> <li>Strengthening of customary and religious communities through various motivating forces such as government, environmental experts, and religious leaders</li> <li>Increasing awareness, understanding, concern and participation of the community</li> </ul>	The community is able to solve its own problems and make use of limited natural resources	strong
		The community has a sense of belonging which leads to an obligation to protect and secure its resources together	strong
Development of cooperation network	<ul style="list-style-type: none"> <li>Identifying or Mapping Partner Objects</li> <li>Discovering Information</li> <li>Analyzing Information</li> <li>Assessing Information</li> <li>Compiling a Work Plan</li> <li>Making an Agreement</li> <li>Signing a Cooperation Agreement</li> <li>Implementation of Activities</li> <li>Monitoring and Evaluation</li> <li>Improvement</li> <li>Follow-up Plans</li> </ul>	Opens lines of communication and coordination to share and exchange experiences and to learn from one another	middle
		Establishes a better capacity for watershed management	low
		Creates a shared information base for all stakeholders	middle
		Forms financing and administration partnerships between the community and other institutions and sectors	strong
		Establishes a cross-regional consensus for decision making	middle
Extension, mentoring, and training for communities	<ul style="list-style-type: none"> <li>Providing extension about planting perennials</li> <li>Mentoring about making conservation constructions</li> <li>Training in land rehabilitation and water resource management</li> </ul>	Increases capacity in communication techniques and mutual motivation	strong
		Builds better social interaction with the community	strong
		Creates greater independence in decision making, running farming businesses, and building networks	strong
		Improves understanding, awareness, concern, and participation of the community in the protection of the conservation area	middle

MDM is a watershed management support system that operates on a field scale and is used as a means to demonstrate the participative process in forest and land rehabilitation management activities (RHL), soil and water conservation techniques, farming in accordance with the capacity of the land, social economy, and community institutions. In the Guidelines for MDM Areal Development (Regulation of Director General of RLPS No. P.15/V-SET/2009), the goal of community empowerment is to increase the skills and independence



of communities in managing resources in micro watershed regions by facilitating education, training, counseling, mentoring, providing financial capital, advocating, providing facilities and equipment, developing farmers' institutions, and developing business enterprises. GN-KPA is carried out by all related sectors and stakeholders, under the coordination of the Ministry of Public Works. PUKLT is an activity of the Ministry of Agriculture. PUKLT prioritizes the conservation of land use to a maximum level throughout the year to increase agricultural production (food crops, horticulture, plantations, and livestock), by applying soil conservation techniques of a mechanical and vegetative nature in order to increase the income and welfare of farmers. The research results show that revitalization of local wisdom is carried out through community empowerment, amongst others by encouraging community participation, developing a cooperation network involving all stakeholders from the government, corporations, and the community, and offering counseling, mentoring, and training for the community about the utilization and conservation of the natural resources of the watershed region, as shown in Table 3.

## 4 Conclusion

In general, conservation technology is not viewed favorably by the community because its realization incurs large costs and its results are not felt immediately by the community concerned, especially the farming community. This condition must be addressed wisely, and alternative solutions sought. Communities living in downstream areas have a strong interest in the preservation of upstream and watershed regions. Therefore, downstream communities need to give more attention to the welfare of upstream communities. One alternative is to offer an incentive which it is hoped will encourage farmers to implement proper conservation techniques. Government efforts to encourage cooperation between other institutions play an important role in accommodating and implementing these conservation techniques. More important still is the participation of all components of the community in demonstrating their concern for soil conservation, especially in upstream and watershed regions. In the view of all religions and all beliefs, there is an obligation for all human beings to protect and preserve the environment, which includes soil and water, so religious norms also serve as binding regulations in conservation efforts. The research results show that the revitalization of local wisdom is carried out through community empowerment, by encouraging community participation, developing a cooperation network involving all stakeholders from the government, corporations, and the community, and providing extension, mentoring, and training for the community in the utilization and preservation of the natural resources of the watershed region.

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