Why do people join the Payment for Ecosystem Services Scheme? A lesson learnt of PES in Mbeliling Landscape, Flores Island, East Nusa Tenggara, Indonesia

Tiburtius Hani[1], *Adi* Widyanto[1], *Vincentia* Widyasari[1], *Lalu Abdi*[1], and *Silfi* Iriyani[2 *]

[1)]Burung Indonesia Komplek Baranangsiang Indah, Bogor City, West Java, Indonesia
[2)]Center for Transdisciplinary and Sustainability Sciences, Bogor City, West Jawa, Indonesia

Abstract. Payment Environment Services are mainly intended with several main focuses, first, as an alternative system for sustainable land production and management. Second, as an effort to improve the welfare of land managers. Third, as ecosystem and environmental protection, and water resource management for sustainable socio-economic and ecological development. Achieving these noble goals requires the participation of the community, especially farmers who manage land within the structural order of water resources in the form of watersheds and forest ecosystems. On Flores Island, the Mbeliling ecosystem area has water resources for community life. Community participation for sustainable water resource management showed excellent and consistent participation. Efforts to PES from the Mbeliling ecosystem have received commitments from parties. This article presents strong evidence of stakeholders' participation in the Mbeliling ecosystem. The approach taken in this study was observation at the community level to find out perspectives on the importance of community roles, determining governance structures, and involvement of other parties such as the government and the private sector. This study found that the level of community participation showed a positive attitude from the role of the community as a trust fund board, advisory board, and technical monitoring body, as well as from the role of private hotel owners who contributed, and there was a positive attitude from the community.

1 Introduction

Payment for environmental services originating from the use of river water resources has been recognized and implemented globally. The payment scheme for river water resource services has been considered a collaborative effort that benefits all parties from upstream to downstream. The components that determine the sustainability of this PES scheme are also determined by whether there are incentives for communities to protect and maintain river water resources in upstream areas [1]. The availability of incentives needs to be a concern, considering that not all communities receive the same benefits, so the social ecological

* Corresponding Author ; silfi@apps.ipb.ac.id

dimension greatly influences the implementation of PES. By considering the social ecological dimensions, it will be possible to design PES, identify processes, and identify obstacles. By knowing this, it will influence the success of policies that do not have the effect of changing the social and ecological system [2]. Thus, PES can be called an effort to achieve two main components in life, namely, meeting economic needs and protecting the environment [3]. This form of connection can also take the form of community attention and commitment decisions. This can happen when the realisation that biodiversity in the landscape responds to changes when hydrology changes. So that downstream communities can also decide to consider how biodiversity protection schemes they can implement [4].

In Indonesia, PES from river water resources has also been initiated and implemented. Between 2001 and 2009, there were 4 provinces, namely Banten with Cidanau river water resources, Lampung, Aceh and West Nusa Tenggara. From these four applications, it is known that the buyers of water environmental services are two companies, one from a water association and one from a state-owned enterprise [5]. Activities undertaken by community groups to protect water resources include planting trees with agroforestry schemes, creating water banks in rivers, conservation, and terracing. In 2001 - 2009, the price paid by buyers ranged from Rp. 1,200,000/ha to Rp. 1,600,000, while payments using group units ranged from Rp. 30,000,000 to Rp. 90,000,000 per group/per contract [6].

Indonesian government data states that there are 5,590 major rivers and 65,017 tributaries [7]. These have the potential for the application of environmental services. One such potential river is in the Mbeliling landscape in eastern Indonesia, West Manggarai Regency, East Nusa Tenggara Province. The 93,126 ha Mbeliling Landscape Ecosystem (BAM) stretches from upstream to downstream, in four watersheds (watersheds), namely the Nae (Mese) watershed, the Jamal watershed, the Nggoer/Roang watershed, and the Bereh watershed [8]. The Mbeliling Forest area is located upstream of the watershed. Water resources from the watershed reach communities in two districts, namely Mbeliling District and Komodo District, including Labuan Bajo City, with a total water utilization of around 5,711 people. A total of 6,707 people living in villages in Mbeliling District, including Cunca Lolos, Golo Desat, Golo Damu, Golo Ndoal, Golo Sembea, Tondong Belang, Liang Ndara, live by relying on water sources from the Bentang Mbeliling ecosystem area. Including 2,973 people in Komodo District, especially in Watu Nggelek village, Golo Pongkor, Tiwu Nampar, also get their life from water sources from the Mbeliling landscape ecosystem. This means that 220 springs in the Mbeliling landscape ecosystem area are absolutely a necessity for people's lives and must be seriously protected [8].

The Mbeliling ecosystem is an area with intact forest vegetation, located at an altitude of 1,300 meters above sea level, and has diverse timber commodities. The vegetation in the Mbeliling ecosystem not only has the function as a source of forestry trees for water storage, but also is suitable for commodity trees planted by the community. The types of plants found in the region include pecan/candlenut (*Aleurites moluccana*), coffee, chocolate, cloves (*Syzygium aromaticum*), teak (*Tectona grandis*, *Gmelina arborea*), and mahogany (*Swietenia mahagony* and *Swietenia macrophyla*). The economic valuation study of the Mbeliling Landscape, the economic value reaches up to 39 billion/year, and 40% of its share is economic value sourced from water resources. This study was conducted in 2009 [9]. If there is a reduction in forest cover in the region and if there is a reduction in forest cover change, the water yield flowing in the river (run off) is increasing, the maximum water discharge increases and vice versa the minimum discharge decreases this means that the water yield through springs is reduced, and the potential for floods and droughts to occur. In the end, this situation will also cause a scarcity of clean water for the community, both upstream and especially for the people who live downstream.

2 Importance of participation in PES schemes

The PES initiative in Mbeliling Landscape is an initiative of communities living in forest landscapes and watersheds, both upstream, midstream, and downstream. This initiative arose because of the need for water resources, especially the amount of water supply, and the initiative to maintain forests in the upstream part, so that it continues to supply water to the central and downstream regions. In the downstream part, water is used not only for water needs for drinking water, agriculture, plantations, and water supply for industry, but also for the hospitality industry. In the central part, the use is more for agricultural activities, and the upstream use is diverse, ranging from agriculture, plantations, and the use of non-timber forest products provided by forests.

The community's need for water is one of the main interests, and socially, this need strengthens the social relations of the community upstream, midstream, and downstream [10]. Thus, it can be ensured that community participation is a crucial need for the utilization and management, and conservation of water resources. Community participation is also a key need to facilitate decision-making at the level of community institutional units [11].

Other parties that also have the same power are formal institutions, entrepreneurs, and the private sector. The role of these parties as a whole is an important part of driving the success of community-built initiatives [12]. This collaboration between parties is also based on expectations about benefits, either in terms of monetary value or services that are not in the form of money but can be converted into monetary value. Services that can be converted into monetary value are water services that are used by the private sector for hotel business needs and paid to water service providers, or to people who are members of one organization as managers. More than that, the value of the money returned to the community, and part of the payment, is used for the conservation of water resources in the upstream area.

The scheme mentioned above then became the basis of the environmental service payment scheme. With such a scheme, it can be understood that the collaboration of the parties greatly determines the success of this initiative and ceremony. The collaboration of the parties is proof of the agreement and commitment of the parties. Commitment is also the basis of the division of roles, where parties express their willingness to participate, support, and contribute.

This paper is also intended to provide an overview of whether the participation of the parties is based on financial interests or on a desire to reduce the risk of river damage. In general, based on several studies, it is rare to find which causes are greater that determine participation. We hope that this study can also clearly describe the reasons for community participation.

3 Method

This research was conducted in the landscape of Mbeliling, West Manggarai Regency, East Nusa Tenggara Province. With 36 communities and a combined population of roughly 40,000, the Mbeliling landscape spans 94,000 hectares (30% state forest area and 70% other land use). Therefore, making sure that village resources are handled sustainably is essential to implementing sustainable management of the Mbeliling landscape. The implementation of the goal of PES on water resources is still seen as complicated by many parties. The complexity is related to governance, including institutions, land ownership, power and authority relations, and the parties as actors involved. Thus, to find out the participation of farmers or land managers comprehensively must be done to a level that can explain why farmers or land managers have the deep awareness to participate.

Furthermore, to find out how PES scheme design and negotiations are carried out with farmers and scheme providers, this study used two empirical approaches combined, namely

(i) qualitative institutional analysis intended to pay attention to governance and institutions, and (ii) using qualitative analysis to identify the factors that significantly affect the participation rate of farmers or land users. The way to do this approach is by field surveys, qualitative data collection, and pre-analysis is also carried out before the survey. The implementation of institutional analysis is carried out by identifying the necessary components in governance to achieve outcomes. Determining what is needed to fulfill the procedure is by determining the context, area of action, and interaction pattern. The procedure and approach are presented in the diagram in Figure 2.

Qualitative input is also highly considered as one of the approaches. One way is to clarify the different roles of actors in the planning, implementation, and supervision process. These inputs are used to view and assess strengths and dependencies between relevant factors.

3.1 Case selection: Mbeliling landscape and PES initiative

The Mbeliling landscape is a direct source of life for approximately 40,000 people spread across 36 villages. 95% of people's livelihood professions are farmers, and in general, have a poverty rate of 18%. In 2013, food commodities in the form of paddy rice and fields were identified in all districts, with a total planting area that continued to grow from 19,488 ha to

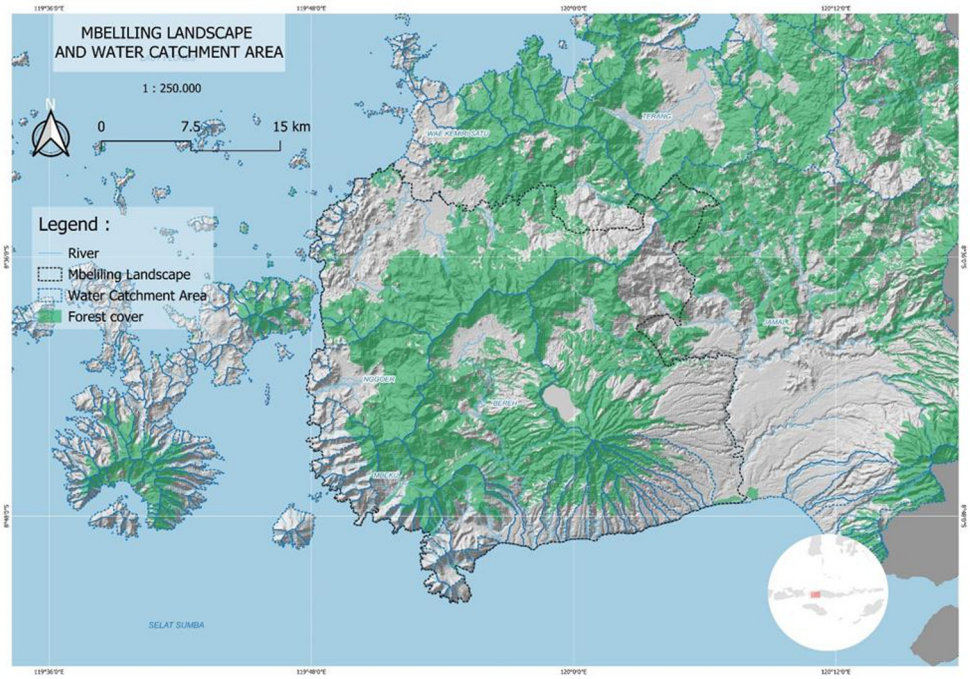

Fig 1. Mbeliling Landscape and its Water Catchment Area

23,894 ha in 2013. The area of paddy fields is only about 10% of the area of paddy rice; the largest areas producing paddy fields are Lembor Selatan, Sono Nggoang, Lembor, and Macang Pacar.

In 2023, the food commodities in the Mbeliling landscape are rice, maize, various yams, and legumes. Local community also produces various trading commodities like clove, coffee, candlenut, cashew, chocolate, and various fruit trees, forming agroforestry, which reduces surface erosion and rainwater absorption.

From the characteristics of community life, the land use in this region has remained relatively unchanged. With such characteristics, water is the main resource for life and the sustainability of land use. So the governance of water resources is very important. This then became a community initiative to organize and manage water resources by developing PES.

3.1.1 Qualitative analysis: governance and institution analysis framework

The analysis of the institutional framework was carried out to see and identify the institution that is the main context of the institutional role in a comprehensive condition between social, economic, and environmental governance functions. In several activities related to agriculture and the use of natural resources, institutional analysis is also generally carried out with the Ostrom approach, known as the sustainable framework. The sustainable framework is closely related to the transaction process within the institution, the characteristics of the actors, the institution, and the governance structure [13,14]. For the case in this study, the institutional framework along with the context within it is shown in the figure below.

The figure below shows how PES governance has three main contexts, namely in the aspect of the location of the area where the community lives from upstream to downstream, the aspect of socio-economic conditions, and the aspect of institutional management. Meanwhile, the context is inseparable from the area of action for the implementation of PES governance, namely the participatory aspects of the parties, the situation of the action carried out, and the partnership between the public and private parties as stakeholders [15]. This approach also contributes to green and environmentally friendly industries [16]. Thus, it will lead to things related to the pattern of interaction between aspects and the roles of the parties based on the benefits obtained [3]. In the long term, PES governance can produce outcomes that can be obtained and felt in the long term, where PES becomes an asset for all parties.

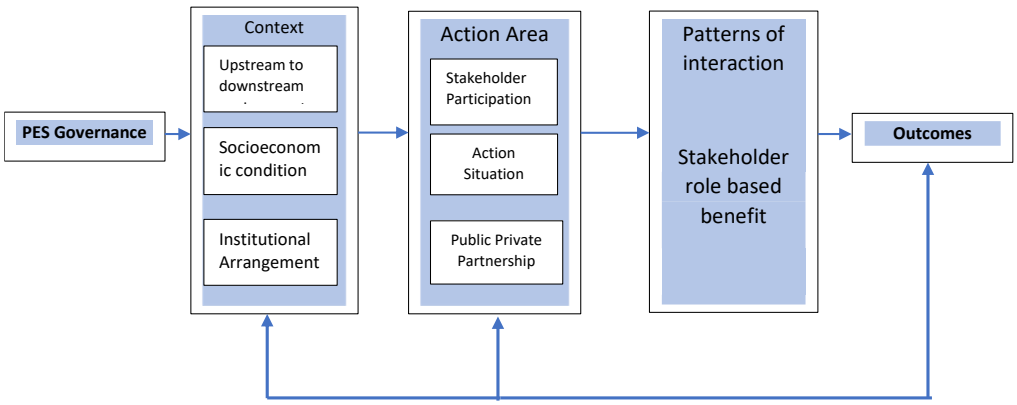

Fig 2. PES Governance flow toward PES outcome

3.1.2 Qualitative analysis: identifying the effect of the participation of farmers and the Private Sector

The success of the implementation of the PES scheme is determined by the participation of the main parties, namely farmers or communities living in the upstream to downstream

areas, as well as private parties. The participation of these two characteristics of the parties will largely depend on the value of the benefits to be obtained and/or obtained from the PES. With the characteristics of the parties, it will also greatly determine how much the payment for environmental services and or contributions of the parties must be paid or contributed by the parties [16].

Consideration of how much payment and/or contribution should be made in the PES scheme will also depend on the location where the parties are. This situation is seen from the close distance of farmers or parties with spring water sources, and also the slope of residences. With this consideration, farmers or other parties can be asked to pay for their environmental services based on the location. Even with strong policies, community participation can be encouraged more strongly. However, the interest and willingness of farmers and parties to participate in and/or join the PES scheme also determine.

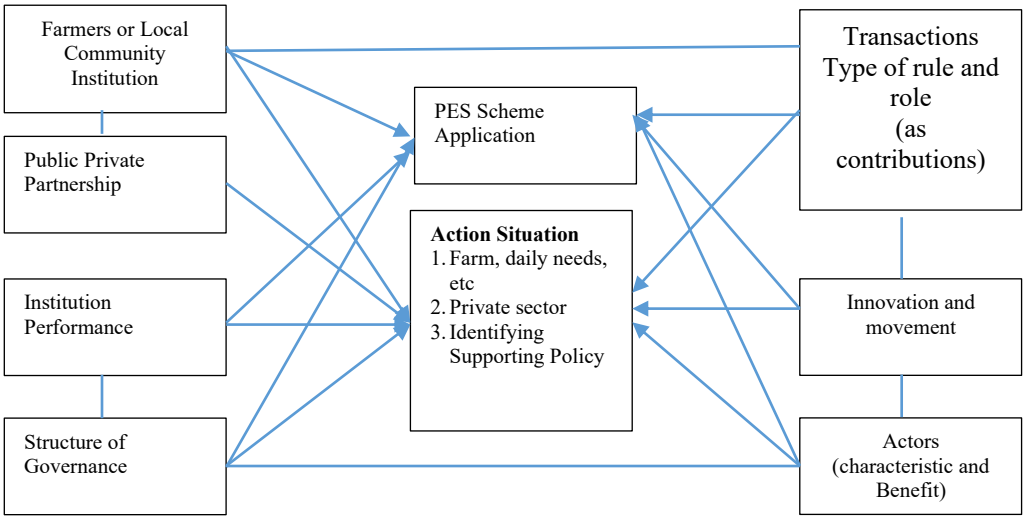

Fig 3. PES institutional sustainability framework

The sustainability of the institution and its relationship with participation based on the interests and willingness of the parties are shown in the figure above. Institutional sustainability will also affect how the PES scheme is implemented and how the needs of the parties are met, which are included in the necessary policies.

4 Results

4.1 The properties of Mbeliling PES Scheme: what, when, and how

In 2023, the food commodity in the Mbeliling landscape is 37.705 ha. From the characteristics of community life, the land use in this region has remained relatively unchanged. With such characteristics, water is the main resource for life and the sustainability of land use. So the governance of water resources is very important. This then became a community initiative to organize and manage water resources by developing PES.

In 2015, the need for water sources was no longer only for households in daily life, gardens, rice fields, and fields, but has also become an important need for the tourism industry. Many managers and developers of ecotourism services, such as hotels, inns, restaurants, and natural tourism, need water as a main resource. From this description, it can

be concluded that there are two transactions in the Mbeliling landscape, namely downstream monetary transactions that use and utilize water resources, with water purchase transactions. Meanwhile, people living in the upstream and central parts carry out transactions in the form of environmental services to ensure the quantity of water, protect against erosion, and increase water storage capacity by planting trees so that water remains in the dry season.

The mutualistic relationship is an initiative to build a common institution. This also happened in the Latuppa watershed of Palopo City in South Sulawesi Province. In that area, there has been a relationship between interested parties so that it is able to facilitate various interests in the area.

In a slight contrast to the Mbeliling landscape, the interests of the parties are recognized by each party, but it still requires institutional strengthening and strong impetus to keep the initiative of the parties strong and solid. Some factors that sometimes seem less supportive include commitments from some parties that are not too strong because they consider the benefits obtained from the number of monetary transactions issued. In other words, there are still parties who want to be involved in the institution, but do not have a good commitment to pay for water services and/or to support the people living upstream.

The situation mentioned above is a form of unequal perception of the parties. People living upstream strongly believe that the activities of planting trees, maintaining water absorption areas, and maintaining water catchment areas are very influential in maintaining water quality and quantity. However, many of those living downstream are not fully aware of whether the efforts made by the upstream community really have an influence on the quality and quantity of water they obtain.

Meanwhile, the people in the central part also show a sense of self-doubt about their own role, whether they are in an area that plays a role in maintaining water resources as large as the upstream community or as a beneficiary, and at the same time who is obliged to pay for the water services obtained.

In addition, the water utilization companies are also still not ready to declare that they are the parties who are obliged to contribute to the water they obtain. This is shown by the attitude and commitment shown to be inconsistent and tend to change. However, the interest in always participating in the formulation of agendas of water resources protection agreements has never been quiet, and is attended by interested parties.

4.2 The characteristics and perception of actors: who and what

The characteristics of upstream communities basically have the choice of land use that exists now as a main need to obtain economic benefits, and at the same time support the sustainability of hydrological functions. Most people state that they want to change land use, the choice of types to be developed is generally in the form of garden plants, namely coffee, cloves, durian, pecan/candlenut, jabon, teak, or types given to government programs, such as mahogany for land recovery and rehabilitation programs.

Community in the downstream area revealed the perception that describes the awareness that water is very important for the survival of various aspects of life. From the economic importance in the Labuan Bajo area, which is very dominant in tourism, the availability and quality of water services for tourists in hotels, restaurants, and tourist boats is very important. There are several actors who are interested in PES Mbeliling. The actor faces challenges related to PES implementation. The first actor is the farmer community or land users in the Mbeliling landscape, the second actor is the water management party from a state institution called PDAM, and the third actor is a policymaker who is authorized with governance, and besides that, there are private parties who use water for business. Each actor has a different perception of PES according to its characteristics [17]. The perception of people living in the upstream watershed towards the condition of water availability in terms of availability

ranges from sufficient to very good, and the quality is still good at this time. This proves that the current condition of land cover is quite supportive of water availability; besides that, the population of upstream areas is relatively small.

The downstream communities have not explicitly stated their willingness to contribute to the management of PES by the upstream communities. Based on the regional regulation, the Regional Drinking Water Company /PDAM is the only party that has the right to hold and distribute clean water from water resources to consumers. The parties have the same point of view that PDAM is a potential party to carry out the role of collecting/collecting contributions to water environmental services.

Some of the issues that arise at the level of actors' characteristics and perceptions are those related to the management of the Mbeliling landscape ecosystem; **the first**, most (approximately 60%) of the Mbeliling landscape area is community land with various forms of use; While the rest is in the form of state forest areas. Efforts to preserve water environmental services from the landscape are influenced by the form of decisions on land use choices by communities in the upstream area. Whether the land use practiced by upstream communities today can be maintained toward the sustainability of water environmental services?.

This is related to the economic benefits of land use obtained by upstream communities, and whether there is support or incentives from parties, especially water users in the downstream area, so that upstream communities can maintain and improve their land management for the sustainability of these water environmental services. Water users in the downstream area face challenges in the form of continuity of water supply with adequate quality. PDAM is an institution that has the right to manage and service the community's water needs. The current condition of PDAM is that the ability to supply water is still very limited to meet about 29,107 consumer needs. At this time, in terms of the potential water supply from the Mbeliling landscape, there are quite a lot of existing springs. There is limited ability for PDAMs to distribute water from springs or distribute it to customers. Another potential challenge is the sustainability of water environmental services, which are closely related to land management, especially in the upstream area.

The second issue and perception that arises is the shift in water use cooperation between communities and multiple stakeholders. While such cooperation initially fosters strong local engagement, the sustainability of these agreements often becomes unclear when water management is later taken over by the local government. This transition can lead to confusion, weaken community ownership, and disrupt previously effective arrangements. In contrast, models like PAMSIMAS (Program Penyediaan Air Minum dan Sanitasi Berbasis Masyarakat / Community-Based Water Supply and Sanitation Program) demonstrate how water management that is organized *from, by, and for* the community can function effectively, ensuring both sustainability and local accountability.

However, while PAMSIMAS provides a promising model, its implementation does not always run optimally. Likewise, in this area, several initiatives have been made to institutionalize water environmental services at the Mbeliling landscape level, but due to various factors, these efforts have not been able to run effectively.

The third issue and perception is related to the support of data that shows that the relationship between land cover conditions and water yield conditions is still very limited. This is a challenge for the parties to monitor and evaluate the development of water environmental services

4.3 The scheme and governance structure: who and what role

The current institutions and institutional systems are shown in the figure below. Each cooperative has its own role. This scheme and institutional form are made based on the

aspirations of interested parties. The combination of the roles created is from administrative management, technical, implementation of activities, and organizational policy direction.

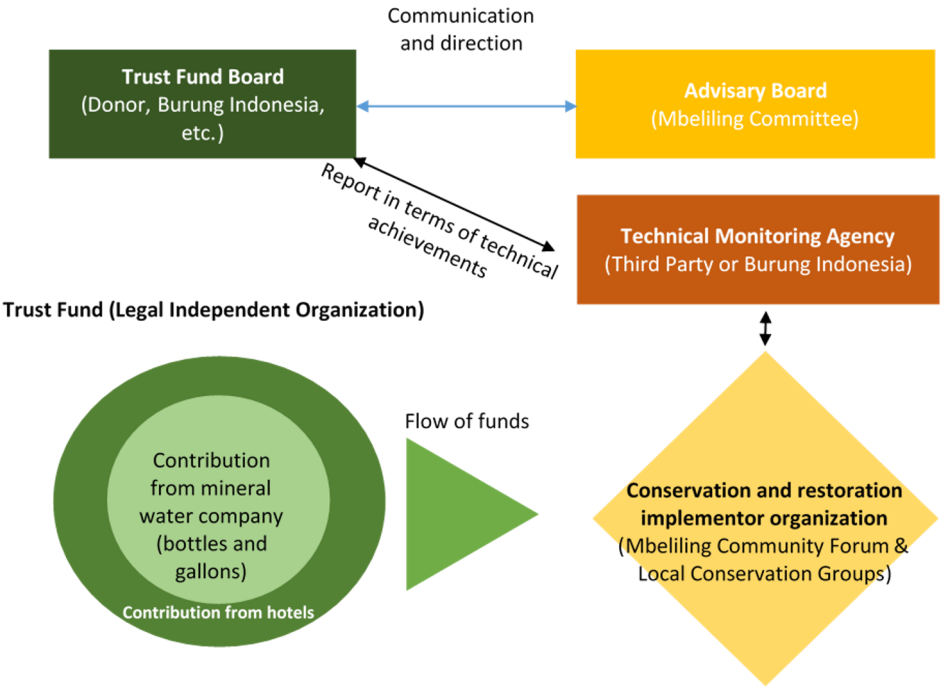

Fig 4. Scheme and Governance Structure

1) Trust Fund

An independent, legally recognized institution with a bank account to collect funds from companies that join the trust fund (water companies, PDAMs, hotels, etc.) and donors. It also plays a role in distributing funds to conservation and restoration organizations. This requires a person or team to administer the entire process on a day-to-day basis.

2) Advisory Board

This role may be undertaken by the Mbeliling Committee to represent the views of stakeholders in the Mbeliling landscape. They will review reports from technical monitoring agencies and consult regularly with the Trust Fund Management. This way, they will provide input into the evolution of the conservation and restoration program design. They can also raise any concerns that the Trust Fund Board considers important.

3) The Trust Fund Managing Institution/ lembaga pengelola dana

This body makes strategic decisions and approves activity plans and annual budgets. Also, depending on the legal status of the Trust Fund, these boards may also be trustees or contributors to the trust fund. So, not all trustees will sit on the Trust Fund Board.

4) Conservation and Restoration Implementing Organization/lembaga pelaksana konservasi dan restorasi

The organization that will play this role is the Local Conservation Group (CDG) or other community groups that will receive funding from the Trust Fund to implement conservation and restoration activities in the Mbeliling landscape. They are responsible for preparing reports and information for the Technical Monitoring part on the activities that have been

implemented. Technical Monitoring Organization about the activities that have been implemented.

5) Technical Monitoring Organization/lembaga pemantau teknis

This is a technically qualified organization that could be a third party (to ensure independence), or Burung Indonesia (if sufficient funds are available or not). Ensure independence, or Burung Indonesia (if sufficient funds are available or no third party is available). In the absence of a third party. They are responsible for monitoring the implementation and results achieved by organizations implementing conservation and restoration activities.

4.4 The determinants of participation; the framework based on one vision

The perception of people living in the upper watershed of the condition of water availability in terms of availability ranges from adequate to very good, and the quality is still good. This proves that the current land cover conditions are quite supportive of water availability, in addition to the relatively small population of the upstream area. People living in the downstream watershed (Labuan Bajo) have a perception that the quality of PDAM water is good, but the availability is poor. Perceptions of the availability of river water are relatively good (64%), while the quality is also quite good (55%).

Regarding watershed management, the community in the upper watershed has already agreed on some points of commitment, expressing their common vision and goal. Those agreement was compiled in one document, namely the Village Resources Management Agreement (VRMA). VRMA not only includes point of commitment regarding natural resources but also include other livelihood resources.

In general, content of VRMA looks like in the following table:

Table 1. Village Resources Management Agreement

<table>
<tr><th>Nature Resources</th><th>Human Resources</th><th>Financial Resources</th><th>Social Resources</th><th>Phisic Resources</th></tr>
<tr><td>Grassing area management</td><td rowspan="2">Skill and knowledge in sustainable agriculture</td><td>Cooperatives</td><td>Local wisdom called “gotong royong”.</td><td>Education facilities</td></tr>
<tr><td>Customary forest</td><td>Business capital disbursed by government</td><td rowspan="3">Community organization for water provision</td><td>Health facilities</td></tr>
<tr><td>Water spring</td><td rowspan="2">Skill in saving and loan management</td><td></td><td>Roads</td></tr>
<tr><td>Rivers</td><td></td><td>Village market facility</td></tr>
<tr><td>Non timber forest product</td><td>Distribution of teachers and medical personnel</td><td>Saving and loan business</td><td>Community organization for irrigation management</td><td>Clean water facility</td></tr>
<tr><td>Community mining</td><td></td><td></td><td></td><td>Irrigation facility</td></tr>
</table>

Tourism object	Skill in tourism management		Community forest monitoring	
Wildlife			Sanitation	
Sacred place			Livestock management	
Agriculture land			Farmer group	
State forest area				

Table 1 above shows five resources that are agreed upon with the community to manage resources. The five resources are natural resources, human resources, financial resources, social resources, and physical resources or infrastructure. The five components of the resource were jointly identified in their status at the time the agreement was built. Thus, the public can know and be aware of the existing situation. The existing situation is then used to plan actions for good management.

5 Result

It is good to know that land use within the landscape, especially in the respective watershed area mostly stable, and this trend must be kept sustainable. It means that in order to keep the stabilization of water discharge, it is necessary to improve the quality of practices in each type of land use. The increase of agroforestry practices in the upstream, although dominantly driven by the trend to follow market demand, nevertheless agroforestry practice has a significant impact on ecology in the upstream, especially for water discharge. This thing is important to bear in mind for the downstream community. The downstream community needs to think about an "award" or an incentive for the upstream community to make this practice bigger in quantity, quality, and continuity.

Governance is one of the most important challenges to implementing the PES scheme, mostly because this scheme will manage public funds. Corruption is still one of the issues that is considered by stakeholders, they certainly refer to their own experiences in the past. It is necessary to provide an example or prototype of an organization that is able to manage public funds professionally and transparently to make them trust that the PES scheme is a possible opportunity.

A common understanding of the downstream community and the upstream community will lead to a common goal, a common vision, and common action for sustainable water resources management. This includes technical knowledge regarding land management, the water cycle, sustainable agriculture, etc. Action to date:

a. Extent of sustainable agriculture practices in the upstream area
b. Documenting various practices of the upstream community that support soil and water conservation.
c. Publish the documentation as a way to raise public awareness
d. Capacity building for "Forerunner Organization," the existing organization now called SiALIR, to be able to act as a Trust Fund Organization in the future.
e. Involving the private sector in various events related to biodiversity conservation, tree planting, etc., as part of raising awareness.
f. Promoting and extending agroforestry practices for the upstream community

g. Pioneering Water Care Company

Besides, this study found the opportunity, challenges, and strategy

a. Basic understanding of parties regarding the importance of Mbeliling as a very important area for water conservation to support the life of the community in town and villages, is a strategic starting point.
b. Dualism of payment could occur since water consumers pay for water to the PDAM. Some consumers think that the PDAM bill is partly responsible for the downstream community for water conservation.
c. Raising awareness is a key strategy since PES in the initial stage is developed as a voluntary scheme.

6 Conclusion

Based on the situation, the management of catchment areas needs an integrated approach, involving all stakeholders. For broader involvement, it certainly presupposes a comprehensive understanding of the social and technical dynamics that occur in the catchment area. With this understanding, it will be known the strategic steps that are embraced and the technical approaches that must be taken by stakeholders.

The downstream community needs to understand and give appropriate appreciation to the efforts of the upstream community in carrying out conservation in the catchment area. Support and appreciation for the upstream community are needed to ensure that they can work more widely, work longer, and work better through activities that are economically efficient but have an ecological impact.

This upstream and downstream cooperation is still at the initiation point, and the road will still be long. However, the existence of an institutional trust fund can be a good start to consolidate all existing potential, both financial and human resources

References

1. J. Sheng and H. Yang, Collaborative models and uncertain water quality in payments for watershed services: China's Jiuzhou River eco-compensation. Ecosystem. Services. **70**, 101671 (2024)
2. R. M. Dextre, M. L. Eschenhagen, M. Camacho Hernández, S. Rangecroft, C. Clason, L. Couldrick, and S. Morera, Payment for ecosystem services in Peru: Assessing the socio-ecological dimension of water services in the upper Santa River basin Ecosystem. Services. Journal of Hydrology **56**, (2022)
3. Y. Fu, J. Zhang, C. Zhang, W. Zang, W. Guo, Z. Qian, L. Liu, J. Zhao, and J. Feng, J. Hydrol. Payments for Ecosystem Services for watershed water resource allocations **556**, 689 (2018)
4. A. Lomeu, A. Shukla, S. Shukla, G. Kiker, C. L. Wu, G. S. Hendricks, E. H. Boughton, R. Sishodia, A. C. Guzha, H. M. Swain, P. J. Bohlen, D. G. Jenkins, and J. E. Fauth, Using biodiversity response for prioritizing participants and service provisions in a payment-for-water-storage program in the Everglades basin Journal Hydrology. **609**, (2022)
5. F. A. Taye, M. V. Folkersen, C. M. Fleming, A. Buckwell, B. Mackey, K. C. Diwakar, D. Le, S. Hasan, and C. Saint Ange, The economic values of global forest ecosystem services: A meta analysis Ecol. Econ. **189**, 107145 (2021)
6. H. Suich, M. Lugina, M. Z. Muttaqin, I. Alviya, and G. K. Sari, Payments for ecosystem services in Indonesia. Oryx **51**, 489 (2017)

7. K. Wisnubroto, Portal Inf. Indones. (2024)
8. I. Machar, Sustain. **12**, (2022)
9. Hendrayanto, Bahruni, and Endrawati, laporan akhir kajian hidrologi bentang alam mbeliling : hasil valuasi air di das nae / mese burung indonesia (Labuan Bajo, 2015)
10. M. A. Sultana, A. R. Sunny, M. A. Hussain, M. R. Islam, A. Raposo, S. A. Al Shiam, A. M. Foysal, M. Nahiduzzaman, M. Kunda, M. Ashrafuzzaman, H. Han, and S. H. Prodhan. Beyond economics: The multitude of benefits from ecosystem services in the Meghna River basin, Regional. Studies. Marine. Science. **81**, (2025)
11. M. Merei, Empowering communities for sustainable water management: Insights from Justdiggit and the Paani Foundation E3S Web Conf. **550**, 0 (2024)
12. F. E., *Payments for Ecosystem Services (PES): A Practical Guide to Assessing the Feasibility of PES Projects* (2014)
13. K. Hagedorn, Can the Concept of Integrative and Segregative Institutions Contribute to the Framing of Institutions of Sustainability?. Sustainability. **7**, 584 (2015)
14. J. Dlouh, J. Vvra, M. Pospíšilov, and Z. Dvořkov Líškov, Role of Actors in the Processes of Sustainable Development at Local Level—Experiences From the Czech Republic. Front. Sustain. **3**, (2022)
15. L. Hanssen, L. H. Leemans, M. S. Engel, M. van der Geest, L. P. M. Lamers, A. J. P. Smolders, B. I. van Tussenbroek, E. Rouwette, M. J. A. Christianen, and M. M. van Katwijk. Early stakeholder involvement using Group Model Building to identify ecological research questions and nature management options. Marine Pollution. Bulletin. **209**, 117179 (2024)
16. D. Huang, C. Liu, Z. Yan, and A. Kou. Payments for Watershed Services and corporate green innovation. International Review Economics and Finance. **87**, 541 (2023)
17. B. Megyesi, A. Gholipour, F. Cuomo, E. Canga, A. Tsatsou, V. Zihlmann, R. Junge, D. Milosevic, and R. Pineda-Martos. Perceptions of stakeholders on nature-based solutions in urban planning: A thematic analysis in six European cities, Urban For. Urban Green. **96**, (2024)